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Editors

T. Pullaiah | K. V. Krishnamurthy | Bir Bahadur

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Volume I

Eastern Ghats and Deccan

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Edited by

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LIST OF ABBREVIATIONS

AICRPE	All India Co-ordinated Research Project on Ethnobiology
AQUAD	analysis of qualitative data
AR	aerial roots
AR	augmented reality
ASHRAM	*Abhayaranya Samrakshan* through Holistic Resource (Array) Management
ASI	Ancient South Indian
AVP	Arya Vaidya Pharmacy
B	bulbs
BDM	Biodiversity Data Management
BMDP	BioMeDical Package
BP	before the present
Br.	bark
BTIS	Biotechnology Information System
C	corms
CADAS	computer-assisted data analysis
CAQDA	computer-assisted qualitative data analysis
CBRs	Community Biodiversity Registers
CCRAS	Central Council of Research in Ayurveda and Siddha
CCRUS	Central Council of Research in Unani Medicines
CFM	Community Forest Management
CPD	Centre of Plant Diversity
CSL	Citation Style Language
DDS	Deccan Development Society
EGMB	Eastern Ghats Mobile Belt
ENVIS	Environmental Information System
EPTRI	Environmental Protection, Training and Research Institute
ERIS	Environmental Resources Information System
FAO	Food and Agricultural Organization
Fl.	flowers
Fr.	fruits
FRIS	Farmers' Rights Information Service
FRLHT	Foundation for the Revitalization of Local Health Traditions
G	gum

IIA	International Institute of Ayurveda
IBIN	Indian Bioresource Information Network
IGCMC	Indira Gandhi Conservation Monitoring Centre
IKS	indigenous knowledge system
In.	inflorescence
INMEDPLAN	Indian Medicinal Plants National Network of Distributed Database
IPBN	Indigenous People's Biodiversity Network
IPC	International Patent Classification
IPR	intellectual property rights
ISMH	Indian Systems of Medicine and Homeopathy
ITDA	Integrated Tribal Development Agency
ITK	indigenous traditional knowledge
IUCN	International Union for Conservation of Nature
JFM	Joint Forest Management
JNTBGRI	Jawaharlal Nehru Tropical Botanical Garden and Research Institute
KKSKT	Kerala Kani Samudaya Kshema Trust
KWIC	key word in context
L	leaves
MAB	Man and Biosphere Programme
MPCAs	Medicinal Plant Conservation Areas
MSSRF	M.S. Swaminathan Research Foundation
MVP	minimum viable population
NBPGR	National Bureau of Plant Genetic Resources
NBRI	National Botanical Research Institute
NBSAP	National Biodiversity Strategy and Action Plan
NIC	National Informatics Centre
NIF	National Innovations Foundation
NTFPs	non-timber forest produces
OCR	optical character recognition
P	pith
PCNM	principal coordinates of neighbor matrices
PGR	Plant Genetic Resources and Commission on Plant Genetic Resources
PIC	prior informed consent
PTG	primitive tribal groups
PVPFR	Plant Variety Protection and Farmers' Rights
QDA	qualitative data analysis
QDAP	qualitative data analysis program

R	root
Rh	rhizome
RRL	Regional Research Laboratory
S	seeds
SAS	statistical analysis system
SPSS	statistical package for the social sciences
SRISTI	Society for Research and Initiatives for Sustainable Technologies and Institutions
St	stem
T	tuber
TDTK	Thiruvananthapuram Declaration on Traditional Knowledge
TK	traditional knowledge
TKDL	Traditional Knowledge Digital Library
TKRC	Traditional Knowledge Resource Classification
TKS	traditional knowledge system
Ts	tender shoots
UNMC	University of Nebraska Medical Center
WHO	World Health Organization
WIPO	World Intellectual Property Organization
WP	whole plant

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PREFACE

Humans are dependent on plants for their food, most medicines, most clothes, fuel and several other needs. Although the bond between plants and humans is very intense in several 'primitive' cultures throughout the world, one should not come to the sudden and wrong conclusion that post-industrial modern societies have broken this intimate bond and interrelationship between plants and people. Rather than, plants being dominant as in the 'primitive' societies, man has become more and more dominant over plants, leading to over-exploitation of the latter, and resulting in a maladapted ecological relationship between the two. Hence a study of the relationships between plants and people-ethnobotany and, thus, between plant sciences and social sciences, is central to correctly place humanity in the earth's environment. Because ethnobotany rightly bridges both of these perspectives, it is always held as a synthetic discipline.

Most people tend to think that ethnobotany, a word introduced by Harshberger in 1896, is a study of plants used by 'primitive' cultures in 'exotic' locations of the world, far removed from the mainstream people. People also think wrongly that ethnobotany deals only with non-industrialized, non-urbanized and 'non-cultured' societies of the world. Ethnobotany, in fact, studies plant-human interrelationships among all peoples and among all. However, since indigenous non-western societies form the vast majority of people now as well as in the past, a study of their interrelationships with people becomes important. More than 10,000 human cultures have existed in the past and a number of them persist even today. They contain the knowledge system and wisdom about the adaptations with diverse nature, particularly with plants, for their successful sustenance. Thus, ethnobotanical information is vital for the successful continuance of human life on this planet.

Ethnobotany is of instant use in two very important respects: (i) indigenous ecological knowledge, and (ii) source for economically useful plants. The first will help us to find solutions to the increasing environmental degradation and the consequent threat to our biodiversity. In indigenous societies biodiversity is related to cultural diversity and hence any threat to biodiversity would lead to erosion in cultural diversity. Indigenous cultures are not only repositories of past experiences and knowledge but also form the frameworks for future adaptations. Ethnic sources of economically useful

plants have resulted in serious studies on bioprospection for newer sources of food, nutraceuticals, medicines and other novel materials of human use. Bioprospecting has resulted in intense research on reverse pharmacology and pharmacognosy. This has resulted in attendant problems relating to intellectual property rights, patenting and the sharing of the benefits with the traditional societies who owned the knowledge. This has also resulted in serious documentation of traditional knowledge of the different cultures of the world and to formalize the methods and terms of sharing this traditional knowledge. It has also made us to know not only *what* plants people in different cultures use and *how* they use them, but also *why* they use them. In addition it helps us to know the biological, sociological, cultural roles of plants important in human adaptations to particular environmental conditions in the past, present and future.

This series of the five edited volumes on ethnobotany of different regions of India tries to bring together all the available ethnobotanical knowledge in one place. India is one of the most important regions of the old world and has some of the very ancient and culturally rich diverse knowledge systems in the world. Competent authors have been selected to summarize information on the various aspects of ethnobotany of India, such as ethnoecology, traditional agriculture, cognitive ethnobotany, material sources, traditional pharmacognosy, ethnoconservation strategies, bioprospection of ethno-directed knowledge, and documentation and protection of ethnobotanical knowledge.

The present series of five volumes is a humble attempt to summarize the ethnobotanical knowledge of the aborigines of India. The first volume is on Eastern Ghats and adjacent Deccan region of Peninsular India. Published information is summarized on different aspects. Our intention is that this may lead to discovery of many new drugs, nutraceuticals, and other useful products for the benefit of mankind.

Since it is a voluminous subject we might have not covered the entire gamut; however, we have tried to put together as much information as possible. Readers are requested to give their suggestions for improvement of the coming volumes.

ACKNOWLEDGMENTS

We wish to express our grateful thanks to all the authors who contributed their research/review articles. We thank them for their cooperation and erudition. We also thank several colleagues for their help in many ways and for their suggestions from time to time during the evolution of this attractive and readable volume.

We wish to express our appreciation and help rendered by Ms. Sandra Sickels, Rakesh Kumar, and the staff of Apple Academic Press. Above all, their professionalism has made this book a reality and is greatly appreciated.

We thank Mr. John Adams, Senior Research Fellow of Prof. K.V. Krishnamurthy, for his help in many ways.

We wish to express our grateful thanks to our respective family members for their cooperation.

We hope that this book will help our fellow teachers and researchers who enter the world of the fascinating subject of ethnobotany in India with confidence, as we perceived and planned.

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CHAPTER 1

INTRODUCTION

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CONTENTS

ABSTRACT

This chapter introduces the scope and contents of this volume, which deals with the ethnobotany of the Eastern Ghats and adjacent Deccan region of India. The physical features and geomorphology of the study region are briefly introduced. The ethnic diversity, worldviews and belief systems, ethnoecology, ethnotaxonomy, ethnonomenclature, traditional crop biodiversity, utilization aspects of plants of different ethnic communities (food, medicine, veterinary medicinal plants, etc.), documentation, conservation and management of ethnoplant resources, etc. of the study region are briefly introduced. The importance of mainstreaming traditional botanical knowledge of the study region is also emphasized.

1.1 PHYSICAL FEATURES AND GEOMORPHOLOGY OF THE STUDY REGION

It is generally agreed upon that the Indian subcontinent was part of the Gondwanaland, got separated from it, drifted northwards and finally collided with the Asian tectonic plate to position itself as we see it today. The drifting took place by the early Cretaceous period and collision around 50–65 million years ago. The present day Indian subcontinent consists of four geomorphic provinces, each of which is structurally and lithologically distinct and physiographically contrasted; the four provinces also have an altogether different evolutionary history (Valdiya, 2010); the four provinces are: (i) The mountainous Himalayan province that girdles the northern border of the subcontinent; (ii) The flat and expansive Indo-Gangetic plains in the middle; (iii) The plateaus and uplands of peninsular India; and (iv) the coastal plains along the seaboard (Arabian Sea on the West, Bay of Bengal on the east and the Indian Ocean on the south). South of the Himalayan mountains is peninsular India, a shield of Archaean antiquity. Four well-defined crustal blocks, called Cratons (containing the oldest granite rocks) make up this mosaic of peninsular shear zones: (i) The Dharwar Craton (3.20 to 3.40 Ga) in south India, covering parts of Maharashtra, Andhra Pradesh, Karnataka, Goa, Tamil Nadu and Kerala; (ii) The Bastor Craton (3.01 Ga) in central India, covering parts of north west Andhra Pradesh, south west Odisha, Chhattisgarh and north east Maharashtra; (iii) the Singhbhum Craton (3.56 Ga) in eastern India, covering northern Odisha, and south West Bengal; and (iv) The Bundelkhand Craton (3.31 Ga) in north western India covering eastern Rajasthan, southwest Uttar Pradesh and north west Madhya Pradesh.

Each of these cratons have undergone "events of crustal rifting and sagging or shrinking of dismembered blocks, with the attendant volcanism, as well as deformations, metamorphosis, and granatization or charnockitization" (Valdiya, 2010). These processes have resulted in the welding of the crustal blocks into composite rigid cratons. During subsequent geological history these craton regions underwent several other geological and geomorphological changes.

Peninsular India is triangular in shape and the apex of the triangle is at the southernmost end of India (at Kanyakumari). It is about 2,200 km long in the N-S direction and around 1,400 km wide in E-W direction (in the region of greatest width). It consists of three physiographic regions: the mountain ranges on its three sides, the uplands and plateaus, the latter two constituting the longer part within the confines of these mountain regions and the coastal plains along the eastern and western seaboards (Figure 1.1). The peninsular Indian region covered in this book is bordered on the north

FIGURE 1.1 Major mountain systems of India.

by the Vindya-Satpura hill range that trends in the ENE-WSW direction, the Sahyadri hill range that extends 1, 600 km southwards from the Tapti valley to Kanyakumari on the western side and the East Coast hill range, which forms a series of physiographically discontinuous hill ranges on the East. The plateaus enclosed within these three hill ranges are the Deccan plateau. It encompasses practically the plains of Maharashtra (especially the Vidarba region), Odisha, the adjoining parts of the undivided Andhra Pradesh, Karnataka and Tamil Nadu. The average elevation of Deccan is 600 m above msl. Covering the whole of Karnataka, adjoining Tamil Nadu and the undivided Andhra Pradesh is the Mysore Plateau, which is made up of Archaean gneisses, granites and high-grade metamorphic rocks.

The major rivers of the Deccan region are the following: The Mahanadi, which has its source in Dandakaranya near Sihawan Rajpur district, has a length of 857 km, covers an area of 141,600 km^2 and the with a volume of average annual flow of 67,000/66,640 million cubic meters. The Godhavari river has its source at Trimbek Plateau near Nasik and has a length of 1,465 km, a drainage area of 312,812 $km^2$and an annual volume flow of 105,000/118,000 million cubic meters. The Krishna river has its source near Mahabaleshwar (northern Sahyadri), runs for a length of 1,400 km, covers an area of 258,948 km^2 and has an annual volume flow of 62,800/67,670 million cubic meters. The Kaveri river has its origin in Talakaveri at central Sahyadri, runs for a length of 800 km, has an annual water flow of 87,900 km^2 and covers a drainage area of 20, 950 million cubic meters. The Pennar river originates near Kolar district in Karnataka, runs a length of 910 km, has an annual water flow of 55, 213 km^2 and covers a drainage area of 3, 238 million cubic meters.

The east coast (=eastern seaboard) stretches from Athagarh in Odisha to beyond Ramnad in Tamil Nadu. It is about 126 km wide. It is a coast of emergence, characterized by well-defined beaches, many sand dunes and sand spits and many lagoonal lakes associated with backwater swamps. The eastern seaboard is believed to have originated in the post-Cretaceous times and has grown and got modified since then. The shore between Visakhapatnam and Ganjam is a shore characterized by cliffs. Pulicat, Kolleru and Chilka lakes are the most prominent lakes in the east coast.

The most important study region covered in this book is the Eastern Hill range or Eastern Ghats (E. Ghats). These are 'tors' of geological antiquity and are geologically older than the Himalayas and Western Ghats. The Ghats orogeny had happened around 1600±100 million years ago. This hill range that lies on eastern side of the Deccan plateau of peninsular India forms a chain of physiographically discontinuous, elevated hill range that does

not have any structural unity (Krishnamurthy et al., 2014). Many geographers consider the Khondmal hills in Odisha as the northern extremity of E. Ghats, while others consider the Simlipal massif of northern Odisha as the northern extremity. The E. Ghats traverse through the states of Odisha, undivided Andhra Pradesh, Tamil Nadu and parts of Karnataka and finally meet the Nilgiris of W. Ghats in the Moyar valley (Figure 1.2). BR hills form the southwestern extremity of E. Ghats while the southern extremity is near Ramnad in Tamil Nadu. The discontinuity in this hill range is mainly due to the great rivers, mentioned earlier, and the small rivers like Dahuda, Vamsadhara, Nagavalli, Sarada, Varaha, etc. that cut through the range.

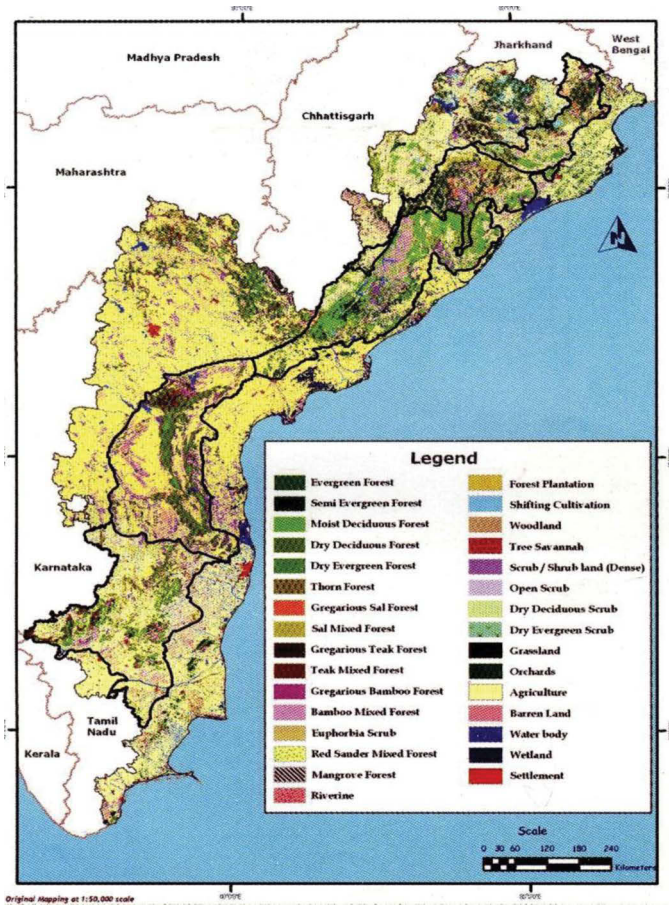

FIGURE 1.2 Four major sections of Eastern Ghats with section 2 divided into two subsections (Source: Murthy et al 2007b [Proc. Nat. Sem. Conserv. Eastern Ghats, 2007, EPTRI]. Used with permission.)

The E. Ghats over an area of about 75,000 km^2, with an average width of about 200 km in the north and about 100 km in the south. A maximum area of about 48% of E. Ghats falls in the undivided Andhra Pradesh, while its area in Tamil Nadu and Odisha is about 25% each and the remaining 2% pass through Karnataka (see Krishnamurthy et al., 2014). The hill range has a length of 1,750 km. the average elevation is about 700 m, though individual peaks may rise up to a height of 1,675 m msl. Most geologists believe that the E. Ghats is geologically heterogeneous in origin: two distinct kinds of hill ranges make up the so-called E. Ghats. The first one (often called the northern E. Ghats runs parallel to the east coast in a N-SW direction up to Krishna valley (Ongole). This is the true E. Ghats and is also called the E. Ghats Mobile Belt (EGMB). The other part runs south of Krishna valley and has hills that are of heterogeneous character. However, in this volume, E. Ghats is been considered to include both these regions, as many others have done earlier. The composite E. Ghats generally is considered to have three major sections: North (North Odisha to Guntur in undivided Andhra Pradesh), Middle (Krishna river to near about Chennai in Tamil Nadu), and South (the rest of the E. Ghats in Tamil Nadu and Karnataka). In Karnataka E. Ghats runs from Bellary, through Chitradurga, Kolar, Tumkar and ends in BR hills. There are 138 major hills in E. Ghats (Krishnamurthy et al., 2014).

1.2 ETHNIC DIVERSITY OF THE STUDY REGION

India is remarkable for its diversity, both biological and human. The Indian subcontinent has about 427 tribal communities (Singh, 1993) with about 62–65 million people (Vinodkumar, 2007), although others speak of 4635 well-defined groups under 532 tribes (of which 72 are primitive including 36 hunter-gatherer tribes). The great ethnic human diversity of India is due to its position at the tri-junction of the African, the northern Eurasian and Oriental realms, as well as to its great variety of environmental regimes. Its plant (and animal) wealth has been continuously attracting humans in many streams starting from about 70,000 to 50,000 years ago, at different historical times and from different directions. This has brought together a great diversity of human genes and human cultures into India and their subsequent mix-up to various degrees. While in other parts of the world the dominant human culture of those parts has been known to absorb or eliminate other cultures that might enter there, the tendency in India, from historic times, has been to isolate and subjucate the subordinated cultures, thereby segmenting the cultural (and thereby the human) diversity (Gadgil et al., 1996). In the light

of this background, the second chapter of this volume contributed by Bir Bahadur et al. provides a detailed account on the ethnic diversity of E. Ghats and Deccan region of India, the ethnobotany of which is the focus of this volume. They have not only explained the origin of the great ethnic diversity of this region, essentially based on the works of Gadgil et al. (1996) and Thangaraj (2011), but also have given details on the various ethnic tribes and their distribution in different parts of the region of study mentioned above.

1.3 WORLDVIEWS AND BELIEF SYSTEMS

Societies, cultures and knowledge systems evolved almost simultaneously with the first establishment of modern human species in different parts of the world all along its migratory routes from Africa. The evolution and establishment of each one of the three was critically dependent on the evolution and establishment of the other two. All the three were not only dependent on the environmental conditions that prevailed in the different places where the human species got settled but also on the threads of culture and knowledge systems that the settling human population already possessed and carried along with it during their migration. Thus, there are two components in their social behavior, culture and knowledge system: one that they had before actually settling down and the other after they got settled to a place. The first component largely explains most, if not all, common aspects of social life, cultures and knowledge systems of the different ethnic societies of the world, however far away they are from each other at present. However, we should not also rule out parallel or independent evolution of certain common components in societal organization, culture and knowledge systems of different ethnic societies of the world.

Hunting-gathering and nomadic society, and cultures and knowledge systems associated with it, were the earliest to evolve as humans were on a constant move during their early migration from Africa, as well as around places of settlement within a reasonably smaller territory until about 10,000 to 12,000 years ago when agriculture and the societies, cultures and knowledge systems associated with evolved and almost replaced the hunter-gatherer culture. It is this hunter-gatherer, short-distance-nomadic populations "settled" on the various migratory routes who have greatly contributed to the evolution of societies, cultures and knowledge systems. These pockets of human population are to be rightly referred to as Indigenous communities. The occupation of new environmental niches by these human societies was initially enabled by the effective tool-making and using abilities,

control over fire and the group-gathering and hunting for food. These adaptations fine-tuned the utilization of the natural resources available around them (Gadgil, 1987). The interrelationship between different members of an ethnic/tribal group, which make social life possible, is called social organization. An ethnic society normally has a territory and is endogamous and is often divided into clans, subclasses/subgroups, etc. each pursuing traditionally a well-defined, similar mode of subsistence and similar levels of access to environmental resources like plants and are egalitarian in nature. The social relationship amongst the members is governed by kinship and mutual help and all of them strive for protecting their environment and its resources and sustainably use them (Gadgil and Thapar, 1990).

The world knows (had known in the past also) a great variety of cultures and civilizations) each with their own knowledge, value and belief systems. Biologists define culture as the acquisition of behavioral traits from conspecifics through the process of social learning (Gadgil, 1987) and, thus culture is one that is learnt. Sociologists define it as that complex whole that includes knowledge, belief, art, morals, law, customs and any other attributes acquired by any one as a member of a society (Tylor, 1874) and thus a culture is a man-made component of the environment (Parthasarathy, 2002). Hence, culture of different ethnic communities is largely dependent on the environmental conditions prevailing in any region, particularly the environmental resources available. It is because of this that cultural diversity and biodiversity of any region go hand in hand, particularly in primitive human locations (McNeely and Pitt, 1985; see also Krishnamurthy, 2003).

The knowledge systems known to traditional/indigenous ethnic societies is called *traditional knowledge system* (*TKS*) or *indigenous knowledge system* (*IKS*). TKS is also referred to by terms, such as *worldviews, cosmovisions* or *beliefsystems*. These three terms actually refer to the different ways of perceiving, interpreting and learning about the world around the people. The different worldviews of different ethnic communities have come to gain knowledge about the world and its environmental components (living as well as non-living) around them, thus resulting in different knowledge contents. Invariably, however, worldview is expressed by conceiving life and the knowledge obtained during a life period in terms of three interrelated and inseparable domains (or worlds or spheres): Natural, Human and spiritual. To a great extent, the ability of an ethnic community to use the local environmental resources like plants is determined by the above worldview. The worldview includes knowledge that is not limited to the world that can be perceived with human senses and can be explained in a rational way, but also to a world beyond human perception. Thus, knowledge, according many

ethnic societies, is a combination of that which is true and that which is believed, and that truth and belief go together. This knowledge is also qualitative, practical, partial, intuitive and holistic. Information relating to worldviews on plants and their validity and importance has largely been obtained through three main approaches (Cotton, 1996): (i) ecocultural approach (ii) cognitive and socio-cultural approach, and (iii) utilitarian or economic approach. The first invokes certain traditional cultural practices, such as sowing, transplanting and harvesting taboos and/or rituals; their importance can only be realized when the relevant cultural influences are known. Despite their culture-specific nature and importance, many traditional cultural practices involving plants may at first glance appear irrational, but in reality they have important functional consequences. The cognitive approach explains how different ethnic communities perceive plants and vegetative types and how such perceptions are influenced by sociocultural factors and spiritual beliefs. This approach also involves rituals/symbolic behaviors that fall in the realm of society, religion, magic, spiritual and supernatural domains. The utilitarian approach records how different species of plants are used as food, medicine or for other materialistic needs of humans and seeks to explain these uses on the basis of modern scientific methods. In Chapter 3, Krishnamurthy explains in detail the worldviews and belief systems of people of the Indian region covered in this book regarding plants and their importance from an ecocultural and sociocultural perspective; this kind of approach has not yet received adequate attention of those who are interested in Western science and its so-called rational (and reductionistic) approach.

1.4 TRADITIONAL KNOWLEDGE ON ETHNOECOLOGY, ETHNONOMENCLATURE AND ETHNOTAXONOMY

Plants were there on this earth long before the evolution of the modern human species. Once on earth, man had to confront all major groups of plants, which had already adapted themselves to diverse habitats/ecosystems of the world, through his own adaptation to the very different environments around him. The knowledge was gained by him gradually during his prolonged period of interaction with the different environments and the diverse plants associated with them. This has resulted in an enormous body of information on traditional knowledge on plants, both wild and domesticated. As already stated, information relating to traditional knowledge on plants and their validity and importance have largely been obtained through ecocultural, cognitive and utilitarian approaches. Traditional knowledge on Indian

plants is both non-codified and codified and cover folk/tribal knowledge. The knowledge on plants as gained in India in historic times is covered under *Vrikshayurveda* (= science of plant life). A thorough understanding of the languages and dialects often are used locally to the correct interpretation of most data/information on plants (Carroll, 1992). A variety of linguistic techniques have been employed so far (Martin, 1995).

The foremost and very important traditional knowledge on plants concerns knowledge on ethnoecology, ethnonomenclature and ethnotaxonomy, the former referring to naming of plants (and animals) around them by ethnic societies, while the third refers to a study of traditional systems of classification of plants (and animals). A critical study reveals that plants were named and classified by almost all traditional societies of the world. According to Malinowski (1974), and many others, satisfying the needs (for food, medicine, etc.) of traditional people is more important in recognizing naming and classifying plants (a materialistic view point). On the contrary, for Levi-Strauss (1966) and some others, the outlook of traditional people towards plants (and animals) is primarily intellectual and cognitive (and a natural urge) and divorced from pragmatic concerns, such as the one mentioned above. Both these perspectives are important in understanding ethnonomenclature and ethnotaxonomy. Ethnoecology concerns the ideas and concepts of ethnic communities on ecology and ecosystems that prevailed around their communities.

Ethnonomenclature and ethnotaxonomy require a deep and critical knowledge on the life of plants (animals) around the different ethnic communities. It also requires several technical/descriptive terms to denote the different structural and functional characteristic of the different plants. Also needed are practical and intuitive knowledge on characters of primary importance, especially identifying sets of contrasting characters, for the diagnosis and classification of plants. In naming plants, linguistic definition has often attained importance. Patterns revealed through linguistic analysis of plant names and categories have often provided clues to the used and other characteristics of plants (Martin, 1995). It is now widely recognized that not all conceptual categories of taxa received linguistic recognition and hence folk taxonomists are now beginning to look only at the *structural* details of linguistically defined nomenclatural and taxonomic systems, but also at their substantive nature (Ellen, 1994). Perhaps the first and detailed ethnonomenclatural and ethnotaxonomic analysis was done by Conklin (1954, 1974). This was followed by a synthesis of general principles by Berlin and his co-workers (Berlin et al., 1973; Berlin, 1992), and a statement on other cross-language patterns in ethnonomenclature and ethnotaxonomy (Brown,

1984, 2000). These aspects are described in detail by Krishnamurthy and John Adams in Chapter 4. These authors have tried to fit in details of nomenclature and classification of ethnic Tamil people into the general principles proposed by Berlin and his group and in the cross-language patterns detailed by Brown.

1.5 TRADITIONAL AGRICULTURAL CROP DIVERSITY

Today, most people depend on agriculture for their daily sustenance. Yet, it is a very recent development in the history of humanity. It is commonly believed that only around 10,000 radio-carbon years ago agriculture started first in South West Asia. The transition from foraging to farming drastically changed the relationship of humans with their environment. Because agriculture allowed more people to be sustained per unit area of cultivable land, it paved the way for a settled human life as well as for the development of towns, crafts, trade, scripts and technologies; there was a drastic cultural, social, and political change as well (Harris, 2005). By about 1500 CE, when Europeans were beginning to colonize other continents, most people of the world were already dependent for their sustenance on agriculture practiced in a variety of environmental systems, except in Australia.

Tracing the exact origin of agriculture (the transition from foraging to farming), at least in some parts of the world, such as Africa, is very difficult, particularly because lack of clinching archaeobotanical records/data. Neither is clear the causes of origin of agriculture. Although several hypotheses, such as the Oasis hypothesis, the Natural habitat hypothesis, the Population pressure hypothesis, the Edge-zone hypothesis, etc. have been proposed in the past to explain the origin of agricultural activity [see Harris (2005) for detailed literature], it is now generally agreed that climate changes, population pressure and technological advancement involving people-plant interaction all have resulted in the origin of agriculture. Once initiated agriculture evolved through the involvement of cultivation, domestication and the establishment of agricultural economies.

The facts relating to the origin, antiquity and sources of agriculture in India are very vexed, hazy and controversial problems (Srivastava, 2008). The earliest evidence of agriculture in the Indian subcontinent is from 8000 years ago from the present (Srivastava, 2008; Jarrige and Meadow, 1980). It started in the Indo-Gangetic region and then got spread to south a little later (see Fuller et al., 2001). Traditional biodiversity knowledge is being studies at three levels: genetic, specific and ecosystem. Traditional

communities throughout the world have been promoting efforts to maintain all these three levels of biodiversity. Maintenance of genetic diversity within a species implies maintenance of that plant species. India is one of the eight centers of origin of crop plant species accounting for about 115 food species and for about 110 non-food species out of about 325 domesticated in India (Krishnamurthy, 2009) out of which about 45 are believed to have been domesticated in Eastern Ghats and adjacent regions (Krishnamurthy et al., 2014). E. Ghats is believed to be a primary/secondary /diffuse center of origin, diversity and spread for rice, pigeon pea, some cucurbits, black gram, banana, mango, jamun, some millets, cow pea, sesame, Okra, green gram leafy amaranths, etc. It also has around 460 out of about 2000 domesticated medicinal plants. Besides, this region is very rich in wild relatives of useful plants. In Chapter 5, Pandravada et al. discusses all aspects related to the diversity of agricultural crops in the region under consideration in this volume.

1.6 UTILITARIAN ETHNOBOTANICAL KNOWLEDGE

It was discussed earlier in this chapter that there are three approaches to the study of ethnobotanical knowledge, one of which is the utilitarian or economic approach (see Cotton, 1996). Harshberger (1896) was perhaps the first to emphasize the strictly utilitarian aspects of ethnobotanical knowledge. This approach involves the collection of knowledge about the uses and management of different plant species as well as about the identification of useful species possessed by the tribal communities although it generally fails to take into account the cultural perception of plants used by different tribal communities, Most protagonists of western science are interested only in the utilization aspects of ethnobotany. The physical structures, the chemical contents and their nutritional, therapeutic and other effects on humans have all enabled the use of plants for various human requirements, such as food, nutraceuticals, medicines, cosmetics, etc. In an age when population is exponentially increasing, man has to find additional/alternate sources of plants for meeting various human needs. Hence it is not surprising that research is mainly aimed at identifying novel plants and plant products that have untapped economic potential and to conserve traditional plant sources. This type of research is known as bioprospecting or geneprospecting (Reid et al., 1993; Sittenberg and Gamez, 1993; Krishnamurthy, 2003). Essentially three methods have been used until now for bioprospecting. The first is the random method, which randomly selects a plant for its probable economic potential. The second is the phylogenetic method, which selected a plant

species for analysis if its related species is already known to have economic value. The third is the ethno-directed method. In this method, attention is specifically focused on plants, which are known to be used by tribal people/ethnic communities, but not yet received wider attention. It is a ready-made knowledge that is sure to yield the desired results in addition to involving less research and development costs; it is also less time-consuming. Hence it is ideal to know and document available information on the various plants used by ethnic communities.

1.7 FOOD PLANTS

The most important utilitarian botanical knowledge relates to food plants. Food is considered the very stuff of life. Along with water and heat, food is the substance and agent of operation and driving force of life. Most, if not all, of the food plants that humans use today have been identified as food plants by the ancient human communities in different parts of the world. It has been estimated that about 70,000 species of plants of the world have been found to be edible by indigenous human societies (Krishnamurthy, unpublished information). However, over the history of humankind on this earth, food and food systems (and their plant and animal sources) have got changed depending on the life-style of people. Hunter-gatherers depended on a tremendous variety of plant food, from tubers and grass seeds to the pith of palms and fleshy fruits. Agricultural-pastoral community tended a much smaller number of plant (and animal) species (around 3,000 species of plants). However, the level of production per unit area from these species is far greater. Such food plant harvests imply an intensification of the outflow of materials from small areas of cultivated and intensely grazed lands. The number of plants depended on as food got drastically reduced as transition from hunting-gathering to specificalized agriculture took place (Gadgil and Thapar, 1990). Thus, the humans gradually became more dependent and specialized for their food supply on a small selection of crops, grains in some parts of the world and on tuber crops and roots in other parts. The traditional foods and food systems, although still survive in many primitive ethnic societies of the world, have been mostly corrupted or altogether replaced in several world communities, gradually in most cases, but quite abruptly in certain others. Globalization and homogenization have replaced local food plants and diet-related chronic disorders and other forms of malnutrition (Kuhnlein et al., 2009). It should, however, be emphazied that the traditional food systems of indigenous communities touch the full spectrum

of life in ways that the present day food systems do not. If something bad happens to the present day food systems and their source plants, we have no other option except to go back to our traditional food sources.

Food is close to the hearts of indigenous peoples and is often suited to their local environmental and cultural conditions. Social networks and cohesion were often involved in traditional food systems. Indigenous peoples' food systems contain treasures of knowledge from the long-evolved cultures and patterns of living in their respective ecosystems. The dimensions of nature and culture that define a food system of an indigenous society contribute to the whole health picture of the individual and the community-not only physical health but also the emotional, mental and spiritual aspects of health, healing and protection from diseases. An impressive array of food species and varieties has been documented and some of these still require botanical identification and nutrient-composition analysis. Equally impressive are the diverse methods that traditional societies have employed in food collection, preservation, processing and cooking. Not all the foods that the ethnic societies used are equal. Some are relished, others only tolerated and still others are loathed, being eaten only when absolutely necessary (Minnis, 2000). Although the greatest scientific attention has been paid so far on the most common and relished food and its source plants, attention need also to be focused on the less desirable foods, frequently called 'famine foods,' 'starvation foods,' 'emergency foods,' or 'queer foods.' In Chapter 6, Sadasivaiah and Pullaiah discuss on the various aspects of ethnic food systems and their source plants. It is evident from their discussion that many tribal food plants have been domesticated; yet there are several others that need to be further researched on their potential to be added to the principal food sources of mainstream people. Also needs to be researched is whether 'famine' or 'starvation' food plants mentioned in this article are once commonly used food plants, as per the suggestions of Minnis (2000).

1.8 MEDICINAL PLANTS

Plants are known not only to have nutritive value and to providing a long life, but also are known to be important allies in the curing of ailments and as antidotes for poisons. Plants also save humans from ailments. The traditional people's wisdom is that there is no herb (=plant), which does not possess medicinal properties (Zimmer, 1935). Most, if not all, human diseases now known were also known to ancient people, although in different names. Ancient medical knowledge is available in the form of both

non-codified folk medicine and of codified medicine. Traditional (also often called alternate or complementary medicine) medicine was particularly well developed in India, China, Tibet, Greece, Egypt and other Arab countries and in many traditional societies of other parts of the world. Although the power of plants is certainly due to the actual physiological processes of healing, for traditional societies it equally seems that their ritual principles of similarity, for example, to "sympathetic" transformations, wherein the appearance, location, or other properties of plants (for example the *panchabhuta* or five-element nature) are directly related to the medical problems at hand.

The tribal communities have a tremendous depth of knowledge regarding the use of natural medicinal resources, including plants. The tribals, in India alone, use over 7,500 to 9,000 species of plants as medicines and nutraceuticals; similarly the codified traditional medical systems of India, such as Ayurveda, Siddha, Unani, etc. use around 8,000 species of plants. An integral component of tribal medicine is its association with shamanism. A *shaman* or *poojari* is a person regarded as having access to, and influence in, the world of benevolent and malevolent spirits; he typically enters into a trance state during a ritual, and practices divination and healing. Shamans are said to treat ailments/illness by mending the soul, while at the same time prescribing ritually sanctified herbals or their extracts/juices. Shamanism cannot be strictly defined as medicine, although healing is its main objective. Shamans have a vast knowledge on the medicinal properties of plants. Thus, tribal medical system effectively combines belief systems and medicinal properties of plants.

In Chapter 7, Karuppusamy and Pullaiah have given an elaborate account on the ethanomedicinal plants of Eastern Ghats and the adjacent Deccan region of south India. They have not only given a detailed list on medicinal and aromatic plants but also the ailments for which these medicinal plants are used. Also given in this chapter are the accounts on the indigenous medicinal systems followed in this region as well as on the major types of medical formulations used.

1.9 PLANTS OF ETHNOVETERINARY IMPORTANCE

India is blessed with a very rich animal biodiversity. It is also one of the important centers of animal domestication. Animal domestication, particularly of cattle, was perfected predominantly by the pastoral people, generally called *Yadavas* (in ancient Tamil country these people were known

as *Idaiyars* or *Konars*), who were generally nomadic and pastoral initially but were settled subsequently. India is known to have 30 indigenous cattle breeds, 12 buffalo breeds, 20 breeds of goat, 40 breeds of sheep, 6 breeds of horse, 8 breeds of camel, 3 breeds of pig, 18 breeds of poultry (Aruna Kumara and Anand, 2006), and many breeds of dogs and cats. Farmers use livestock and many other animals as a source of milk, manure and fuel, as draft animals for plowing and carting, and as a source of animal protein; some are treated as pets. The most important breeds of cattle in the region covered in this book are Amruthmahal, Hallikar, Krishna valley, Ongole, Punganur, Baragur, Kangayam, Manapparai, Malaimadu, Pulikkulam, Toda buffalo, etc.

Traditional communities paid a good deal of attention to animal husbandry which included breeding, feeding and maintenance, and preventing and curing diseases that may afflict domesticated animals or livestock. Fodder from wild and cultivated resources was given importance in feeding domesticated and in attracting game animals. Indeed, many traditional communities demonstrated a considerable knowledge of both the nutritional quality of different grazing or forage plant species and the ecological interactions between particular wild species of plants and animals (Krishnamurthy et al., 2014). Traditional communities also paid very great attention to prevention, control and eradication of diseases of domesticated and game animals. Ethnoveterinary medicine is as old as the domestication of animals, and in India and many other tribal localities of the world this medicine is rich and efficient and plays an important social, religious and economic role in the life of traditional societies. It comprises of belief, knowledge, practices and skills pertaining to healthcare and management of livestock (Nair, 2006). More than 250 diseases and their preventive and curative herbs have been known. However, there is a great need for documenting local ethnoveterinary practices as well as to assess these practices and knowledge for their efficacy and safety. There is also a need to revitalize these practices. In Chapter 8, Hari babu et al. discuss and summarize our knowledge of the traditional societies of Eastern Ghats and adjacent Deccan region on local ethnoveterinary practices involving plants.

1.10 PLANTS THAT ARE USED FOR PURPOSES OTHER THAN FOOD AND MEDICINE

Species of plants provide an array of products, other than food and medicine, used by people. Certain of these plants are exploited from the wild,

while others sustain humanity through cultivation. In spite of vast overall development, plant biodiversity as a resource largely remains poorly understood, underexploited and inadequately documented. Knowledge on plant use from indigenous people has not yet been translated into wider use largely because of its non-availability to most people. Other than for food and medicine ethnic communities throughout the world have been exploiting, sustainably, plants around them as sources of horticultural and ornamental plants, timber, fiber, dyes, fuel and other renewable energy and a host of other products used in industry and commerce (Krishnamurthy, 2003). In Chapter 9, Chandrasekhara Reddy et al. have provided a detailed account on the traditionally used plants of Eastern Ghats and the adjacent Deccan region for purposes other than for food and medicine. It is evident from their account that many traditionally-used plants of this region should be brought into mainstream use not only through populationization and cultivation but also through biotechnological tools and techniques.

1.11 CONSERVATION, DOCUMENTATION, AND MANAGEMENT OF TRADITIONAL KNOWLEDGE ON PLANTS

The idea that ethnic knowledge on plant biodiversity is worth conserving rests on several fundamental arguments including nostalgia and human benefits and needs. The innate desire to experience the great pleasure that ethnic plant biodiversity knowledge has given us is part of the nostalgic argument for its conservation, although this nostalgic argument should not push us into construing conservation as an act aimed at considering tribal biodiversity knowledge an untouchable entity. Conservation, on the contrary, should be considered as a philosophy of managing plants and other environmental resources in a sustainable way so that it does not despoil, exhaust, or extinguish the resources and the values and uses they have.

The first and foremost effort towards conservation of traditional knowledge on plants is the serious and effective documentation of such knowledge since most, if not all, such knowledge have all along been passed on from one generation to another, mostly orally. It was possible that valuable information might have been already lost in this process. Documentation should begin at the most local level, for example, at each of the traditional communities of the world. An important example is the initiation of community Biodiversity Registers by Gadgil and his coworkers (Gadgil et al., 1995; see details in Krishnamurthy, 2003). The creation of databases and

Networks on indigenous knowledge is another. As examples we may cite the Indigenous people's Biodiversity Network (IPBN) and SRISTI. Yet another effort is the running of newsletters like the ones on Eastern Ghats, medicinal plants, Seshaiyana, etc. with the help of Ministry of Environment and Forests, Government of India. Mention must also be made on the All India Coordinated Project on Ethnobotany and the National Agricultural Technology Project on germplasms of useful Indian plants as well as books written by various authors on ethnobotanical information pertaining to Indian indigenous communities. Bir Bahadur et al. have given an excellent account on the documentation efforts so far undertaken in Chapter 10.

Traditional communities themselves have been excellent conservators of their own knowledge and resources. Their approach is based more on cultural and social perspectives as well as on belief systems than on political and reductionist western scientific systems. A truly sustainable developmental approach is followed by them with the involvement of the entire community in benefit sharing of the common resources. Participatory resource management and use of the resources owned commonly by the entire community is one such approach. A detailed account on conservation strategies, documentation and management of ethno-knowledge followed for Eastern Ghats and the adjacent Deccan region is also provided in Chapter. These activities are made easy through developments in computer science and information technology in the last two to three decades. Chapter 11 written by Pal and Bir Bahadur deal in detail with computer applications in ethnobotany.

1.12 MAINSTREAMING TRADITIONAL BOTANICAL KNOWLEDGE

Attempts to make a wider use and application of indigenous knowledge system, because of the superiority of the ethno-directed approach, have begun to revolutionize the food, agriculture, health and other consumer sectors. Hence there is an increasing effort to mainstream traditional knowledge, popularize it and to exploit it through Bioprospecting. Such an effort has often resulted in biopiracy and deprivation of the legitimate rights to benefits of traditional societies which own this knowledge (see discussion in Krishnamurthy, 2003). Bioprospecting looks for every valuable traditional genetic and/or biochemical resource that finds use in pharmaceutical, food, cosmetic, agricultural and biotechnological industries either through

bioprocesses unique to the resource or through novel end or byproducts that can be obtained from it. The medical formulations found in codified and non-codified systems of medicine are now getting gradually subjected to phytochemical and therapeutic analysis to understand the chemical bases of their activity through reverse pharmacognosy and reverse pharmacology. The number of plants investigated so far in this way is very few and more traditionally used plants should be prioritized for analysis on a war-footing (Krishnamurthy, 2009). In Chapter 12, Pushpangadan et al. discuss some aspects related to bioprospecting, ethnopharmacology and patenting. The demand for ethnobotanicals is often not with adequate supply of genuine raw materials and is topped up, often, with substitutes or adulterants. As a result, we need standardization of ethnobotanicals through proper authentication using techniques like microscopy, phytochemistry and molecular biology.

1.13 CONCLUSIONS

There is no doubt of the considerable potential benefits that arise from ethnobotnaical research. There is also no doubt that these benefits have considerable importance to the sustainable economic development, particularly of rural areas, in spite of problems that may be associated with ethno-directed developmental projects. India, as discussed in the chapters of this volume, is an ethnobotanically rich country and, therefore, can develop into an economically sound country, if its ethnoresources are adequately conserved and sustainably exploited. It is also very clear from the chapters of this volume that attention needs to be focused in future not only on a utilitarian approach but also on a cultural and cognitive social-cultural approach, so that the development that would be achieved would be definitely holistic and not reductionistic. It is certain that ethnobotany-based development in India would indirectly contribute to the overall development of the whole world. One of the fundamental problems which, however, remains is the protection of the ethnic tribes themselves and also their bundle of rights, including the benefit-sharing rights. The other problem pertains to the standardization of ethnobotanicals using adequate techniques including techniques of ethnogenomics.

KEYWORDS

- **Belief Systems**
- **Deccan**
- **Eastern Ghats**
- **Ethnocrop Diversity**
- **Ethnofood Plants**
- **Ethnogenomics**
- **Ethnomedicinal Plants**
- **Ethnotaxonomy**
- **Worldview**

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CHAPTER 2

ETHNIC TRIBAL DIVERSITY OF EASTERN GHATS AND ADJACENT DECCAN REGION

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CONTENTS

ABSTRACT

This chapter deals with the ethnic diversity of Eastern Ghats and the adjacent Deccan region. Emphasis is laid on the major ethnic tribes of Odisha, Undivided Andhra Pradesh, Tamil Nadu, and Karnataka. Ethnic tribal communities form a fairly a dominant percentage of the population of this area. These communities are the sources and holders of great knowledge on plants of cultural, social and utilitarian value. Not only the evolutionary origin of these ethnic communities, but also their social and cultural life are dealt with.

2.1 ORIGIN OF ETHNIC TRIBAL DIVERSITY

The term "tribe" means a group of people that have lived at a particular place from time immemorial. Anthropologically the tribe is a system of social organization which includes several local groups on lineage and normally includes a common territory, a common language and a common culture, a common name, political system, simple economy, religion and belief, primitive law and own knowledge system. India is culturally, linguistically religiously and ethnically a very diverse country. Hence, "Tribals" are found in almost all the States of India. Tribals constitute 8.14% of the total population of India, numbering 84.51 million (as per 2001 census) and cover about 15% of the country's area. Currently about 540 scheduled tribal communities exist. In terms of geographical distribution about 55% of tribals live in Central India, 28% in west, 12% in north-east India, 4% in South India and 1% elsewhere. These communities are actively working to preserve their rich cultures through broad institutional efforts. The strength of these communities varies from 31 people of Jarwa tribe to over 7 million Gonds. Thus, the Gonds form a very big tribal community, whereas the small communities comprising less than 1000 people include the Andamanese, Onge, Oraon, Munda, Mina, Khond and Saora. India is one among the top few countries with respect to its ethnic diversity (Singh, 1993; Vinod Kumar, 2002). Besides the ancient tribal communities, there is great ethnic diversity even among the mainstream people of India. It is derived from both the ANI and ASI populations (see later in this section for details). Although Hindus constitute the majority, there are also Muslims, Christians, Jains, Buddhists and Parsis. While ancient tribals invariably occupy forested and hilly tracts, the mainstream people occupy plains of India.

It is now more or less clear that the modern human species (*Homo sapiens*) originated in East African near Ethiopia around 200,000 years ago. It is also now known that the modern humans must have lived in Africa twice as long as anywhere else in the world. These details were evident from a study of mitochondrial genome (mt DNA) of females and Y chromosome of males of diverse primitive ethnic tribes of the world. As in the case of the origin of modern human species, its spread to different parts of the world is also deciphered by a study of mt DNA and Y chromosome. The earliest known mutation, which is found in all non-Africans, that helps to detect the human spread outside Africa is M168 in Y chromosome. This mutation had happened around 70,000 to 50,000 years ago (see Carney and Rosomoff, 2009). This mutation was followed by M9, which is common in all Eurasians and which first appeared in Middle East/Central Asia around 40,000 years ago. This was followed by M3 mutation, which arose in all Asian human populations that reached the Americas around 15,000 to 10,000 years ago. What made them to migrate out of Africa when they did so is still an unresolved mystery, although a few hypotheses have put forward (Scholz et al., 2007)

Which route did the modern humans take when they migrated out of Africa? Two paths lay open to Asia: (i) the path that led up the Nile valley, across the Sinai Peninsula and north into the Levant in Middle East. However, genetic data do not support this migration route; and (ii) from the horn of Africa via the mouth of Red Sea into Arabia and from there to central Asia, particularly Kazakhstan. From Kazakhstan humans got spread to other parts of Asia, Europe and Australia. Once in Asia, genetic evidence suggests that the population got split, one moving to Middle East, second to Europe, third to South East Asia and China (eventually reaching Siberia and Japan) and the last to Australia via India. Genetic data also indicate that humans in north Asia migrated eventually to Americas.

Migration of modern human species into India is the most complicated and discussed aspect of human spread. It is a well-known fact that India is remarkable for its rich ethnic diversity, as also for its plant (and animal) diversity. The ethnic diversity is due to India's geographical position at the tri-junction of African, the north Eurasian and the Oriental realms, as well as due to its great variety of environmental regimes. India's biological wealth has been attracting humans in many streams, at different times and from diverse directions of the old world. This had resulted in bringing together a great diversity of human genes as well as human cultures. This had also resulted in the mixing up between different ethnic groups. Hence, it is vital to focus on early human migrations into India in order to correctly

understand the present day ethnic diversity that is seen in any region of the Indian subcontinent.

Gadgil et al. (1996) have made a fairly detailed discussion on the major migrations of humans into India. They speak of four major migrations: (i) the Austric language speakers soon after 65,000 years before the present (BP), probably from the north east; (iv) the Dravidian speakers in several waves after 46,000 years BP; (iii) the Indo-European speakers in several waves after 6,000 years BP; and (iv) the Sino-Tibetan speakers in several waves after 6,000 years BP.

Fairly recently, Thangaraj and his co-workers (see detailed literature in Thangaraj, 2011) have analyzed nearly 16,000 individuals from different ethnic populations of India (including several tribes) with genetic evolutionary markers (medinas and Y chromosome) to understand the genetic origins and structure of the ethnic Indian populations. In another genetic study the same group screened 560,123 SNPs across the genomes of 132 individuals belonging to 25 diverse groups from 14 Indian States (including Andaman) and six language groups. From these studies it was concluded by them that relatively small groups of ancestors founded most Indian groups, which then remained largely isolated from one another with limited cross-gene flows for long periods of time, perhaps 45,000 years BP. They have identified two main ancestral groups in India: (i) an "Ancestral North Indian (ANI)," and (iii) an "Ancient South Indian (ASI)." The first one is directly related to the Middle East, central Asia and Europe, while the second one is fairly indigenous (either not related to groups outside India or had some connection which is not yet established). Based on their studies, these authors have suggested three early major migrations from Africa to India: (i) *via* sea to Andaman; (ii) *via* land to South India through west coast (ASI population); and (iii) *via* land to North India (ANI population). From both ANI and ASI populations, the remaining parts of India were then populated.

2.2 ETHNODIVERISTY

Nearly one tenth of the total population of India lives in Eastern Ghats. According to Chauhan (1998) and Ratna Kumari et al. (2007) 54 tribal communities (nearly 34% of the total population of Eastern Ghats region) occur in Eastern Ghats but according to another estimate there are

62 tribal communities (Swain and Razia Sultana, 2009). In the northern Eastern Ghats alone (Odisha and undivided northern Andhra Pradesh north of Godavari river) 54 tribal communities with about 60,00,000 people have been reported (see Krishnamurthy et al., 2014). According to other estimates there are 63 ethnic communities in Odisha State alone, of which several live in the Eastern Ghats region (Merlin Franco et al., 2004; Sandhibigraha et al., 2007). There are 33 tribes (27 according to Pullaiah, 2001) in the undivided state of Andhra Pradesh with a population of 42 lakhs (Sastry, 2002). Of these 33 tribals, 27 inhabit Eastern Ghats (Ratna Kumari et al., 2007). Some of these tribes are common to Odisha and northern Tamil Nadu. There are 36 tribal communities in Tamil Nadu of which about 10 communities are associated with E. Ghats and adjacent regions. There are five tribals communities that are associated with the E. Ghats of Karnataka. Thus, there is no uniformity in past reports with reference to the number of ethnic communities in Eastern Ghats and the adjacent region and the problem is at least partly due to the fact that some tribes are known by more than one name in different parts of this study region. Most, if not all, traditional ethnic communities of the Deccan region are the earliest inhabitants and autochthonous people of the forest tracts. It is needless to emphasize here that all the ethnobotanical knowledge of this study region are the result of the contributions of these various ethnic tribals groups due to their long interaction with nature. The tribals use a variety of plant species in their daily life and are well-versed with knowledge of edible greens, vegetables, fruits, seeds, medicines and other materials.

This section deals with the most important tribals communities of E. Ghats and the adjacent Deccan region. A detailed list of ethnic tribals associated with E. Ghats is given in Krishnamurthy et al. (2014).

2.2.1 TRIBALS OF ODISHA

Odisha accounts for 3.47% population of India with a population density of 269 as against the national 342 per km^2. Tribals form a major share of Odisha population, have many sociocultural similarities and together they characterize the notion of tribalism. Although as many as 75 tribals have been reported 11 are the most important. Some of these are described here.

2.2.1.1 GONDS

Gonds or Gondi people are a Dravidian people of Central India, spread over the states of Madhya Pradesh, Eastern Maharashtra (Vidarbha), Chhattisgarh, Uttar Pradesh, Telangana and Odisha. With over seven million people, they are the largest tribe in Central India. They are also the most important tribe of Odisha. They are a designated Scheduled Tribe. The Gonds are also known as Raj Gonds. The term "Raj Gond" was widely used in 1950s, but has now become almost obsolete, probably because of the political eclipse of the Gond Rajas. The Gondi language is related to Telugu and other Dravidian languages. About half of Gonds speak Gondi language or 'kui' language while the rest speak Indo-Aryan languages including Hindi. According to the 1971 census, their population was 51.54 lakhs (5,154,000). By the 1991 census this had increased to 93.19 lakhs (9,319,000) and by 2001 census this was nearly 110 lakhs.

The Pardhan Gonds are a clan of the large Gond tribe inhabiting Central India. They traditionally served the larger tribal community as musicians, bardic priests and keepers of genealogies and sacred myths. With declining support for their traditional role, the Pardhan Gonds have adapted to making auspicious designs on the walls and floors of mud huts, acrylic paintings on canvas, pen and ink drawings, silkscreen prints and large-scale murals. Traditionally the Gondi people had a social institution (school) known as Ghotul, a kind of mixed dormitory system for the unmarried youth, which was the main means of education and introduction to adult life.

Gonds go out for collective hunts and eat fruits and roots they collect. They usually cook food with oil extracted from sal and mahua seeds. They also use medicinal plants. These practices make them mainly dependent on forest resources for their survival. Their religion is animistic, and their pantheon of gods includes 83 gods. Kandhamal district in Odisha has a 55% Gond population, and was named after a subtribe.

Dongria Gonds inhabit the steep slopes of the Niyamgiri Range of Koraput district and over the border into Kalahandi and work entirely on the steep slopes for their livelihood. The Niyamgiri Range provides a wealth of perennial springs and streams, which greatly enrich Dongria cultivation. Gonds also occupy northern parts of Telangana and Andhra Pradesh (Figure 2.1).

FIGURE 2.1 Two Gond Women.
(Source: http://indianholocaustmyfatherslifeandtime.blogspot.in/2010/02/unseen-lessons-of-history-taught-by.html)

2.2.1.2 SAVARAS

The Savaras are found inhabiting the Eastern Ghats of Odisha and undivided Andhra Pradesh. Their population is 1,05,465 (1991 census). The total literacy rate among Savara is 13.68. They build their settlements on hill slopes and near hill streams to facilitate easy access to terrace fields, and for fetching water. The most significant feature of the social organization of the Savaras is the absence of clan organization. For all practical social purposes, such as marriage, the group having a common surname is exogamous.

2.2.1.3 BHILS

Bhils or Bheels are primarily an aborigine Adivasi people of Central India, particularly of Odisha. They speak the Bhil languages, a subgroup of the Western Zone of the Indo-Aryan languages (Figure 2.2).

FIGURE 2.2 Bhils tribe.
(Source: http://tribes-of-india.blogspot.in/2008/09/bhils-tribes-of-india.html)

Bhils are divided into a number of endogamous territorial divisions, which in turn have a number of clans and lineages. The Ghoomar dance is one well-known aspect of Bhil culture.

2.2.1.4 BAGATA

The Bagata tribe is regarded to be one of the aboriginal tribes of India. Tribal communities reside in different parts of Odisha and in Northern Andhra Pradesh. Festivals, dance as well as musical bonanza make the culture of these Bagata tribes quite exquisite. Special mention must be made about the Dhimsa dance that has been practiced in the Bagata tribal society. It is a dance form where Bagata tribes of all ages participate quite energetically.

2.2.1.5 MUNDA

Munda tribe mainly inhabits Odisha. Hunting is the main occupation of the Munda tribe. Originally they were living in core forest areas of Odisha but now have been pushed to buffer zones (Figure 2.3).

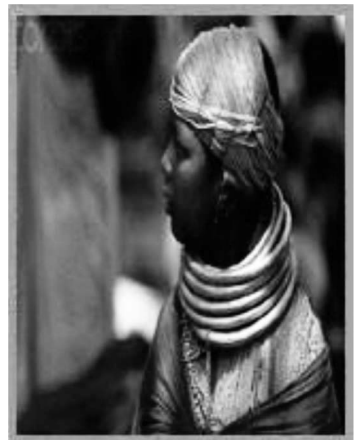

FIGURE 2.3 Munda tribal woman.
(Source: http://tribes-of-india.blogspot.in/2008/10/munda-tribes-of-india.html)

2.2.1.6 SANTHAL

The Santhal tribe is the third largest tribes in India. Belonging to pre-Aryan period, and have been the great fighters, this tribe is found, Odisha, Santhal Tribe take pride in their past. Santhali is the prime language spoken by the Santhal tribe. This tribe also has a script of its own called Olchiki. Apart from Santhali they also speak Bengali, Oriya and Hindi.

2.2.1.7 GADABA

The Gabada tribe is one of the oldest and jovial tribes in India and are located in the southern fringes of the Koraput district. Gadabas are very friendly and hospitable. Their villages are with square or circular houses and conical roofs. The women are well-dressed and are fond of wearing ornaments generally made out of brass or aluminum.

2.2.1.8 JATAYA

Jataya tribe of Odisha is named after the mythological figure Jatayu of Ramayana epic.

2.2.2 TRIBALS OF UNDIVIDED ANDHRA PRADESH

Nearly 70% of the total population of undivided Andhra Pradesh lives in rural and forested areas. More than 35 ethnic tribes have been reported and the most important are discussed in the following subsections.

2.2.2.1 SAMANTHAS

The Samanthas of Visakhapatnam agency are one of the few traditional agricultural communities living in the Eastern Ghats of Andhra Pradesh and Odisha (Sathya Mohan, 2006). They speak "Kuvi," a language which is a brand of Telugu language. Samanthas clear the jungle on hill slopes, burn the trees and grow the crops in the ashes. Podu—the Slash and burn cultivation—is the major livelihood for these tribals. They used to cultivate a plot for six or seven years and leave the land fallow for about 10 years, by shifting their cultivation to another hill slope thus enabling the soil fertility of the old plot. Now-a-days, the fallow period is reduced to two or three years. The podu cultivation is simple and uses only hoe and human labor. Though the crop output is poor and not profitable, slash and burn cultivation is meant for their own survival. The remarkable feature of podu cultivation is that many varieties of cereals and vegetables can be grown in one plot (Figure 2.4).

FIGURE 2.4 (a) Samantha women; (b) Samantha community enjoying festivities through drinking, and smoking (Sathya Mohan, 2006; used with permission from ENVIS Division of EPTRI).

The Samanthas have a strong sense of community living. Each and every activity of the village including festivals is carried out by all the families working in close co-operation with each other and every household

contributes for it. Slash and burn cultivation is initiated with a religious ritual. In February, during the seed festival known as "Biccha Parbu," the Samanthas worship the village Goddess "Jakiri Penu" by offering animal sacrifices. The Samanthas believe that sowing seeds mixed with the sacrificial blood will impress the fertile powers of Nature. They mainly grow dry paddy, ragi (*Eleusine coracana*), *sama* and *oliselu* (*Guizotia abyssinica*) in these fields.

Every family also cultivates kitchen garden crops like chillies, tobacco and vegetables in a small piece of land near their hamlets. Women and children collect minor forest produce of various types, such as edible and herbal roots, tubers and creepers, leaves and fruits. The Samanthas sell most of these products at the weekly shandies and buy commodities like kerosene, oil, salt, ornaments and clothing. Traditionally, the shandies have provided the people with an opportunity to barter their surplus produce. The distribution system earlier was limited to the tribal communities in the shandies of this area. But today, these market places have become the centers for commercial exploitation of the tribals by the traders from the plains.

Their economic activity is interdependent with their religious life, which consists of various Gods and Goddesses, who are symbols of various forces of Nature. They believe in absolute surrender of human spirits to the Natural forces. The availability of food in the jungle, the fertility of the Mother Earth, the rainfall and also the outbreak of epidemics are supposed to be dependent on the mercy /wrath of the respective Gods and Goddesses. In the event of an epidemic the Samanthas propitiate the Goddess of the disease known as "Ruga Penu". After worshipping they ceremonially send the Goddess out of the village. The religious sense of archaic oneness with Nature has characterized the many generations of traditional life among the Samanthas.

2.2.2.2 KOYAS

The Koyas are one of the few multi-lingual and multi-racial tribal communities (Sathya Mohan, 2006). They are also one of the major peasant tribes of Andhra Pradesh and Telangana numbering about 3.60 lakhs in 1981. Physically they are classified as Australoid. The Koyas call themselves "Koithur." The lands of Koithur includes those near the Indravati, Godavari, Sabari, Sileru rivers and the thickly wooded Eastern Ghats, covering parts of Bastar, Koraput, Warangal, Khammam, Karimnagar and the East and West Godavari districts. Most Koyas speak the Koyi language which a blend of Telugu (Figure 2.5).

FIGURE 2.5 Koya men with traditional head gear.
(Source: http://www.storypick.com/27-beautiful-photos-from-different-ethnic-tribes-of-india/)

The story of the Koyas dates back to pre-historic times. They seem to have had a highly evolved civilization in the past in which they were a ruling Tribe. According to the Koya mythology, life originated from water. The friction between the fourteen seas resulted in the emergence of moss, toads, fish and saints. The last saint was God and He first created *Tuniki* (*Diospyros melanoxylon*) and *Regu* (*Ziziphus mauritiana*) fruits. During the 18th century, the Marathas invaded and subverted the Koyas along with the Gonds. The continuous pillage and harassment by the non-tribals resulted in the loss of the vestige of Koya civilization. The Koyas were driven to take refuge in the inaccessible highlands. In this period they were depicted by travelers as treacherous savages.

There are many endogamous sub-divisions among the Koyas of Bhadrachalam agency, such as Racha Koya, Lingadari Koya, Kammara Koya and Arithi Koya. Each group is vocationally specialized having a separate judiciary system, which ensures group endogamy. There are also differences in food habits. Lingadari Koyas do not eat beef and do not interdine with others. They perform purificatory rites to depollute the effects of inter group marriages. The Racha Koyas are village administrators. They also perform rituals during festivals. Kammara Koyas make agricultural implements. They are blacksmiths and are generally paid in kind. Arithi Koyas are bards. They narrate the lineages. They are the oral custodians of Koya mythology. Each of these sub-divisions among the Koyas has exogamous phratries having separate totems, which are again split into a number of totemistic sects, which form the lineage ("velpu") pattern. For example, in Chinthur mandal of Bhadrachalam agency, the Paderu Gatta (phratry) of Racha Koyas worship "Dhoolraj" and their totem is wood. These phratries have a number of totemistic sects each denoted by a name, totem and worshipped by a

group of families having separate names. For instance, Gatta worshippers of Bheemraj are further classified into three groups on the basis of their "Ilavelpulu" (family deities).

The Koyas have a patrilineal and patrilocal family called "Kutum." The nuclear family is the predominant type. Usually, sons in a family live separately after marriage, but continue to do joint cultivation (*Pottu Vyavasayam*) along with parents and unmarried brothers. Monogamy is prevalent among the Koyas. The preferential marriage rules favor mother's brother's daughter or the father's sister's daughter. Generally, the mate is selected through negotiations. But other practices of capture and elopement also exist, involving a simple ritual of pouring water on the girl – the water being the symbol of fertility. There is bride price involved in arranged marriages. Marriage is celebrated for three days. It is not simply an affair between two families. It is an occasion for two villages and all the relatives. Every person carries grain and liquor to a marriage to help the bridgroom's family. Marriages take place in summer when palm juice is abundantly available. The Bison-horn dance is a special feature on the occasion of a marriage ceremony among the Koyas. Birth, marriage and death are the three important aspects of life and each event is celebrated on a grand scale in Koya society. The funeral ceremony among the Koyas is strikingly peculiar. The corpse is carried on a cot accompanied by the kinsmen and villagers including women. They symbolically offer material objects like grains, liquor, new clothes, money and a cow's tail by placing them on a cot besides the corpse and the whole cot is placed on the pyre with the feet towards the west. They generally burn the corpse. The corpses of pregnant women and children below five months old are buried. They have a ceremony on the eleventh day after the death, which is called "Dinalu." At this time they believe that the spirit of the dead comes back and resides in the earthen pot called "Aanakunda." The occasion of death is a common concern in which all the relatives share the burden and expenditure of the family of the deceased. After the ceremony is over, they sing, dance and have a feast.

The major forest species exploited by Koyas are teak, bamboo, maddi (*Terminalia alata*) and cashew. The minor forest produce includes beedi leaves (*Diospyros melanoxylon*), gum, honey and tamarind. Sorghum is the staple crop and rice and tobacco are grown along the river banks.

There are 89 Koya villages and a small town in Chintur mandal with a population density of 123 persons per sq.km. Agriculture is totally dependent on rains. Owing to small land holdings (the average land-holding per family is 2.0 acres wet and 4.1 acres dry land) and no irrigation facilities, about 55% of the families continue practicing slash and burn (podu) cultivation,

while 10% of the population is landless. Due to the limited availability of land for cultivation, total dependence on rain for irrigation and the growing population pressure over the Koyaland, the agriculture activity of the Koyas has become predominantly a subsistence way of farming. The ecological surroundings – especially forests – provide the Koyas with food, beverages, fodder, shelter and medicinal herbs.

Though the Koyas are farmers by occupation, most of their food supplies are drawn from the forest. Roots and fruits form their subsidiary food. They eat *Keski dumpa* and *Karsi dumpa*, which are the common roots available in this region. They cut these roots into pieces, keep them in running water for three days and boil them to make them edible. During drought years the Koyas go in groups into the forest to collect these roots in large quantities. Their staple diet is sorghum. They grow several varieties of sorghum (*Konda jonna, Pacha jonna*, etc.) and a few pulses. Rice is also grown in a few wetlands.

The Koyas also collect various forest products to supplement their meager agricultural returns. They sell these products in the weekly shandy and buy other required commodities. There is no other monetary transaction among the Koyas except in the shandy. On the whole only 0.4% of the agricultural produce is sold.

Joint cultivation, known as "Pottu Vyavasayam" is a common practice among the Koyas. Landless families go with their agricultural implements and join those who own land. The yield is shared between the landowner and others who have contributed labor. This practice ensures unity within the group and avoids further division of land holdings.

The Koyas are expert hunters and the good hunters are looked upon as heroes. For the Koyas, hunting is an essential skill for food as well as for defense from wild animals in the forest. On the occasion of the "Vijja Pandum" (the festival of seeds), Koyas go hunting in groups. Fish is another important food for the Koyas. In villages near rivers, quite often fish is a meal for every family. They ensure fair share of fish to all. The Koyas use various types of nets tied to bamboo poles, which are used in still waters.

During the toddy palm season, every Koya family lives mainly on palm juice for almost four months. For them palm juice is not just a beverage, but also a complete food. On an average, every Koya family owns at least four to eight palm trees. Palm juice is consumed three to four times a day in large community gatherings known as "gujjadis." The Koyas consider the palm tree as a gift of nature and to secure this gift they worship the village Goddess "Muthyalamma." On all social and religious occasion, liquor plays an important role among the Koyas. The "Ippa Sara" or the mohuva drink

(*Madhuca longifolia*) is purely an intoxicating beverage. The Koyas consume mohuva liquor to get relief from the physical hardship of the day and to withstand extreme variations in the climate.

The houses are built within one's own agricultural land. These are rectangular and are built of the material that is available from the forest. These houses are constructed on an elevation of two to three feet with walls made of bamboo, plastered with mud and roofed with palm leaves. They are leakproof, quite warm during winter and cool during summer. Most of their festivals are related to agricultural operations. Kolupu is one such occasion, which comes during November. The Koyas worship the Earth-Goddess "Bhudevi" and they enlist the co-operation of the Goddess by offering animal sacrifices during the festival. They believe that sowing seeds that are soaked in sacrificial blood brings them good crops. The Koyas deify their ancestors and worship them on all social occasions. The entire clan members join together to worship their ancestors. The Koyas believe in four guardian deities who are supposed to control the four directions. The Koya pantheon consists of various gods and goddesses who are the symbols of various forces. Among them Bhima, Muthyalamma, Sammakka and Sarakka are worshipped by non-tribals of the surrounding regions as well. The sense of supernaturalism is strongly rooted in the Koya's concept of nature. They worship personal spirits, which are thought to animate nature. They also believe in evil spirits that are dangerous to the harmony of group life. The traditional medicine man "Buggivadde" and the sorcerer "Vejji" are supposed to ward off all kinds of evil spirits. The Koyas celebrate festivals indicating the onset of particular seasons for tapping palm juice, collecting mohuva flowers, beginning agricultural operations, hunting and fishing. Every koya village is a socio-political unit and also a part of a larger social and territorial unit called "Mutha," a cluster of villages linked by economic, political and kinship ties. The customary law of the Koyas ensures communal ownership of natural resources administered by the village headman known as "Pedda." The pedda is the senior-most person who first settled in the village and established the village Goddess. This position is held by descendents of the same family. Pedda controls the social, political and religious activities in the village. The village panchayat consists of the other members (Pina pedda, Vepari, Pujari, etc.) who deal with minor problems. Sometimes the pedda holds two or three positions in a panchayat. The village panchayat is the final authority over all issues in a village. The overall judicial system of a cluster of villages is maintained by the "Samithi Poyee," a judicial head who is assisted by the people known as "Veparis." Issues are dealt with in

co-operation with the village panchayat and this makes every village a part of a wider cluster known as mutha and is held by tribal norms.

2.2.2.3 BANJARA

The Banjara are a class of nomadic people from the Indian State of Rajasthan, now spread all over Indian sub-continent. They claim themselves to have descended from Rajputs, and are also known as Lakha Banjara means Lakhapati, Banjari, Pindari, Bangala, Banjori, Banjuri, Brinjari, Lamani, Lamadi, Lambani, Labhani, Lambara, Lavani, Lemadi, Lumadale, Labhani Muka, Goola, Gurmarti, Dhadi, Gormati, Kora, Sugali, Sukali, Tanda, Vanjari, Vanzara, and Wanji. According to J.J Roy Burman's book titled, "Ethnography of a Denotified Tribe the *Laman* Banjara," the name Laman is popular long before the name Banjara and the Laman Banjaras originally came from Afghanistan before settling in Rajasthan and other parts of India. According to Motiraj Rethod also, the Lamans originally hailed from Afghanistan. Together with the *Domba*, they are sometimes called the "gypsies of India". They are known for colored dress, folk ornaments and bangles. The Lambadas are one of the largest tribes in Andhra Pradesh and Telangana and live in exclusive settlements of their own called Tandas, usually away from the main village. They tenaciously maintain their cultural and ethnic identity. The Lambadas believe that the world is protected by a multitude of spirits benign and malign. Hence the malignant spirits are periodically appeased through sacrifice and supplication called Tanda.

Banjara people celebrate *Teej* festival in a grand scale. The festival, which is celebrated during Shravan in the month of August, is considered as a festival of unmarried girls who pray for better grooms. Girls sow seeds in bamboo bowls and water them three times a day, for nine days and if the sprouts grow thick and high, it is considered as good omen for a better future groom. The bowls with seedlings are kept in a prominent place and girls sing and dance circling the bowl.

Folk art of Banjara people includes Dance, Rangoli, Embroidery, Tattooing, Music and Painting, of which embroidery and tattooing have special significance in the community. Lambani women specialize in preparing lepo embroidery on clothes by interweaving glass pieces in colorful clothes. The craft known as Sandur Lambani Craft made by Lambani people has got Registered Geographic Indication tag in India, enabling the community people to exclusively market them in that name.

Banjara people are generally classified as Hindus. They worship Hindu gods like Krishna, Balaji, Jagadamba Devi, Hanuman, etc. They also worship Sati Aayi, Seva Bhayya (or Sevalal), Mithu Bhukhiya, Banjara Devi, etc., which are specific to the community. Banjara Devi is located usually in forests in the form of a heap of stones. Mithu Bhukhiya was known as an expert dacoit of the tribe and the community pays high respect to him who is worshipped in a hut built in front of Tanda or village with a white flag on top. Nobody sleeps in the special hut built for Mithu Bhukhiya. Seva Bhaya or Seva Lal is another historic person who draws high respect from Banjara people. He became a saint and protector of women of the community. They speak Banjari language, also called Goar-boli, which belongs to Indo-Aryan group of languages and the language has no script. In India, Banjara people were transporters of goods from one place to other and the goods they transported included salt, grains, firewood and cattle.

2.2.2.4 KONDA REDDY

Konda Reddy is a community that prefers to remain unmarried than to stir out of its habitation mostly in Khammam, Telangana. They are concentrated in Pusukunta. They preferred to live in hills for decades by stonewalling the influence emanating from the civilized plains. Living far from the maddening crowd, the clan is still primitive. Apprehensive of losing their rights over minor forest produce, which is their source of livelihood, they turned down the offer of land and pucca houses as part of the rehabilitation programmers. The 'Konda Reddy' tribe is against exchanging Pusukunta for any kind of marriage proposal.

2.2.2.5 VALMIKI

It is a Dalit sect of Hinduism centered on the sage Valmiki. The community is found in Punjab, Rajasthan, Andhra Pradesh, Karnataka, and Gujarat and Punjab, Rajasthan (Figure 2.6).

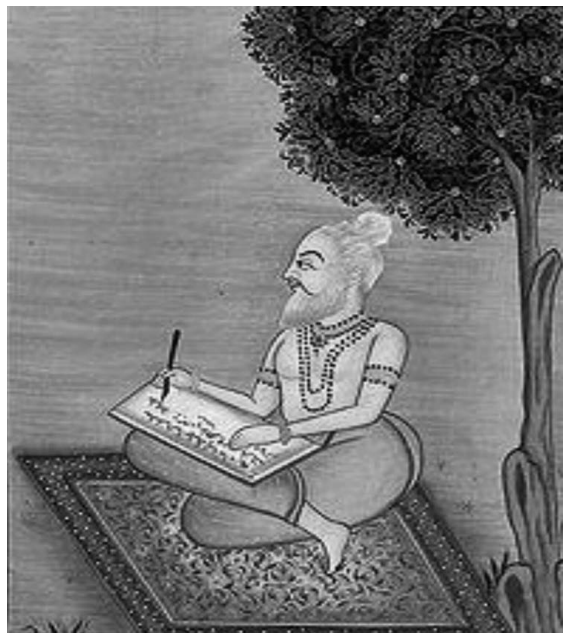

FIGURE 2.6 Valmiki composes the Ramayana.
(Source: https://en.wikipedia.org/wiki/Valmiki)

They worship Valmiki as their ancestor and God. They consider his works, the Ramayana and the Yoga Vasistha, as their holy scripture. In the state of Andhra Pradesh, Valmikis are referred to as Boyas. The titles of the Boyas are said to be Naidu (or Nayudu), Naik, Dora, Dorabidda (children of chieftains), and Valmiki.

2.2.2.6 KONDA DORA

Visakhapatnam district of Andhra Pradesh is known for Konda Dora tribe. Konda Dora tribe is divided into a number of clans, such as Korra, Killo, Swabi, Ontalu, Kimud, Pangi, Paralek, Mandelek, Bidaka, Somelunger, Surrek, Goolorigune, Olijukula, etc., Konda Dora are very dominant in the district. These tribal communities are considered to be forest dwellers living in harmony with their environment. They depend heavily on plants and plant products for making food, forage, fire, beverages and drinks, dye stuff and coloring matters, edible and non-edible oils, construction of dwellings, making household implements, in religious ceremonies, magico-religious

rituals, etc. A close association with nature has enabled these tribal people to observe and scrutinize the rich flora and fauna around them for developing their own traditional knowledge and over the years, they have developed a great deal of knowledge on the use of plants and plant products as herbal remedies for various ailments.

2.2.2.7 CHENCHUS

The Chenchus are a designated and conservative Scheduled Tribe community found in the Indian States of Andhra Pradesh, Telangana, Northern Karnataka and Odisha but predominantly undivided Andhra Pradesh. They are an aboriginal tribe whose traditional way of life is based on hunting and gathering, particularly in the Nallamalai forests or Andhra Pradesh. The Chenchus speak the Chenchu language, a member of the Telugu branch of the Dravidian language family. Some Chenchus have specialized in collecting forest products for sale to non-tribal people. Many Chenchus live in the dense Nallamala forest of Andhra Pradesh for hundreds of years.

The Chenchus are unfazed by their natural surroundings. The bow and arrow and a small knife is all the Chenchus possess to hunt and live. The slender build of their bodies is deceptive and express little of their strong and resilient nature.

The dark-complexioned Chenchus are one of the primitive tribal groups that are dependent on forests and do not cultivate land but hunt with bow and arrow for a living. The Chenchus have responded rather unenthusiastically to government efforts to induce them to take up farming themselves. They prefer to live in the enclosed space and geography leading a life of an unbroken continuity (Sathya Mohan, 2006). Their meal is simple and usually consists of gruel made from jowar or maize, and boiled or cooked jungle tubers. The Chenchus collect jungle products like roots, fruits, tubers, beedi leaf, mohua flower, honey, gum, tamarind and green leaf and sell them. They have hardly developed any technique for preserving their food. The Chenchu village is known as 'penta' with a few huts scattered here and there. The village elder is the authority. The Chenchus are a broad exogamous group and are basically Hindus. The marriage ceremony is performed with traditional rituals in front of the community and the priest or *Kularaju* officiated over the marriage rites. The Chenchus have a strong belief system and worship their deities like Lingamayya, Maissamma/Peddamma, Particularly during July/August. Their celebrations are austere, serene, simple and sometimes can be wild, intoxicating and mystical.

2.2.2.8 MALIS

Tribes are predominantly found in tribal areas of Visakhapatnam, Vizianagaram and Srikakulam districts. They are also called Mahali and Malli. Their population according to 1991 census is 2925. The total literacy rate among Mali is 17.47. The traditional dormitories, known as 'Kuppus' were once popular in this community. Marriage by negotiations, marriage by mutual love and elopement, marriage by service are different ways of acquiring mates.

2.2.2.9 KOTIA

Kotia is chiefly found in the tribal areas of Visakhapatnam district of Andhra Pradesh and adjoining Odisha; their population as per 1991 census is 41,591 and their total literacy rate was 17.83. Four types of acquiring mates are in vogue in this community. They marry by negotiations, by mutual love and elopement, by capture and marriage by service. Divorce is permitted. Widow or widower re-marriages are permissible (Figure 2.7).

FIGURE 2.7 A Kotia woman.
(Source: https://www.pinterest.com/pin/24629129183141977/)

2.2.2.10. KOLAMS

Kolam tribe inhabits areas of Telangana (and Maharashtra). They mainly speak Kolami language, but are also fluent in Marathi, Telugu and Gondi languages. They follow Hindu based rituals and ceremonies. Agriculture and working in the forests are the occupations. Kolam tribe return barefoot after

performing a pilgrimage. Drum or tappate and bamboo flute or vas are the musical instruments used in festive occasions.

2.2.2.11 ANDH

The Andh are one of the tribes of India living in the hilly tracts of Adilabad in Telangana. They are further subdivided into the Vertali and the Khaltali. Marriage by negotiations is common among Andhs but marriage by intrusion is also prevalent. Widow remarriages are permitted among Andhs. Divorce is permitted. They mainly subsist on agriculture followed by agricultural labor. They partly subsist on collection of forest produce, hunting and fishing.

2.2.2.12 YANADIS

Yanadis are one of the most primitive tribes and occupy the forest areas of East Godavari in Andhra Pradesh and a part of Khammam District in Telangana state. They occupy of the Godavari river in the forests. The Yanadis of Nallamalais are essentially hunters and foragers and their settlement patterns reflect this type of activity. Their huts are made of bamboos. They frequently migrate from one place to another when resources are exhausted, but this migration is only within a short radius. They use simple traps and snares and catch small rodents for their food (Parthasarathy, 2002).

2.2.2.13 YERUKALA

The Yerukala tribe is considered as one among the 33 scheduled tribes of Andhra Pradesh and Telangana (India census 2006). It is a semi-nomadic tribe inhabiting the plains. The people of this tribe are traditionally basket makers and swine herders. Though live mostly in multi-caste villages, maintaining symbiotic relations with non-tribals, they cultivate their unique beliefs and practices. They are considered to be the native of Southern Andhra Pradesh but now largely occupy Telangana, particularly in Warangal district. The traditional healers of Yerukala ethnic community have been using around 30 plant species for various formulations to cure chronic disorders.

2.2.3 TRIBALS OF KARNATAKA

A blend of culture, religion and ethnicity is represented by the tribes of Karnataka. More than 55 ethnic tribes have been reported. The most important tribes of Eastern Ghats of Karnataka State includes Bedar, Hakkipikki, Kadu kuruba, Kattunayakan, Konda kapus, Sholaga, etc. These tribes of Karnataka have built their settlements in several hilly and mountainous areas like Sandur, Chitradurga, Nandi and BR hills. As far as the languages are concerned, the tribes of Karnataka state converse with each other in different languages. Kananda language is the main language. Following the tradition of most of the tribes of the whole country, these tribes of Karnataka too have taken to diverse religions, although Hinduism is the most prevalent religion. Several other tribal communities of Karnataka possess their distinct tradition and ethnicity. They communicate in their local dialect and they also maintain their own tradition. Some of them are also reckoned as being originated from the warrior race.

The tribes of Karnataka are also known for their costumes, cultural habits, folk dances and songs, foods and their way of celebrating different festivals and occasions. A renowned dance format of the tribal communities of Karnataka is the open-air folk theater, better known as Bayalata. The theme of this dance drama centers around several mythological stories. This dance is executed at religious festivals and various social and family occasions. Generally these festivals start at night and carry on till quite a long period of time until day break.

The Bedar tribes belong to the Dravidian language family group. The Bedar tribal community can be found in several places of Karnataka. They are also known as Beda, Berad, Boya, Bendar, Berar, Burar, Ramoshi, Talwar, Byadar, and Valmiki. The word 'bedar' has an etymological significance and is derived from the word bed or bedaru, which signifies a fearless hunter. The ancestors of Bedar tribes may be the Pindaris or Tirole Kunbis. Within the Bedar tribal community, there are few Hindus and are called Bedar while the Muslims are referred to as Berad. The societal structure of the Bedar tribal community is quite significant. The Bedar tribe has six social groups. They have their indigenous customs and traditions. They eat meat and also drink liquor. Just like many of the tribal communities, the institution of marriage is given prime importance in Bedar tribal communities. The proposal of marriage usually comes from the parents of the bridegroom. Although child marriage is prevalent in the Bedar society, the bride does not reside with her husband till her puberty. Marriage within the subgroup of the Bedar community is not allowed. Widow re-marriage and divorce are

permitted. In matters of administration, especially in case of disputable matters, the Bedar tribes take the help of the village headmen, popularly called Kattimani. Bedar tribal community has developed immense faith on various practices related to religion and spiritualism like fortune telling, magic and astrology.

Kadu Kuruba tribals of Karnataka live in forests as their name indicates. Cultural excellence is widely being depicted in all its aspects like dance, language, religion, festival, etc. by this community. Just like many of the tribal communities of Indian subcontinent, Kuruba tribes also are the ardent followers of Hinduism. To top of it, these kadu Kuruba tribes practice Halumatha, also known as palamatha by many people of the Indian Territory. The peculiar ritual of this Kadu Kuruba tribal community is that they revere 'Almighty Source' in a stone, which has been identified as Linga. According to the beliefs of these tribes, stone is the source for the soil, which in turn nourishes all the plants. Some anthropologist go to the extent of saying that the worship of stone as well as Shakti, in the form of deities like Yellamma, Renuka, Chowdamma, Kariyamma, Chamundi, Bhanashankari, Gullamma, etc. have originated from the tradition of Kadu Kuruba tribal community. However ancestral worship too has been incorporated in the religion of the Kadu Kuruba tribal community. Kadu Kuruba tribe is one of the significant tribes who have got the rich tradition of worshiping stone and also their predecessors with lots of festivity and enthusiasm. Apart from these tribal groups, the Kattunayakan tribe is said to be the descendants of the Pallavas. Collection of food is one of the chief professional activities of the Kattunayakan tribe.

Another important tribal group is the Sholaga tribe. Members of the scheduled Sholaga tribe converse with each other in the beautiful language of Sholaga. They are known by different names like Kadu Sholigau, Sholigar, Solaga, Soligar, Solanayakkans, Sholanayika. They follow of Hindu religion. They occupy the BR hills besides being present in Tamil Nadu's Timban-Sathyamangalam hills. As per 1981 census their population was 4828. They worship Madeshwara, the god of hunting. They are non-vegetarians. They were originally described to sleep naked around a fire lying on a few plantain leaves and covering themselves with others. They live chiefly on the summits of mountains where tigers do not frequent. Their huts are made on bamboos. The sholaga society is divided into 12 exogamous, partrilineal clans called *kulams* which regulate their marriage system. They bury the dead. They are hunters and food gatherers and were earlier known to practice shifting cultivation (Parthasarathy, 2002). Sholaga tribe are scattered in different parts of Karnataka, such as Mysore and BR hills. Sholaga

tribal community of Karnataka is basically settled in several parts of this state and has enriched the culture and heritage of this state with their own distinctness.

Quite a number of this Sholaga tribal community collects various products from the forest areas. That this Sholaga tribal community is very much pious and the people of this group are religious minded. Hinduism is the main religion. However, many of the members of this Sholaga tribal community have still retained the local practices and customs of this community.

Lingayat Mathpatis often act as their priests. Janai, Jokhai, Khandoba, Hanmappa, Ambabai, Jotiba, Khandoba are some of the supreme deities of the Bedar tribal community. Images from deities like Durgava, Maruti, Venkatesh, Yellamma and Mallikarjun are made from silver, copper or brass. Cultural exuberance of the whole of the Bedar tribal community has nicely being depicted in all its aspects like festivals, language, jewelries, etc. The people communicate in Bedar language. Both Bedar males and females are very fond of wearing ornaments that are made up mainly from silver and gold. In addition, Bedar females place their hair in loose knots, wear several other ornaments like nose-rings and a gold necklace. Moreover there are quite a handful of Bedar tribes who also shave their heads, according to the custom. Tattooing also is a special custom of these Bedars. Males and females of the Bedar tribe do tattooing on the several parts like forehead, corners of the eyes and forearms. Rites, rituals and customs are part of the Bedar community.

2.2.4 TRIBALS OF TAMIL NADU

According to the 2001 census the tribal population of Tamil Nadu is 6,51,321. There are around 38 tribes and sub-tribes in Tamil Nadu. The tribal people are predominantly farmers and cultivators and most of them are much dependent on forest lands.

2.2.4.1 KURUMBA

Kurumbas are jungle-dwellers. They are generally believed to be the descendants of the Pallavas. They have settled in scattered settlements. The tribe is divided into five groups. Shola Nayakkars, Mullu, Urali, Beta and Alu. They have flat noses, wedge-shaped faces, hollow cheeks and prominent cheekbones, slightly pointed chins, and dark complexion. The women wear a waist cloth and sometimes a square cloth that comes up to the knees. Ornaments

play a major part in the costumes. They have their distinct culture, tradition, religious customs and social practices. Kurumbas are one of the backward tribes of Tamil Nadu with no accessibility to modern amenities. Many of them are illiterate. Many Kurumbas were known for their black magic and witchcraft in the past. They speak the distinctive Kurumba language. The Kurumba art uses four colors traditionally: red (from red soil), white (from both soil), black (from the bark of Karimaram), and green (from the leaves of Kattu Aavaarai).

The Uraly subtribe of Kurumba tribe Tamil Nadu is found only in the Eastern Ghats in the districts of Erode and Salem. Their population as per 1981 census was 9224. The term Uraly means a village person. According to Parthasarathy (2002) they occupy the low land region between Eastern Ghat peaks of Salem and Erode. They speak Kannada and Tamil. They are non-vegetarians although ragi is their staple food. The Uraly society is divided into seven exogamous class called Kulams (Kanar, Kodiyari, Ennayari, Onar, Thuriyar, Vethi and Vayanar). Married women wear a Thali around their neck. The society is patrilineal. They bury the dead and perform ancestral worship. They practiced shifting cultivation in the past but no longer do it now. For their living they collect fruits, trap wild animals and birds. Women are skilled at making fine mats and baskets out of reed and bamboo.

2.2.4.2 IRULAS

Irulas are an important tribal community of Tamil Nadu and occupy Coimbatore, Erode and part of Nilgiri districts. Their total population is around 25,000. Nearby 100 Vettakad Irula settlements are found in forest areas and in the deep mountainous jungles. Traditionally Irulas main occupation has been snake and rat catching, but also work as laborers in agricultural fields during sowing and harvesting. They also are involved in fishing. This tribe produces honey, fruits, herbs, roots, gum, dyes, etc. and trades them with the people in the plains. They speak the Irula language, a member of the Dravidian family. The Irulas are related to the mainstream Tamils, Yerukalas and Sholagas.

2.2.4.3 MALAYALIS

One of the most important and largest scheduled ethnic tribes of Tamil Nadu is the Malayali tribe. They occupy the Eastern Ghats hills of Tamil Nadu, such as Kolli, Shervaroys, Pacha malais, Kalrayans, Javad, Pudurnadu

and Yelagiri. According to 1981 census the population of Malayalis was 2,09,040. They are Hindus. The tribes consists of cultivators, woodmen and shepherds and are not uncivilized. They migrated to hills in fairly recent times. They are believed to be Vellalars who have migrated to hills due either to Muslim rule or due to fearing for conversion to Vaishnavites. They speak the Tamil language. They are divided into two endogamous groups on the basis of their tattooing marks on their bodies (Parthasarthy, 2002): Karalar gounders without tattooing marks and Vellalar gounders with tattooing. The society is patrilineal. The entire composite extended families are involved in cultivation and share the produce. Malayali marriages are by elopement, force or by negotiation. The Malayali traditional political organization has close affiliation with their territory within the hills. The territories are called *nadus* and are headed by Nattans.

KEYWORDS

- **Cultural Diversity**
- **Eastern Ghats**
- **Ethnic Diversity**
- **Ethnic Societies**
- **Origin of Ethnic Tribes**

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CHAPTER 3

ETHNOBOTANY OF WORLDVIEWS AND BELIEF SYSTEMS OF EASTERN GHATS AND ADJACENT DECCAN REGION

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CONTENTS

ABSTRACT

This chapter deals with plants that are associated with the worldviews and belief systems of the ethnic communities of Eastern Ghats and the adjacent Deccan region of India. Plants have played a vital role in the evolution of societies and cultures of these ethnic communities. They are connected to the natural, spiritual and human domains and their interactions. The information on plants and their validity and importance in traditional worldviews and belief systems have been obtained through three approaches: utilitarian, ecocultural and cognitive. Plants often symbolize rituals and the correct interpretation of rituals provides insight into various aspects of human behavior while using a plant or its product. This chapter covers aspects relating to plants involved in life cycle, social, religious, agricultural and food rituals. It many cases, the origins of such plant symbolisms associated with various rituals have become largely obscured and unfortunately, only their so-called 'superstitious' and 'occasional irrational' tags remain, leading to the questioning of the rituals themselves. A critical reexamination of the importance of this plant symbolism in rituals is urgently needed.

3.1 INTRODUCTION

It is generally believed that societies, cultures, worldview and belief systems were simultaneously evolved in different regions of the world which formed parts of various migratory routes of modern human species (*Homo sapiens*) when it left the African continent around 70,000 years ago. It is also generally believed that the evolutions of all the above is inextricably related to one another and that this evolution was also dependent on the environmental conditions that existed in the different regions of original human occupation. It was also dependent on the threads of social ideas, cultures, worldviews and belief systems that the settling human populations already possessed on its long journey before settling down in a region. Hence, it is natural to find two distinct components in all the four: (i) the components that are common to all ancient traditional ethnic communities; and (ii) the components that are unique to each one of these communities. It is also possible that some of the first category components might have had a parallel or independent evolution in these communities.

The pockets of human populations that got settled on specific locations of the world and have been associated with these locations for a very long time are called indigenous or traditional communities. The interrelations

between different members of an indigenous community that enable better social life constitute social organization or society. All ethnic societies normally have a distinct territory, are endogamous and are often subdivided into clans, subclasses, classes, etc. The social relationship amongst members of such endogamous ethnic groups is governed by kinship and mutual help. Their beliefs extend these interrelationships from the social to the natural environment. Each of these societies pursue tradionally well-defined modes of subsistence, have similar levels of access to various environmental resources and are egalitarian (Gadgil and Thapar, 1990). A very important component of the ethnic society is the *shaman***,** the spiritual leader**,** and *shamanism* is central to the well-being and the continued conservation of the ethnic society and its culture, worldviews and belief systems.

It is often difficult to define culture and many definitions are available. It is defined by Gadgil (1987), from a biological perspective, as the acquisition of behavioral traits from conspecifics through the process of social learning. These behavioral traits, which include traits related to knowledge, belief systems, arts, morals, laws, customs and any other capability and habit acquired by people as members of a society, are socially transmitted from one generation to another (Tylor, 1874). Culture, thus, is a man-made component of the environment (Parthasarathy, 2002).

The knowledge systems known to indigenous/traditional societies are known as indigenous/traditional knowledge systems (IKS/TKS). TKS is also known by terms, such as Worldviews and Cosmovisions. All these terms refer to the different ways of perceiving, ethnic societies/communities. The different worldviews of various ethnic societies have come to gain knowledge about the environment and its living and non-living components around them. However, more often, worldviews are expressed by conceiving life's knowledge obtained during a life time in terms of three inter-related and often inseparable *domains* (or spheres or worlds): Natural (or Material), Human (or Social) and Spiritual (Figure 3.1). The natural world provides the message from the spiritual world to the human world.

It is to be emphasized here that, to a very large extent, the ability of an ethnic community to sustainably use the environmental resources available around it is determined by the above worldview. This worldview always includes knowledge that is not only limited to the world which can be perceived with human senses and which can be explained in a rational/scientific way, but also to a world beyond human perception and existing rational/scientific explanation. Thus, knowledge, according to traditional worldview, is a combination of that which is true and rationally explained by science, and that which is believed by humans (=belief systems); thus, truth and

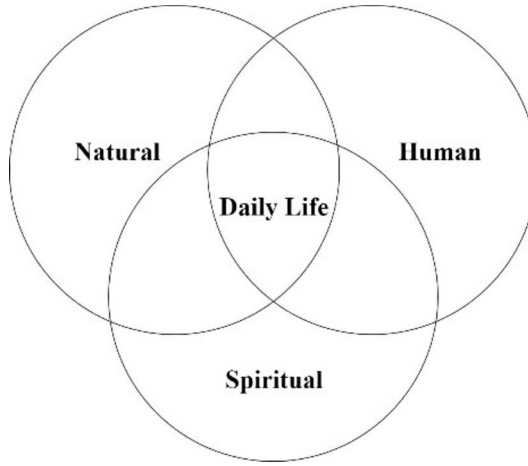

FIGURE 3.1 Interactions of three domains that results in worldviews.

belief go together. This worldview is also qualitative, practical, intuitive and holistic. TKS in the natural domain includes thematic areas related to specific resource generation/collection, agricultural, health and other practices. It includes knowledge about the physical world and the biological world and their constituents and material resources. The human domain implies the social life of people and includes knowledge about local organization, community life, family ties, local spiritual leadership, management of local resources, mutual help, conflict resolution, gender relations, and language and communication. The spiritual domain includes knowledge and beliefs about the invisible world, divine beings, spiritual forces and ancestors and transmitted through values and practices, such as rituals, festivals, etc. None of these three domains exists in isolation; all the domains together reflect the expressions of a unity. Some ethnic societies consider the confluence of these three domains as giving rise to a fourth domain/sphere called daily life domain. It is in this fourth domain that all the shared practices, such as the necessary techniques and technologies for the continuity of life and the social, material and spiritual reproduction take place for all humans. When a man respects his natural sphere and adapts himself to it spiritually and socially, nature will maintain its equilibrium and supply him what he needs. Thus, "all is related to all."

The ability of the ethnic communities to use the local resources to a large extent is determined by the above worldview. There are six categories of resources: (i) Natural resource (landscapes, ecosystem, climate, plants and

animals); (ii) Human resources (Knowledge, skills, local concepts, learning ways and experiments); (iii) Human-made resources (buildings, infrastructure, tools, equipments, etc.); (iv) Economic and financial resources (markets, incomes, ownerships, price-relations, credits, etc.); (v) social resources (family, ethnic organizations, social institutions and leaderships); and (vi) Cultural resources (beliefs, norms, values, rituals, festivals, art, languages, lifestyle, etc.). This division is a further elaboration of the concept of three domains mentioned above.

Information relating to worldviews on plants and their validity and importance have largely been obtained through three main approaches (Cotton, 1996) in the ethnic societies of the study region, as in most other ethnic societies of the world: (i) Ecocultural approach; (ii) Cognitive and Socio-cultural approach; (iii) Utilitarian or Economic approach. The first approach invokes certain traditional cultural practices involved not only in foraging but also in settled agriculture, such as those involved in sowing, transplanting, and harvesting taboos and/or rituals. Many traditional cultural practices involving plants may at first appear irrational, but in reality these practices have very important and significant functional consequences. The cognitive approach tells us how the various ethnic societies perceive plants and also how such perceptions are influenced by sociocultural factors and spiritual beliefs. This approach invariably involves rituals/symbolic behaviors that fall in the realms of society, religion, magic, spirituality and supernatural domain. Utilitarian approach records how different ethnic cultures use the plants for their various materialistic needs. All the old ethnic communities in the study region are Dravidians. In the account that follows only ecocutural, cognitive and sociocultural approaches and plants associated with these approaches are dealt with; utilitarian approach to plant utilization is given importance in a few other chapters of this volume.

3.2 RITUALS AND PLANTS ASSOCIATED WITH THEM

3.2.1 DEFINITION AND TYPES OF RITUALS

Rituals may be defined as any serious and voluntarily conducted act/event at the individual, family or community level with the appropriate and correct behavioral and procedural formalities to gain impetus to lead a purposeful life in a serious and symbolic manner. Thus, rituals make people to lead life with serious and virtuous goals, as they add auspiciousness and sanctity to life (Eliade, 1959). Rituals help people to accept, without questioning, the

importance and sanctity of energy and the myths and belief systems associated with this energy. Rituals are seen in all ethnic communities of the world, including those studied in this chapter, and are characteristic of all religions, whether basic or formal, primitive or advanced. According to basic religious and Hindu religious philosophies of India, which are mainly followed by the ethnic communities in the Eastern Ghats and adjacent Deccan region, human life is intimately connected to the cycle of life, right from birth until death and that between these two phases there is a sequential change from childhood to senescence. Since, human life in these ethnic societies is also culture-related, the biological phase changes are also subjected to the influences of culture. In other words, life cycle changes are also socio-cultural changes. In fact more than life cycle changes, it is at the socio-cultural level that life-phase changes get more polished. Each phase change gets culturally entangled to very specific ritualistic phenomena or gets itself ritualized. The ritualized phase changes become life cycle rituals. Birth, naming of the child, ear-boring, birthday celebrations, attaining puberty, marriage, nuptials, pregnancy, child-bearing, childbirth, and ultimately the death of the individual, etc. are the most important life phases which are ritualized in the ethnic societies of Eastern Ghats and adjacent Deccan region.

In addition to these life cycle rituals, there are other rituals that are associated with social, economic, religious, agricultural, food and arts/crafts activities of these ethnic communities. Thus, rituals are multifaceted. The nature of rituals changes with many factors, such as time, place and environment at which they are conducted, as well as on the aim and need for the conduct of a ritual. Although the rituals of each ethnic community have unique characteristics, we can also find common characteristics between them. The common ones are the following: Thought-related action-oriented, conduct-related, voluntary, visible, esthetic, periodic, repetitive, auspicious, collective, social, non-entertainmental and having rational and instrumental components. Each ritual also has a unique role, unique character, unique action and unique way of conduct. Cults like *totemism* (see a subsequent page for more details) followed in many ethnic communities in the study region depend on belief systems and practices associated with them. These belief systems and rituals are inseparable, not only because rituals are often the role manifestation of otherwise imperceptible ideas but also because they react upon and, thus, alter the nature of the ideas themselves. The rituals serve and can serve to sustain the vitality of beliefs and to keep the beliefs from being effaced from memory. Rituals help to protect the integrity of the society and its culture, keep them intact, remove all contradictions and oxymorons, bring about cooperation among people of the community, protect all

the values that the society should preserve, and conserve societal relations, carry out the aspirations of the individuals of the society in order to make him a valuable component of the society, etc. Rituals of ethnic communities in the study region can be classified in various ways: technical *vs* ideological, positive *vs* negative, conformatory *vs* transformatory, separatory *vs* incorporatory, auspicious *vs* inauspicious, prescriptive *vs* performatory, etc. Ritual is known in ancient Tamil language as *Karanam*.

With all the rituals, plants or plant products are invariably associated. They often symbolize rituals and an analysis of these symbolic items basically involves the recurring themes of all rituals, the correct interpretation of which can provide insight into certain aspects of human behavior while using a plant or a plant product. In many cases the origins of such plant symbolism have become largely obscured and only their so-called 'superstitious' and occasional 'irrational' tags remain, leading to the questioning of the rituals themselves.

3.2.2 LIFE CYCLE RITUALS

3.2.2.1 BIRTH RITUALS

Birth rituals are very special for certain ethnic societies. Birth indicates the addition of one body and a soul to the earth. During this ritual the umbilical cord and the uterine liquid that comes out of the vagina of the mother are considered as very sacred and auspicious. These two are buried behind the house and the burial mound is considered sacred until 10th or 16th day after child birth depending on the community. The mound is enclosed by a fence made of Palmyra or coconut leaves and rachis. The mother takes bath within this fenced enclosure until the 10th or 16th day as the case may be. On that day three full plantain leaves are put in front of the mound on which are served cooked rice. *Sambar* prepared with salted dried fish or black pepper (depending on non-vegetarian or vegetarian family) is poured on the rice; also put are either boiled eggs or balls made of palmyra jaggery mixed with *Alpinia* rhizome paste. Then a wooden twig/stick is inserted vertically on the rice. Also kept near the banana leaves is a vessel filled with water and sprinkled with floral petals. This is followed by worship to God to protect both the mother and the newborn child. Then the food on the three leaves is eaten respectively by mother, the woman who helped her during childbirth, and the nurse who helped her medically to yield the child. The child is kept over the burial mound. The whole ritual is conducted by women only and

men are not allowed. The burial pit plus the mound over it are considered as equivalent to the *Yoni* on vagina, the stick/ twig the male organ and the liquid *sambar* poured over cooked rice is the fluid that comes out of uterus along with the child (Paramasivan, 2001).

Couple who do not have a child and who want to adopt a child follow an interesting ritual. The couple gives a cup/vessel full of powered paddy husk to the person who gives her child for adoption by the couple. This means that the child for adoption is not got free but by paying husk in return.

3.2.2.2 MARRIAGE RITUALS

The most important ritual connected to marriage in many ethnic communities of the study region is the tying of the *mangala sutra* (*Thaali* in Tamil and Telugu) or the sacred cotton thread soaked in turmeric dye on the neck of the bride by the bridgegroom. Wearing this sacred thread until the death of husband is a must for the married women. Once this thread is tied, all relatives of both the bride and bridegroom (both patrilineal and matrilineal) bless the newly-married couple by showering on them with rice grains stained with turmeric dye. In the most ancient Dravidian, particularly Tamil, culture, there existed only secret love affair (called *Kalavu* in Tamil) that was either permitted or not by the parents and there was no marriage *per se*. However, sooner or later this *kalavu* system gave rise to the marriage system that was more and more tagged with chastity through wearing of *Thaali*. No remnant of Thaali was discovered in Adichanallur excavations conducted in the southern part of Tamil Nadu. Initially the thaali thread was tied along with flowers of *Jasminum auriculatum* (which represent chastity) before it is put on the bride. The most ancient foraging communities wear a black thread to which a collar bone (Clavicle) was tied. The dying of *thaali* with turmeric was done much later in Dravidian history but not earlier than 10th century CE according to many Tamil scholars (Paramasivan, 2001; Krishnamurthy, 2007). In the marriage hall/stage are kept many colored (often yellow/red) pots (called *Arasaani* pots) filled with turmeric water. These indicate that the marriage should lead to wealth, prosperity and fertility, as turmeric symbolizes auspiciousness. Some tribes also keep a pair of winnowing pan (*muram* in Tamil), made of bamboo, again tinged with turmeric dye. Betel leaves, and coconuts, plantain fruits, areca nuts, etc. are all kept on a pan in the marriage stage always in even numbers. Banana trees one on either side are kept on the entrance to the hall or on the marriage stage, often along with the inflorescence, again in pairs, of coconut, palmyra, phoenix species or

very rarely in northern Eastern Ghats region *Corypha* species tied to the banana stems. The keeping of all the above in even numbers signifies *bilateral symmetry* that is reflected in the life of the people of these ethnic communities. This is in contrast to the death rituals (see later) where things including plants/ plant parts used are always in *odd numbers.*

The marriage hall/stage specially houses laticiferous plants or their twigs in the marriages of many ethnic communities of the study region. This symbolizes fertility of the woman to get married, especially the lactating ability of her breasts after child birth and the child-bearing fertility of her womb. This ritualistic symbol is characteristic of the matriarchal society, according to Turner (1963), although it should be mentioned that this ritual is followed in ethnic societies which are also patriarchal. Probably, all the ethnic societies were originally matriarchal and then some of them became patriarchal. Ritualistic plants, such as banana, coconut, palmyra, phoenix, *Corypha*, *Ficus*, Mango, turmeric and a few others used in the marriage venue are believed to convert the mortal bodies of the marriage couple into divine couple and godly status in the luminal space of the marriage hall. The wearing of floral garland and new cotton clothes and new cotton thread by the bride also helps to bring about this change.

3.2.2.3 DEATH RITUALS

In the study region, the ethnic communities either bury or burn the dead people depending on the community (Paramasivam, 2001; Rajan, 2004). The dead body is buried in specially devised structures in the ground or is put in a huge mud pot (*Thazhi* in Tamil) which is then buried. Along with the dead body grains of rice, sorghum or minor millets are put inside the pot or in the pit. Such pots have been discovered in several parts of ancient Tamil country through archaeological excavations (Rajan, 2004). Burning the dead is considered by some as more ancient than burying since the latter is often believed to have arisen along with the evolution of agriculture. Many death rituals are quite opposite to the ones that are conducted during the auspicious phases of the life cycle like birth or marriage. This is indicative of bilateral symmetry, as already mentioned. The death rituals are intimately connected to the concept of rebirth after death. The cycle of rebirth includes humans and animals, but does not include plants (i.e., plants after death do not have rebirth) in all the ethnic societies. However, as early Hindu texts analyze about what may happen to a dead person, plants are brought into the process. Burying the entire dead body or burying the bones of the dead after

burning are considered as equivalent to sowing seeds of a crop plant and the emergence of seedlings from them as equivalent to rebirth/resurrection after getting a new life. Plants are also believed to feature as a destination or a way-station for parts of the dead person on journey after his death in the life cycle process. For example, his hairs go to the herbs and his head to the trees. In other words, the dead are born on earth again as "rice and barley, herbs and trees, as seasame plants and beans" (Radhakrishnan, 1993). Just before burying or burning the body of the deceased the patrilineal relatives stuff the mouth of the dead with rice grains. Thus, plants and their seeds are centered to the ritual mechanics that cycle the deceased into his next existence.

In the *Saanthi* or peace-making death ritual performed by many ethnic communities, after collecting the bones of the burnt dead person, flowers, wood, grass and butter/ghee are used by the survivors of the dead person to renew his life after the sweeping and eleaning the site of the mound using special ritual twigs of *Palasa* (*Butea frondosa*) tree, plowing the site and then sowing seeds of various herbs before pouring out the bones. Over the top of the mound, the worshipper sows paddy grains and covers the mound with *Avaka* plants for moisture and *Dharba* grass (*Imperata cylindrica*) for softness (Kane, 1990–1991).

Many offerings of cooked rice and vegetables are made throughout the death rituals. One particular instance that exemplifies the role of plants in death rituals is the *Sraardha* ritual. In this ritual offerings are made for the *pitroos*, the immediate paternal ancestors of the worhipper so as to enable the deceased to be received by them to be among them. This ritual uses *pindum* or ball of cooked rice, which represents the dead body. This *pindum* is worshipped using incense, flowers, ghee, white threads/clothes and a cup of water with sesame seeds. This worship is done normally for 10 days, although in some communities this period may be shortened or prolonged by a few days. Each day the number of cups is increased by one. It is believed that the use of *pindum* ritually creates the new body of the deceased for life in the community of ancestors and eventually for rebirth for himself among the world of humans. Thus, this ritual places plants at the center of the ritual's transformatory process. The material that makes up the *pindum* is invariably rice, although some minor millets are used in some ethnic communities of the study region, and barley in some communities in northern-most Eastern Ghats.

The Koyas of Eastern Ghats symbolically offer material objects like grains, palm liquor (from *Caryota urens*), new clothes, money and a cow's tail by placing them on a cot beside the corpse and the whole cot is placed on the funnel pyre with the feet of the corpse towards the west. They have

a ceremony on the 11th day after death called 'Dinalu.' At this time they believe that the spirit of the dead comes back and resides in the earthen pot called '*anakunda'*

3.2.3 RELIGIOUS RITUALS

All the traditional ethnic societies of the study area follow Hinduism, which believes in the existence of many gods. It is well-known that Hinduism is a very diverse, varied and broad-based religion and has no identified founder. It originated in India perhaps as an amalgamation of vedic religion and the various basic religions of the different ancient ethnic groups. However, under the broader umbrella of Hindu religion, it is the worldviews of basic religions that are still dominant in most, if not all, ancient ethnic groups of the study region. As per basic religions, people considered themselves dependent on various natural forces, which are supposed to be controlled by Gods/spirits to whom they can pray, worship or make sacrifices for support (Krishnamurthy, 2005). The basic religions include animism, bongaism, totemism, naturalism, ancestral worship and polytheism (Hopfe and Woodward, 1998; Pushpangadan and Pradeep, 2008). Although basic religious customs, rituals and taboos still prevail in many cultures, there is a gradual transition from these basic aspects to those of mainstream Hinduism. Village/family gods/ goddesses are still the most popular among the tribal groups than formal and mainstream gods. The village gods/goddesses are believed to protect crops, irrigation water, harvested produce, etc.

The ultimate goal of all religions is reaching god and thereby truth. Religious show the way as to how humans must relate themselves to god and truth. Praying, worshipping and offerings are manifestations of this relationship. Because of their centrality in human lives, plants are often the objects of sacred attentions and religious activities. Besides being the objects of worship themselves, plants come to play important roles in religious practices, such as fuel for the sacred fire, as wood for ritual implements, as the materials (such as leaves, flowers, fruits, seeds and even whole plants) used for worship of god, as food offered for gods and priests, and as *prasaadams* given to devoters (Findly, 2008). For example, Lord Shiva himself is conceived as a *yupa* fashioned in *Khadira* or *sami wood*, and both woods are believed to have fire in them.

All the basic religious, and particularly totemism, involve some form of identification between tribes or between clans of a tribe and an animal or plant species (Zimmer, 1935; Whitehead, 1921; Subramanian, 1990) or

a natural phenomenon/object. It is a belief in the mysterious relationship between plants (and animals) on the one hand and humans on the other and their veneration and propitiation as totem objects. The totem is often considered by many tribes as the ancestor of the clan and its relationship implies certain common characteristics as well as taboos in eating or foraging/hunting. Such a relationship is articulated as the concerned plant (or animal) is believed to have helped or protected the respective ancestors of a clan, or it had been proved to be of some use. The totem plant is held in great respect and reverence and it should not be hurt or destroyed. In some cases, its utilization is not normally permitted. The dead totemic plants (and animals) are given full honor and are attended to in their last rites. The best way thought by these ancient ethnic groups to protect plants (and animals) was to create a sense of fear, respect or faith in human minds towards the plants as abodes of gods/spirits. Deities living in various trees are not all the same, however, and, they reside there for different purposes. Tree deities are spirits of fertility, prosperity and protection. The early understanding of the nature of a deity inhabiting a plant is how the deity relates to the health of humans. That is, those plants with healing properties house deities of health and prosperity, while those that cause symptoms of disease house deities of wickedness and debilitation. Concerning the latter, many examples of plants are being used to protect humans from curses, witchcraft, sorcery and black magic-inflicting enemies. Trees can also house the spirits (*Preta* or ghosts) of the recently departed (dead) who, while still in states of transition, are unsatisfied and need human attention. Thus, plants are considered as sentiment beings equal to humans in that they, too, can become *pretas* –spirits in the process of being remembered on their way to rebirth. Services by the deity living in a tree are much like the services offered by the tree itself.

The concept of *Sthalavriksha* (=temple trees) is an extension of tree worship practiced in basic religions of ancient S.E. India, when these religions got transformed into formal religions, particularly when institutions of worship like temples developed. Even today many ethnic societies in this region worship trees. The names of presiding deities in many temples are based on or related to tree/plant names (Varadarajan, 1965; Kalyanam, 1970). In 270 temples (but 275 according to Sundara Sobitharaj, 1994) of Tamil Nadu, nearly half have one of the 80 species of trees/ plants as the *sthalavriksha*. These are mostly trees, although there are shrubs, subshrubs, herbs, climbers and even grasses (Swamy, 1978; Sundara Sobitharaj, 1994; Krishnamurthy, 2007). The concept of *sthalavriksha* must have been born just before 7th century CE in Tamil country as a result of the evolution of formal religion and the development of temples as major religious institutions. The idea

that each temple should have a temple-plant seemed to have been formalized gradually. Krishnamurthy (2007) has given a comprehensive list of all the temple plants of Tamil Nadu and adjoining regions of Andhra Pradesh, Karnataka and Kerala, which formed part of the ancient Tamil country. These temples include not only *Saivite* (74 species of plants) but also *Vaishnavite* (18 plants) temples and 12 plants were common to both. The same plant species may serve as the temple plant of more than one temple. There are also a few temples with more than one temple tree. For instance, Bilva (*Aegle marmelos*) is the temple tree of 26 temples, *Vanni* (*Prosopis spicigera*) of 26, *Konrai* (*Cassia fistula*) of 22, *Punnai* (*Calophyllum inophyllum*) of 18, Jack tree (*Artocarpus integrifolia*) of 17, Mango (*Mangifera indica*) of 12, and palmyrah (*Borassus flabellifer*) of 9 temples. Another way in which trees/plants were attached religious sanctity by the ethnic societies of this region has been to associate them with the 27 stars recognized and named by ancient Hindus. It is to be stated here that even before a temple was built, its temple tree was decided by the temple committee. The builder first mentions the place where the temple has to be built and the presiding deity to be enshrined in the temple. Subsequently, the architect and the priest identify the star related to this deity and accordingly, the shape and size of the idol are decided. The details on the plants assigned to each of the 27 stars are found in Krishnamurthy (2007).

Sacred groves, *Nandavanas* (temple gardens) and temple tanks that are associated with temples form another important aspect of sanctity and importance given to plants by the ethnic communities of the study region. Sacred groves are parts of natural vegetations that are always associated with the so-called minor temples that are given importance to by basic religions and are seen in village/rural/forested regions, in contrast to *Nandavanas* which are newly established in association with larger temples (of Hinduism) in towns/cities. In the former case, sacred groves come first and 'temples' are established subsequently, while the reverse is true in the latter. The concept of sacred groves can be said to have evolved even at the hunter-gather stage (Kosambi, 1962), while that of *Nandavanas* is of post-agricultural evolution. There are more than 50,000 sacred groves in India of which in the study region covered by this book there are about 3,000 groves; 500 of these are fairly well-known. The sacred groves are places of great power and people have traditionally set them aside as places of physical and spiritual benefits to humans and non-humans alike. They are one of the finest instances of traditional ways of reverence to plants. Plants in sacred groves cannot be cut and several other taboos are associated with sacred groves (Krishanmurthy, 2003). The deity in the temple associated with a sacred grove may be male

or female. No one owns the sacred grove and it belongs to everyone in the community.

Temples and the sacred groves/*nandavanas*/tanks associated with them have strengthened the tie between religions and plants. In all cultural, educational and religious activities and rituals associated with temples, plants and their parts (leaves, flowers, fruits, seed, etc.) obtained from *nandavanas*/sacred groves and tanks are used; particularly for the daily worship of the deity and the offering of *Prasadams* to the devotes (see details in Krishnamurthy, 2007).

Specific species of plants are associated with specific gods in the formal Hindu religious practices of the study region, as is evident from literary and epigraphic evidences as well as from temple murals/paintings. Generally *Saivite* gods were worshipped with leaves of *bilva* (*Aegle marmelos*) and flowers of *Leucas aspera* and *Cassia fistula*, while *vaishnavite* gods with *tulsi* (*Ocimum* spp.) leaves, flowers of *Mimusops elengi*; Lord Ganesa is worshipped with the grass *Cynodon dactylon*. Certain plants or their parts were offered to all gods: coconut, betel leaf, betel nut, lotus flowers, *Nerium* flowers, etc. Each god was also assigned specifically a plant and its flower or leaf: *Cassia fistula* for Lord Shiva, *Neolamarckia cadamba* for Lord Muruga, *Nymphaea* spp. For goddess Lakshmi, *Nelumbo nucifera* (white variety) for Goddess Saraswati, *Mimusops elengi* for Lord Vishnu, *Saraca asoca* for Mahavir, *Nerium oleander* for goddess Kali, *Bauhinia* spp. for Lord Indra and so on. Later on, this specificity was corrupted and all the above were used for all gods/goddesses. Sandal paste is continued to be used for anointing the idols as also coconut water for holy bath of idols. Camphor was beginning to be used in the *Sanctum Sanctorium* of temples so as to enable the devotees to see the idol, while oil cloth wrapped on woody twigs was lighted in village temples (=*Teeppandam* or torch of fire) for the same purpose. The oil used for burning temple lamps was originally obtained from the seeds of *Madhuca longifolia*, although this was subsequently replaced by other oils, such as sesame oil.

Prepared plant food items were being offered to god, often as substitutes for live animals like chicken, goats, etc., or along with them as sacrifice. One of the oldest and most popular food items offered to village deities is *pongal*, a preparation made of rice, pulses and ghee. It is often prepared at the community level (Paramasivam, 2001; Krishnamurthy, 2007). The offered *pongal* was known as *Madi* or *Kulirthi* in Tamil. During the *Thaipoosam* religious festival *Pongal* is offered to God, by the whole community, along with *Colocasia*, elephant foot yam, palmyra seedling tuber, etc. *Pongal* is also a ritual food throughout the Tamil *Margazhi* month (December–January) for

most communities. *Pongal* represents an offering to God from the raw plant to the cooked state of the same, a trend that was common to all ethnic societies. Some consider the pot in which *pongal* is prepared as the goddess, and the boiling rice as the destructions of male chauvinism. When *pongal* offering is done at the community level, each family prepares it by using only palmyra leaves as the fuel. Another food item offered by some traditional communities in the arid regions is *Paanakam* (a mixture of palmyra jaggery, tamarind, ginger and water). Yet another item is *ulundu sundal* (a preparation of boiled and salted black gram). In some societies, cooked rice is not offered, but only rice soaked in water and germinated pulses. These communities, on critical analysis, were found to be originally foraging nomadic communities. In S.E. Indian Hindu temples food items offered as sacrifice (*Padayal* in Tamil) to God and given as *prasaadams* to devotees were always vegetarian. In all likelihood this practice began in the 7th century CE, after the *Bakthi* movement. A partly dilapidated epigraph discovered in 1927 (epigraph number 127) mentions ten different items of food as dear to Lord Shiva, but details could not be obtained. A 9th century CE epigraph of king Varagunapandian found in Ambasamudram in Tirunelveli distirct, Tamil Nadu mentions a list of food items offered as ritual sacrifice including *Pulikkari, Pulugookkari, Porikkari*, Kummayam, etc. (Epigraphica Indica IX. No.10). A 11th century CE epigraph of king Veerarajendra Cholan (Epigraphica indica XXI. No.30) mentions, in addition to the above, *Milagukkari*. A 16th century Vijayanagara kingdoms's epigraph reveals that different kinds of food items were offered to Gods and these included vegetables, *Kariamudu, Vaaikkamudu, Neyyamudu, Kootu, Pachchadi, Kadukkorai, Aappam, Vedhuporiaappam, Vadai, Idli, Sugian, Daddiyannam* (Curd rice), etc. Some of these have either been lost, or have had name changes, so as not enabling us to identify them correctly.

Sacrifice to Gods/Spirits arose in Totemism which recognizes totems or emblems which are usually plants or animals. In all ethnic societies, animal sacrifice to Gods/Spirits was offered to begin with during cultural revolution and it is continued to be done even today in many societies at least on special religious rituals. Sooner or later animal sacrifice was replaced by plant sacrifice. Initially both animal and plant sacrifices were done and finally plants replaced animals totally in formal religious institutions like big temples. The blood of chicken or goat is mixed with rice and offered in cane baskets to Lord Muruga, according to ancient Tamil literary sources. Along with *Tinai* rice (a millet) and flowers, goat and chicken were also offered. However, blood was replaced by red dyes obtained from plants and these were mixed with rice or stuffed into lemon or ash gourd fruits and offered to Gods. Such

a transition is also seen in many ethnic communities in other parts of the world like the Jews and Nuers. Evolution from animal sacrifice to plant sacrifice did not change the ideology and theoretic basis of a ritual but only brought about an operational and technical chance (Evans Pritchard, 1956).

3.2.4 AGRICULTURAL RITUALS

As in many other ethnic cultures of the world, most ethnic societies of Eastern Ghats and adjacent Deccan region follow agriculture for their sustenance and food security. The agricultural cycle in this region is hedged around with ritual and ceremonious activities directed towards furthering the powers of fertility manifest in soils and in various crops to ensure a good harvest. Hence, agricultural activities, such as planting, harvesting, weeding, etc. in these societies are associated with belief systems, taboos and rituals. Agriculture is treated as a pious and virtuous act by all these societies, as in ethnic societies elsewhere in the world (Salas, 1994). These rituals are related to the type of agricultural activity and the time of the year, and take place at various levels (individual/family/community), and include social conduct based on the concept of reciprocacity. At family level simple rituals are performed more or less on a daily basis at home or in the agricultural field to appease the natural spirits and to attract good luck and abundance of crop yield. Many rituals are combined with a sacrifice or offering of an animal or a plant food preparation, such as *pongal*. For example, in February during the seed festival known as '*Biccha Parbu*' the Samantha tribe of Eastern Ghats worship the village Goddess '*Jakiri Penu*' by offering animal sacrifices and then they sown seeds mixed with sacrificial blood of animals. Offering of *pongal* (also called *pallayam* offering or *Padayal*) signifies the fact that the space inside the pot for *pongal* preparation is symbolically converted into a space in the agricultural field and the prepared *pongal* is symbolically equivalent to the crop yield. Most often this *pongal padayal* is carried out at the community level.

3.2.5 FOOD RITUALS

Human subsistence in all traditional societies signified more than the food that fed commerce (Carney and Rosomof, 2009). It asks us to engage the broader relationship of food to culture, and culture to identity. According to the belief systems of many traditional societies, including those of the region

studied here, food is provided by Gods/Spirits, often in response to prayers and gratitude, expressed through a variety of ceremonial rituals. The Hindu texts, which have been the source of inspiration to many ethnic societies of this region, say clearly that plants are most often necessary to make food for Gods and priests to eat. Some of these texts specify ten cultivated grains that are to be used in foods associated with rituals: rice, barley, sesame, beans, millet (probably black gram) and Vetch. When used for sacrificial purposes, these grains are ground and soaked in curd, honey or ghee before being offered as part of on oblation. Cakes made of different grains are offered in different directions, often wrapped up in leaves of *Udumbara* (*Ficus glomerata*) tree. Rice cake, for example, is placed on the eastern direction. Even trees were worshipped with ritual plant foods, often at night. The foods offered include milk, porridge, sweets, rice, curd, sesame and "eatables of various kinds." Food offerings are done to trees also before they are cut down for some purpose.

The food taken by many ethnic communities in the ancient Tamil country is ritualistic. In many communities food taken on Tuesdays, Fridays and/or Saturdays are purely plant-based; so also throughout the Tamil month of *Purattasi* (September–October). In many villages, people consume only vegetrarian diet during the village religious festivals, particularly after the temple flag has been hoisted (=*Kaappukattal* in Tamil) (Paramasivam, 2001). During these days, in many families, the following vegetable items are not cooked: bitter gourd, some pulses (especially those that are not native) and *Sesbania* leaves. The food that is consumed includes thick porridge of black gram, puffed rice, cooked rice flour sweetened and added with coconut shreds, *Kummyam*, sesamum seed preparations, etc.

3.2.6 SOCIAL RITUALS

A number of social rituals are conducted. These rituals are meant to keep the social harmony intact and to bond the members of a society together. Social rituals are related to festivals, pilgrimage, etc. Rituals practiced to remove the effects of 'evil eye' (removing *Drishty*) are very important in the social context. By 'evil eye' we mean the jealousy/hatred/cold war that is shown towards a person or family by some other member/family of an ethnic community for various reasons; the affected person/family believes that the evil eye is the reason for the suffering (in terms of health, finance or otherwise). Sometimes sorcery is also involved in creating the evil effects. In order to remove these evil efforts, the affected person or family follows certain rituals

which it believes will not only remove the ill-effects but also will not reveal the identity of the person responsible for fixing the 'evil eye in public. The latter preserves social harmony. The rituals conducted are either preventive or curative and take many forms. Hanging of an ash gourd (often with a ghost face drawn on it), an *Agave* plant upside down on a black-colored thread, or a bunch of chilly fruits sewn together along with a lemon fruit on a black thread in front of a house is done to remove the evil eye. Crushing of a lemon or ash gourd fruit stuffed with red dye in front of the house is done in some instances. Sometimes chilly fruits with or without betel leaves kept on water dyed red in a pan is spilled in front of the house or in the street corner. The reason why these particular plants are used for these rituals is not clear.

Another type of social ritual is related to the act of thanking God for fulfillment of vows, promises, oaths, etc. During these rituals the concerned person/family consumes plant food that is different from their daily food. Social rituals also include rituals connected to education. The *Gurukula* system of education was the prevalent system that existed among the ethnic communities of the study region. On the first day of initiation the child is taught to write the first alphabet on paddy/rice spread on a plate. The teachers or *Gurus* are paid *Gurudakshina* for educating the child. This concept arose in Buddhism and then got extended to Hinduism (Paramasivam, 2001). The students are given leave on the newmoon and fullmoon days and these days were called '*Uva*' days. On these days the students give their teachers *Dakshina* (=fees) in the form of rice, vegetables and fruits. This rice is called '*Uva rice*' which later on got corrupted as '*Vavarisi*.' This practice is still continued in some ethnic societies,

Many social rituals involve laticiferous plants. It is under laticiferous trees like banyan and peepul (species of *Ficus*) that the meeting of ethnic communities including *Panchayats* are held. Women go around a *Ficus religiosa* tree praying for a child. Marriages and puberty functions are conducted in halls/venues kept with twigs of laticiferous/resinous/or other juicy trees like mango, banana, palms, *Ficus*, etc. These latex-secreting plants probably symbolize a matriarchal nature of most, if not all ancient ethnic societies of this region. These symbols are archetypal symbols. *Panchayats* below *Ficus* trees (symbolizes mother's rule), worshiping of *F. religiosa* trees by women wanting to have a baby (matrilineal tradition), tying the umbilical cord onto a laticiferous tree (matrilineal reproductions), etc. are all represented by the same symbol to indicate a multifaceted and collective meaning and content. These symbols connect womenhood and fertility.

Rituals connected to festivals remove social problems and bring about social harmony. In village festivals, the idol of the village temple is brought

from the temple to the place where it was originally residing and from there it is brought back to the temple. The whole place is decorated with festoons of plant leaves (particularly of mango, coconut, etc.) and flowers. Invariably *pongal* is offered along with sweetened rice flour cakes over which a ghee lamp (*Maavilakku* in Tamil) is lit. The idol is worshipped also with incense stick, betel leaf and nut, banana fruits, etc. The Banjara tribe celebrates the *Teej* festival in the month of August in a ritualistic manner. This festival is considered as important for unmarried girls who pray for better bridegrooms. The girls sow seeds in bamboo bowls and water them three times a day for nine days. The bowls are kept in a prominent place and girls sing and dance around the bowls. If the sprout from the seeds grow thick and tall, it is considered as a good omen for getting a better groom.

3.3 HEALTH CARE RITUALS

Rituals connected to disease prevention and cure in the primitive ethnic communities of the study region are intimately related to a concept similar to *Shamanism* followed in some Latin American and African ethnic societies (Thaninayagam, 2011). The *Shaman* or spiritual leader (male or female) in this region is often known by the Tamil terms *Poojary* or *Pandaram* The shaman of *Koya* tribe is called '*Buggivadde'*; this tribe also has a sorcerer called '*Vejji.'* The shanman is not only the village doctor but also the priest of the village temple and caretaker of the sacred grove associated with it. It is from the sacred grove that he often obtains the medicinal plants needed for the village community. He often practices medicine by combining with it spirituality, magic, godly faith and fear and sometimes even sorcery. Very often curing of diseases is ritualistic and combines one or more of the above. The *poojary* is regarded as having access to, and influence in, the world of benevolent and malevolent spirits; he typically enters into a trance state during a ritual through ritual dances and practices divination and healing. The *poojaries* are often considered as intermediaries/messengers between the human world and the spiritual world. They operate primarily within the spiritual world, which in turn affects the human world. They are said to treat ailments/diseases by mending the soul. They also enter supernatural realms or dimensions to obtain solutions to problems afflicting the ethnic community. The restoration of balance results in the elimination of the disease (Eliade, 1972). Shamanism cannot be strictly defined as medicine, although healing is its main objective. The *poojary* has a vast knowledge on the medicinal properties of plants around him. Strange ceremonies, rites, rituals, chants,

dances, colorful outfits, perfuming with incense and invocations are part of the shamanic world. Consumption of trance-giving plants is regarded as sacred is not hallucinogenic. Naokov (2000), for example, has elaborated his observations on shamanism after extensive fieldworks in Villupruam district of Tamil Nadu. The Nattar people, according to him, get cured through religion and magic-related actions, or mental and physical illness. He mentions of rituals related to *Kuri*-telling (=divine indication or forecasting/fortune-telling), black magic, counter black magic, sorcery, driving away of ghost/evil spirits, offering live sacrifice, etc. which are important in disease prevention/curing in this community. On getting subjected to these rituals, the person who gets a disease shows slow changes towards betterment while being watched by his relatives. Both prescriptive and performative rituals are conducted in this connection.

One ritual that is followed is tattooing (*Akki*-writing in Tamil) or suitable make ups on the body, aimed at disease curing. Anointing parts of body with clay or acquisition/control of body energies in an intelligent manner are also done through rituals and associated activities mentioned in the previous paragraph. Most of these rituals are often classified under technical rituals. Specific plants are used in this connection and the nature of relationship of these plants to actions like black magic and sorcery is not very clear. However, many of these plants contain tranquilizing or hallucinating principles in them.

KEYWORDS

- **Cosmovision**
- **Domain Concept**
- **Eastern Ghats**
- **Rituals**
- **Traditional Knowledge System**

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CHAPTER 4

ETHNOECOLOGY, ETHNOTAXONOMY, AND ETHNONOMENCLATURE OF PLANTS OF ANCIENT TAMILS

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4.1 INTRODUCTION

It is generally agreed that the first land plants evolved on this earth during the late Silurian and early Devonian periods. Hence, when the modern human species, *Homo sapiens*, arose around 200,000 to 250,000 years ago, he had to confront all major groups of plants, including angiosperms, which were already there on this earth. By that time, plants had adapted themselves to the diverse habitats/ecosystems of the world through structural and functional modifications. The early human populations also had to adapt themselves to these diverse habitats/ecosystems, made possible largely through the generation and application of knowledge, both ecological and technological, which they gradually gained during their long years of hunter-gatherer experience (Cotton, 1996). This ethnic knowledge system is often called traditional knowledge system (TKS). When one critically analyzes the ethnic cultures and their non-codified and codified TKS of different parts of the world, he would be greatly impressed on knowing that these cultures placed great emphasis on the value and importance of their environment and its resources. Hence, it is not surprising that Merculieff (1994) had shown how traditional concepts on environment and ecology have preempted modern ecological ideas of western science. It is now possible to get a fair idea on the traditional systems of classifications of ecosystems, vegetation types and plants (and animals). This chapter deals with ethnoecology, ethnotaxonomy and nomenclature of the ancient Tamil people belonging to the Dravidian race that occupied the major part of the study region covered in this volume. The Tamils are one of the most ancient ethnic peoples of this world with a history of around 50,000 years. The Tamil TKS is also a well-codified system of knowledge in the form of ancient literary works that belong to the *Sangam* (200 BCE to 250 CE) and post-*Sangam* (250 BCE to 600 CE) periods. This article summarizes the knowledge that belonged to these periods, although it should be stated that most of this knowledge continued to be there till the British occupation of India in the 16th century.

4.2 ECOSYSTEM CLASSIFICATION

The ecosystem classification proposed by ancient Tamils is one of the most significant and oldest of all traditional ecosystem classifications. There are very strong evidences in *Tolkappiam*, *Sangam* and post-*Sangam* Tamil literature to show that this classificatory system was in existence even by

about 250 BCE in the Tamil country (Krishnamurthy, 2007). The Tamils classified their landscape into five ecosystems or *Thinais*: *Kurinji*, *Mullai*, *Marutham*, *Neithal* and *Paalai*. These names were believed by many to be based on the most characteristic plants (type plants) of the respective ecosystems: *Strobilanthes kunthianus* (*Kurinji*), *Jasminum auriculatum* (*Mullai*), *Lagerstroemia speciosa* (*Marutham*) (wrongly denoted earlier as *Terminalia arjuna*), *Nymphaea nouchali* (*Neithal*) and *Wrightia tinctoria* (*Paalai*). It was however, believed by Varadarajan (1965) that these names of ecosystems were first applied to the flowers of the type plants belonging to the different ecosystems, subsequently to the landscapes and finally to indicate the differences in the love-related virtuousness and behavior of the peoples of these ecosystems. On the other hand, Nedunchezian (2003) did not agree with this opinion. He argued that these names were based, beyond flowers, on the habits of plants. However Krishnamurthy (2007) believed that the names of ecosystems were based on flowers, landscapes, love-related virtuousness and behavior and habits of plants, in a holistic manner since this viewpoint is in agreement with the traditional concept of biodiversity (see details on a subsequent paragraph of this article).

The five ecosystems, respectively, represent the mountainous ecosystem (*Maivarai Ulagam*), Scrub savanna ecosystem (*Kaaduraiulagam*), the predomianatly agricultural ecosystem with abundant lotic and lentic water bodies (*Theempunal Ulagam*) the marine and coastal ecosystem (*Perumanam Ulagam*), and the degraded mountain and scrub savanna ecosystem (*Vanpulam*). Each ecosystem was assigned a system of primary components or *MudalPorul*, of core components or *Karupporul* and of the personal love component or *Uripporul* (See Table 4.1). Each ecosystem has two primary components: Landscape type or *Nilam*, as mentioned above and time or *Pozhudu*. The latter is spoken in terms of different periods of a day (*Siru-pozhudu*) (six periods were recognized in a day) and of different periods or seasons of a year (*Perumpozhudu*) (six seasons were recognized in a year). Each ecosystem was related to a particular *Pozhudu* (both *Siru-* and *Perum-Pozhudu*), which was considered significant to that ecosystem. Fourteen items were assigned to constitute the core components of each ecosystem. Among these the most important are the principal God, plants, animals, birds, harvested food crops, foods, the main substances used, generic names of people, their profession, the hamlets (Place of living), etc. The third component, *Uripporul*, is the most important and it added a great deal of intrinsic, moral and personal importance and significance to this ecosystem classification.

TABLE 4.1 *Mudal*, *Karu* and *UriPoruls* of the Different Ecosystems Recognized by Ancient Tamils

Sl. No	Ecosystem	Mudal Porul	Karupporul (most important only given)	Uripporul
1	*Kurinji*	1) Landscape Mountainous area 2) Time a) Season Windy season & Early winter b) Day Night time	1) God *Seyon* (=Murugan) 2) Plants-*Kurinji* (*Strobilanthes kunthianus*), *Venkai* (*Pterocarpus santalinus*), *Moongil* (*Bambusa* sp.) 3) Animals-Bear, Tiger 4) Birds-Peacock, Parrot 5) Harvested crops-*Thinai* (millet), mountain paddy. 6) Foods-Rice, fruits, honey. 7) People-*Koravas* 8) Profession-Collecting honey, plucking tubers. 9) Hamlet-*Chirukudi* 10) Leader-*Kundranadan*	Union of lover (or husband) and the loved (or wife).
2	*Mullai*	1) Landscape Scrub savanna (=*Puravu* or *Vianpulam*) 2) Time a) Season Rainy season b) Day Evening time	1) God-*Maayon* (=*Maal, Tirumaal*) 2) Plants-*Mullai* (*Jasminum auriculatum*) *Konrai* (*Cassia fistula*) *Kaanthal* (*Gloriosa superba*) 3) Animals-Dear, Rabbit 4) Birds-Peacock, Hen/cock 5) Harvested Crops-*Varagu*, *Muthirai*, *Saamai* (all minor millets) 6) Foods-Millets 7) People-*Aayar*, *Kovalar*, *Idaiyar* 8) Profession-Cattle-rearing and feeding 9) Hamlets-*Paadi*, Cheri, *Palli* 10) Leader-'*Kon'*	Separation of lovers (or husband and wife); women maintaining chastity.

TABLE 4.1 *(Continued)*

Sl. No	Ecosystem	Mudal Porul	Karupporul (most important only given)	Uripporul
3	*Marutham*	1) Landscape-cultivated agricultural lands with a lot of lentic and lotic water bodies (called in Tamil *Pazhanam*, *Kazhani* and *Cheru*) 2) Time a) Season All six seasons of the year b) Day Very early morning and sunrise time	1) God-Vendan 2) Plants-*Marutham* (*Lagerstroemia speciosa*) *Ambal* (*Nymphaea pubescens*) *Pakandrai* (*Operculina turpethum*) 3) Animals-Buffalo, Bull 4) Birds-Stork, Duck 5) Harvested crops-Paddy, Plantain, sugarcane 6) Foods-Rice, Banana, Jack fruit, Sugarcane 7) People-Uraar 8) Profession-Agriculture Hamlets-*Perur*, *Mudur* 9) Leader-Uran	Tiffs between lovers or between husband and wife and their subsequent removal.
4	*Neithal*	1) Landscape a) Coastal land and sea (Kaanal and Kadal) 2) Time a) Season All six seasons of the year b) Day Morning time	1) God-*Varunam* 2) Plants-*Neithal* (*Nymphaea nouchali*), *Thazhai* (*Pandanus* sp.), *Punnai* (*Calophyllum inophyllum*) 3) Animals-Crocodile, Crabs, Fishes 4) Birds-Swan, Egret 5) Harvested Food source-Fishes, Prawns 6) Foods-Fish, Prawns, Crabs 7) People-*Bharathavar* (Fisherfolks) 8) Profession-Fishing 9) Leader-*Thuraivan*, *Pulamban*	Wife/lover waiting for the separated husband/lover to return home

TABLE 4.1 *(Continued)*

Sl. No	Ecosystem	Mudal Porul	Karupporul (most important only given)	Uripporul
5	*Paalai*	1) Landscape-Degraded *Kurinji* and *Mullai* lands (=*Vanpulam*) 2) Time a) Season Late winter and summer b) Day Midday time	1) God-*Durgai* 2) Plants- *Panai* (*Borassus flabellifer*) *Omai* (*Anogeissus latifolia*) Kura (*Tarenna asiatica*) 3) Animals-Dogs 4) Birds-Vultures 5) People-*Ainer* 6) Leader-*Midalai*, *Kaalai* 7) Profession-Robbery 8) Hamlet-*Kurumbu*	

Although the Tamil concept of ecosystem has certain features of certain other ethnic ecosystem classifications, it has certain unique features not known to other systems. The common features concern the distinction of local vegetation types on the basis of factors, such as location, dominant life forms and predominance of particular plant/animal species of cultural or utilitarian value. This, for example, is the virtue of Hanuno's culture in the Mindora island of Philippines also (Conklin, 1974). The unique feature of the Tamil system is that a social and cultural dimension has been intricately added to the ecosystem concept, for example, the assignment of separate *Mudal*, *Karu* and *UriPoruls* to each ecosystem. Hence, the Tamils may be considered as one of the earliest ethnic societies that included social and cultural diversity aspects in their concept on biodiversity. This inclusion is only recently being suggested and emphasized by UNESCO and UNEP (see Krishnamurthy, 2003). Cultural diversity recognizes the pivotal role of sociological, ethical, religious and ethnic values in human efforts concerning biodiversity classification (UNEP, 1995).

4.3 ETHNONOMENCLATURE AND CLASSIFICATION OF PLANTS

4.3.1 TRADITIONAL ETHNIC APPROACHES

A critical examination of traditional cultures of various parts of the world reveals that plants were recognized, named and classified. Ethnonomenclature refers to the recognition and naming of plants (and animals) around them by the ethnic societies, while ethnotaxonomy is a study of the traditional system of classification of plants (and animals). Ethnotaxonomy requires the identification and naming of plants that need to be classified. For ethnic societies satisfying their basic needs, such as food and medicine is more important in properly recognizing and naming plants, a materialistic view point (Malinowski, 1974). Hargreaves (1976) has, in fact, shown that plants were named according to their uses and that many plants in Chitipa have no local name because they have no use. However, others like Levi-Strauss (1966) argued that the outlook of the ethnic societies towards the natural world in general, and its resources like plants in particular, is primarily intellectual an cognitive and divorced from pragmatic concerns. Some plants in Malawi, as elsewhere, have names but no apparent utility and hence there appears to be no correlation between ethnic nomenclature and plant use. In his early theories of structural anthropology, Levi-Strauss showed the universal human tendency or urge to organize and classify perceived phenomena, experience or things (Seymour-Smith, 1986). These two different viewpoints respectively of Malinowski (1974) and Levi-Strauss (1966) naturally advocate different kinds of intellectual and classificatory modes. For Levi-Strauss (1966), ethnic societies are concerned with a mode of thinking that unifies through symbolic logic the various aspects of their cultures, while for Malinowski (1974), Berlin and his associates (1974) and others ethnic peoples are protobotanists who are concerned with ordering the natural world through criteria based on structural morphology of plants. Although both these perspectives are necessary and are not mutually exclusive, they have limited our understanding of ethnic taxonomies. To consider ethnotaxonomics simply as taxonomics, abstracted from utilitarian, environmental and cultural concerns, greatly limits our understanding of how human societies are intimately related to the natural environment. The approach of Levi-Strauss focuses on symbolic logic and over systematizes the social communities. On the contrary, the approach of ethnotaxonomists tends to underplay the relevance of practical interests in structuring ethnotaxonomies. A critical analysis of ethnotaxonomy of the ancient Tamils shows that it is a mainly based

on Levi-Strauss' intellectual and cognitive approach. It does not appear to have a materialistic basis.

4.3.2 PERFECTION OF DESCRIPTIVE TECHNICAL TERMS

The fact that both ethnonomenclature and ethnotaxonomy have developed very well in many, if not all, ethnic societies of the world must have required a deep and critical knowledge on the life of plants on the part of these societies. This, in fact, is true for the ancient Tamil culture. These people have also coined specific technical terms numbering to around 150 to denote the various characters and character states of plants. A list of the more important technical terms used in ancient Tamil literature to denote the various characteristics is given in Table 4.2. These technical terms have been used to not only distinguish one taxon from another, but also to name and classify them. The ancient Tamils have also used several metaphoric similes to compare/describe a number of plant characteristics of ethnotaxonomic importance. Some examples are given Table 4.3.

TABLE 4.2 Representative Botanical Terms Used by Ancient Tamil Community

Sl. No	Botanical terms in Tamil	Equivalent English terms
1.	*Maram, Maran*	Plant
2.	*Marundu*	Plant
3.	*Maram*	Tree
4.	*Kodi*	Climber/twiner
5.	*Pul*	Grass
6.	*Poodu*	Bulbous Plant
7.	*Pudal*	Clump of herbs
8.	*Pavar*	Straggler
9.	*Payir*	Runner, also as crop.
10.	*Paruookkodi*	Woody climber (Liane)
11.	*Punkodi, Menkodi, Nunkodi*	Herbaceous climber
12.	*Aambi, Kaalaambi*	Fungus/Mushroom
13.	*Paasi*	Alga
14.	*Kandu*	Trunk
15.	*Sinai*	Branch, Twig
16.	*Kaambu*	Stalk
17.	*Thandu*	Stem
18.	*Thaal*	Slender stalk
19.	*Kizhangu*	Tuber

TABLE 4.2 *(Continued)*

Sl. No	Botanical terms in Tamil	Equivalent English terms
20.	*Mul*	Thorn/spine
21.	*Kodu/kottu*	Branch
22.	*Ilai*	Leaf
23.	*Siriilai*	Leaflet/small leaf
24.	*Perilai*	Large leaf
25.	*Nettilai*	Lanceolate leaf
26.	*Olai*	Palm like leaf
27.	*Idazh*	Lamina/blade
28.	*Eerkku*	Midrib
29.	*Paalai*	Spathe
30.	*Madal*	Folded blade
31.	*Thalir*	Young leaf
32.	*Sethil*	Scale
33.	*Thol*	Skin
34.	*Koththu*	Flower bunch
35.	*Thoththu*	Hanging inflorescence/flower bunch
36.	*Kulai*	Inflorescence of palms
37.	*Manjari*	Inflorescence with distinctly seen flowers
38.	*Thunar*	Spike
39.	*Inar*	Catkin
40.	*Poo*	Flower
41.	*Malar*	Open Flower
42.	*Nani*	Floral primordium
43.	*Arumbu*	Young flower bud
44.	*Mugai*	Older flower bud
45.	*Podu/Podhi/Pugil/Pogil*	Flower at anthesis
46.	*Alar*	Pollinated open flower
47.	*Vee*	Pollinated flower with abscising floral parts
48.	*Pulli*	Calyx
49.	*Alli*	Corolla
50.	*Adazh*	Perianth
51.	*Makaram*	Stamen
52.	*Poguttu/Kannigai*	Ovary
53.	*Taadhu*	Pollen
54.	*Then*	Nectar
55.	*Nara/Narai*	Honey
56.	*Kal/Mattu/Theral*	Fermented honey
57.	*Nirai poo*	Complete flower
58.	*Kurai Poo*	Incomplete flower
59.	*Sool*	Ovule

TABLE 4.2 *(Continued)*

Sl. No	Botanical terms in Tamil	Equivalent English terms
60.	*Kai*	Unripe fruit
61.	*Kani/Pazham*	Ripe fruit
62.	*Vidai/Kazh*	Seed
63.	*Kural*	Cob
64.	*Koli*	Non-Flowering tree
65.	*Umi*	Lemma/palea
66.	*Thoombu*	Air canal
67.	*Vazhumbu*	Mucous
68.	*Naar*	Fiber
69.	*Akakazh*	Wood
70.	*Vayiram*	Heartwood
71.	*Pararai*	Trees with heartwood
72.	Veezh	Aerial root

TABLE 4.3 Some Examples of similes of Ethnotaxonomic Importance Used by Ancient Tamils (Krishnamurthy, 2006)

Sl. No	Similies used
1.	*Mullai* flower buds like teeth of women
2.	*Neithal*, *Kaavi*, *Kuvalai* and *Senkazhuneer* flowers like the eyes of women
3.	*Sesamum* flowers like the nose of women
4.	*Vallai* leaves similar to the ear lobe of women
5.	Flower buds of *Kongu* akin to the breast of young women
6.	Perianth lobes of *Gloriosa superba* like the fingers of women tinged with *Lawsonia* dye
7.	*Nochi* flower buds similar to the eyes of a crab
8.	*Vagai* flower similar to peacock's headtuft
9.	The young flower bud of *Kuravu* similar to the teeth of snake
10.	The young flower bud of *Punnai* similar to the egg of house lizard
11.	*Thalava* flower looking like the beak of Kingfisher bird
12.	*Thalava* flower bud similar to the nail of *kauthari* bird
13.	*Iluppai* flower similar to the foot of a cat
14.	*Adappam* flower similar to the young one of *kurumpoozh* bird
15.	*Mulli* flower similar to the tooth of Squirrel
16.	*Avarai* flower similar to the beak of a parrot
17.	*Agaththi* flower similar to the tooth of a pig
18.	The leaf of *nochi* looking like the foot base of peacock
19.	*Ambal* leaf like the ear lobe of a rabbit
20.	*Oogu* is similar to the tail of *anil*
21.	*Kundri* seed looking like the eye of a white rat
22.	*Adumbu* leaf looks like a deer's foot.

TABLE 4.3 *(Continued)*

Sl. No	Similies used
23.	The truck of *Omai* tree is similar to the skin of crocodile
24.	*Perupoolai* leaf hairs similar to the hairs of a kitten
25.	Leaflet margin of Neem looking like a saw
26.	*Iluppai* flower similar to arrowhead
27.	*Makilam* flower similar to the wheel of a cart
28.	*Padiri* flower looking like a painter's brush
29.	*Pungam* flower bud similar to puffed rice
30.	*Karumbu* flower similar to a upright spear
31.	The inflorescence of *Venkadambu* and the fruit of *vila* similar to a ball
32.	*Paalai* unripe fruit similar to a tong
33.	The corm of *Kanthal* looking like a plow
34.	Bunch of *Konnai* fruit similar to the beard of a sage

4.3.3 ETHNONOMENCLATURE

It is interesting to know how different ethnic societies of the world named and classified the different plants (and animals) and, thus, conceptualize the natural world. Like any other sub-discipline of anthropology, ethnobotany has heavily borrowed from linguistic analysis, both in the emphasis placed on recording and studying those categories of taxa which are linguistically defined and in the focus on identifying sets of contrasts. Patterns revealed through taxonomic labels often provide clues, not particularly cultural, of local plants (Martin 1995; Cotton 1996) see also Ellen (1994). The transcribed traditional names can then be translated either by the use of a gloss or free translation, in which case the closest equivalent word available in English is used, or, the terms may be translated literally, in which case the world is translated word-for-word.

Between 250 BCE and 600 CE, the Tamil ethnic community had around 350 generic plant names. Subsequent to this period, this number gradually increased (Krishnamurthy, 2007). There are two unique aspects about these generic plant names: (i) These names cannot be translated either by the use of a gloss or free translation, as discussed in the previous paragraph, and hence, the closest equivalent English word cannot be found, or these generic names cannot also be translated literally and, hence, the name cannot be translated word-for-word, as in many other ethnonomenclatural systems of the world. The Tamil generic names for plants can only be transliterated. Since these generic names and the information as to which plants they refer

to have been passed on through successive generations of Tamil people, we now know what Tamil generic name indicates which plant. In spite of this, we are not able to find the correct Tamil botanical names for some of the ancient Tamil generic names found in literature since enough descriptions of these plants are not available in the literature, which could facilitate their correct identification. In some cases the descriptions are not enough to help in accurate identification and only tentative identifications have been given. As examples of the former we may cite the following: *Anicham, Asakam, Arai, Aravu, Ingulam, Iram, Kaduvu, Kalmitham, Kaavithi, Kusappul, Koovai, Sengurali, Puzhagu, Vayalai, Visai,* etc. (ii) The generic names used by ancient Tamils to denote the different plants are very unique in their own rights (Shanmugasundaram, 1970; Krishnamurthy, 2007). Almost all generic names are very short and consist of one (for example, *Che-Alangium salvifolium*), two (Ari-*Bambusa* species), three (*Aacha-Hardwickia binata*), four (*Adumbu-Ipomoea pes-caprae*), or five Tamil letters (*Iranthai*, *Zizyphus mauritiana*). Six and seven letter generic names are extremely rare (e.g., *Kannikaram*, *vellothiram*). The names are easy to pronounce and are very attractive. The names often end with soft and rhythmic sound with the following Tamil letters only: Aa, E, U, I, Il, Im or Ir (representative examples are *Ukaa, Inge, Kamugu, Panai, Vel, Aaram* and *Aar*). However, from the *Bakthi* Literature period (late half of 7th century CE) onwards such a type of naming of generic categories of plants declined very rapidly. Many Sanskrit generic names started to be in prevalent use, as is evident from Tamil *Nigantus* (Dictionaries) (Examples: *Athimaduram*, *Kanaveeram*, *Aravindam*, etc.). There was also an influence of Ayurveda and Siddha medicines on the naming of generic taxa of plants, particularly at the village/rural level. In villages new names for plants were coined (sometimes even for the existing Tamil generic names) so as to enable lay people to easily recognize and identify the plants of medicinal value. As examples, we may mention *Kalappai Kizhangu* (tuber shaped like a plow) for *kaanthal* (*Gloriosa superba*), *Santhanam* (for Aaram, *Santalum album*), *Kudaivelam* (for *Udai*, *Acacia planifrons*) and *Udumbaram* (for *Atthi*, *Ficus glomerata*). The method of naming generic taxa by ancient Tamils also allows us to distinguish original plants that were available at the time of such naming from the plants (and their names) that were subsequently introduced into the Tamil country from other parts of India or from other parts of the world. As examples we may cite native *Malli* (*Jasminum* sp.) from the introduced *PavazhaMalli* (*Nyctanthes arbortristis*) (Probably introduced from Odisha) and *Panai* (*Borassus flabellifer*) from *Koonthal Panai* (*Caryota urens*).

4.3.4 ETHNOTAXONOMY

Traditional societies have been classifying objects around them, including plants and animals. It is interesting to record that "a culture itself amounts to the sum of a given society's folk classifications" (Sturtevant, 1964). The earliest critical study of ethnic taxonomy/classificatory system was that of Conklin (1954, 1957, 1974), who investigated the classification system followed by a tribe in the Philippine island of Mindoro. Subsequently, the plant classification systems of several ethnic cultures of the world have been reviewed and a synthesis of their features, in the form of some general principles has been proposed (Berlin et al., 1973). These principles are discussed below in reference to the classificatory system that was followed by the ancient Tamil culture.

The first general principle is that in all languages it is possible to identify groups of taxa which are recognized linguistically and that these taxa are based on varying degrees of inclusiveness (like in English language *Casuarina*, tree and plant respectively represent taxa of increasing inclusiveness). In ancient Tamil language also this was seen (for example, *Mullai*, *Kodi* and *Maran* or *Maram,* respectively, represent the increasing hierarchy of generic name, lifeform and plant).

The second general principle is that biological taxa are grouped into a number of ethnobiological categories, similar to the modern plant/animal taxonomic ranks. In 1972, these categories were respectively designated as unique beginner, life form, intermediate, generic specific and varietal, in a decreasing order of inclusiveness. This categorization was also noticed in the Tamil classification system. Folk taxonomic hierarchies are considered to be relatively shallow and that the term hierarchy is almost is misnomer. It is especially true, for instance when about 20% of Tzeltal plant categories are unaffiliated to any life-form taxa, and that 85% of the generics are monotypic. Similarly, plants in Bunaq taxonomy appear to be classified more according to a complex web of resemblances rather than forming, neat hierarchy.

The third principle states that mutually exclusive ethnobiological categories mentioned above are arranged hierarchically, each encompassed by the single unique beginner taxon, which is almost equivalent to the plant kingdom suggested in modern biological classificatory system. This principle is also seen in the Tamil ethnic classification system.

The fourth principle states that the taxa of the same ethnobiological rank commonly occur at the same taxonomic level. This is true of Tamil ethno classificatory system also.

The fifth principle states that the unique beginner taxon (i.e., plant) is not normally named with a single, habitual level, but at the next level, there normally exist between five to ten life forms, which are normally labeled the Tamil classificatory system the unique beginner taxon is not labeled by the term *Thaavaram* which is used in modern Tamil as equivalent to plant until around the 7th century CE (Krishnamurthy, 2007). On the contrary, the unique beginner taxon was labeled as *Maram* or *maran*, which in fact was a term used at the next habitual level also to denote trees. In other words, all plants were called by ancient Tamil culture as *Maram* or *Maram* and at the same time to denote a habit category also, for example, tree. The term *Marundu* was also used by the ancient Tamils to denote plants at the unique beginner taxon level since they believed that plants formed the source of medicines (see discussion in Nedunchezian, 2003; Krishnamurthy, 2007).

The sixth principle states that most ethnotaxonomies appear to contain around 500 taxa at the *generic* level and that these taxa invariably represent the basic building blocks of these taxonomies. These taxa are also the most salient psychologically. This principle further states that most of these *generic* taxa are included within a given life-form category. There are also a few morphologically unique or economically very important and often aberrant taxa and also taxa that are not conceptually regarded as affiliated to any life-form categories in those ethnotaxonomies. The Tamil ethnotaxonomy contains around 350 generic taxa; like in other ethnotaxonomies these taxa represent the basic building blocks of the Tamil taxonomic system. These taxa are also the most salient. A critical analysis shows that all these taxa are included within the life-form categories recognized by this system. Eight life-form categories have been identified by the ethnotaxonomy of Tamils: of these seven refer to land life-forms and one to aquatic life form. The ligneous life-form constitutes the trees which are characterized by wood, often with a region of heartwood, and perennial life span. This life-form was indicated by the terms *Maram*, or *Maran* in Tamil, as already mentioned. Grasses form the next life form category. They are indicated by the word '*pul'* in Tamil (although in a broader sense, this Tamil term indicated the 'monocots' also, see discussion later). *Pudal* forms the third life-form category. In modern Tamil this word refers to a bush. According to some Tamil scholars *Pudal* includes all life forms other than trees, but this is not accepted by most other Tamil scholars. A critical study of literature shows that Pudal refers to a close clump of herbs. It is interesting to note here that the modern Tamil term for herb is *chedi* but this term was not used for herb until around the 7th century CE. The fourth category of life-form is *poodu*, which in modern Tamil got corrupted into *Poondu*. This word indicates plants with

underground bulbs as in onion. The fifth category is *Kodi*, which denotes a climber/twiner. There are herbaceous climbers recognized by the use of terms, such as *Menkodi* (weak/slender climber), *Nunkodi* (small climbers) and *Punkodi* (weak-stemmed climbers), and there are woody climbers or lianes, which from the sixth category. These lianes are indicated by the term *Paruookkodi*. The seventh category is referred to by the Tamil word *pavar*. This word describes plants that grow adpressed to another plant, and form literary description and examples cited in literature (like *Calamus*) it is likely to indicate a straggler. The eighth category refers to aquatic plants. There are also references to fungi and algae in the early Tamil literature. These respectively are indicated by the Tamil words *Aambi*/*Kalambi* and *Paasi*. Whether these should be treated as intermediate categories or as life-form categories is not clear. Some, with whom the authors of this paper had discussion with, even suggest these terms as *generic*.

According to the seventh principle, specific and varietal taxa are less numerous than the generic taxa. The members of a given *contrast set* differ from the other members in a few, often 'verbalisable,' characters. In the Tamil ethnotaxonomy there are around 350 *generic* level taxa. Out of these few alone have specific and varietal level taxa; these constitute about 10% of the total. This number is much higher than the average of less than 2% of such taxa in world ethnotaxonomies (Martin, 1995; Berlin, 1992). The species and varietal level taxa always have prefixes to the original *generic* labels in Tamil ethnotaxonomy, such as *Karu* (indicating black), *Sen*(*g*) (indicating red), *Ven* (indicating white), *Siru* (indicating 'smaller'), *Peru* (indicating 'bigger'), *kaattu* (indicating 'forest'), etc. These prefixes are often adjectives or another noun.

Special discussion must be made here about the '*intermediate*' taxa recognized in only some ethnotaxonomies and hence are rare or difficult to detect. These are also seldom named in such ethnotaxonomies and hence are called covert or unnamed taxa. These generally encompass a number of related generic level taxa. As far as Tamil ethnotaxonomy is concerned two intermediate level taxa were recognized: *Akakkazh* plants and *Purakkazh* plants. The former refer to plants that have a true wood while the latter to plants that lack true wood. These two groups are respectively equivalent to modern day taxa dicotyledons and monocotyledons. It is very interesting to note that the supposedly earliest Tamil grammar text *Tolkappiam* classified plants into trees and grasses, which respectively indicated dicotyledons and monocotyledons. The latter included palmyrah and other palms and bamboo under the life-form category *Pul* (=grass), although they are arborescent and 'woody' (Rajeswari, 2005). Tolkappiar, the author of *Tolkappiam*, has

listed the following structures as belonging to the grasses (i.e., monocots): *Thodu* (Leaf or inflorescence sheath), *Madal* (folded leaf blade), *Olai* (Palm leaf), *Eadu* (lamina without petiole), *Idazh* (perianth lobe), *Paalai* (spathe), *Eerku/Eadu* (linear) and *Kulai* (inflorescence like in palms). Similarly, he had listed the following appendicular structures as characteristic of *Maran* (=the dicotyledons). *Ilai* (leaf), *Muri* (twig), *Thalir* (sprout), *Sinai* (branch), *Kuzhai* (twig with leaf bunch), *Poo* (flower), *Arumbu* (young flower bud), *Nanai* (floral primordium, etc.). He has also listed the following as belonging to both these groups: *Kaai* (unripe fruit), *Pazham* (fruit), *Thol* (Skin), *Setil* (scale), Veezhr (aerial root).

The seven principles discussed above have been accepted by many ethnobiologists, although other cross-language, based on a survey of folk classification in 188 languages for plants, patterns have become apparent in ethnobotany (Brown, 1984, 2000). Some pertinent to Tamil Ethnotaxonomy have been detailed above. Brown has assembled evidence from a large number of globally distributed languages and suggested that plant life-form categories are typically added to languages (i.e., lexically encoded in more or less fixed sequences as shown in Figure 4.1.

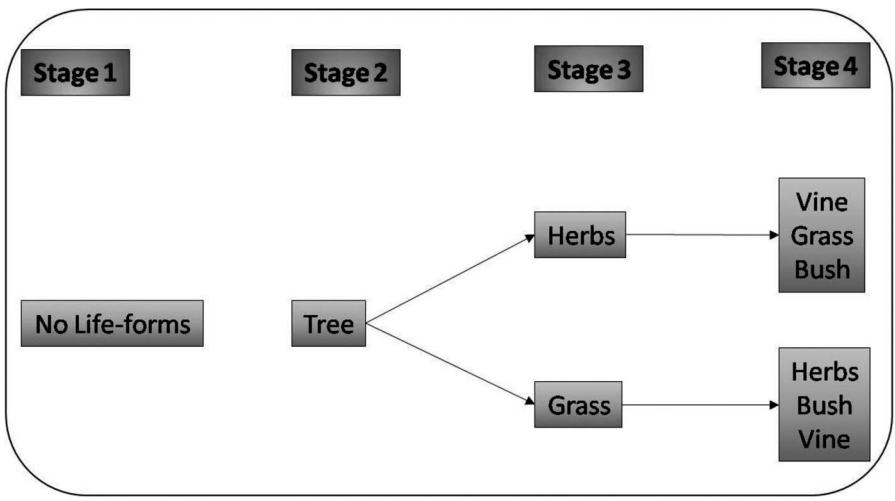

FIGURE 4.1 Addition of plant life-form categories to ethnic languages fixed sequences (based on Brown, 2000).

In the figure, stage 1 languages lack names for botanical *life-form* categories and in the successive stages these languages have added further life-form categories. Ancient Tamil language is one language that has all

life-form categories except herb (in Tamil, *Chedi*). This life-form category was added in the language only by about the 5th century CE.

In 1997 Berlin has revised and expanded the seven principles discussed above and proposed a total of seven principles of ethnobiological categorization and, five principles of ethnobiological nomenclature. These principles were summarized by Martin (1995) as a general purpose ethnotaxonomy. This is summarized, with modifications, in order to explain the ancient Tamil ethnotaxonomy of plants (Table 4.4).

TABLE 4.4 Major Features of General Purpose Classification of Plants of Ancient Tamils*

Sl. No	Plant Category	Nature of label	Label proposed in Tamil culture	Numbers
1.	Kingdom (Plant)	Not covert	Labeled as *Maram*/*Maran* or as *Marundu*	1
2.	Life-forms	Primary		8
	Ligneous and with wood		*Maram*	
	Grass		*Pul*	
	Clump of herbs		*Pudal*	
	Bulbous plants		*Poodu*	
	Herbaceous Climbers		*Kodi*	
	Liana		*Paruookodi*	
	Straggler		*Pavar*	
	Aquatic plants		*Neerpoo*	
3.	Intermediate 'Dictos'	Not covert	*Akakkazh*	2**
	'Monocots'		*Purakkazh* or *Pul*	
4.	Generic	Primary	Basic plant name	350
5.	Specific and Subspecific	Secondary	Basic plant name plus attribute(s)	35(10%)

*This table has been made on the basis suggested by Berlin (1992).

**Whether to include fungi and algae here is a matter of debate and still undecided.

4.4 CONCLUSIONS

The above account clearly demonstrates the deep knowledge that ancient Tamils had on plants, their naming and classification. The Tamil classificatory system is of great convenience to the originator and user of this system. This system is not utilitarian but basically based on symbolic logic and culture, but at the same time allows for a communication between members of

the Tamil society. This chapter also falsifies statements, such as the following: "Great in accuracy and a general absence of scientific system obtains in the Tamil botanical nomenclature."

KEYWORDS

- **Ancient Tamil People**
- **Mudal Porul**
- **Sangam Literature**
- **Similes**
- **Thinais**

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CHAPTER 5

ETHNIC PLANT GENETIC RESOURCES DIVERSITY OF EASTERN GHATS AND DECCAN

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CONTENTS

ABSTRACT

Eastern Ghats is a rich abode and a treasure trove for ethnic diversity in plant genetic resources consisting of different agri-horticultural crops, their wild/weedy relatives, medicinal, aromatic and dye yielding plants. However, due to socio-economic developmental programs and other biotic pressures the endemic crop genetic diversity accumulated through years of evolution under domestication and natural selection by the tribal groups is being wiped out from the nature. Concerted and systematic efforts have to be made now and in future as there is a tremendous urgency and scope for collection and conservation of ethnic plant genetic diversity for sustainable utilization from the Eastern Ghats. This chapter describes the nature and spectrum of plant genetic resources diversity with special reference to ethnic agri-diversity and their wild relatives in the Eastern Ghats region. Conservation strategies and utilization of these ethnic genetic resources and the factors contributing to genetic erosion of native wealth are also discussed.

5.1 INTRODUCTION

The Eastern Ghats of Indian sub-continent is immensely rich in ethnic plant genetic resources diversity of crop species, wild relatives and medicinal plants. It constitutes our invaluable assets to meet the growing demands to increase crop production and productivity. Ethnic plant genetic diversity is fundamental to crop improvement programs and the key to establishing future food and nutritional security. Ethnic plant diversity in the form of seeds and plants provide the raw materials that scientists use to address crop production challenges, develop new crops and identify new uses for existing crops. Scientists use these resources to develop knowledge or products valuable in coping with inadequate water or nutrient supplies, diseases or insect pests, heat and cold tolerance, understand their nutritional properties and for many other purposes. The importance of ethnic plant genetic resources has increased significantly in the recent years with the changing global scenario in material ownership and the legal regimes with respect to access to plant genetic resources under the International Agreements.

Plant genetic resources are the genetic material of plants, which determines their characteristics including their ability to adapt and survive. The ethnic plant genetic resources diversity profile of a crop, therefore, includes its wild species, weedy companion species, sub-species, botanical varieties, landraces, ancient and heirloom cultivars, that make up the part of total gene pool of the crop.

The Eastern Ghats, one of the major hill ranges of India, located between 77°22′ and 85°20′ E and 11°30′ and 21°0′ N form an assembly of discontinuous ranges, hills, plateaus, escarpments, narrow basins and spread in an area of about 75,000 km^2. The Eastern Ghats stretching from Orissa, Chhattisgarh, through Andhra Pradesh to Tamil Nadu and parts of Karnataka are endowed with a large variety of biological species, geological formations and indigenous tribal groups. For Eastern Ghats, the Mahanadi basin marks the northern boundary while the southern boundary lies in the Nilgiri hills. While the tips of Bastar, Telangana, Karnataka plateaus and Tamil Nadu uplands form the boundary in the West, the coastal belt forms the boundary in the east.

The Eastern Ghats region is inhabited by nearly 54 tribal communities, which constitute nearly 30% of total population (Chauhan, 1998). The major tribes in the Eastern Ghats are *Arondhan, Irular, Kota, Kotanayakam, Kurmar, Puniyan, Pulayan, Sholaga, Tuda* and *Malayali* in the southern region, *Bagata, Chenchu, Gadaba, Jatapu, Kammara, Kondadora, Kondakapu, Kondareddy, Kandha, Kotiobenthu Oriya, Koya/ Goud, Kulia, Mali, Mannedora, Nayaka, Nukadora, Paraja, Reddidora, Savara, Valmiki, Yenadi* and *Yerukala* in central region and *Bathudi, Birjhal, Bhuiyan, Dhuma, Bhumis, Bhuttada, Gond, Khana, Kisan, Kolba, Munda, Oraon, Soarha* and *Sounti* in the northern region. The variations in altitude and climatic conditions, especially in rainfall have immensely contributed in the evolution of rich ethnic floristic diversity in the Eastern Ghats. This region is very rich in terms of natural wealth, which is manifested in its greatest biological diversity. Out of 2,500 species of flowering plants belonging to Angiosperms, Gymnosperms and Pteridophytes known to occur in Eastern Ghats, about 77 species (67 Dicots, 9 Monocots and 1 Gymnosperms) are endemic.

5.2 ETHNIC AGRICULTURAL DIVERSITY

In the Eastern Ghats, the natural flora includes many economic plant species that offer food, fiber and shelter. The sowing of selected seeds of different crop plants in limited pockets or under some trees and harvesting them later was the practice over a number of years initially. The farming community in the Eastern Ghats constitute only the tribal population initially. With the increasing requirements of quantity and the spectrum of food, the pressure to bring in more land for organized cultivation came in to existence. As the gathering of wild seeds, beans and tubers stopped, the hill slopes are brought in to cultivation with the slash and burn (*podu*) cultivation. As the soil is virgin, the ash and the plant debris acted as the needed organic fertilizer**.** In

this process, the forest felling, degradation and denudation paved a way for Agriculture in the Eastern Ghats.

Agriculture is practiced by all the tribal groups among others concentrated in the forest areas like *Kondaporas, Kondareddy, Chenchus, Gonds* (Andhra Pradesh), *Sholingars, Kurumbas, Thodas, Irulas, Nari kuravas* (Tamil Nadu) and *Porjas, Gadabas, Bondas, Savaras, Samanthas* and *santhals* (Odisha) mainly by *podu* cultivation. Due to intensified Integrated Tribal Development Agency (ITDA) extension programs the tribals have been given some hill slopes for cultivation and all the required inputs to divert them to agriculture. There are instances very recently where the PTG (Primitive tribal groups, for example, *Kondareddis* in Khammam district) have been persuaded by the ITDA officials to come down the hills and settle down near the foothills and join the mainstream. Ethnic plant genetic resources from Eastern Ghats with more emphasis on medicinal plants had been dealt earlier by many researchers (Banerjee, 1977; Dikshit and Sivaraj, 2014; Krishnamurthy et al., 2002, Pandravada and Sivaraj, 1999; Pandravada et al., 2000; Pullaiah, 2002; Rama Rao and Henry, 1996, Ravisankar and Henry, 1992; Rao and Harasreeramulu, 1985; Reddy, 1980; Reddy et al., 2002; Sandhya Rani and Pullaiah, 2002; Saxena and Dutta, 1975; Sivaraj et al., 2006, 2015; Sudhakar Reddy et al., 2002; Thammanna and Narayana Rao, 1998; Varaprasad et al., 2006, 2010; Vedavathy et al., 1997).

5.2.1 NATURE AND SPECTRUM OF ETHNIC PGR DIVERSITY

Given the history of development of modern agriculture especially that of improved varieties, the importance of agri-diversity and germplasm encompassing landraces, primitive cultivars, wild and weedy relatives of crop species need not be emphasized, which is the basic material in any crop improvement program. Out of the existing native ethnic floristic wealth many plant species are yet to be utilized/explored by man especially with regards to the future needs/ requirements. The list of some of the landraces existing in several ethnic agri-horticultural crops in Eastern Ghats region from parts of Andhra Pradesh, Chhattisgarh, Odisha, Tamil Nadu and Telangana is provided in Table-1.

The contribution of the tribal groups in the domestication and enrichment of the genetic variability in different agri-horticultural crops is immense and indispensable in the crop improvement programs. The way the tribal groups utilize different crops as food material is very interesting and throws light on the trials and errors, permutations and combinations of culinary processes

TABLE 5.1 Ethnic Crop Diversity in Eastern Ghats, India

S. No.	Botanical Name	Family	Common English name	Landraces/Local Name
Cereals and Pseudocereals				
1	*Oryza sativa* L.	Poaceae	Rice, Paddy	*Akasavai vadlu, Akkullu, Anjan, Attedlu, Bandabudamalu, Battadhanyam, Bodadhanyam, Badshabhog, Bagni dhan, Baiganmangi, Bakti chudi, Bandabudamalu, Bandhichudi, Baradhai, Barangi, Bayahunda, Bhayagunda, Bhus katia, Budama, Budimivanji, Chittimutyalu, Chittiporu, Chudi dhan, Dasarabhogalu, Dasara vadlu, Davaralvanji, Dawalakavanji, Dengichudi, Desidhan, Dhagruvanji, Dhanwakitaka, Dhavaralvanji, Dhonanellu, Dhubraj, Doddodlu, Ekhlo, Errabudduma, Erra mallelu, Errodlu, Erravadlu, Garadavadlu, Gowrani vadlu, Isukaravvalu, Jajati, Kalajeera, Kakirekkala vadlu, Kondadhanyam, Kondabudamalu, Kukumbanthulu, Lalat, Meher, Malainellu, Mettadhanyam, Moddugarikalu, Mullodlu, Nalla vadlu, Nallamettadhanyam, Nallasathikalu, Nevarivari, Nimmalosari, Pandadivanji, Pandarisada, Pisodi vadlu, Polala vadlu, Puraval, Ragalvanji, Regativadlu, Sannadhanyam, Seeraga samba, Seethammasavaralu, Tellabudamalu, Tella vadlu, Umri chudi, Vattodlu, Voodasannalu, Yerrakondadhanyam, Yerramallelu*
2	*Triticum aestivum* L.	Poaceae	Bread wheat	*Metta goduma, Kodumai*
3	*Triticum durum* Desf	Poaceae	Durum wheat	*Erra goduma, Kodumai*
4	*Zea mays* L.	Poaceae	Maize, corn	*Chinna makka, Erra makka, Gundu makka, makka cholam, Pelala makka*
Millets				
5	*Sorghum vulgare* Pers.	Poaceae	Sorghum	*Aragidi jonna, Badigi jonna, Chikkati jonna, Chinna jonna, Dambral, Deyam jonna, Darawat jonna, Gadda jonna, Gattumalle jonna Gunjidi jonna, Gunjidipedda jonna, Guvvi jonna, Jalleda jonna, Jinghri jowar Kathani jonna, Kempujola, Kondajonna, Kondamuddajonna, Konakadala jonna, Leh jowar, Markandi jonna, Moddu jonna, Motitura, Pachchajonna, Pachchaboda jonna, Padijonna, Palepujonna, Podujonna, Pala jonna, Pelala jonna, Pandari jonna, Pasupu jonna, Pasupupachcha jonna, Potiki jonna, Pottithimmalu, Purabodaka jonna, Sai jonna, Sanna jonna, Sevata jonna, Sivira jonna, Tellaboda jonna, Varagadi jonna, Vubiripatti jonna, Vullipitta jonna, Billi jola, Chiru talavalu, Moti jowar, Natujonna, Seethammavarijonna, Tella jonna, Tellamalle jonna, Yerrajonna*

TABLE 5.1 *(Continued)*

S. No.	Botanical Name	Family	Common English name	Landraces/Local Name
6	*Echinochloa frumentacea* Link	Poaceae	Barnyard millet	*Badasuan, Bonta sama, Burada samalu, Chinna samalu, Koyya sama, Maghi sama, Malle sama, Nalla samalu, Pedda sama, Sama, Peru sama, Samai, Kudirai vali*
7	*Eleusine coracana* Gaertn.	Poaceae	Finger millet	*Burada chollu, Chinna chollu, Garuvu chodi, Metta chodi, Mudda chodi, Nadipi chollu, Pedda chodi, Punasa chollu, Pyru chollu, Tella ragulu, Tholakari chollu*
8	*Panicum miliaceum* L.	Poaceae	Common, Proso millet	*Badi, Variga, Varagu*
9	*Panicum scrobiculatum* L.	Poaceae	Kodo millet	*Bonthalu, Burka sama, Chinna oodalu, Konda voodalu, Voodalu, Pedda voodalu, Punasa voodalu*
10	*Pennisetum typhoides* (Burm,) Stapf & C.E. Hubbard	Poaceae	Pearl millet	*Cumbu, Gantlu, Pedda ganti, Pitta ganti, Podu ganti, Punasa ganti*
11	*Setaria italica* (L.) Beauv.	Poaceae	Italian or fox-tail millet	*Chinna korra, Erra korra, Jada korra, Konda korra, Kukka toka korralu, Nakka toka gaddi, Punasa korra, Thinai, Perunthinai*
Pulses				
12	*Cajanus cajan* (L.) Millsp.	Papilionaceae	Pigeon pea, Red gram	*Erra kandulu, Kandulu, Mabbu kandi, Natu kandulu, Srikandi, Tellakandulu, Chirukandi, Konda kandi, Parimi kandulu, Pedda kandi, Podu kandi, Siri kandulu, Tandur*
13	*Cicer arietinum* L.	Papilionaceae	Chick pea, Bengal gram	*Buta, Senegalu, Konda kadalai*
14	*Cyamopsis tetragonoloba* (L.) Taub	Papilionaceae	Cluster bean	*Kottavarai, Gorechikkudu*
15	*Dolichos lablab* L.	Papilionaceae	Hyacinth bean	*Avarai, Chikkudu, Nalla chikkudu, Gane chikkudu*
16	*Glycine max* Merril	Papilionaceae	Soybean	*Soya mochai*

TABLE 5.1 *(Continued)*

S. No.	Botanical Name	Family	Common English name	Landraces/Local Name
17	*Lathyrus sativus* L.	Papilionaceae	Grass pea	*Kesari*
18	*Lens culinaris* Medic	Papilionaceae	Lentil	*Masur pappu/Chirisenegalu*
19	*Macrotyloma uniflorum* (Lamk.) Verdc	Papilionaceae	Horse gram	*Kollu, Ulavalu, Kulthi*
20	*Mucuna utilis* Wall ex.wight	Papilionaceae	Velvet bean	*Dulagondi, Pilliadugu, Poonai pidukkan, Poonai Kali, Kainchow*
21	*Pachyrrhizus erosus* (L.) Urban	Papilionaceae	Yam bean	—
22	*Psophocarpus teragonolobus* DC.	Papilionaceae	Goa bean	*Morisu avarai*
23	*Vicia faba* L.	Papilionaceae	Broad bean	—
24	*Vigna aconitifolia (*Jacq.) Marechal	Papilionaceae	Dew gram, moth bean	*Tuluka payir, Kuncumapesalu*
25	*Vigna mungo* (L.) Hepper	Papilionaceae	Black gram	*Bhema urad, Biri, Biri kandalu, Bunadiri, Gaju minapa, Giddu minumulu, Koloth, Konda minumulu, Kuppa minumulu, Malbiri, Mettu minumulu, Minimulu, Nalla Minumulu, Muga dali, Pacha minumulu, Sada minumulu, Teega minumulu, Toppa Minumulu, Tudu minumulu, Barre minumulu, Moddu Modda minumulu, Lal urad*
26	*Vigna radiata* (L.) Wilczek	Papilionaceae	Green gram	*Nalla pesarulu, Paccha pesaru, Pesarulu, Teega pesarulu, Chinna pesaralu, Ganga pesarlu, Chamki pesarlu, Kotta pesarlu, Nelala pesarlu, Konda pesalu, Balintha pesarlu*
27	*Vigna umbellata* (Thunb.) Ohwi & Ohasi	Papilionaceae	Rice bean	*Thattam payiru*

TABLE 5.1 *(Continued)*

S. No.	Botanical Name	Family	Common English name	Landraces/Local Name
28	*Vigna unguiculata* (L.) Walp	Papilionaceae	Cowpea	*Alasandalu, Judumulu, Controma, Bijunumulu, Junumulu, Barabatti, Batta judumulu, Baragudi chhoin, Bobbarlu, Boijudumulu, Bobbiri judumulu, Challa bobbarlu, Chinna bobbarlu, Chitti bobbarlu, Dhota judur, Erra bobbarlu, Judum, Judumulu, Karri bobbarlu, Konda bobbarlu, Konda judumulu, Matcha bobbarlu, Nalupu judumulu Nalla bobbarlu, Natu alasandhalu, Pedda bobbarlu, Siri bobbarlu, Tella bobbarlu, Thoppa junumulu*
Oilseeds				
29	*Brassica juncea* (L.) Czern. & Coss	Brassicaceae	Indian mustard	*Malai kadugu, Sorisa*
30	*Brassica nigra* (L.) Koch	Brassicaceae	Black mustard	*Malai kadugu, siru kadugu, Nallaavalu*
31	*Carthamus tinctorius* L.	Asteraceae	Safflower	*Sendurakam, Tella kusuma, Kusumalu*
32	*Guizotia abyssinica* Cass.	Asteraceae	Niger	*Verrinuvvulu, Paiyellu, Uchellu, Alisi*
33	*Linum usitatissimum* L.	Linaceae	Linseed	*Avise, Alivirai, Javas*
34	*Madhuca longifolia* (Koening) Macbr.	Sapotaceae	Butter tree	*Ippa, Moha*
35	*Madhuca indica* J.F. Gmel.	Sapotaceae	Mahua	*Ippa, Iluppai, Iluppa, Mahula, Moha, Madigi*
36	*Pongamia pinnata* Pierre	Papilionaceae	Pongam oil tree	*Kanuga, Pungu, Ponga, Koranjo*
37	*Ricinus communis* L.	Euphorbiaceae	Castor	*Amanakku, Kottai muthu, Amudamu*
38	*Seamum indicum* L.	Pedaliaceae	Sesame	*Nuvvulu, Ellu, Khasa, Rasa*

TABLE 5.1 *(Continued)*

S. No.	Botanical Name	Family	Common English name	Landraces/Local Name
Vegetable and Tuber Crops				
39	*Abelmoschus esculentus* (L.) Moench	Malvaceae	Okra, Lady's finger	*Benda, Naatu benda, Bhendi, Vendai, Eedakula benda, Pasara benda, Patcha benda, Ssudibenda*
40	*Allium cepa* (L.) var. *aggregatum*	Alliaceae	Multiplier onion	*Chinna vengayam*
41	*Allium cepa* L.	Alliaceae	Onion	*Vengayam, Ulligadda, Nirulli, Piyaz*
42	*Allium sativum* L.	Alliaceae	Garlic	*Rasuna, Tella gadda, Velluli, Vellai poondu*
43	*Alocasia indica* (Roxb.) Schott	Araceae	Taro	*Charakanda, Merukan kilangu*
44	*Amaranthus viridis*	Amaranthaceae	Green Amaranth	*Siru keerai, Kuppai keerai, Chailakathottakura*
45	*Amorphophallus campanulatus* Bl.ex Decne	Araceae	Elephant foot yam	*Kanda, Karunai kizhangu*
46	*Asparagus officinalis* L.	Liliaceae	Asparagus	*Shimai shadavari, Challa gadda, Pilli tegalu teegalu, Satavari*
47	*Basella alba* L.	Basellaceae	Indian spinach	*Batsala*
48	*Basella rubra* L.	Basellaceae	Indian spinach	*Erra Batsala*
49	*Benincasa hispida* (Thunb.) Cong.	Cucurbitaceae	Ash gourd	*Buditha gummadi, Gummadikaya, Poosanikkai, Pani kakharu*
50	*Beta vulgaris* L.	Chenopodiaceae	Sugar beet	*Chukandar*
51	*Canavalia gladiata* (Jacq.) DC.	Papilionaceae	Sword bean	*Thammakaya, Adavi thamma, Kozhi avarai, Vellai Tambattai, Vella tamma, Tella tamma, Sigapu tambattai, Erra tamma*
52	*Chenopodium album* L.	Chenopodiaceae	Pig weed	*Paruppu keerai, Pappu kura*

TABLE 5.1 *(Continued)*

S. No.	Botanical Name	Family	Common English name	Landraces/Local Name
53	*Coccinea cordifolia* Cogn.	Cucurbitaceae	Ivy gourd	*Dondakaya, Donda*
54	*Colocasia esculenta* (L.) Schott	Araceae	Elephant ear yam	*Sharu, Chama dumpa, Chema gadda, Cehppa kizhnagu*
55	*Cucumis melo* L. var *Conmon*	Cucurbitaceae	Pickling melon	*Dosakaya*
56	*Cucumis sativus* L.	Cucurbitaceae	Cucumber	*Budama, Adavi dosakaya, Keera Dosakaya, Channekakkide, Vellarikkai*
57	*Lagenaria siceraria* (Mol.) Standl.	Cucurbitaceae	Bottle gorud	*Anamkap kaya, Ekathari kaya, Lau, Sorakaya, Suraikkai*
58	*Luffa acutangula* (L.) Roxb.	Cucurbitaceae	Ridgegourd	*Beera, Donda beera, Beerakaya, Chedu beera, Janni, Pedda beera, Peerkai*
59	*Luffa hermaphrodita*	Cucurbitaceae		—
60	*Luffa cylindrica* (L.) M.J. Roem.	Cucurbitaceae	Sponge gourd	*Neti beera, Guthi beera, Ghiya tori, Mezhugu peerkai*
61	*Lycopersicon esculentum* Mill	Solanaceae	Tomato	*Naatu Thakkali, Takkali*
62	*Lycopersicon pimpinellifolium*	Solanaceae	Cherry tomato	*Ramankaya*
63	*Manihot esculenta* Crantz	Euphorbiaceae	Tapioca	*Mara valli kizhangu, Karra pendalamu, Kappa*
64	*Momordica charantia* L.	Cucurbitaceae	Bitter gourd	*Chedu kakara, Kakara, Kakara kaya, Pagarkkai*
65	*Momordica dioica* Roxb. ex Willd.	Cucurbitaceae	Spinegourd, Kakora	*Agakara, Tholoopavai, Paluppakal, Golkandra*

TABLE 5.1 *(Continued)*

S. No.	Botanical Name	Family	Common English name	Landraces/Local Name
66	*Moringa oleifera* Lam.	Moringaceae	Drumstick	*Munakaya, Munaga, Mulaga, Murungai, Shobanjana*
67	*Phaseolus lunatus* L.	Papilionaceae	Lima bean	*Butter beans, Manjal beans, Khasi kollu*
68	*Phaseolus vulgaris* L.	Papilionaceae	French bean	*Beans, Mittai beans, Kakki bean*
69	*Solanum melongena* L.	Solanaceae	Brinjal, egg plant	*Bangda, Baigana, Katthiri, Tellacharakaya, Nallavanga, Namalakaya, Tellakaya, Guttivanga, Neetivanga, Manda saapa, Mettavanga, Mulla vankaya, Pandiri vnakaya, Chigurukotavanga, Jegurupaduvanga, Tantikondavanga, Medichinta, Vankaya*
70	*Spinacia oleracea* L.	Chenopodiaceae	Spinach	*Palak, Palanga saga, Palakkeerai*
71	*Trichosanthes anguina* L.	Cucurbitaceae	Snake gourd	*Potlakaya, Chetipotla, Kooshi, Chhachindra, Pudalai*
72	*Trigonella foenum-graecum*	Papilionaceae	Fenugreek	*Methi, Vendayam, Methi saga*
73	*Vigna unguiculata* (L.) Walp. var. *sesquipedalis* Aschers. & Schweinf.	Papilionaceae	Yard long bean, Asparagus bean	*Alasanda, Jhudanga, Kampa chikkudu, Podugu chikkudu*
Fruits and Nuts				
74	*Achras sapota* L.	Sapotaceae	Sapota	*Safeta, Sapota*
75	*Aegle marmelos* Correa ex Roxb.	Rutaceae	Bengal Quince	*Maredu, Bilvam*
76	*Anacardium occidentale* L.	Anacardiaceae	Cashewnut	*Jidi, Jidi-mamidi, Muntha-mamidi, Mindri, Hijli-badam, Munthiri*

TABLE 5.1 *(Continued)*

S. No.	Botanical Name	Family	Common English name	Landraces/Local Name
77	*Ananas comosus* (L.) Merril	Bromeliaceae	Pineapple	*Annaci*
78	*Annona reticulata* L.	Annonaceae	Bullocks heart	*Rama sita phal, Nona, Ramphal*
79	*Annona squamosa* L.	Annonaceae	Custard apple	*Aata, Sita phal, Seetha pazham*
80	*Areca catechu* L.	Arecaceae	Arecanut	*Paaku, Vakka, Poogiphalam*
81	*Artocarpus altilis* (Park.) Fosberg	Moraceae	Bread fruit	*Seema panasa, Seema pala, Seema pila*
82	*Artocarpus heterophyllus* Lam.	Moraceae	Jack fruit	*Panasa pandu, Pala pazham, Pilapalam*
83	*Averrhoa carambola* L.	Averrhaceae	Star fruit, Carambola	*Arai nelli*
84	*Borassus flabellifer* L.	Arecaceae	Palmyrapalm	*Tadi chettu, Panai, Tal*
85	*Buchanania lanzan* Spreng.	Anacardiaceae	Almandette	*Sara pappu, Morala, Pival, Chironji*
86	*Canarium ovatum* Engl.	Burseraceae	Pilu	*Jangli badam, Karapu kongiliam, Nalla rojanamu*
87	*Capparis decidua* Edgew.	Capparidaceae	Ket	*Kariramu, Sengam, Karira*
88	*Carica candamarcensis* Hook.f.	Caricaceae	Mountain papaya	*Kondapapaya, Malaipappalli*
89	*Cairica papaya* L.	Caricaceae	Papaya	*Amrutabhanda, Boppayi, Pappalli*
90	*Carissa congesta* Wight	Apocynaceae	Karonda	*Vaka, Kalakkai*

TABLE 5.1 *(Continued)*

S. No.	Botanical Name	Family	Common English name	Landraces/Local Name
91	*Carissa spinarum* L.	Apocynaceae	Karamadika	*Chiru, Kila, Kalivi, Karamadika*
92	*Citrus grandis* (L.) Osbeck	Rutaceae	Pummelo	*Pambalimasu, Pampalamasam, Chakotra*
93	*Citrus limon* (L.) Burm.f.	Rutaceae	Lemon	*Bijapuram, Periya elumichai, Nimma*
94	*Citrus madurensis*	Rutaceae	Edapandu	*Edapandu*
95	*Citrus sinensis* (L.) Osbeck	Rutaceae	Sweet orange	*Sathugudi, Chini, Narinja, Sini, Satghudi, Musambi*
96	*Elaeocarpus floribundus* Blume	Elaeocarpaceae	Jalpai	*Rudrakhyo, Rudraksha*
97	*Emblica officinalis* Gaertn.	Euphorbiaceae	Emblic myrobalan	*Usirikai, Nelli, Amlaki*
98	*Feronia limonia* (L.) Swingle	Rutaceae	Wood apple	*Velaga, Vilanga, Kait*
99	*Ficus carica* L.	Moraceae	Fig	*Anjuru, Anjira, Manjimedi, Simayatti, Simaiyatti, Tenatti*
100	*Grewia subinaequalis* DC.	Tiliaceae	Phalsa	*Jana, Nallajana, Phutiki, Pharasakoli, Palisa, Tadachi*
101	*Mangifera indica* L.	Anacardiaceae	Mango	*Amba, Mamidi, Maangai, Mavi, Mau, Am*
102	*Manilkara hexandra* (Roxb.) Dubard	Sapotaceae	Khirni	*Khirni, Khirni pazham, Pala, Manjipala, Palla, Palai, Rayan*
103	*Morus nigra* L.	Moraceae	Black mulberry	*Shah-tut*
104	*Musa paradisiaca* L.	Musaceae	Banana	*Arati, Kura arati, Konda arati, Malai vazhai, vazhai*

TABLE 5.1 *(Continued)*

S. No.	Botanical Name	Family	Common English name	Landraces/Local Name
105	*Psidium guajava* L.	Myrtaceae	Guava	*Jama, Koyya, Pijuli*
106	*Punica granatum* L.	Punicaceae	Pomegranate	*Mathulai, Dalimba, Danimma, Dalim*
107	*Pyrus communis* L.	Rosaceae	Pear	*Berikkai, peri*
108	*Spondias pinnata* (L.F.) Kurz	Anacardiaceae	Indian Hogplum	*Ambula, Amodo, Amaratoko, Kondamammidi, Adavimammidi, Kotamara, Amabalam, Eginam*
109	*Syzygium cuminii* (L.) Skeels	Myrtaceae	Java plum	*Neredam, Naval, Sambal, Neredu, Jamun*
110	*Tamarindus indica* L.	Caesalpiniaceae	Tamarind	*Chintha pandu, Puli, Tentuli*
111	*Terminalia catappa* L.	Combretaceae	Indian almond	*Badamuchettu, Vedam, Natvadom, Deshi-badam*
112	*Ziziphus jujuba* Mill.	Rhamnaceae	Chinese date	*Pitni-ber, Ilandai palam, Kandika*
113	*Ziziphus mauritiana* Lam.	Rhamnaceae	Jujube	*Ber, Barkoli, Bodokoli, Bodori, Elandai, Elladu, Regu, Gangaregu, Karakandhavu*
114	*Ziziphus nummularia* (Burm.f.) Wight & Arn.	Rhamnaceae	Jharber	*Neelaregu, Korgodi, Bhukamtaka*
Spices and Condiments				
115	*Capsicum annuum* L.	Solanaceae	Chilli	*Mirapa, Miri, Milagai, Lanka*
116	*Capsicum frutescens* L.	Solanaceae	Bird chili	*Lanka, Seema mirapa*
117	*Cinnamomum tamala* Nees & Eberm	Lauraceae	Indian Cassia Lignea	*Talisapatri, Tejpatra, Tamalaka, Tejpat*

TABLE 5.1 *(Continued)*

S. No.	Botanical Name	Family	Common English name	Landraces/Local Name
118	*Cinnamomum zeylanicum* Breyn	Lauraceae	Cinnamom	*Dalchini, Lavangapattai, Ilayangam*
119	*Cuminum cyminum* L	Apiaceae	Cumin	*Jilakara, Siragam, Jiraka, Zeera*
120	*Curcuma longa* L.	Zingiberaceae	Turmeric	*Manjal, Pasupu, Haldi, Kasturipasupu, Hinga, Woldi, Kodipasupu*
121	*Foeniculum vulgare* Mill.	Apiaceae	Fennel	*Shombu, Sopu, Pedda jilakarra, Mauri*
122	*Mentha piperita* L.	Lamiaceae	Mint/ peppermint	*Pudina, Paparamina, Gamathi phudina*
123	*Murraya koenigii* (L.) Spreng.	Rutaceae	Curry leaf	*Bhrusanga patra, Karepak, Kariveppilai*
124	*Nigella sativa* L.	Ranunculaceae	Black cumin	*Kalnonji, Nela Nella jeelakarra, Karunjiragam*
125	*Piper betle* L.	Piperaceae	Betel leaf	*Tamalaku, Vettrilai kodi*
126	*Piper longum* L.	Piperaceae	Long pepper	*Pippalu, Thippili*
127	*Piper nigrum* L.	Piperaceae	Black pepper	*Milagu, Kari milagu, Gol maricha*
128	*Trachyspermum ammi* (L.) Sprague	Apiaceae	Carum	*Vaamu, Omum, Ajowan, Ajwain*
Dye Yielding plants				
129	*Bixa orellana* L.	Bixaceae	Annatto	*Japhara, Latkan*
130	*Caesalpinia sappan* L.	Caesalpiniaceae	Sappan wood	*Bakam, Bakamu, Patungam*
131	*Indigofera tinctoria* L.	Papilionaceae	Indigo	*Nil, Aviri, Nili*

TABLE 5.1 *(Continued)*

S. No.	Botanical Name	Family	Common English name	Landraces/Local Name
132	*Lawsonia inermis* L.	Lythraceae	Henna	*Benjati, Maruthani, Goranti*
133	*Mallotus philippensis* (Lam.) Muell.Arg	Euphorbiaceae	Kumkum tree, Red Kamala	*Kapli, Kungumam, Sinduri, Kunkuma, Kapilogundi*
134	*Rubia cordifolia* L.	Rubiaceae	Indian madder	*Barheipani, Manjistha, Shevelli, Manjitti, Chiranji, Taamaravalli*

perfected over a period of time. The diversity of plants under cultivation include an array of crops belonging to cereals, millets, legumes, tubers, vegetables by the tribal groups who inhabited the Eastern Ghats in six states of the country. Pandravada et al. (2004) and Sivaraj et al. (2009) have given an account of the spectrum of agri-biodiversity that is available in the Eastern Ghat areas.

5.2.1.1 CEREALS AND MILLETS

Significant ethnic diversity is reported in rice, sorghum, pearl millet, finger millet, italian millet, proso millet, little millet, kodo millet and barnyard millet from Eastern Ghats (Pandravada et al., 2008b).

Rice is known in India from about 2,000 BC or even earlier (Vishnu-Mittre, 1968). It can be deduced from the available evidences that, eastern India is the area of domestication of Asian rices (Harlan, 1975). Tremendous diversity in both the cultivated and wild *Oryza* species occur in Koraput (Odisha), which could be the place of origin and domestication for the Asian rices. Rich diversity occurs in paddy germplasm especially for scented ness, plant height, seed dormancy, grain slenderness and resistance to pests and diseases, resistance to lodging, moisture stress, maturity, panicle structure, grain size, glume color, kernel color and endosperm. The endemic scented rice diversity (*isuka ravvalu, kampusannalu, vasanodlu*) occurs in Visakhapatnam (Araku hill tracts), pockets of Vizianagaram, Srikakulam and Nizamabad districts. Some of the tall cultivars like *basangi, krishnakatukalu, bayahunda, gottedlu* and *akkullu* are grown in the coastal districts specifically for the straw to thatch the huts and as a feed for cattle. Landraces from Srikakulam (*pottibasangi, soppiri* and *jajati*) are reported to have seed dormancy and do not germinate on standing. Landraces of upland rainfed ecosystem with very fine-grained medium/long slender seed (*voodasannalu, chinnakondengi, mettabudagalu*) with good potential either for direct selection and/or for crossing are found in the tribal belts of Srikakulam district. In the Telangana and Rayalaseema regions also there are diffused pockets in which indigenous variability occurs in upland rice. These landraces have high degree of resistance to pests and diseases.

Most of the above landraces are being fast replaced with the high yielding varieties ignoring the specific qualities for high yield/income particularly in the tribal areas of north coastal districts of Andhra Pradesh. The practice of cultivating early maturing (3 months) upland rice in mixed cropping mainly with sorghum, pearl millet and small millets and sometimes even

with pigeon pea is disappearing and currently improved varieties of rice are mostly grown as a sole crop. Cultivation of upland rice itself is replaced by the high-income crops, such as tomato, cauliflower, cabbage, etc. in high altitude tribal pockets.

The important areas of diversity for *kharif* sorghum are districts of Adilabad and Kurnool in Telangana and Andhra Pradesh states respectively. Many distinct landraces (*chiru talavalu, moti jowar, motitura, jinghri jowar, leha jowar, pottithimmalu, tellamalle jonna*) belonging to *durras* and *roxburghiis* are the main races grown under *kharif* sorghums. Mainly variability occurs in plant height, peduncle shape and size, ear head shape and size, glume and grain color. Landraces of *rabi* sorghums (*markandi jonna, gattumalle jonna, sai jonna, mudda jonna, pelala jonna, erra jonna*, etc.) are grown to a great extent especially in the tribal pockets of Adilabad, Khammam, Kurnool and Cuddapah. Sorghum belonging to races *durra, bicolor, guinea, caudatum* and their intermediate types occur in these areas (Figure 5.1). Potential diversity occurs for panicle compactness/shape and glume covering. Sources of resistance for drought and birds (fully covered glumes) occur in the northern Telangana areas.

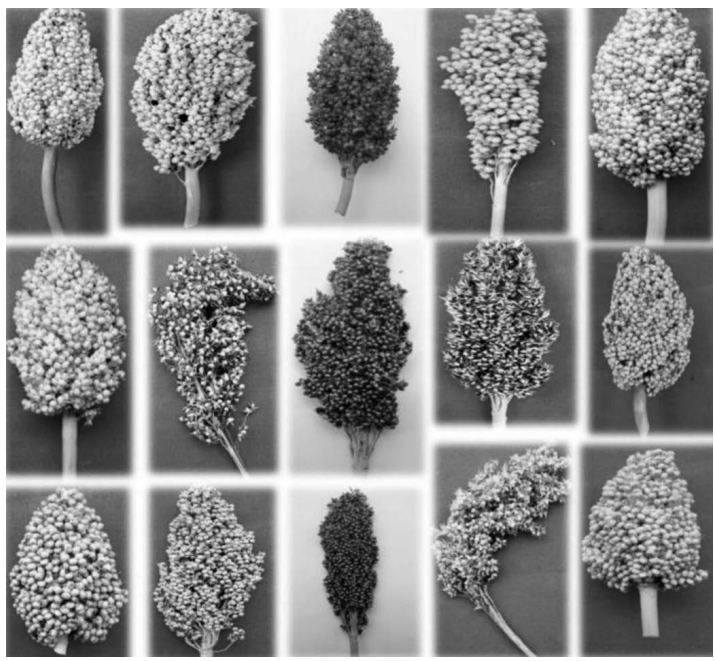

FIGURE 5.1 Ethnic sorghum (*Sorghum bicolor*) diversity in Eastern Ghats region (Courtesy: NBPGR, RS, Hyderabad).

Pearl millet germplasm variability is known to occur in Visakhapatnam, Vizianagaram, Srikakulam, Nalgonda, Mahaboobnagar, Kurnool and Prakasam districts. *Pittaganti*, a popular landrace of north coastal districts is an early maturing and highly tillering type. Variability occurs in plant height, stem thickness, tillering, spike length, size and shape and seed characters.

In small millets, the important crops are finger millet, italian millet (Figure 5.2), proso millet, kodo millet, little millet and barnyard millet. Variability in plant height, tillering, finger compactness, number of fingers/ ear and ears/ plant exists in finger millet in the districts of Visakhapatnam, Vizianagaram, Srikakulam, Ranga Reddy and Mahaboobnagar. Endemic local variability occurs in the other small millets.

FIGURE 5.2 Ethnic diversity in Italian millet from Eastern Ghats region (Courtesy: NBPGR, RS, Hyderabad).

However, the area under small millets has been coming down very alarmingly because of the introduction of subsidized rice scheme in Andhra Pradesh. It has insidiously contributed in the replacement of small millets with improved varieties of crops, such as chilli and other vegetables in north coastal districts and sunflower and castor in Telangana and Rayalaseema regions, there by losing the endemic diversity of small millets.

5.2.1.2 PULSES

The important pulse crops in which significant endemic diversity occurs are Pigeon pea (Figure 5.3), Lima bean, French bean, Cowpea, Hyacinth bean and Rice bean. In Pigeon pea variability exists in the north coastal tribal belt and Telangana region in Andhra Pradesh and Koraput and Gajapati districts of Orissa for days to maturity, flower color, plant height, pod size, seed shape/color etc. Local landraces, which are tolerant to pod borers *viz. 'Konda kandulu*' are perennial with very bold white/creamish-white seeds, exists in the above areas. The landraces with red/brownish-red seed are cultivated in the northern Eastern Ghats region where as white/creamish-white seeded landraces are preferred in the central Eastern Ghats region.

In Cowpea (*chittibobbarlu, bobbarlu*) the variability mainly includes cultivars with bushy/viny forms, days to maturity, pod character and seed color.

FIGURE 5.3 Ethnic diversity in Pigeon pea from Eastern Ghats region (Courtesy: NBPGR, RS, Hyderabad).

5.2.1.3 OIL SEEDS

The important oil seed crops in which good variability still occurs are sesame and niger. Sesame is an important ancient and traditional oil seed crop for which the sub-continent is the secondary center of diversity. There is significant variability in the cultivars with regards to specific planting season and region specificity due to photosensitivity. Variability is available in plant height, days to maturity, seed size, color, oil content and the extent of tolerance/resistance to different biotic/abiotic stresses.

Among the oilseeds, niger is the crop of the tribals, by the tribals and for the tribals and plays a significant role in the tribal economy. Rich variability exists in Visakhapatnam, Medak and Mahaboobnagar districts of Andhra Pradesh, Koraput of Orissa and Jagdalpur of Chhattisgarh especially for height, stem color, leaf size, branching habit, days to maturity, capitulum size and number of florets, achene size/shape, yield and oil content. The landraces do possess drought tolerance also. Germplasm accessions having high oil content were found and collected from the Koraput region.

5.2.1.4 VEGETABLES

The important vegetables for which good native diversity occurs are brinjal, chillies, okra, cucumber, gourds, onion, beans, tuber crops, and leafy vegetables.

The districts of Srikakulam, Visakhapatnam, East Godavari, West Godavari, Krishna, Guntur, Chittoor and Ranga Reddy, Koraput and Gajapati are important for brinjal diversity. Variability occurs for plant height, fruit shape, color, spininess of the pedicel and clustering and presence of blotches/stripes on the fruit surface. In Koraput the *pottangi* variety of very primitive landrace which is the progenitors of the present day cultivars of *Solanum melongena* occur. The important landraces that are under the cultivation include *tellacharakaya, nallavanga, namalakaya, tellakaya, guttivanga, neetivanga, mettavanga, chigurukotavanga, jegurupaduvanga, tantikondavanga, medichinta* etc.

In chilli the local diversity for growth habit, fruit color, bearing, shape and size and pungency occur all along the Eastern Ghats. Chillies with small round cherry types, small oblong stout and small conical stout, extra long broad and tapering fruits occur in the north coastal districts of Andhra Pradesh. Cultivation of chilli local landrace which bear yellow fruits (*pachchamirapa*) is confined to Gollaprolu area in the East Godavari district. Indigenous

paprika chilli landraces with low pungency are mostly confined to Warangal (*doddukaya, warangalkaya, tomato chilli*) and Rayalaseema region (*byadige* types) which are characterized by folds after drying. *Capsicum frutescens* (Bird's pepper) occurs in all the tribal areas in the Eastern Ghats.

In Okra diversity is mainly concentrated in the districts of Kurnool, Visakhapatnam, East Godavari and Adilabad. The important landraces that occur are *edakula benda, pasara benda, patcha benda* and *sudibenda*. Native diversity occurs for plant height, pigmentation and fruit characters. Very tall, robust, purple pigmented, tolerant to cold and late maturing types (*chalibenda*) occur in the Adilabad district of Telangana region.

The important gourds for which local ethnic diversity especially for fruit size and shape occur are bottle gourd, pumpkin, snake gourd, ridged gourd and bitter gourd (Sivaraj and Pandravada, 2005; Sivaraj et al., 2010; Sunil et al., 2014). The important districts under gourds cultivation where local diversity occurs are East Godavari, Warangal, Khammam, Adilabad, Karimnagar, Visakhapatnam, Koraput and Gajapati districts. Bottle gourd with different fruit shapes occurs in the tribal pockets in the above districts (Figure 5.4). The wild forms are very bitter and trailed on the huts and harvested after drying to use them for carrying water and arrack and also for storage. Extra-large fruited types (*Nelabeera*) almost to one meter are found in the Adilabad district.

FIGURE 5.4 Ethnic bottlegourd (*Lagenaria siceraria*) diversity in Eastern Ghats region (Courtesy: NBPGR, RS, Hyderabad).

In tuber crops the important districts are Srikakulam, Visakhapatnam Vizianagaram, East Godavari, West Godavari, Krishna, Nellore, Koraput and Gajapati. Local cultivars and wild tubers which are well adapted and are being grown/ collected from the forests occur in Elephant foot Yam (*pedda kanda, chinna Kanda, theepi kanda*), *Colacasia*, *Dioscorea*, *Xanthosoma* and Tapioca (Figure 5.5).

In the leafy vegetable the important types for which local variability occur are amaranth, spinach, *Rumex*, *Basella*, *Trigonella*, etc. in all the districts of Eastern Ghats. In Amaranth types which are green, completely/ partially purple and spiny generally occur.

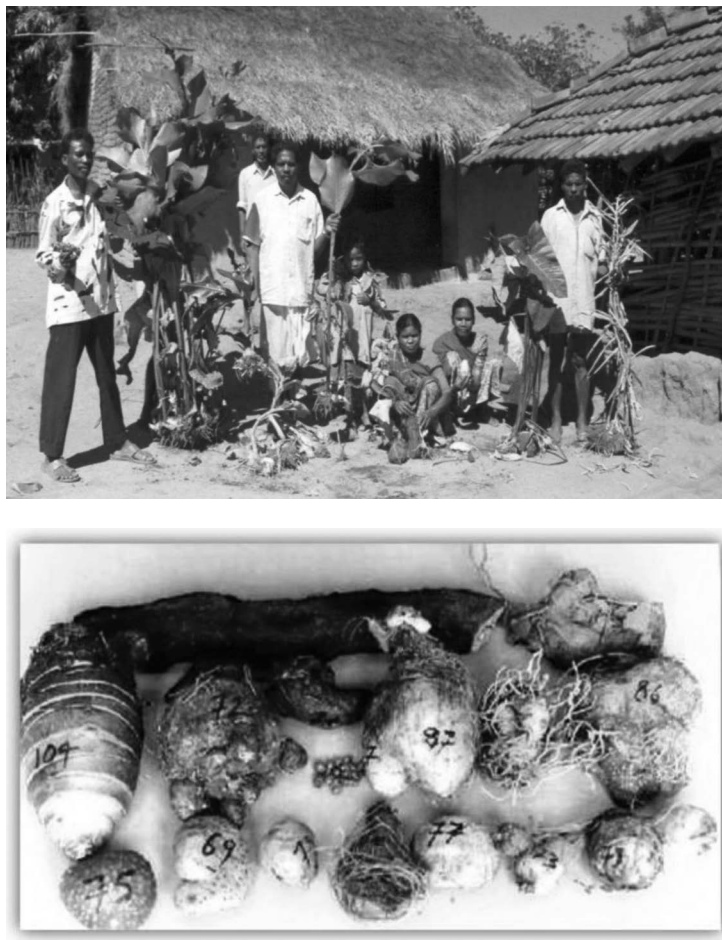

FIGURE 5.5 Ethnic community with tuber crops diversity in Eastern Ghats region (Courtesy: NBPGR, RS, Hyderabad).

5.2.1.5 FRUIT CROPS

The important fruits which have native diversity are mango, banana, citrus fruits, custard apple, ber, pine apple, wood apple, bael and jamun etc.

In Mango the main variability occurs in the coastal areas, Khammam district in the Telangana and eastern Rayalaseema regions. Diversity occurs for tree size, maturity, bearing, fruit color, size, flesh characters, keeping quality and yield. Also cultivars specific for table and pickling and resistant to hoppers and which can withstand wind and drought are also found. The wild species occur in the tribal dominated hilly areas of Visakhapatnam and Vizianagaram districts.

In banana the districts which are important for germplasm variability are East Godavari, West Godavari, Kurnool, Vizianagaram, Visakhapatnam, Cuddapah, Koraput and Gajapati. The traditional and popular varieties (*amruthapani* and *chakkarakeli*) are alarmingly replaced by the improved varieties. Good local varieties occur both in table and vegetable types. Diversity occurs in plant height, maturity, bunch size, fruit shape, size and aroma. *Musa ornata* and *Ensete glaucum* occur in the hills of Eastern Ghats interspersed in East Godavari and Visakhapatnam districts.

Among the *Citrus* species, *Citrus madurensis* has been naturalized in the hills of East Godavari and Srikakulam. The other fruits in which significant local diversity exist is pine apple in the Visakhapatnam (Simhachalam). Custard apple, which occurs in semi-wild state in the hills has good diversity for habit, plant type, fruit and reticulation size, seed size and number in Mahaboobnagar, East Godavari and Anantapur. In jack, the important local types include *kharja panasa* and *tene panasa*. Good local diversity for fruit size and shape occur in the coastal areas. In the hills, good variability occurs in wood apple, bael and jamun.

5.2.1.6 SPICES

The crops of importance in spices include turmeric, ginger, and Indian long pepper, etc.

In turmeric, landraces are still popular because of their adaptability and significant levels of tolerance/resistance to biotic/abiotic stresses. Native and wild types occur in Araku (*kasturipasupu, hinga, woldi, kodipasupu*) and Mahendragiri hills with good variability for days to maturity, rhizome shape and size, inside color, surface color, aroma and yield.

In ginger the important areas of diversity are Araku hill tracts and other areas of Visakhapatnam, Medak, Koraput and Gajapati districts. The native types (*pandimallelu, rellakommalu*) possess variability for rhizome shape, size, in side and surface color, aroma and resistance/tolerance to rhizome rot and other diseases.

5.2.1.7 FIBER CROPS

The important fiber crops in Eastern Ghats are cotton and mesta. Among the old world diploid Asiatic cottons rich genetic diversity occurs in *Gossypium arboreum* and *Gossypium herbaceum*. The landraces under *G.arboreum* include *srisailam, errapathi, pandapur, mudhole, nandyal, mungari* etc. and *javvari* and *jayadharu* in *G.herbaceum.* Diversity occurs in the cotton germplasm in plant height, boll shape, size and surface, lint color and in seed characters. The perennial types of *G.arboreum* (*jadapathi, pagadapathi, pydipathi* etc.) are grown in temples, backyards of the households and as escapes throughout the ghats. Also it is amazing that both the annual and perennial types of *G.arboreum* cottons are disease/pest free and are sources of resistance for black arm, boll warm and sucking pests. However, with the introduction of superior long stapled new world cottons of *Gossypium hirsutum,* the desi cottons are being replaced at an alarming rate.

In *Mesta* diversity in *Hibiscus sabdariffa* and *H.cannabinus* occurs in the north coastal districts. Variability could be observed in stem pubescence, stem color, branching habit, fruit pubescence, stem diameter, seed color and other seed characters.

5.2.1.8 WILD RELATIVES OF CROP PLANTS

The ethnic plant genetic resources diversity of Eastern Ghats includes wild/weedy relatives and related taxa of crop plants which are crucial for the improvement of crops. These plant species constitute a part of the crop genepool and possess, a big reservoir of untapped genes that have potential to be utilized in improvement of crops.

At least 91 wild related species of crop plants are reported in the Eastern Ghats region by Arora and Nayar (1984). Pandravada et al. (2008a) enumerated the genetic resources of wild relatives of 73 major cultivated crops belonging to crop groups of cereals, millets, small millets, pulses, oil seeds, vegetables, leafy vegetables, tuber crops, fruit crops and spices in Eastern

Ghats region of Andhra Pradesh which are represented by 71 genera and 203 species of 36 plant families. Important examples of wild relatives from Eastern Ghats ethnic pockets are: *Abelmoschus ficulneus, Abelmoschus moschatus, Amorphophallus paeoniifolius, Cajanus cajanifolius, Capsicum frutescens, Citrullus colocynthis, Cucumis hardwickii, Cucumis pubescens, Curcuma angustifolia, Dioscorea oppositifolia, Luffa acutangula* var. *amara, Luffa cylindrica, Luffa tuberosa, Lycopersicon pimpinellifolium, Momordica dioica* (Figure 5.6)*, Moringa concanensis, Moringa pterigosperma, Mucuna monosperma, Murraya paniculata, Musa ornata, Ocimum americanum, Ocimum basilicum, Oryza malampuzhaensis, Oryza nivara, Oryza rufipogon, Pennisetum hohenackeri, Piper longum, Sesamum alatum, Solanum incanum, Solanum indicum, Solanum nigrum, Solanum pubescens, Solanum surattense, Solanum torvum, Solanum trilobatum, Sorghum halepense, Trichosanthes bracteata, Trichosanthes cucumerina, Vanilla wightiana, Vigna trilobata, Zingiber cassumunar, Zingiber roseum, Ziziphus oenoplia, Ziziphus xylopyrus etc.* Identification of wild relatives of many crop plants and establishing their close genetic affinities have made it possible to utilize them as potential source of genetic variation by the breeders (Kalloo and Berg, 1993; Sharma et al*.,* 2003; Pandravada et al*.,* 2008a).

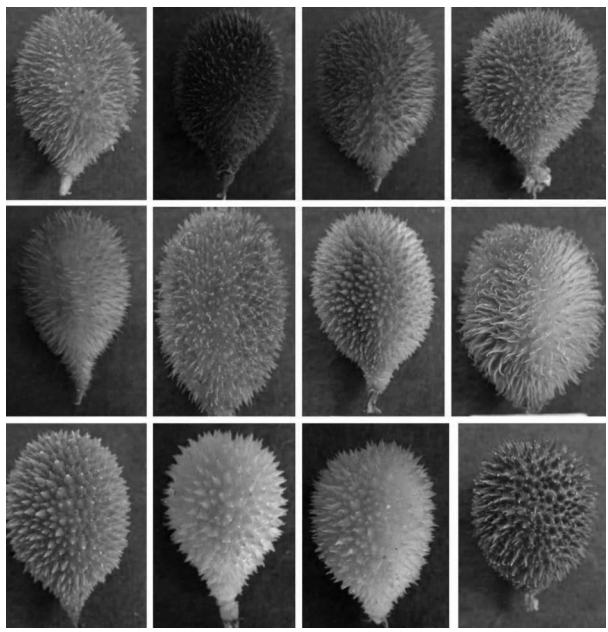

FIGURE 5.6 Ethnic diversity in spine gourd (*Momordica dioica*) in Eastern Ghats region (Courtesy: NBPGR, RS, Hyderabad).

FIGURE 5.7 Wild relatives of crop plants species diversity from Eastern Ghats region (Courtesy: NBPGR, RS, Hyderabad).

A. *Luffa tuberosa* B. *Citrus madurensis* C. *Sesamum alatum* D. *Vanilla wightiana*

5.2.1.9 ETHNIC LIFE SUPPORT SPECIES OF EASTERN GHATS (NON-TIMBER FOREST PRODUCE)

Ethnic life support species have an important role to play for the betterment of mankind, especially under situations of abiotic stresses related to soil, water, nutrients and energy, particularly in view of increased human and livestock population. Some of the important NTFP species recorded in the Eastern Ghats region are *Andrographis lineata, Amorphophallus paeoniifolius, Artocarpus heterophyllus, Bambusa bambos, Borassus flabellifer, Caesalpinia bonduc, Canarium strictum, Ceiba pentandra, Dioscorea bulbifera, Entada pursaetha, Phyllanthus emblica, Ficus hispida, Gloriosa superba, Helicteres isora, Gymnema sylvestre, Hemidesmus indicus, Jatropha curcas, Madhuca indica, Myristica fragrans, Myristica dactyloides, Ocimum gratissimum, Pongamia pinnata, Strychnos nux-vomica, Syzygium cumini, Sterculia urens, Tamarindus indica, Terminalia bellirica, Terminalia chebula, Urginea indica, Ziziphus mauritiana, Ziziphus xylopyrus* etc. The dependence of tribal communities on these plant resources is inevitable. In this

context, more important is exploitation of plants occurring in extreme environmental conditions of Eastern Ghats region. These life support species are expected to provide new sources of food, fiber, fuel, fodder, hydrocarbon and industrial products.

FIGURE 5.8 Palmyra palm diversity, a life supporting species of ethnic communities (Courtesy: NBPGR, RS, Hyderabad).

5.3 ETHNIC PLANT GENETIC DIVERSITY CONSERVATION

The conservation of ethnic plant genetic diversity involves two basic strategies (i) *in-situ* and (ii) *ex-situ*. *In-situ* conservation of ethnic plant genetic diversity has to be carried *on-farm,* where landraces and locally improved/adapted material are cultivated, evaluated, utilized and conserved as part of traditional farming systems. These farming systems are of particular importance in maintaining local genetic diversity and providing food for local consumption and local markets. *Ex-situ* conservation requires collection and systematic storage of seeds/propagules outside the natural habitats of species for short-medium and long-term after proper characterization and evaluation.

The ethnic plant diversity including agro-biodiversity is a vibrant and indispensable component in the overall conservation strategies for Eastern Ghats. The seed material of different agri-horticultural crops of orthodox nature is stored at –20°C with the seed moisture brought down to 5–8% and RH being maintained at 25–32% at National Gene Bank, New Delhi. In some difficult species, which are recalcitrant, pollen and seed material is stored at –180°C in liquid nitrogen in the cryo tanks at the National Gene Bank.

For medium term conservation, the seed material is stored at 5°C with the seed moisture brought down to 5–8% and RH being maintained at 30–35% in the cold storage modules at National Bureau of Plant Genetic Resources (NBPGR) Regional Station, Hyderabad. The crops which are multiplied by vegetative means and medicinal plant species which are non-seed bearing (stem cuttings/root cuttings/whole plant) are being maintained in the Glass house/ Field gene bank at NBPGR Regional Station, Hyderabad in live condition.

Genomic resources of ethnic plant diversity, such as cloning vectors, expression vectors, binary vectors, RFLP probes, Cloned genes, promoters fused to reporter genes, sub-genomic, cDNA, EST, repeat enriched libraries, BAC, YAC, PAC clone set from sequencing projects, genomic, mitochondrial or chloroplast DNA, cloned DNA from wild and weedy species produced exclusively for the repository can be stored by the following methodologies:

- 1–2 years at 4°C; 4–7 years at –20°C and greater than 5 years when stored at –70°C;
- ESTs, full-length cDNAs, BACs, PACs and YACs, are maintained in 96-well or 384-well micro plates at –80°C;
- cDNA clones as plasmid DNA at –20°C;
- Lyophilized DNA for long-term storage;
- Ambient temperature storage.

A total of 1,87,439 germplasm accessions of various crops including ethnic plant diversity of Eastern Ghats were characterized and preliminarily evaluated at NBPGR and its regional stations. These have been documented and published as several crop catalogs for the utilization by breeders in various crop improvement programs in the country.

5.4 UTILIZATION OF ETHNIC PLANT GENETIC RESOURCES DIVERSITY IN CROP IMPROVEMENT

Keeping in view, the importance and potential of the crop genetic diversity, NBPGR Regional Station, Hyderabad has been making earnest efforts to explore, collect and conserve this ethnic plant genetic diversity (Agri-diversity) in the Eastern Ghat areas in Andhra Pradesh, Telangana and adjoining areas of other states.

A paddy accession *Voodasannalu*, a super fine grained upland drought resistant landrace collected jointly by NBPGR, Hyderabad and ANGRAU from the *Jatapu* tribal group from Seethampeta Mandal, Srikakulam district was released as a variety as *Maruteru Sannalu* in Andhra Pradesh. A coriander accession collected from Ongole Mandal, Prakasam district was released as a variety *Sudha* by ANGRAU as per the state varietal release committee recommendations. A Roselle landrace which was found to be quite promising as a leafy vegetable and designated as UJWALA is in the minikit trials of ANGRAU for release as a variety. '*Arka Mangala*' a yardlong bean variety was released at Institute level by IIHR for extra long pods. This variety was developed as pure line selection from accession IC582850 from Eastern Ghat region of Jeypore, Orissa. The variety, evaluated at IIHR over two seasons, recorded a yield of 24.7 t/ha with an increase of 24% and 30% pod yield over the check varieties Lola and Vyjayanthi respectively. The accession is a pole type, photo insensitive variety with green smooth pods. Significant number of Sorghum accessions found to be promising got included in the ICRISAT core collections (*kharif* and *rabi*) for utilization in crop improvement programs. Some collections in Paddy and Chillies were found to be promising against biotic stresses as well. In addition to these, 17 accessions with special traits were registered with the ICAR – Cowpea accession INGR 08084 resistant to *Black eye cowpea mosaic virus;* Chilli accession INGR 08097 for resistance to thrips and powdery mildew; Chilli accession INGR 08095 for resistance to thrips and mites; Jatropha accessions INGR 08087 and INGR 08088 for high oil content; Linseed accessions INGR 10027 high oleic acid content (32%), INGR 10028 High oil content (42.6%); Dolichos bean INGR 110311 field tolerant to Anthracnose and mites; Bottle gourd INGR 10064 unique spindle shape; Chilli accession INGR14040 Purple genotype; Sorghum accessions INGR 09103, INGR 09104, INGR 09105, INGR 09106 Source of resistance to multiple foliar diseases (Rust, zonate leaf spot, sooty stripe, downy mildew and ergot); Greengram accession INGR 11031 Photosensitive line; Blackgram accession INGR 13057 Photosensitive line; Pongamia accession INGR 10134 four seeded pod.

5.5 FACTORS CONTRIBUTING TO GENETIC EROSION OF ETHNIC PLANT GENETIC RESOURCES DIVERSITY

The Eastern Ghats is a vibrant habitat for ethnic diversity in different agri-horticultural crops, their wild/ weedy relatives, medicinal, aromatic and dye yielding plants. However, due to degradation of forests as a result of *podu*

cultivation by the tribals, encouragement for raising plantations by the departments of agriculture/horticulture, increase in population and the need to produce more food and non-food agricultural commodities, changing food habits and initiation of other socio-economic developmental programs by the Government and NGOs, the endemic genetic diversity accumulated through years of evolution under domestication and natural selection by the tribal groups is being wiped out from nature. The local landraces/ traditional cultivars and even some crops are gradually being replaced by improved HYV/ Hybrids and other profitable crops.

The nutritional balance of the soil and the ecological foundations of the Ghats has been affected by inappropriate land use (shifting cultivation cycles), changes in agricultural systems, overgrazing of grasslands by herbivores, deforestation due to over exploitation of forest resources, land clearance for developmental activities, such as mining, thermal and hydro-projects and the lack of pollution control measures are adding to the problem. With the increase in the population, the demand of land for agricultural purposes has been increasing, thus resulting in the encroachment of large forest area by the people.

The subsidized rice scheme especially in north coastal Andhra Pradesh has made the hitherto subsistence farming being practiced by the tribal groups in to commercial farming looking for remuneration and profits in cultivation as they were getting rice at a very cheap rate for consumption. This has resulted in unforeseen changes in the cropping patterns and replacement of traditional crops like sorghum, pearl millet and small millets with coffee/ tea/cashew or mango plantations there by losing the diversity in those crops. The practice of raising crops in the kitchen gardens and seed storage for next season sowing being discontinued made them to rely on market forces and middle men. This also contributed towards erosion of ethnic diversity in several agri-horticultural crops. The reduction/abandonment of utilization of wild tubers, fruits, millets etc. as sources of food also has resulted in the loss of diversity and indigenous traditional knowledge (ITK). The dependence on modern medicine is gradually leading to erosion of ethno botanical knowledge.

5.6 FUTURE THRUSTS

Approaches to better management of ethnic plant genetic resources diversity need to focus on the following major elements (i) looking for more species and genes to provide bio-alternatives and (ii) using both traditional breeding

approaches and modern technologies. It has to be addressed in order to match the increasing human and animal interventions in Eastern Ghats region of India. Following are some of the future thrusts for effective management of ethnic plant genetic resources diversity on sustainable terms:

- Harnessing the eco-regional (Eastern Ghats) potentials, to meet the climate change.
- Need to have geo-referenced and time series data on ethnic plant genetic resources diversity to take informed decisions.
- Need to develop methodologies and tools to make the dynamic conservation of the genetic diversity of multiple ethnobotanical species compatible with poverty alleviation and increased wellbeing for its keepers.
- Development of Genomic Resources from ethnobotanically valued genetic resources and their conservation.
- *In-situ*/*on-farm* conservation.
- Developing cost-effective *in-vitro* multiplication and conservation protocols for ethnic plant genetic resources diversity.
- Mapping of ethnic genetic diversity for quality conservation.
- Developing ability, appropriate institutional arrangements and policy framework for handling intellectual property rights related issues.
- Need for safeguarding the regional and national interests in order to meet the challenges of the new legal regimes of the CBD, the WTO & TRIPS, UPOV and ITPGRFA.

5.7 CONCLUSIONS

There is a tremendous urgency and scope for collection and conservation of Ethnic plant genetic diversity in general and medicinal plants, wild relatives and endemic tree species in particular for sustainable utilization from the Eastern Ghats. As the replacement of local cultivars has become very fast and alarming, rapid efforts have to be resorted to collect and conserve the ethnic crop genetic resources diversity from Eastern Ghats. Another concern is the collection of wild/weedy relatives of crop plants and endemic diversity in medicinal and aromatic plants before the natural habitats are destroyed. Concerted and systematic efforts have to be initiated involving all the agencies/institutes concerned to avoid duplication of efforts. It should be ensured that, participation of the communities and stakeholders in comprehensive documentation of tribal life systems including ITK, folklore and

domestication of plant species etc. In view of changing scenario in both agricultural and vegetation diversity, a suitable conservation strategy should be evolved for addressing sustainable development to save the Eastern Ghats for the people of present and future generations.

KEYWORDS

- **Conservation**
- **Eastern Ghats**
- **Germplasm**
- **Plant Genetic Resources**
- **Tribal Groups**

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CHAPTER 6

ETHNIC FOOD PLANTS AND ETHNIC FOOD PREPARATION IN EASTERN GHATS AND ADJACENT DECCAN REGION

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CONTENTS

ABSTRACT

The present study provides information about 785 species of edible plants under 449 genera and 134 families from various sources and published literature (Table 6.1). Among 134 families Helvellaceae (Fungi), Marseliaceae, Polypodiaceae (Pteridophyta) and Cycadaceae (Gymnospermae) are from other groups while 130 families belong to Angiosperms. Fabaceae is the dominant family with 51 edible plant taxa, followed by Amaranthaceae (32 taxa), Poaceae (29 taxa), Euphorbiaceae (28 taxa), Rubiaceae (26 taxa) and Cucurbitaceae (25 taxa). A total of 47 families like Begoniaceae, Bromeliaceae, Caricaceae, Nelumbonaceae are represented with single species; 24 families are represented by 2 taxa, 41 families are represented by 3–10 taxa and 22 families are representing with more than 10 species. Among the all edible plant parts a total of 320 are fruits, 294 leaves, 122 underground parts (including roots, bulbs, corms, tubers), 113 seeds, 67 stems, 36 flowers, 8 whole plants and 19 other parts like gum, bark, etc. are consumed by the tribal people of Eastern Ghats and adjacent Deccan region.

6.1 INTRODUCTION

All the familiar vegetables and fruits of our kitchen gardens, as well as the cereals of our fields, were once wild plants; or to put it more accurately, they are the descendants, improved by cultivation and selection, of ancestors as untamed in their way as the primitive men and women who first learned the secret of their notoriousness (Saunders, 1920).

There is sufficient capacity in the world to produce enough food to feed everyone adequately; nevertheless, in spite of progress made over the past two decades, 850 million people still suffer from chronic hunger. Among children, it is estimated that 161 million under five years of age are chronically malnourished (FAO, 2012). In human history, 40–100,000 plant species have been regularly used for food, fibers, industrial, cultural and medicinal purposes. Now a day's only 30 plant species are used to meet 95% of the world's food energy needs (Anon., 1996). About 50% of the world's food dry weight is derived from four cereals: rice, wheat, maize and barley. These crops are widely and intensively cultivated and have been selected from a large agro biodiversity basket containing more than 7,000 food species (Wilson, 1992). In many developing countries millions of people, particularly tribal and rural communities still collect and consume a wide variety of wild plant resources to meet their food requirements (FAO, 2004; Balemie

and Kebebew, 2006; Bharucha and Pretty, 2010). In India, a considerable proportion of rural population, particularly in remote areas do not produce enough food grains to meet yearly food requirement. Therefore, most of the rural population is meeting their nutritional requirement through unconventional means, by consuming various wild plants (Singh and Arora, 1978).

There are 45,000 species of wild plants in India, out of which 3,900 plant species are used by tribals as food (out of which 145 species comprise of root and tubers, 521 species of leafy vegetables) (Kamble and Jadhav, 2013). About 7000 plant species have been cultivated for consumption in human history. Presently, only 30 crops provide 95% of human food energy needs, four of which (rice, wheat, maize and potato) are responsible for more than 60% of our energy intake (FAO, 2012).

Forests among the most important repositories of terrestrial biological diversity, and play a vital role in the daily life of rural communities in many areas, as source of timber and non-timber forest produce, as contributors to soil and water conservation, and as repositories of aesthetic, ethical, cultural and religious values. Losing forest diversity means missing opportunities for medicines, food, raw materials and employment opportunity in one word: welfare. The traditional knowledge and consumption of wild edible plants of Indian ethnic communities are rich and unique in the world (Panda, 2014).

The Eastern Ghats is inhabited by about 54 tribal communities, which constitute about 30% of tribal population of India (Verma, 1998; Chauhan, 1998; Karuppusamy and Pullaiah, 2005; Pandravada et al., 2007; Sanyasirao et al., 2014). They depend mostly on various forest resources available locally for their livelihood. The common tribal people living in the hills of Eastern Ghats are as follows:

Orissa: Bathudi, Bhottoda, Bhumia, Bhumiji, Dharua, Gadaba, Gond, Khanda, Kandha, Gouda, Kolha, Koya, Munda, Paroja, Omanatya, Santal, Saora, Birhor, Bonda, Didayi, Dogaria Kondh, Hill Kharia, Juang, Kutia Kondh, Lanjia Saora, Mankirdia, Paudi Bhuyan and Saora.

Andhra Pradesh and Telangana: Chenchus, Gadabas, Savaras, Konda Reddis, Koyas, Khonds, Kolamis, Nayakpods, Valmikis, Bhagatas, Jatayus, Yanadis and Yerukalas, Nookadora, Kotiya, Kondakammari, Muliya, Kondadora.

Tamil Nadu: Malayalis, Paliyans.

The forest related tribal groups are confronted with deteriorating livelihoods due to a declining resource base, population increase, and the impact of economic policies. There are nevertheless a number of contemporary Forest Related Tribal Groups who, after contact with other societies, continue their ways of life with very little external influence, these include the

Chenchus, the Jarawa, the Sentinelese, the Onge and the Shompen. They face great problems with respect to health, nutrition, control over resources and participation in decision making processes. Due to commercial logging operations, immigration and conversion of forest into agricultural land, the resource base has come under increasing pressure over the past century (Appalanaidu, 2013).

According to Pushpangadan (1994) in India, 68 million people belonging to 227 ethnic group and comprising of 573 tribal communities derived from six racial stocks namely – Negroid, Proto – Australoid, Mongoloid, Mediterranean, West Breachy and Nordic exists in different parts of the country. The population of tribal people in India is 8,43,26240, mainly concentrated in the forest and high altitude zones of Eastern Ghats, Western Ghats, Central, North-Eastern and Himalayan mountains. These tribal people are spread throughout the country. India is the second largest tribal populated country after Africa continent. United Andhra Pradesh itself has 6.6% tribal population of total population (Census of India, 2001). Haimendorf (1943, 1945, 1979) published accounts of life-styles, customs, socio-economic conditions and, to some extent, the crops raised and plants used by Chenchus, the Reddis of Bison hills and the Gonds of Adilabad.

Forests have a large and indispensable role to play in improving food security of tribes. Wild edible plants are important in the livelihood strategies of forest dwellers/tribal populations because they help the people to meet one of their most important basic needs the food. While these foods are not widely accessible, locally they are great relevance for nutrition and food security in many countries. India has a tribal population of 42 million of which some 60% live in forest areas and depend on forest for various edible products. Wild edible plants are much important than is generally assumed in the food supplies of many countries. Some wild foods are used as staples or as basic components of substantial meals. Many plants used in industrialized countries today were originally identified and developed through indigenous knowledge.

Wild fruits and tubers are available throughout the year; these wild edible plants grow in organic rich soil and in pollution free area. They are not exposed to any artificial chemical fertilizers and are enriched with natural nutrients. Consumption of these wild edible plants makes the tribal people less prone to diseases and they have more strength when compared to people in plains. Useful wild plants in ethnic ecosystems show a trend of utilization of locally available resources both in areas with high plant diversity and marginal habitats. The oral transfer of the indigenous knowledge of

conventional uses of wild plants between elder and younger generation is not always ensured. Now-a-days, the traditional knowledge is declining due to lack of interest in the present generation and also absence of records about the useful plants. Hence, the truthful indigenous knowledge is immediately to be documented and validated for serving future generations and their nutritional values should be analyzed.

6.2 REVIEW OF LITERATURE

Due to rich Biodiversity; India has large ethnic society and immense wealth. There are 45,000 species of wild plants out of which 9,500 species are ethno botanically important species. Of these 3,900 plant species are used by tribals as food; out of which 145 species comprise of root and tubers, 521 species of leafy vegetables, 101 species of bulbs and flowers, 647 species of fruits (Arora, 1991).

Krishnamachari (1900) has reported the use of the leaves of *Erythroxylum monogynum* (Devadari) and the roots of *Aloe vera* (Kalabanda) as a food during famine. Pal and Banerjee (1971) reported the less-known plant-foods among the tribals of Andhra Pradesh and Orissa. According to Mathew (1983) Malayali tribes in Jawadhu hills of Tamil Nadu are using 24 plant species for food, religious purposes, rituals, decorative purposes, insect repellents, bio fertilizers, construction purposes, making household implements and hedge and fuel. Uma and Singh (1987) have explored 15 edible fruit species of *Diospyros* with distribution, fruit morphology and way of utilization observed in India. The tribal belts of Orissa were studied for wild edible plants by Girach et al. (1992) and Girach and Aminuddin (1992). Ansari et al. (1993) worked on less known edible plants of Shevoroy and Kolli hills of Eastern Ghats. Goud and Pullaiah (1996) ethnobotanically surveyed Kurnool district of Andhra Pradesh and stated that some of the wild edible plants observed in their study. Alagesaboopathi et al. (1996) studied about 30 wild edible fruits used by Malayali tribes in Shevaroy hills in Tamil Nadu. Umashankar et al. (1996) explained about importance of food processing of *Phyllanthus emblica* fruits. Four wild edible plants used by the local people of B.R. Hills were studied by Murali et al. (1998). Girach et al. (1997) have compiled 31 plant species consumed as wild edible plants by tribal and rural people of Bhadrak district of Orissa. Sudhakar and Vedavathy (1999) studied wild edible plants used by the tribal people of Chittoor district of Andhra Pradesh. Prasad et al. (1999) documented the food plants of Konda Reddis of Rampa Agency, East Godavari district. Subramanyam and Rama Mohan

(2001) studied on the ecology and food security of tribes lived in Visakha agency area and noted that tribes following shifting cultivation. The tribal farmers grow mixed crops of millets, pulses and oil seeds.

Murthy et al. (2003) reported a total of 419 wild edible plants from undivided Andhra Pradesh, of them most of the plants used tribal people lived in the hills of Eastern Ghats. Hebbar et al. (2003) have recorded 29 wild edible fruit yielding plants under 21 different families from Dharwad district of North Karnataka. Ganesan and Setty (2004) have enumerated the importance and uses of amla fruits in the preparation of pickles, jam and juice. Rajasab and Isaq (2004) enlisted 51 wild food plants from North Karnataka. Out of 51 plants most of them are trees, followed by herbs, shrubs and climbers. Sinha and Lakra (2005) studied about three tribal dominated districts of Orissa namely Kheonjhar, Mayurbhanj and Dhenkenal for plant consumption pattern in five tribal groups (Gond, Sounti, Bhumiz, Kol and Juang) and a total of 126 wild edible plants have been reported, of them majority are leaves (50) and fruits (46). Reddy et al. (2006) worked on ethno botany of 28 endemic plants of Eastern Ghats used by local ethinic gropus namely Bagatas, Chenchus, Gonds, Kondareddis, Koyas, Lambads, Nukadoras, Valmikis, Yanadis, Yerukalas of Andhra Pradesh and Kondhas, Gadabas, Sauras, Didayas, Kolhas of Orissa and reported 28 endemics; of them the seeds of *Cajanus cajanifolius* used to prepare curry, the seeds of *Cleome chelidonii* var. *pallai* are used as condiment, pith of *Cycas beddomei, Cycas sphaerica* used to prepare "*Sago*" and fruits of *Phyllanthus indofischeri* are edible. Mamatha et al. (2006) have described 100 medicinal plants used by Soliga community of B.R. Hills, among them 10 are edible plants. Devaraj et al. (2006) have enumerated 11 edible plants along with common name, part used, harvesting season and uses from households of tribal communities from Kollegal taluk.

Reddy et al. (2007) reported the traditional knowledge on wild food Plants in Andhra Pradesh and listed 156 wild food plants. Rout (2007) did a wonderful work on Ethnobotany of diversified wild edible fruit plants in Similipal Biosphere Reserve of Orissa. Behera et al. (2008) documented wild edible plants of Mayurbhanj district of Orissa. Gayatri and Srividya (2008) made a note on ethno medicinal knowledge of traditionally used edible leaves, seeds flowers among women. Dhole et al. (2009) studied on ethno medicinal properties of weeds in crop fields of Marathwada region and reported 57 problematic weeds, of them 18 are used as medicinal plants to cure many diseases and some of them are edible like *Alternanthera sessilis* and *Portulaca oleracea*.

Among the various types of plants, edible plants received the earliest attention of mankind and reflect man's search for knowing more and more about their nutrients (Jain, 1981). The seeds of *Paracalyx scariosus* are rich in sodium, phosphorus, calcium, zinc, manganese and iron. Anti-nutritional factors, such as total free phenols (5.56%) tannins (2.78%), L-DOPA (0.63%), hydrogen cyanide (0.065%) and phytic acid (0.85%) are present in variable quantities. From the results these plants have a good potential as food crops in Andhra Pradesh (Murthy and Sambasiva Rao, 2009). Even though Rice is a major crop in the Agrobiodiversity of Jeypore tract, the other cultivated crops include *Zea mays, Eleusine coracana, Vigna radiata, V. mungo, Brassica juncea, Sesamum indicum, Arachis hypogaea, Panicum miliaceum, Setaria italica, Guizotia abyssinica, Cajanus cajan, Macrotyloma uniflorum, Saccharum officinarum, Solanum tuberosum* and *Zingiber officinale* (Sharma et al., 1997; Misra, 2009). The study was done on the forest patches of Orissa in some districts and it revealed that a total of 15 wild edible plants recorded from Maliparbat area of Koraput district, 40 species from Khandualmali of Kalahandi district, 13 species from Kutrumali and 40 species from Baphlimali of Raygada district. *Morchella esculenta* is an important edible mushroom belonging to the family Helvellaceae also reported from Orissa in Baphlimali village, Rayagada district (Vasundhra, 2009).

Sadasivaiah (2009) in his work on diversity, quantification and conservation of herbaceous plant resources of Nallamalais recorded and quantified 36 wild edible plant resources. Of the 36 wild edible herbs of Nallamalais, *Ceropegia spiralis* is a vulnerable species and 12 are medicinal plants, 3 are wild relative plants. Basha (2009) recorded 102 wild edible trees from the forests of Nallamalais and they are consumed by human as well as animals, most of them are eaten by human beings.

The estimated 2800 species of vascular plants of Orissa state (India), about 150 wild edible fruit species occurring in different parts of eastern India's deciduous forests are consumed in various quantities by rural communities (Mahapatra and Panda, 2009). Naidu and Khasim (2010) reported 118 ethno botanical plants from Eastern Ghats of Andhra Pradesh and among them a good number of wild edible plants also mentioned in their work. According to Sahu et al. (2013) Boudh district of Orissa is famous for cultivation of minor millets. The tribal communities cultivate various millet species like Jav (*Hordeum vulgare* L.), ragi (*Eleusine coracana* (L.) Gaertn.), Maka (*Zea mays* L.), Kangu (*Setaria italica* (L.) P. Beauv.), Mandia (*Eleusine coracana* (L.) Gaertn.), Suan (*Panicum sumatrense* Roth. ex Roem. & Schult.) and pearl millet (*Pennisetum typhoides* (Burm. f.) Stapf & C. E. Hubb.).

Recently Rao et al. (2011) discovered a new species of *Brachystelma* and named after Pullaiah as *Brachystelma pullaiahii* and the tubers of the species are locally eaten. An ethnobotanical survey undertaken by Xavier et al. (2011) in Kolli hills of Eastern Ghats of Tamil Nadu revealed that the Malayali tribes of Kolli hills are using 50 plant taxa to treat various diseases while *Moringa oleifera, Solanum nigrum* and *S. torvum* are edible. The chemical and nutritional composition of *Cajanus albicans*, an underexploited tribal pulse in Eastern Ghats of Andhra Pradesh was determined and proved that it is very rich in crude protein than other commonly consumed legumes like *Cicer arietinum* (Murthy, 2011). Murthy and Emmanuel (2011) studied the nutritional properties of a wild legume *Rhynchosia bracteata* and concluded that it may be further exploited in breeding programs and popularized for mass cultivation and consumption in third world countries, such as India to alleviate hunger and poverty. A variety of trees are grown by the Adivasis in Eastern Ghats on their land, the produce (fruits, nuts, oil from seeds) of which are used for household consumption as well as for augmenting income through sale. The common trees grown on land include jackfruit, orange, guava, mango, gooseberry, java plum, Indian fir/mast tree, tamarind, myrobalan and marking nut/black cashew. The other trees grown include silver oak, custard apple, Indian beech tree, beech, fishtail/toddy palm, lemon, eucalyptus, teak, pomegranate and banana (Seema Mundoli, 2011).

Launea procumbens, a wild edible plant of Asteraceae is found as a weed in crop fields and wastelands and it is rich in Calcium and Iron and commonly found in black cotton soils. Local women used this as leafy vegetable and sold in market in Gulbarga district of Karnataka (Rajasab and Rajshekhar, 2012). Dhore et al. *(*2012) explored Digras Tahsil, of Yavatmal district of Maharashtra for wild edible plants and reported 25 species. Mahapatra et al. (2012) identified superior/identical nutritional status in terms of carbohydrate, sugar and protein and mineral contents in non cultivated indigenous forest species, for example, *Eugenia rothii, Mimusops elengi, Ziziphus oenoplia, Zizipus rugosa, Bridelia tomentosa* and *Carissa spinarum* comparable to the cultivated fruits like mango, pomegranate, sapota, grapes, guava, cherry, banana and lemon, etc. The analysis indicates the scope of using wild edible fruits for dietary supplement since it has valuable ingredients as Iron, Sodium, Potassium and Calcium. Kumar et al. (2012) reported that 11 edible wild *Dioscorea* species are available in the Simlipal Biosphere Reserve forest, Orissa. Reddy (2012) reported a total of 61 wild edible plants from Chandrapur district of Maharashtra state. Samydurai et al. (2012) surveyed Kolli hills of Eastern Ghats for wild edible tubers and revealed that a total of

38 tuberous plants are being used by tribal people of Kolli hills. Kumar et al. (2012) studied on wild edible plants of Simlipal Biosphere Reserve of Orissa and they specially focused on the tuberous species of *Dioscorea*. Sadasivaiah and Ravi Prasad Rao (2012) worked on tribe Ceropigeae in Eastern Ghats of Andhra Pradesh and listed 19 taxa under 6 genera. Of these, the stems of *Boucerosia, Caralluma,* the tubers of *Brachystelma, Ceropegia* are edible by the tribal people of Eastern Ghats.

The species of *Dioscorea* play a vital role among the tribal communities by serving as a food and as a traditional medicine to cure different types of diseases during critical period (Kumar et al., 2013). A total of 216 numbers of ethnobotanical interested species were collected with the help of medicine man (Baidya or elder village people) from different tribal populated village areas at Nabarangpur district of Odisha. Out of 270 uses recorded 153 are as medicinal, 54 as food, 7 veterinary, 8 fodder, 7 rope making, 2 herbal dye, 9 tooth brush, 3 insect repellent 4 hair oil and 25 other purposes (MoEF, 2013). Mukesh Kumar et al. (2013) reported 21 plant species belonging to 19 families used as wild edible plants by the tribal and rural communities of Balasore, Bhadrak, Jajpur, Keonjhar and Cuttack districts of Odisha. Bagul (2013) enlisted 27 medicinal plants from Jalgaon district of Maharashtra and some of them are edible. Deshpande and Kulkarni (2013) studied on *Theriophonum indicum* a leafy vegetable commonly consumed by Gondia tribe in Vidarba region of Maharashtra and explained a new technique developed by Gondia tribes for the preparation of food material with *Theriophonum indicum* because, the tubers will give irritation. Misra and Misra (2013) emphasized on leafy vegetables available in South Odisha and listed 106 leafy vegetables. Out of 106 leafy vegetables 78 grow in wild and 28 are cultivated. Singh (2013) on his work on probable Agricultural Biodiversity Heritage Sites in the South-Central region of Eastern Ghats mentioned many edible and wild edible plants. The Malayali tribals cultivate edible plants, like tapioca, pineapple, banana and cash crops, such as pepper, coffee, jack fruit, clove and cereals like ragi, thinai, makkasolam, samai and panivaraku (Vaidyanathan et al., 2013). Prabakaran et al. (2013) worked on wild edible forest products of Chitteri Hills of Southern Eastern Ghats collected by Malayali tribes which included wild fruits, leafy vegetables, tubers, commonly used for self subsistence. A total of 38 species of wild edible fruits, 11 different leafy vegetables were listed. The Bagatas, Koyas, Gonds, Manne Doras, Malis, Reddi Doras, Nooka Doras and Valmikis living in the valleys and nearby streams where plain landscape prevails, have totally adopted to settled cultivation but the same tribes inhabiting near the hill

tracts and interior forests are resorting to shifting cultivation (Subramanyam and Veerabhadrudu, 2013). However, a few of them currently growing commercial crops like turmeric, maize, tobacco, chillies, cotton, cashew, orange, ginger, pippallu (*Piper longum*), different varieties of beans, etc., mixed cropping like pulses, millets and oil seeds is the dominant feature in the dry and Podu cultivation. Misra (2013) documented 26 wild edible plants and stated that they are the common property of villagers, of them 13 are fruit yielding plants and 13 are leafy vegetable. Vaidyanathan et al. (2013) studied ethnomedicinal plants used by Malayali tribes in Kolli hills of Eastern Ghats and recorded 250 ethno medicinal plants, among them some are edible by the tribal people.

Misra and Misra (2014) reported 38 wild edible plants with underground parts from South Odisha. Nagalakshmi (2014) reported 54 species of wild leafy vegetables from rural households of Anantapur district of Andhra Pradesh. Among 54 wild edible leaves, 11 are coming from the family Amaranthaceae. Tripathy et al. (2014) stated that *Trichosanthes cucumerina* possesses sound ethnobotanical values and its parts are used in various disorders and microbial infections and also young fruits are used as vegetable. Fruits are rich with carbohydrate (26.24%), lipid (2.20%), protein (1.50%), fiber (1.96%) and good amount of moisture. Panda (2014) enlisted 86 wild edible plants of 51 families from Odisha state and stated that and Dioscoreaceae and Amatanthaceae are the dominant families.

Investigation on uncultivated vegetables in the Dumbriguda agency region of Visakhapatnam District was done by Sanyasi Rao et al. (2014) and listed 55 indigenous food plants and stated that most of them are leafy vegetables. Around 64% of the people in the North-western Deccan Plateau Region are employed in agriculture and allied activities. Field crops include wheat, rice, sorghum, pearl millet, minor millets, pulses, and oilseeds, while horticultural crops are dominated by tropical fruits, such as mango, grape, banana, orange, pomegranate, etc., and diverse vegetables. Cash crops include cotton, sugarcane, turmeric, groundnut, and tobacco in the Northwestern Deccan Plateau Region (Singh, 2014). Mukesh Kumar et al. (2014) studied 43 Ethno medicinal plants in the Khordha forest division of Khordha District, Odisha, which are used by Kondh, Sabra, Naik tribes of the area, among them some of the plants also used as edible, such as the rhizomes of *Amorphophallus paeoniifolius* and the fruits of *Averrhoa carambola*.

Misra and Misra (2014a) did nutrient analysis of 27 wild leafy vegetables available in South Odisha and concluded that all the edible leafy vegetable plants contain appreciable amount of nutrients which are readily available.

Hence they could be consumed to supplement the scarce or non-available sources of nutrients to the tribal and poor rural people. Pandravada et al. (2014) reported the distribution and cultivation practices of *Luffa hermaphrodita* for the first time in Andhra Pradesh from Adilabad district. Deepa et al. (2014) studied wild edible plants used by Malayali tribes of Bodha Hills, Southern Eastern Ghats, Namakkal district of Tamil Nadu and identified 95 wild edible plants belonging to 75 genera and 48 families. Out of 95 wild edible plant species, 43 are leafy vegetables, 38 wild fruits. Rekka and Senthil Kumar (2014) published a note on ethnobotanical wild edible plants used by Malayali tribals of Yercaud Hills, Eastern Ghats, Salem District of Tamil Nadu and identified 42 wild edible plant species under 36 genera and 29 families. Among these, 27 are fruits, 9 are leafy vegetables. Among 42 plant species, trees (13 species) were found to be most used plants followed by herbs (11 species), shrubs (8 species), climbers (6 species) and small trees (4 species). These products are collected from both wild and cultivated plants. Documentation of wild edible plants in old Mysore district by Nandini and Shiddamallayya (2014) encompasses 105 plant species belonging to 77 genera of 47 families. The wild edible plant species are composed of 6 climbers, 28 shrubs, 30 herbs and 41 Trees. Of enlisted 62 plants used as raw, 30 are used as boiled and 13 plants are used as raw and boiled form in rural and tribal population of old Mysore. Satyavathi et al. (2014) gathered information on Bogata tribes of Paderu division of Andhra Pradesh and listed a total of 30 angiosperm plant taxa for ethno botanical uses, among them some are used as edible plants.

Nayak and Basak (2015) evaluated some of the nutritional properties in 8 wild edible fruits reported to be consumed by rural people and tribals of Odisha. Among them, *Dillenia pentagyna* showed highest total carbohydrate (18.5%), total sugar (16.8%) and iron content (16 mg/100 g) making it a good competitor against other popular cultivated fruits like mango (17.00%), pomegranate (17.17%) with reference to carbohydrate content and grapes (16.25%) with regard to total sugar content. Similarly, wild edible fruits like *Streblus asper* (12.7%) and *Carmona retusa* (11.8%) also recorded high sugar content in comparison to cultivated fruits, viz., apple (10.39%), pineapple (10.8%) and pears (7.05%). The protein content in *Melastoma malabathricum* (5.48%) and *Carmona retusa* (4.1%) were found higher in comparison to cultivated fruits like banana (1.09%), mango (0.51%) and guava (2.54%). With regard to the mineral content, like iron, manganese, copper and calcium, *Dillenia pentagyna*, *Streblus asper*, *Melastoma malabathricum*, *Calamus guruba* were also found at par with apple, mango, banana and guava.

6.3 GROWTH FORM ANALYSIS

The growth form of the edible plants used by the tribal people of Eastern Ghats as observed in the review includes herbs are dominating with 362 taxa followed by trees (255 taxa), climbers (113 taxa) and shrubs (55 taxa). Sanyasi Rao et al. (2014) enlisted wild food plants consumed by tribals of Dumbriguda area of Vizag and stated that most of them are trees which occupied highest position with 21, followed by herbs (14 species), climbers (9 species), Shrubs (6 species), each one species of fern and Vine.

6.4 EDIBLE PART ANALYSIS

Rekka and Senthil Kumar (2014) recorded 42 wild edible plants from Yercaud Hills, Eastern Ghats, of which 13 trees, 11 herbs, 8 shrubs, 6 climbers and 4 small trees. The edible parts consumed as food by the tribal people of Eastern Ghats are Aerial roots (AR), Bark (Br.), Bulbs (B), Corms (C), Gum (G), Whole Plant (WP), Root (R), Tuber (T), Rhizome (Rh), Leaves (L), Stem (St), Flowers (Fl.), Fruits (Fr.), Seeds (S), Pith (P), Tender shoots (Ts) and Inflorescence (In.) and these plants still share a good proportion of tribal dishes all over world (Anonymous, 1970–1988; Samant and Dhar, 1997; Sasi et al., 2011). Most of the collected edible parts of plants eaten as raw as well as cooked as vegetables, snacks, or used as beverages. The analysis on edible parts revealed that major parts of the plants are used as food by the local tribal are fruits with 320 plant taxa, followed by Leaves (294 taxa), underground parts including B, C, Rh, R, T (122 taxa), Seeds (113 taxa), stems (67 taxa), flowers (36 taxa), whole plants (8 taxa) and 19 other parts like Gum, Bark, etc.

Mukesh Kumar et al. (2013) documented 8 wild edible fruits, 4 flowers, 6 leafy vegetables and one species of grain, 1 tuber and 1 whole plant as edible by the tribal and local inhabitants of Balasore, Bhadrak, Jajpur, Keonjhar and Cuttack districts of Odisha. Sanyasi Rao et al. (2014) reported 55 indigenous food plants consumed by tribal communities of Dumbriguda area of Visakhapatnam district, among them 24 species are used as leafy vegetables, 21 fruits, 6 tubers, 4 tender shoots, 2 each for seeds and flowers. Rajasab and Isaq (2004) have explored 22 species of plants used as edible leaves, stem, flowers, fruits, seeds and roots as part of regular diet by village folks of North Karnataka. Rajasab and Isaq (2004) recorded 51 wild edible plants from the district of Gulbarga of Deccan region of them 27 are edible fruits, 16 leaves/stems, 4 flowers, 3 seeds and the roots of *Decalepis*

hamiltonii. Sinha and Lakra (2005) documented 126 wild edible plants of which 50 are edible leaves, 46 fruits, 15 flowers, 14 tubers, 11 seeds and 5 gums are the part of tribal diet in Orissa (Figure 6.1).

FIGURE 6.1 Methodology. (Photos courtesy of Naveena Photo Parlour, Wanaparthy.)

6.4.1 UNDERGROUND PARTS

The underground parts are delicious, provide instant energy and meet food requirements to some extent. The underground parts are washed properly, eaten as raw, burnt, or largely practiced by a complex process of boiled, sliced, cooked to remove the acrid taste and eaten. Some of them are just eaten as raw just after collection and peeling the outer skin owing to its good taste. Some of the tubers were powdered and added for fermentation of local wine (Misra et al., 2013). The tubers of *Brachystelma, Ceropegia* species are edible by the locals in Eastern Ghats (Sadasivaiah and Rao, 2012).

A total of 122 plants belonging to 44 families yield underground edible parts (Figure 6.2). They are categorized as bulbs, corms, root stock, rhizome and tubers. Among 44 families, monocots are dominating than dicots. Zingiberaceae is the dominating family that yields 16 edible underground parts followed by Dioscoreaceae (13 taxa), Araceae (12 taxa) and Asclepiadaceae (11 taxa). The members of Araceae (corms), Dioscoreaceae (tuberous), Liliaceae (bulbous) and Zingiberaceae (rhizomatous) are the major underground parts yielding plants in Monocots and Apiaceae (tuberous), Asclepiadaceae (tuberous) and Cucurbitaceae (root stocks) are in dicots. Tribal people collected 15 species of wild edible tubers during the crucial months and of the 15 tubers 11 are the species of *Dioscorea* (Sinha and Lakra, 2005).

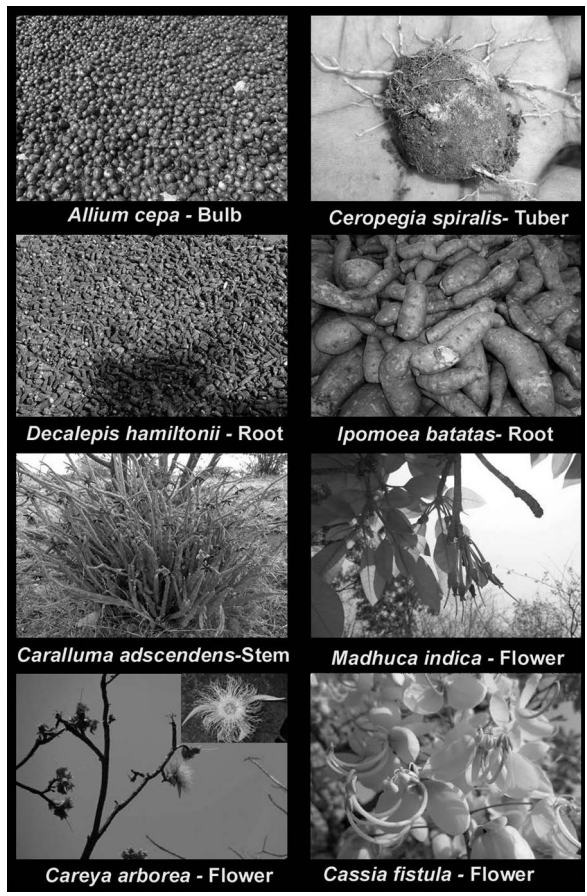

FIGURE 6.2 Edible underground parts/stems/flowers. (Photos courtesy of Naveena Photo Parlour, Wanaparthy.)

The bulbils of *Aponogeton natans* are sweet in taste and are directly eaten as raw as snacks. The fresh tubers of *Dioscorea glabra* and *D. puber* are taken as snacks (Misra and Misra, 2014). The bulbs of *Allium cepa*, *A. fistulosum* and *A. sativum* are also used as spice. The species of *Amorphophallus, Arisaema tortuosum*, *Colocasia esculenta* corms are used as vegetable along with other vegetables. Kumar et al. (2013) worked out on the medicinal and food properties of 12 *Dioscorea* species available in the forests of Odisha and stated that, all the species are rich in starch and carbohydrates and also they used to treat diabetes and various skin diseases.

6.4.2 STEMS

The stems of 67 species and pith of 6 species belonging to 37 families are also edible by the tribals of Eastern Ghats. Among the 37 families, Asclepiadaceae, Asteraceae and Poaceae are dominating with 5 species in each family. The stems of *Amorphophallus bulbilfer, Caralluma adscendens, Caralluma umbellata*, *Cissus quadrangularis,* tender stems of *Achyranthes aspera* and *Curcuma zedoaria* are used as vegetable and the stems of *Saccharum officinarum* used to prepare candy, juice and also eaten as raw. *Saccharum officinarum* is cultivated throughout Eastern Ghats and it is also available in local markets. The pith of stems of the species of *Phoenix* is eaten as raw. 'Sago' is prepared from the pith of *Metroxylon sagu* and *Cycas sphaerica*. Toddy, a local drink is coming from the stems of *Phoenix sylvestris, Borassus flabellifer* and *Caryota urens*. The stems of *Boucerosia* and *Caralluma* are used in chutnies and or directly eaten as raw in Eastern Ghats of Andhra Pradesh.

6.4.3 LEAVES

Good number of leaves is edible by tribal people of Eastern Ghats. Two Hundred and Ninety four taxa of leaves under 77 families are utilized as edible. Most of the edible leaves are used as leafy vegetable (Figure 6.3). Some of the leaves have potential economic value. These leaves have more proteins, vitamins, etc. Some of them are available in local market and most of them are under neglected species. The families like Amaranthaceae (32 plant taxa), Fabaceae (20), Caesalpiniaceae (16), Asteraceae (11) and Euphorbiaceae (10) are the dominant families that yield edible leaves. The leaves of *Alternanthera sessilis, Trianthema portulacastrum, Allmania*

nodiflora, Digera muricata, Basella alba, Tamarindus indica, Boerhavia diffusa and some other species of leaves need to be enhanced to market level. The species like stalk of *Allium cepa* and leaves of *Alternanthera sessilis*, *Amaranthus spinosus*, *Cassia tora, Celosia argentia, Centella asiatica, Colacasia esculenta, Moringa oleifera, Murraya koenigii*, *Portulaca oleracea*, *Trianthema protulacastrum* and *Solanum nigrum* leaves are commonly consumed by adivasi communities all theses leafy vegetable are rich in vitamin-A. There is a good demand for the leaves of *Coriandrum sativum* and *Murraya koenigii* in the market. *Alternanthera philoxeroides* is an exotic cultivated in Eastern Ghats for its edible leaves (Reddy and Raju, 2005).

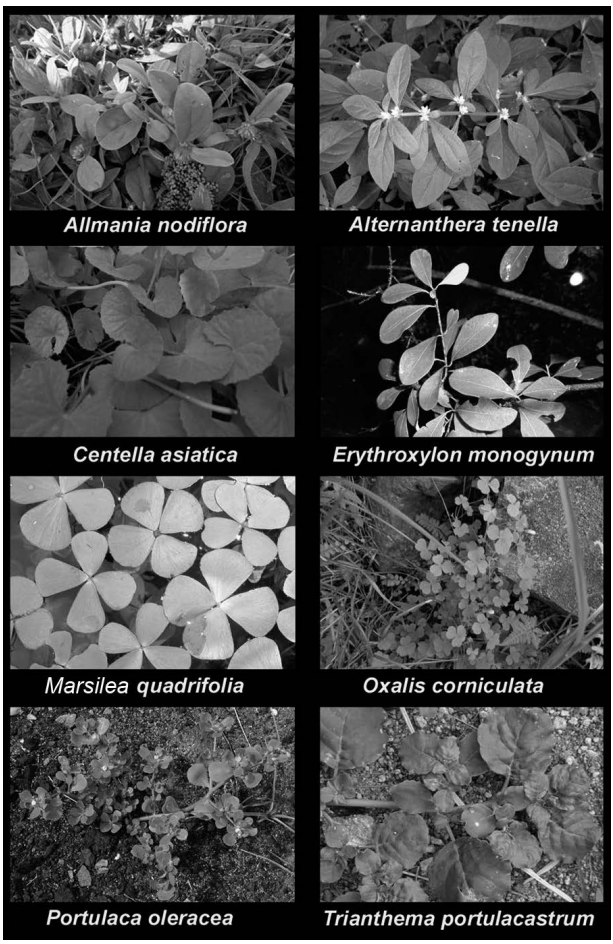

FIGURE 6.3 Edible leaves. (Photos courtesy of Naveena Photo Parlour, Wanaparthy.)

Kamble et al. (2013) reported that 3,900 plant species are used by tribals as food, out of which 145 species comprise of root and tubers, 521 species of leafy vegetables. Nagalakshmi (2014) surveyed the leafy vegetables of Anantapur district and reported 54 plants under 44 genera of 29 families. Sinha and Lakra (2005) reported 50 wild edible leaves from the forest of Orissa, consumed by *Gond, Sounti, Bhumiz* and *Juang* tribes, among 50 leaves 32 are very popular among all tribes and often consumed in their respective season. All these edible leaves commonly available in forests or found in cultivated fields as weeds. Misra and Misra (2014) analyzed the nutritional values of 27 leafy vegetable of South Odisha, of 27 species *Murraya koenigii* showed the highest total sugar content, followed by *Tamarindus indica* and *Senna tora. Tamarindus indicus* contains the highest vitamin B1 content followed by *Bambusa bambos* while *Moringa oleifera* showed the highest vitamin C content followed by *Cleome viscosa*.

6.4.4 FLOWERS

Flowers of 36 species belonging to 21 families are edible either raw (*Holostemma ada-kodien, Tamarindus indica*) or cooked as vegetable and used in the preparation of curries. Caesalpiniaceae is the dominant family with 8 speices that yields edible flowers. The flower buds of *Syzygium aromaticum* are used as spice. The parts of flowers like stamens and thalamus of *Nelumbo nucifera* are directly eaten by the tribal people living in Eastern Ghats. The flowers of *Holostemma ada-kodien* are sweet in taste and *Tamarindus indica* are sour in taste as said by tribal people of Nallamalais, who live in Andhra Pradesh and Telangana.

Wild edible flowers are consumed seasonally according their availability in the forests by 5 tribal people of Orissa forests, some of them are *Sesbania grandiflora, Cochlospermum religiosum, Tamilnadia uliginosa, Madhuca indica*. Of the 15 species of wild edible flowers 6 are commonly found in summer season, where as 4 species are found in rainy season and very few occur in other season (Sinha and Lakhra, 2005).

6.4.5 FRUITS

Wild fruits play a significant role in human nutrition and they are generally used as raw or processed, which help to compensate the day-to-day requirement of calories. These fruits are sources of carbohydrates, proteins, vitamins,

minerals, dietary fiber and enormous medicinal potential (Quebedeaux and Bliss, 1988; Quebedeaux and Eisa, 1990; Craig and Beck, 1999; Wargovich, 2000).

Some fruits like *Annona squamosa, Aegle marmelos, Ziziphus* species are cultivated and also available in market at commercial level, but still the tribal people collected these from forests. *Diospyros melanoxylon, Phoenix sylvestris, Ziziphus oenoplea, Manilkara hexandra* and *Buchanania lanzan* are collected from forests and commonly sold in local markets by the tribals (Reddy, 2012).

Gathering and exploitation of wild edible fruits is a common activity of the indigenous people in Eastern Ghats and Deccan region (Figure 6.4). A total of 320 species of fruits belonging to 70 families were collected from

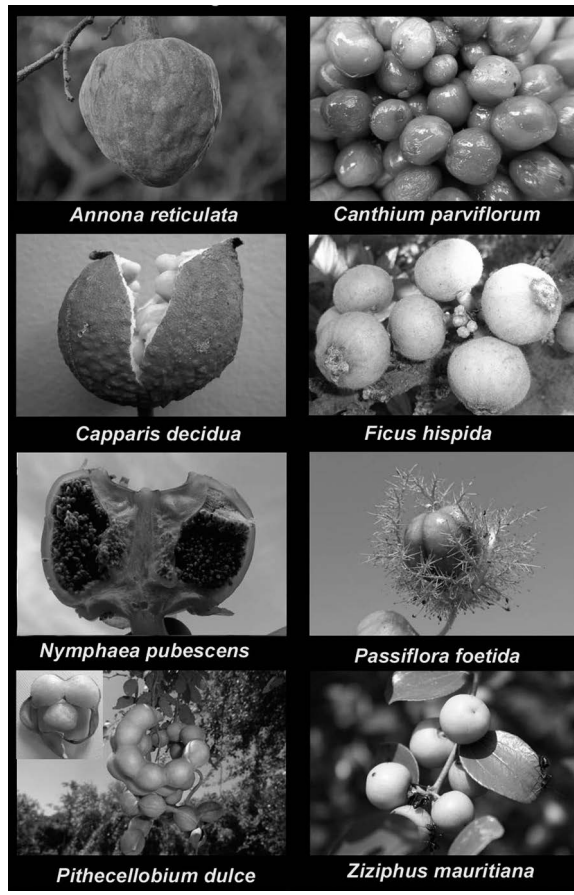

FIGURE 6.4 Edible fruits. (Photos courtesy of Naveena Photo Parlour, Wanaparthy.)

Eastern Ghats and Deccan. Out of 320 fruits, most of them are found in forests as wild and some of the fruits are available in wild as well as in markets; and few of them are cultivated in home gardens or in brought from local markets. It shows that the indigenous people collect many wild fruits from the area. These wild edible fruits may not be the alternatives for food but they contribute the necessary nutrient requirements of the aboriginal people (Sasi and Rajendran, 2012).

Out of 70 families identified in the widely utilized species belonged to Cucurbitaceae (23 taxa), followed by Solanaceae (20 taxa), Rubiaceae (18), Rutaceae and Moraceae (17) and rest of the families represented 1–14 species. The wild edible species have been meeting the protein, carbohydrates, fat, vitamins and mineral requirements of the local residents to a great extent (Sebastin and Bhadari, 1990; Omo Ohiokpehai, 2003). The fruits also contain antioxidants which protects people against heart disease and certain type of cancers (Saxena, 1999). The dangerous diseases like cancer, cardiovascular disorders, Alzheimer, cataract are reduced due to regular consumption of wild edible fruits (Liu, 2003).

Some of the wild edible fruits were collected by local people and they are selling in nearby urban area for income generation (Sasi and Rajendran, 2012). The species like *Mangifera indica, Murraya koenigii, Pithecellobium dulce, Syzygium cumini, Tamarinus indica* are collected for domestication. Domestication grew out of food gathering almost led to cultivation (FAO, 1999). The fruits of *Trichosanthes cucumerina* are used as vegetable by the tribal people of Simlipal Biosphere Reserve (Tripathy et al., 2014). Sinha and Lakra (2005) documented 46 wild edible fruits, of which 32 are popular to tribal people and they are used as vegetables, used to prepare pickles and some of them are eaten directly. Nayak and Basak (2015) evaluated nutritional properties in 8 wild edible fruits, for example, *Antidesma ghaesembilla, Careya arborea, Dillenia pentagyna, Streblus asper, Carmona retusa, Melastoma malabathricum, Calamus guruba* and *Ficus hispida* reported to be consumed by rural people and tribals of Odisha.

6.4.5 SEEDS

A total of 113 seeds of plant species of 31 families were identified as edible seeds in Eastern Ghats. Fabaceae is the largest family having 27 edible seeds, followed by Poaceae (23 species), Caesalpiniaceae (6 species) and Cucurbitaceae (5 species). Nearly 50% of the seeds are coming from Fabaceae and Poaceae families only (Figure 6.5). These two families are the

main source for most of the food grains and pulses. Eleven species of seeds are utilized as spices, such as *Coriandrum sativum, Cuminum cyminum, Piper longum* and *Brassica nigra*. A good number of seeds eaten as raw and some seeds like *Arachis hypogaea, Hibiscus cannabinus, Cucumis sativus, Bauhinia vahlii* roasted and consumed. Some of the seeds used to prepare chutnies, sweets, salads and a few of them used as medicinal. Some of the seeds are boiled and consumed.

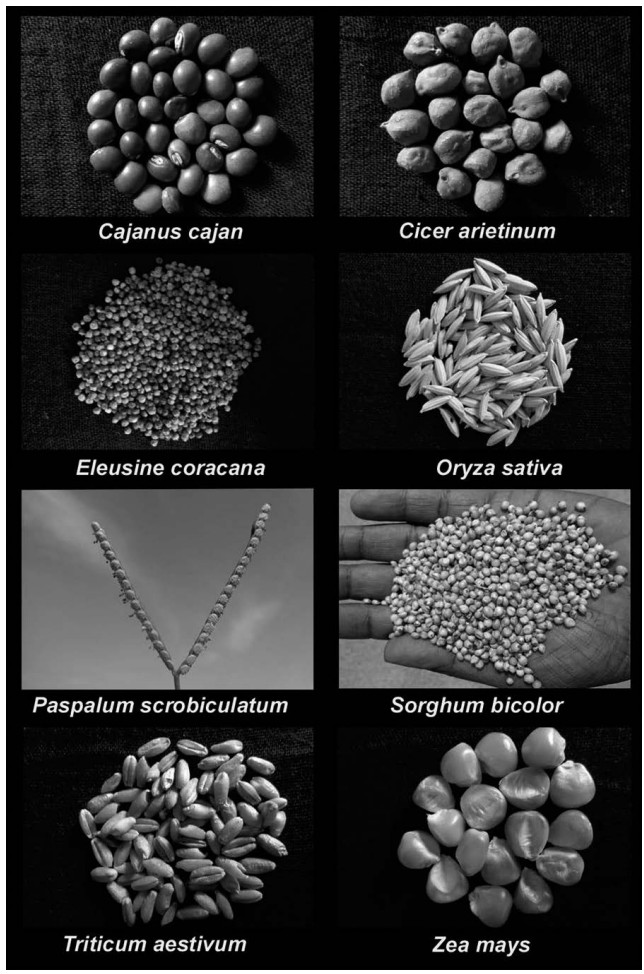

FIGURE 6.5 Edible seeds. (Photos courtesy of Naveena Photo Parlour, Wanaparthy.)

To meet the diet of increasing population, new food resources are increasing, the seeds of wild plants, including the tribal pulses, received more attention in this case, because they are well adapted to adverse environmental conditions, highly resistant to disease and pests, and exhibit good nutritional qualities (Maikhuri et al., 1991). Wild seeds are commonly used in different parts of the world as proteinaceous food (Amubode and Fetuga, 1983). In India different tribal people used some 28 wild legumes as pulses (Arora et al., 1980; Murthy and Pullaiah, 2005). The tribal communities living in Eastern Ghats and adjacent Deccan region collected the seeds of wild legumes randomly in the vicinity of the forests, soak in water and consumed the seed meal after boiling and decanting for four to twelve times (Murthy, 2011).

Sinha and Lakra (2005) recorded 11 edible seeds consumed by the tribal people of Orissa, most of them are coming from trees. Some of the seeds have market value.

6.4.6 OTHERS

The Aerial roots of epiphytic orchids, such as *Pelatantheria insectifera* and *Vanda tessellata* are used as snacks just after burning by children (Misra et al., 2013). The bark of *Cinnamomum verum* is used as spice and it is collected from forests and also brought from markets. The gum of *Anogeissus latifolia* and *Sterculia urens* are eaten as raw and used in the preparation of sweets respectively. The whole plant of *Agaricus bisporus,* a fungi used as vegetable and also as snacks, whereas *Parmelia tinctoria* is a foliage lichen used as spice. The sustainable collection of *Agaricus bisporus* and *Parmelia tinctoria* gives good economic benefit to the tribals in Eastern Ghats. The gum of *Terminalia alata, Terminalia bellirica* and *Ficus benghalensis* are consumed by the local tribal people of Orissa (Sinha and Lakra, 2005).

6.5 USE CATEGORY

Analysis of data on use category showed that the identified edible plants especially wild species provide 5 major edible and allied categories based on local practices, such as food, food supplements, liquor additives, food flavorings (spices and condiments), medicine and sorcery. Every plant has

one or more uses. It revealed that majority of taxa have multiple uses that means the same plant serves more than one use category. Some of the plants have some cultural or ritual importance that the tubers of *Asparagus racemosus, Smilax zeylanica, Nymphaea pubescens, Lygodium flexuosum* and the fruits of *Solanum melongena* var. *insanum* are tied to the neck/body of the children/pregnant women to keep away of evil spirits and to maintain god health.

6.6 INCOME GENERATING SPECIES

Besides the household consumption as supplementary food by the tribal people, some wild edible plants are marketable and provide opportunity for earning additional income. According to Misra et al. (2013) 22 edible tubers, Basha et al. (2009) 13 species of wild edible fruits were domesticated and 19 wild edible fruits are having commercial marketing values. Most of the traditional leafy vegetables have commercial value and some of them are already available in local markets nearby forest areas. The commercial usage of the rootstocks of *Decalepis hamiltonii,* the gum of *Sterulia urens,* fruits of *Limonia acidissima* are needed to be enhanced up to national and international levels. Sale of forest food products have potential to increase the purchasing power of the households and therefore contribute indirectly to food products and daily need, such as rice, salt, clothes, etc.

6.7 DISCUSSION

Eastern Ghats are the rich source for a good number of wild edible plants. Most of the wild plants especially leafy vegetables, fruit yielding plants, tuberous and rhizomatous plants can easily grow in the back yards of houses, home gardens, so that it can be used readily. According to Nordeide et al. (1996), Orech et al. (2007), Sundriyal and Sundriyal (2001) the nutritional values of traditional leafy vegetables is higher than common vegetables. Samyadurai et al. (2012) studied 38 wild edible roots and tuberous species of Kolli hills of Eastern Ghats and stated that these species are closely related to socio-economic conditions of tribals of Kolli hills for their day-today requirement. Southern Eastern Ghats of United Andhra Pradesh were explored for wild edible fruits by Basha et al. (2009) and recorded 69 species belonging to 44 genera and 28 families. Of these 69 species, 13 are

domesticated by the local communities and 19 species are having commercial value for marketing.

The root stocks of *Cissampelos pareira, Asparagus racemosus, Lygodium flexuosum, Rubia cordifolia, Orthosiphon rubicundus, Elephantophus scaber, Madhuca indica, Clerodendrum serratum* and few others are used as liquor additives (Misra et al., 2013). Some of the edible plants are also used as medicine by the tribal people of Eastern Ghats. Most of the members of wild edible plants of Zingiberace, Dioscoreaceae, Apiaceae, Asclepiadaceae and other family members are also used as medicine by tribal people. This confirms the fact that the food and medicinal plants are closely related particularly in rhizomatous/tuberous species and can lead to the development of pharma-food or nutraceuticals (Etkin and Johns, 1998; Bonet et al., 1999).

6.8 CONCLUSION

The aboriginal people of Eastern Ghats through their traditional knowledge infer what to eat what not to eat. They are thoroughly acquainted with methods of excluding the harmful substances from the edible plants and prepared acceptable recipes. The corms and aerial bulbs of *Dioscorea* eaten as raw, cause a terrible itching sensation in throat, hence for removing itching sensation, they will be peeled, double boiled in tamarind water and smeared with turmeric paste. This is one of the methods devised in the kitchens of the tribal people in Eastern Ghats.

The high diversity of these indigenous species within Eastern Ghats affirmed the importance in sustaining the livelihoods of tribal communities. The hilly undulating terrain with limited cultivable lands, non- availability of sufficient food, poor accessibility and marketability and very low agriculture yield are the main attributes for use of wild edible plants as food. Some of the species like *Dioscorea hamiltonii, Curculigo trichocarpa, Habenaria plantaginea, Vanda tessellata, Amomum dealbatum* consumed by the children and very poor households during normal and difficult times ensured their contribution and further maintenance of indigenous knowledge, however, the transmission of such data and wisdom on edible use of some species in food scarcity, gradually lead to the fading away of traditional knowledge associated with those species. The wild edible fruits are playing a vital role in providing nutritional and economic securities to the poor masses in rural areas, but the commercial and market value of these wild fruits is unknown

to them. The commercial and market value of these wild edible plants should be tapped timely and seasonally.

Tribal women are well experienced and they play major role in utilization of wild edible plants. The oral transmission of traditional knowledge is declining day by day, so there is an urgent need to document the traditional knowledge on wild edible plants as well as the preparation modes of food. There is much scope for improving the growth forms of wild edible plants by using modern agronomy techniques. For all such endeavor, thorough fieldwork in various tribal areas and critical ethno botanical observation on wild edible plants are the basic requirements.

As a supplementary source of income, non-timber forest produce is important to the tribal people. The unsustainable collection, lopping of branches by the forest dwellers and grazing leads to over exploitation of wild resources. Over exploitation of wild edible plants may lead to great threat to certain species. Hence there is a need to find the sustainable methods of collection of wild edible plants for their conservation. The tribal people should be trained in mode of collection and preservation of wild edible plants for better shelf-life period. Forest product conservation and sustainable collection are the two very important factors for the development of economic status of tribal people of Eastern Ghats. All these wild edible plants also have immense potential for the fauna in the forests.

It is evident from many works on wild edible plants collectively that with the effect of several factors, such as migration of tribal inhabitants from core to transitional zone, influence of modern lifestyles on younger generation with change in dietary habits and their impression of forest plants as poor men's food, agriculture encroachment and launching of Government schemes on food security, we have started to lose the indigenous knowledge required to identify, locate, gather and know the consumption pattern of wild edible species. In addition, many of the wild edible plant species are under the pressure of various categories and magnitudes, thus public awareness and community based programs through joint forest management plan need to be encouraged at all levels for *ex-situ* and *in situ* conservation of such species of future potential. Therefore, sustaining the wild edible plants species will be worthwhile only if conservation efforts be made into execution for those potential species to preserve their cultural heritage and to enhance the food security of tribal communities in Eastern Ghats.

TABLE 6.1 List of Food Plants

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
1	*Abelmoschus crinitus* Wall.	R, T	Underground fleshy tubers are first boiled and consumed as vegetable	Misra et al. (2013); Misra and Misra (2014)
2	*Abelmoschus esculentus* (L.) Moench	Fr.	Used as vegetable	Singh (2013)
3	*Abrus precatorius* L.	L, Fl.	Occasionally leaves and flowers eaten raw	Reddy et al. (2007); Dhore et al. (2012)
4	*Abutilon indicum* (L.) Sweet	Flb, S, L	Flower buds and seeds are occasionally edible. Leaves used as vegetable	Murthy et al. (2003); Rajasab and Isaq (2004); Reddy et al. (2007)
5	*Acacia concinna* (Willd.) DC.	L	Young leaves are ground to coarse paste along with red chilies and salt to make chutney	Nagalakshmi (2014)
6	*Acacia nilotica* (L.) Delile	S	Rosted with salt and eaten	Murthy et al. (2003)
7	*Acacia pennata* (L.) Willd.	L, Fr.	Cooked and eaten along with boiled rice; fruits edible	Rekka and Senthil Kumar (2014); Sanyasi Rao et al. (2014)
8	*Acacia sinuata* (Lour.) Merr.	L	Tender leaves used as vegetable	Murthy et al. (2003)
9	*Acalypha fruticosa* Forssk.	L	Used as vegetable	Deepa et al. (2014)
10	*Acalypha indica* L.	L	Used as vegetable	Murthy et al. (2003)
11	*Achyranthes aspera* L.	Ts, L	Tender shoots and leaves used as vegetable	Murthy et al. (2003); Reddy et al. (2007); Prabakaran et al. (2013); Misra and Misra (2013); Deepa et al. (2014)
12	*Achyranthes bidentata* Blume	L	Used as vegetable	Deepa et al. (2014)
13	*Acorus calamus* L.	Rh	Used as vegetable	Samydurai et al. (2012)
14	*Acronychia pedunculata* (L.) Miq.	L	Used as vegetable	Murthy et al. (2003)
15	*Adenanthera pavonina* L.	S	Eaten raw	Panda (2014)
16	*Aegle marmelos* (L.) Correa ex Serr.	Fr.	Pulp taken orally. Ripe fruits eaten raw, or prepare juice	Murthy et al. (2003); Reddy et al. (2007); Basha et al. (2009); Singh (2013); Deepa et al. (2014)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
17	*Aerva lanata* (L.) Juss.	Ts, L	Tender shoots and leaves used as vegetable	Murthy et al. (2003); Reddy et al. (2007); Misra and Misra (2013)
18	*Aeschynomeme aspera* L.	Ts, L	Tender shoots and leaves used as vegetable	Reddy et al. (2007)
19	*Agave americana* L.	In., St	Tender shoots and inflorescence edible	Murthy et al. (2003)
20	*Aglaia elaeagnoi-dea* (Juss.) Benth.	Fr.	Fruits eaten raw	Murthy et al. (2003)
21	*Aglaia lawii* (Wight) Sald.	Fr.	Aril eaten raw	Hebber et al., 201
22	*Alangium salvifolium* (L.f.) Wangerin	Fr.	Ripe fruits eaten as raw	Murthy et al. (2003); Reddy et al. (2007); Basha et al. (2009); Prabakaran et al. (2013); Rekka and Senthil Kumar (2014); Deepa et al. (2014)
23	*Albizia lebbeck* (L.) Willd.	S	Seeds roasted and eaten	Murthy et al. (2003)
24	*Allium cepa* L.	B, L	Used as spices. Leaves used as vegetable	Misra and Misra (2013); Singh (2013)
25	*Allium sativum* L.	B	Used as spice	Pandravada et al. (2007); Singh (2014)
26	*Allmania longepe-dunculata* (Trimen) Gamble	L	Used as vegetable	Deepa et al. (2014)
27	*Allmania nodiflora* (L.) R. Br. ex Wight	L	Used as vegetable	Reddy et al. (2007); Prabakaran et al. (2013); Deepa et al. (2014);
28	*Allmania nodiflora* (L.) R.Br. ex Wight var. *angustifolia* Hook. f.	L	Used as vegetable	Sadasivaiah (2009)
29	*Allmania nodiflora* (L.) R.Br. ex Wight var. *aspera* (Heyne ex Roth) Hook. f.	L	Used tas vegetable	Sadasivaiah (2009)
30	*Allmania nodiflora* (L.) R.Br. ex Wight var. *dichotoma* Hook. f.	L	Used as vegetable	Sadasivaiah (2009)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
31	*Allmania nodiflora* (L.) R.Br. ex Wight var. *procumbens* Hook. f.	L	Used as vegetable	Sadasivaiah (2009)
32	*Allmania nodiflora* (L.) R.Br. ex Wight var. *roxburghii* Wight	L	Used as vegetable	Sadasivaiah (2009)
33	*Allophyllus cobbe* (L.) Raeuschet	Fr	eaten as raw	Murthy et al. (2003)
34	*Alocasia fornicata* (Roxb.) Schott	Rh	Boiled with fruit or leaves of jajo (tamarind) and cooked along with other vegetables	Misra et al. (2013)
35	*Alocasia macrorrhiza* (L.) G.Don	Rh	Sliced, successively boiled and cooked with pulses	Misra et al. (2013)
36	*Aloe vera* (L.) Burm.f.	Fl.	Cooked as vegetable	Murthy et al. (2003)
37	*Alpinia galanga* (L.) Willd.	Rh	Rhizomes used as vegetable	Samydurai et al. (2012)
38	*Alternanthera amoena* (Lemaire) Voss	L	Leaves used as vegetable	Sinha and Lakra (2005)
39	*Alternanthera paronychioides* St. Hil.	L	Used as leafy vegetable	Reddy et al. (2007)
40	*Alternanthera philoxeroides* Mart.	L	Leaf and leafy shoots are cooked as vegetable	Panda (2014)
41	*Alternanthera pungens* Kunth	L	Used as leafy vegetable	Deepa et al. (2014)
42a	*Alternanthera sessilis* (L.) R. Br. ex DC.	L	Leaves boiled and squeezed, then add groundnut powder and eaten along with boiled rice	Murthy et al. (2003); Reddy et al. (2007); Prabakaran et al. (2013); Misra and Misra (2013); Rekka and Senthil Kumar (2014); Deepa et al. (2014)
43	*Alternanthera tenella* Colla	L	Leaves boiled and squeezed, then add groundnut powder and eaten along with boiled rice	Rao (2014)
44	*Alysicarpus rugosus* DC.	L	Leaves used as vegetable	Murthy et al. (2003)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
45	*Amaranthus caudatus* L.	L	Used as vegetable	Sanyasi Rao (2014)
46	*Amaranthus cruentus* L.	L	Used as vegatable	Rao (2014)
47	*Amaranthus dubius* Mart. ex Thell.	L	Used as vegetable	Singh (2013)
48	*Amaranthus graecizans* L.	L	Used as vegetable	Rao (2014); Nagalakshmi (2014)
49	*Amaranthus hybridus* L.	L	Used as vegetable	Rao (2014); Murthy et al. (2003)
50	*Amaranthus polygamus* L.	L	Used as vegetable	Dhore et al. (2012)
51	*Amaranthus roxburghianus* Nevski	L	Used as vegetable	Rao (2014)
52	*Amaranthus spinosus* L.	L	Used as vegetable	Murthy et al. (2003); Reddy et al. (2007); Misra and Misra (2013); Singh (2013); Rekka and Senthil Kumar (2014); Deepa et al. (2014)
53	*Amaranthus tenuifolius* Willd.	L	Used as vegetable	Singh (2013)
54	*Amaranthus tricolor* L.	L	Used as vegetable	Reddy et al. (2007); Misra and Misra (2013); Deepa et al. (2014); Murthy et al. (2003);
55	*Amaranthus viridis* L.	L	Used to prepare Dall and curry	Murthy et al. (2003); Reddy et al. (2007); Misra and Misra (2013); Singh (2013); Deepa et al. (2014)
56	*Ammannia baccifera* L.	L	Used as vegetable	Reddy (2012)
57	*Amomum dealbatum* Roxb.	Rh	Peeled, burnt or boiled and eaten as chutney by children to stimulate appetite	Misra et al. (2013)
58	*Amorphophallus bulbilfer* (Roxb) Bl.	St, L, Rh, Fl.	All the parts are used as vegetable	Misra et al. (2013)
59	*Amorphophallus campanulatus* (Roxb.) Blume ex Decne	C	Corm used as vegetable	Singh (2014)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
60	*Amorphophallus paeoniifolius* (Dennst.) Nicolson	T, L	Petiole/ bulb as vegetable; chutney; underground fleshy tuber and corms are first boiled with rice husk and kept overnight then sliced and cooked along with boiled potato or other vegetables are made into chutney	Murthy et al. (2003); Reddy et al. (2007); Samydurai et al. (2012); Singh (2013); Misra et al. (2013); Misra and Misra (2014); Mukesh Kumar et al. (2014)
61	*Amorphophallus sylvaticus* (Roxb.) Kunth	C, L	Petiole/bulb as vegetable; Chutny; Underground fleshy tuber and corms are first boiled with rice husk and kept overnight then sliced and cooked along with boiled potato or other vegetables are made into chutney	
62	*Ampelocissus latifolia* (Roxb.) Planchon	Fr., L	Ripe fruits edible; tender leaves used as vegetable	Murthy et al. (2003); Rout (2007)
63	*Ampelocissus tomentosa* (Heyne ex Roth) Planchon	Fr.	Ripe fruits edible	Murthy et al. (2003)
64	*Anacardium occidentale* L.	Fr.	Ripe fruits eaten raw	Murthy et al. (2003); Prabakaran et al. (2013); Rekka and Senthil Kumar (2014); Deepa et al. (2014)
65	*Ananas comosus* (L.) Merr.	Fr.	Ripe fruits eaten raw	Naidu and Khasim (2010); Rekka and Senthil Kumar (2014); Deepa et al. (2014)
66	*Anethum graveolens* L.	L	Leaves and young shoots are roasted then eaten.	Misra and Misra (2013)
67	*Anisochilus carnosus* (L.f.) Benth.	L	Used as leafy vegetable	Murthy et al. (2003); Reddy et al. (2007); Misra and Misra (2013)
68	*Annona cherimola* Miller	Fr.	Ripe fruits eaten raw	Rao (2014)
69	*Annona muricata* L.	Fr.	Ripe fruits eaten raw	Rao (2014)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
70	*Annona reticulata* L.	Fr.	Ripe fruits eaten raw	Rao (2014)
71	*Annona squamosa* L.	Fr.	Ripe fruits eaten raw	Murthy et al. (2003); Basha et al. (2009); Deepa et al. (2014); Singh (2013)
72	*Anogeissus latifolia* (Roxb.ex DC.) Wall. ex Guill. & Perr.	G	Dried gum eaten raw, used in sweet preparation	Murthy et al. (2003)
73	*Anthocephalus chinensis* (Lam.) A.Rich. ex Walp.	Fr	Eaten raw	Murthy et al. (2003)
74	*Antidesma acidum* Retz.	Fr., L	Ripe fruits edible; leaves used as vegetable	Reddy et al. (2007); Basha et al. (2009); Murthy et al. (2003)
75	*Antidesma bunius* (L.) Spreng.	Fr.	Eaten raw	Murthy et al. (2003)
76	*Antidesma diandrum* Heyne ex Roth	L	Leaves edible	Sinha and Lakra (2005)
77	*Antidesma ghaesambilla* Gaertner	Fr.	Eaten raw	Basha et al. (2009); Sinha and Lakra (2005); Murthy et al. (2003)
78	*Aponogeton natans* (L.) Engl.	R, T	Starchy bulbils and tuberous roots are eaten as raw	Murthy et al. (2003); Reddy et al. (2007); Misra and Misra (2014)
79	*Aponogeton undulatus* Roxb.	R, T	Used as vegetable; starchy bulbils in winter are consumed after cooking.	Misra and Misra (2014)
80	*Arachis hypogaea* L.	S	Edible oil extracted from seeds, seeds eaten raw and roasted, seeds used in various sweets, chutnies, etc.	Singh (2013, 2014)
81	*Ardisia solanacea* Roxb.	L, Fr.	Young leaves and fruits are fried eaten	Murthy et al. (2003); Reddy et al. (2007); Misra and Misra (2013)
82	*Argemone mexicana* L.	L	Very young leaves cooked along with red gram	Nagalakshmi (2014)
83	*Argyria nervosa* (Burm.f.) Boj.	L	Young leaves are fried and eaten	Misra and Misra (2013); Murthy et al. (2003)
84	*Arisaema tortuosum* (Wall.) Schott	C	Corm sliced, double boiled with tamarind and cooked as vegetable	Murthy et al. (2003); Misra et al. (2013)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
85	*Arisaema leschenaultii* Blume	T	Boiled and eaten	Samydurai et al. (2012)
86	*Arthrocnemum indicum* (Willd.) Moq.	Wp	Whole plant used to prepare pickle.	Murthy et al. (2003)
87	*Artocarpus heterophyllus* Lam.	Fr.	Ripe fruits edible and seeds used as vegetable	Murthy et al. (2003); Reddy et al. (2007); Prabakaran et al. (2013); Rekka and Senthil Kumar (2014); Deepa et al. (2014)
88	*Artocarpus hirsutus* Lam.	Fr.	Raw fruits cooked and eaten	Rekka and Senthil Kumar (2014)
89	*Artocarpus lacucha* Buch.-Ham.	Fr.	Fruits edible.	Murthy et al. (2003)
90	*Asparagus racemosus* Willd.	R, T	Root tubers roasted, cooked and eaten. Sliced tuber pieces are dried for a week and the tuber powder along with sugar made into pudding (Khiri) during festivals and ceremonies. Tubers also eaten as raw	Murthy et al. (2003); Samydurai et al. (2012); Misra et al. (2013); Misra and Misra (2014)
91	*Aspidopteris indica* (Roxb.) Hochr.	T	Tubers are edible.	Murthy et al. (2003)
92	*Asteracantha longifolia* L.	L	Leaves cooked as vegetable	Panda (2014); Sinha and Lakra (2005)
93	*Atalantia monophylla* (L.) Correa	Fr.	Green fruits used to make pickles	Basha et al. (2009); Prabakaran et al. (2013); Rekka and Senthil Kumar (2014); Deepa et al. (2014)
94	*Atylosia scarabaeoides* Benth.	L, Fr., S	Leaves and green pods used as vegetables. Seeds eaten as raw	Reddy et al. (2007); Misra and Misra (2013); Rajasab and Isaq (2004);
95	*Averrhoa carambola* L.	Fr.	Ripe fruits edible	Mukesh Kumar et al. (2014)
96	*Azadirachta indica* A. Juss.	Fr.	Ripe fruits edible	Murthy et al. (2003); Basha et al. (2009)
97	*Azima tetracantha* Lam.	Fr.	Fruits edible	Murthy et al. (2003); Reddy et al. (2007)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
98	*Bacopa monnieri* (L.) Wettest.	St, L	Leaves and young shoots cooked and eaten	Rajasab and Isaq (2004); Misra and Misra (2013)
99	*Balanites aegyptiaca* (L.) Delile	Fr.	Dried fruit pulp is edible.	Rajasab and Isaq (2004); Murthy et al. (2003)
100	*Baliospermum-montanum* (Willd.) Muel.-Arg.	L	Leaves used as vegetable	Murthy et al. (2003)
101	*Bambusa arundinacea* (Retz.) Roxb.	St., L	Young shoots cut into small pieces cooked with salt and chilly and eaten; used as vegetable	Reddy et al. (2007); Misra and Misra (2013); Sanyasi Rao et al. (2014); Murthy et al. (2003);
102	*Bambusa bambos* (L.) Voss	S, St	Seeds made into flour and are used in cakes.Young shoots used as vegetables	Panda (2014); Misra and Misra (2014)
103	*Benkara malabarica* (Lam.) Tirveng.	Fr.	Ripe fruits edible	Reddy et al. (2007)
104	*Barringtonia acutangula* (L.) Gaertn.	L	Tender leaves edible	Murthy et al. (2003); Reddy et al. (2007)
105	*Basella alba L.*	St, L	Young shoots and leaves used as vegetable	Murthy et al. (2003); Rajasab and Isaq (2004); Misra and Misra (2013); Deepa et al. (2014)
106	*Bauhinia divaricata* L.	Fl.	Flowers are used as vegetable.	Panda (2014)
107	*Bauhinia malabarica* Roxb.	St, L	Young shoots and leaves are eaten raw	Murthy et al. (2003)
108	*Bauhinia purpurea* L.	L, Fl., S	Leaves, flowers, seeds used as vegetable	Murthy et al. (2003); Reddy et al. (2007); Rekka and Senthil Kumar (2014); Dhore et al. (2012)
109	*Bauhinia racemosa* Lam.	L	Leaves, flowers, seeds as Vegetable and prepared chutneys	Naidu and Khasim (2010); Nagalakshmi (2014); Dhore et al. (2012); Murthy et al. (2003)
110	*Bauhinia semla* Wunderlin	L	Young leaves are cooked as curry and taken	Misra and Misra (2013)
111	*Bauhinia vahlii* Wight & Arn.	L, S	Leaves used as vegetable. Seeds used to prepare chutney and roasted and eaten	Murthy et al. (2003); Misra and Misra (2013); Sinha and Lakra (2005)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
112	*Bauhinia variegata* L.	L, Fl, S	Leaves and young flowers used as vegetables. Seeds used to prepare chutney	Murthy et al. (2003); Misra and Misra (2013);
113	*Begonia picta* Sm.	L	Leaves used as vegetable.	Murthy et al. (2003); Misra and Misra (2013)
114	*Benincasa hispida* (Thunb.) Cogn.	Fr.	Used as vegetable; prepare sweets	Murthy et al. (2003)
115	*Bidens bipinnata* L.	St	Fleshy shoots used as vegetable	Murthy et al. (2003)
116	*Boerhavia chinensis* (L.) Rottb.	R, L	Tender leaves and leafy shoots as vegetable	Misra and Misra (2013)
117	*Boerhavia diffusa* L.	R, L	Roots and leaves used as vegetable	Murthy et al. (2003); Reddy et al. (2007); Samydurai et al. (2012); Misra and Misra (2013); Deepa et al. (2014)
118	*Boerhavia erecta* L.	L	Cut into small pieces and cooked with salt, chilly and with oil Prepared Fry	Deepa et al. (2014)
119	*Bombax ceiba* L.	L, Fl.	Tender leaves used as vegetable	Reddy et al. (2007)
120	*Borassus flabellifer* L.	Fr., R	Ripe fruits are eaten as raw. Baked young roots are edible	Murthy et al. (2003); Reddy et al. (2007); Basha et al. (2009); Prabakaran et al. (2013); Singh (2013); Deepa et al. (2014)
121	*Boswellia serrata* Roxb. ex Coleber.	Fr., Fl	Fruits used to prepare pickle. Flowers eaten as raw	Murthy et al. (2003); Dhore et al. (2012)
122	*Brachiaria ramosa* (L.) Stapf	S	Used as food grains	Singh (2013)
123	*Brachystelma glabrum* Hook. f.	T	Eaten as raw	Sadasivaiah and Ravi Prasad Rao et al. (2012)
124	*Brachystelma volubile* Hook.f.	T	Eaten as raw	Sadasivaiah and Ravi Prasad Rao (2012)
125	*Brachystelma pullaiahii* Ravi Prasad et al.	T	Eaten as raw	Rao et al. (2011)
126	*Brassica compestris* L.	S	Used as spice	Singh (2013)
127	*Brassica juncea* Czern. & Coss.	S	Used as spice	Rao (2014)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
128	*Brassica napus* L. var. *glauca* (Roxb.) Schulz	L	Leaves and stems dried in shade, stored in an earthen container	Misra and Misra (2013)
129	*Brassica nigra* (L.) Czerniak.	S	Used as spices	Sadasivaiah (2009)
130	*Brassica oleracea* L. var. *botrytis* L.	In.	Used as vegetable	Misra and Misra (2013)
131	*Brassica oleracea* L. var. *capitata* L.	L	Used as vegetable – prepare curries	Rao (2014)
132	*Brassica rapa* L.	R, T	Root boiled, cooked, roasted and then consumed as vegetable. Cultivated.	Misra and Misra (2014)
133	*Breynia vitis-idaea* (Burm.f.) Fischer	L	Young leaves used as vegetable	Reddy et al. (2007); Misra andMisra (2013); Murthy et al. (2003)
134	*Bridelia cinerescens* Gaertn.	Fr.	Fruits are edible	Murthy et al. (2003); Naidu and Khasim (2010)
135	*Bridelia monoica* (Lour.) Merr.	Fr.	Fruits are edible	Murthy et al. (2003)
136	*Bridelia montana* (Roxb.) Willd.	Fr.	Fruits are edible	Murthy et al. (2003); Reddy et al. (2007)
137	*Bridelia retusa* (L.) Spreng.	Fr.	Ripe fruits eaten raw	Murthy et al. (2003); Sinha and Lakra (2005)
138	*Bridelia stipularis* (L.) Bl.	Fr.	Fruits edible	Rout (2007)
139	*Bridelia tomentosa* Blume	Fr.	Ripe fruits eaten raw	Nayak and Basak (2015)
140	*Bruguiera gymnorrhiza* (L.) Savi	R	Vegetable	Murthy et al. (2003)
141	*Buchanania axillaris* (Desr.) Ramamoorthy	Fr.	Ripe fruits eaten raw	Murthy et al. (2003); Reddy et al. (2007); Basha et al. (2009); Prabakaran et al. (2013); Rekka and Senthil Kumar (2014)
142	*Buchanania lanzan* Sprengel	Fr., S	Ripe fruits and seeds eaten raw	Murthy et al. (2003); Sinha and Lakra (2005); Reddy et al. (2007); Rout (2007); Basha et al. (2009)
143	*Bupleurum ramosissimum* Wight & Arn.	Wp	Plant used as vegetable, fresh plant as flavoring agent	Girach (2001)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
144	*Butea monosperma* (Lam.) Taub.	R, L	Flour prepared from young roots to make bread.	Reddy et al. (2007)
145	*Butea superba* Roxb.	Sap	Watery sap oozing out from the stem on cutting is used for drinking purpose by the tribal people.	Misra and Misra (2013)
146	*Cadaba fruticosa* (L.) Druce	L	Leaves and young parts cooked as curry	Nagalakshmi (2014)
147	*Caesalpinia pulcherima* (L.) Sw.	Fl., S	Flowers and young seeds are edible occasionally.	Rajasab and Isaq (2004)
148	*Caesulia axillaris* Roxb.	L	Young leaves are mixed with rice and cooked then eaten	Misra and Misra (2013); Murthy et al. (2003)
149	*Cajanus albicans* (Wight & Arn.) van der Maesan	S	Seeds used as pulse	Murthy (2011)
150	*Cajanus cajan* (L.) Millsp.	S	Seeds as pulse	Naidu and Khasim (2010); Singh (2013)
151	*Cajanus cajanifolius* (Haines) Maesen	S	Seeds used as pulse	Girach (2001); Reddy et al. (2006)
152	*Calamus guruba* Buch. Ham.	Fr.	Ripe fruits are edible	Nayak and Basak (2015)
153	*Calamus rotang* L.	Fr.	Ripe fruits eaten as raw	Panda (2014)
154	*Callicarpa arborea* Roxb.	St	Young shoots used as vegetable	Murthy et al. (2003)
155	*Callicarpa macrophylla* Vahl	Fr.	Fruits used as raw	Murthy et al. (2003)
156	*Canavalia gladiata* (Jacq.) DC.	Fr.	Green fruits used as vegetable	Rao (2014)
157	*Canavalia ensiformis* (L.) DC.	Fr.	Green fruits used in curries	Rekka and Senthil Kumar (2014); Deepa et al. (2014)
158	*Canna indica* L.	Rh, St.	Rhizome made into pieces and used to prepare curries	Mohan and Kalidass (2010)
159	*Cansjera rheedi* J.F.Gmel.	L, Fr.	Leaves used as vegetable, fruits are edible	Murthy et al. (2003); Hebber et al. (2010); Prabakaran et al. (2013)
160	*Canthium dicoccum* (Gaertn.) Teijsm. & Benn.	Fr.	Ripe fruits are edible	Prabakaran et al. (2013); Hebber et al. (2010)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
161	*Canthium parviflorum* Lam.	Fr., L	Ripe fruits are edible; Young leaves are cooked with fermented rice water and eaten	Murthy et al. (2003); Reddy et al. (2007); Basha et al. (2009); Misra and Misra (2013); Deepa et al. (2014)
162	*Capparis brevispina* DC.	Fr.	Fruits used to prepare pickle.	Murthy et al. (2003)
163	*Capparis decidua* (Frossk.) Edgew.	Fr.	Fruits are edible as raw and made into pickle.	Murthy et al. (2003)
164	*Capparis divaricata* Lam.	Fr.	Tender fruits used as vegetable	Murthy et al. (2003); Deepa et al. (2014);
165	*Capparis grandis* L.f.	Fr.	Tender fruits used as vegetable	Murthy et al. (2003);
166	*Capparis roxburghii* DC.	Fr.	Used as vegetable	Murthy et al. (2003);
167	*Capparis zeylanica* L.	Fr.	Unripe fruits used as vegetables, ripe fruits eaten	Murthy et al. (2003); Reddy et al. (2007); Dhore et al. (2012); Rout (2007); Deepa et al. (2014); Panda (2014)
168	*Capsicum annuum* L.	Fr.	Used as spices	Singh (2013)
169	*Caralluma adscendens* R. Br. var. *attenuata* (Wight) Grav. & Mayuranathan	St	Used as raw and also prepared chutny	Murthy et al. (2003); Reddy et al. (2007); Sadasivaiah and Ravi Prasad Rao (2012); Misra and Misra (2013); Deepa et al. (2014);
170	*Caralluma indica* (Wight & Arn.) Plowes	St	Shoots are edible	Sadasivaiah and Rao (2012)
171	*Caralluma pauciflora* (Wight) N.B. Br.	St	Used as raw and also prepared chutney	
172	*Caralluma stalagmifera* Fischer	St	Used as raw and also prepared chutny	Sadasivaiah (2009)
173	*Caralluma umbellata* Haw.	St	Used as raw and also prepared chutney	Murthy et al. (2003); Sadasivaiah and Rao (2012)
174	*Cardamine hirsuta* L.	L	Leaves used as vegetable	Murthy et al. (2003)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
175	*Cardiospermum halicacabum* L.	L	Used as vegetable	Reddy et al. (2007); Deepa et al. (2014)
176	*Careya arborea* Roxb.	Fr., L, Fl	Ripe fruits are eaten; Tender leaves are roasted then eaten. Flowers used as vegetable.	Murthy et al. (2003); Reddy et al. (2007); Basha et al. (2009); Dhore et al. (2012); Misra and Misra (2013)
177	*Carica papaya* L.	Fr.	Ripe fruits eaten raw	Naidu and Khasim (2010)
178	*Carissa carandas* L.	Fr.	Chutnies prepared from green fruits and ripe fruits eaten as raw.	Murthy et al. (2003); Basha et al. (2009); Prabakaran et al. (2013); Singh (2013); Deepa et al. (2014)
179	*Carissa inermis* Vahl	Fr.	Chutnies prepared from Green fruits and Ripe fruits eaten as raw	Rao (2014)
180	*Carissa paucinervia* A. DC.	Fr.	Ripe fruits eaten raw	Basha et al. (2009)
181	*Carissa spinarum* L.	Fr.	Chutnies prepared from Green fruits and Ripe fruits eaten as raw	Murthy et al. (2003); Basha et al. (2009); Deepa et al. (2014); Nayak and Basak (2015)
182	*Carmona retusa* (Vahl) Masam	Fr.	Fruits are edible	Nayak and Basak (2015); Murthy et al. (2003)
183	*Carthamus tinctorius* L.	S	Used to oil seeds	Singh (2013)
184	*Caryota urens* L.	Fr.	Stem pith is used as vegetable. Ripe fruits edible; toddy from cut inflorescence stalk drunk	Girach (2001); Murthy et al. (2003); Naidu and Khasim (2010); Sanyasi Rao et al. (2014)
185	*Casearia esculenta* Roxb.	Fr.	Ripe fruits eaten as raw	Murthy et al. (2003); Reddy et al. (2007)
186	*Casearia graveolens* Dalz.	Fr.	Ripe fruits eaten as raw	Murthy et al. (2003); Sinha and Lakra (2005); Panda (2014)
187	*Casearia tomentosa* Roxb.	Fr.	Fruits used to prepare pickle	Murthy et al. (2003)
188	*Cassia auriculata* L.	Fl.	Flowers are edible, young flower buds powdered and used as tea powder.	Rajasab and Isaq (2004); Reddy et al. (2007); Deepa et al. (2014)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
189	*Cassia fistula* L.	Fl., L	Leaves, flowers used as vegetable.	Murthy et al. (2003); Reddy et al. (2007); Dhore et al. (2012)
190	*Cassia italica* (Mill.) Andr.	L	Cooked as vegetable	Reddy et al. (2007);
191	*Cassia obtusifolia* L.	L	Cooked as vegetable	Murthy et al. (2003)
192	*Cassia serecea* L.	L	Used as vegetable	Rajasab and Isaq (2004)
193	*Cassia tora* L.	L	Cooked as vegetable	Murthy et al. (2003); Prabakaran et al. (2013); Misra and Misra (2013); Deepa et al. (2014)
194	*Cassine glauca* (Rottb.) Kuntze	Gum	Gum roasted and eaten	Murthy et al. (2003)
195	*Catunaregam spinosa* (Thunb.) Tirvengadum	Fr.	Ripe fruits are eaten after roasting	Murthy et al. (2003)
196	*Cayratia auriculata* (Roxb.) Gamble	St, L	Tender leaves and shoots used as vegetable	Murthy et al. (2003)
197	*Cayratia trifolia* (L.) Domin.	L	Leaves used as vegetable.	Murthy et al. (2003); Reddy et al. (2007);
198	*Celastrus paniculatus* Willd.	Fr.	Unripe fruits boiled and cooked as vegetable, fruits edible.	Murthy et al. (2003); Sinha and Lakra (2005)
199	*Celosia argentea* L.	L	Used to prepare dal and curry	Murthy et al. (2003); Reddy et al. (2007); Sadasivaiah (2009); Misra andMisra (2013); Deepa et al. (2014)
200	*Celosia argentea* L. var. *cristata* Kuntze	L	Leaves cooked as curry	Murthy et al. (2003)
201	*Centella asiatica* (L.) Urban	L	Used to prepare chutnies and make it into powder and eat with boiled rice	Murthy et al. (2003); Reddy et al. (2007); Sadasivaiah (2009); Misra and Misra (2013); Deepa et al. (2014)
202	*Ceriscoides turgida* (Roxb.) Triveng.	Fr.	Ripe fruits are eaten	Murthy et al. (2003); Reddy et al. (2007)
203	*Ceropegia bulbosa* Roxb.	T, L	Tubers and leaves are edible as raw	Murthy et al. (2003); Reddy et al. (2007); Sadasivaiah andRao (2012)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
204	*Ceropegia candelabrum* L.	T	Consumed raw in empty stomach to check hyperacidity. Tubers cooked as vegetable	Samydurai et al. (2012); Sadasivaiah and Rao (2012); Misra et al. (2013)
205	*Ceropegia hirsuta* Wight & Arn.	T	Edible as raw	Murthy et al. (2003); Reddy et al. (2007); Sadasivaiah and Rao (2012)
206	*Ceropegia juncea* Roxb.	WP	Edible as raw	Sadasivaiah and Rao (2012)
207	*Ceropegia spiralis* Wight	T	Eaten as raw	Murthy et al. (2003); Sadasivaiah and Rao (2012)
208	*Cheilocostus speciosus* (J.Koenig) C.D.Specht	Rh	Rhizomes used as vegetable. Rhizome is boiled, cooked with pulses and tamarind/tomato, then consumed as curry.	Murthy et al. (2003); Reddy et al. (2007); Samydurai et al. (2012); Misra et al. (2013); Misra and Misra (2014)
209	*Chenopodium album* L.	L	Leaves used as vegetable	Murthy et al. (2003); Sinha and Lakra (2005); Rao (2014)
210	*Chlorophytum arundinaceum* Baker	T	Tubers are edible.	Reddy et al. (2007)
211	*Chlorophytum tuberosum* (Roxb.) Baker	T	Tubers cooked as vegetables	Murthy et al. (2003); Reddy et al. (2007); Samydurai et al. (2012); Misra et al. (2013)
212	*Chrysophyllum roxburghii* G. Don	Fr., Fl	Flowers and fruits roasted and eaten	Murthy et al. (2003)
213	*Cicer arietinum* L.	S, L	Seeds used as pulse food. Leaves used as vegetale.	Dhore et al. (2012); Singh (2013)
214	*Cinnamomum tamala* (Buch.-Ham.) Nees & Eberm.	L	Used as spices	Rao (2014)
215	*Cinnamomum verum* J. Presl	Br.	Used as spices	Rao (2014)
216	*Cissus quadrangularis* L.	L, St	Prepared curries, used to prepare chutnies, cut into small pieces and cooked with salt, chilly and with oil	Murthy et al. (2003); Reddy et al. (2007); Naidu and Khasim (2010); Deepa et al. (2014); Rekka and Senthil Kumar (2014)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
217	*Cissus repanda* L.	L, Fr.	Leaves and fruits used as vegetable	Murthy et al. (2003)
218	*Cissus vitiginea* L.	T	Used as vegetable	Murthy et al. (2003)
219	*Citrullus colocynthis* (L.) Schrader	Fr.	Eaten as raw and vegetable	Deepa et al. (2014)
220	*Citrullus lanatus* (Thunb.) Matsum. & Nakai	Fr., S	Ripe fruits. Seeds roasted and eaten	Singh (2013)
221	*Citrus aurantiifolia* (Christm.) Swingle	Fr.	Ripe fruits are edible	Singh (2013, 2014)
222	*Citrus aurantium* L.	Fr.	Ripe fruits are edible	Rao (2014); Singh (2014)
223	*Citrus limon* (L.) Burm.f.	Fr.	Fruit juice is used to prepare salads, sharbaths and various rice items	Rao (2014); Singh (2014)
224	*Citrus medica* L.	Fr.	Pickles prepared with green fruits	Rao (2014); Singh (2014)
225	*Citrus reticulata* Blanco	Fr.	Ripe fruits edible	Rao (2014); Singh (2014)
226	*Citrus sinensis* (L.) Osbeck	Fr.	Ripe fruits edible	Rao (2014); Singh (2014)
227	*Citrus maxima* (Burm.) Merr.	Fr.	Ripe fruits edible	Singh (2013, 2014); Rekka and Senthil Kumar (2014)
228	*Clausena dentata* (Willd.) Roem.	Fr.	Ripe fruits edible	Rekka and Senthil Kumar (2014); Deepa et al. (2014)
229	*Clausena excavata*Burm.	Fr.	Fruits edible	Rout (2007)
230	*Clausena heptophylla* Wight & Arn.	L	Leaves chewed with betel	Murthy et al., 200
231	*Cleistanthus collinus* (Roxb.) Benth.	S	Seed pulp eaten as raw	Murthy et al. (2003)
232	*Cleome gynandra* L.	L, St	Leaves and young shoots roasted, then eaten	Murthy et al. (2003); Sinha and Lakra (2005); Reddy et al. (2007); Misra and Misra (2013);
233	*Cleome isonandra* L.	L	Vegetable	Sinha and Lakra (2005)
234	*Cleome monophylla* L.	L	Cooked with salt, chillies and oil	Misra and Misra (2013); Murthy et al. (2003)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
235	*Cleome viscosa* L.	L	Used as vegetable	Misra and Misra (2013, 2014)
236	*Cleome chelidonii* L.f. var. *pallai* V.S. Raju & C.S. Reddy	S	Seeds used as condiment	Reddy et al. (2006)
237	*Clerodendrum serratum* (L.) Moon	L	Leaves used as vegetable.	Murthy et al. (2003); Reddy et al. (2007); Misra et al. (2013);
238	*Coccinia grandis* (L.) Voigt	Fr., L	Unripe fruits as vegetable and pickle, ripe fruits eaten raw. Leaves and leafy shoots, green fruits cooked with salt, chillies and with oil	Murthy et al. (2003); Rout (2007); Misra and Misra (2013, 2014); Deepa et al. (2014)
239	*Cocculus hirsutus* (L.) Diels	L	Tender leaves are allowed to coagulate and after adding sugar, then eaten.	Reddy et al. (2007); Prabakaran et al. (2013); Misra and Misra (2013); Deepa et al. (2014);
240	*Cochlospermum religiosum* (L.) Alston	L, Fl	Used as vegetable	Sinha and Lakra (2005);
241	*Cocos nucifera* L.	Fr.	The liquid endosperm is used to drink, solid endosperm is used to prepare chutnies and also used in masala curries. Sweets are prepared with sugars and candy.	Rao (2014)
242	*Coffea arabica* L.	S	Seeds are made in powder, this powder used to make a Coffee.	Rekka and Senthil Kumar (2014)
243	*Coix lacryma-jobi* L.	S	Used as food grains	
244	*Coleus aromaticus* Benth.	T	Tubers cooked as vegetables to cure heavy cold and asthma	
245	*Coleus forskohlii* (Poir.) Briq.	T	Tubers cooked as vegetables to cure fever, cold and cough	Samydurai et al. (2012)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
246	*Colocasia esculenta* (L.) Schott	C, L	Tubers cooked as vegetables to stimulant and indigestion. Used as vegetable and cooked as curries, chutney. Corm pieces smeared with rice flour are fried as cake	Murthy et al. (2003); Reddy et al. (2007); Naidu and Khasim (2010); Samydurai et al. (2012); Misra et al. (2013); Prabakaran et al. (2013); Misra and Misra (2013, 2014); Rekka and Senthil Kumar (2014)
247	*Colocasia gigantea* Hook.f.	L	Used as vegetable	Murthy et al. (2003)
248	*Combretum roxburghii* Spreng.	Sap	Sap used as drink	Misra and Misra (2013)
249	*Commelina benghalensis* L.	L, St	Used as vegetable	Naidu and Khasim (2010); Samydurai et al. (2012); Prabakaran et al. (2013); Misra and Misra (2013); Deepa et al. (2014); Murthy et al. (2003)
250	*Commelina communis* L.	L	Used as vegetable	Murthy et al. (2003)
251	*Commelina ensifolia* R. Br.	L	Used as vegetable	Murthy et al. (2003)
252	*Commelina obliqua* Buch.-Ham.	L	Used as vegetable	Murthy et al. (2003)
253	*Commiphora caudata* (Wight & Arn.) Engler	Fr.	Unripe and ripe fruits eaten raw	Murthy et al. (2003); Singh (2013)
254	*Corchorus aestuans* L.	L, St	Tender leaves and young shoots fried and eaten	Misra and Misra (2013, 2014); Singh (2013)
255	*Corchorus capsularis* L.	L, St	Tender leaves and young shoots fried and eaten	Misra and Misra (2013); Deepa et al. (2014)
256	*Corchorus fascicularis* Lam.	L, St	Tender leaves and young shoots fried and eaten	Misra and Misra (2013); Murthy et al. (2003)
257	*Cordia dichotoma* Forst. f.	Fr.	Ripe fruits edible	Murthy et al. (2003); Rajasab and Isaq (2004); Reddy et al. (2007); Basha et al. (2009); Prabakaran et al. (2013)
258	*Cordia domestica* Roth.	Fr.	Ripe fruits edible	Basha et al. (2009)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
259	*Cordia evolutior* (C.B. Clarke) Gamble	Fr.	Ripe fruits edible	Basha et al. (2009)
260	*Cordia gharaf* (Forsskal) Ehrenb.	Fr.	Ripe fruits edible	Basha et al. (2009)
261	*Cordia macleodii* Hook. f. & Thoms.	Fr.	Ripe fruits edible directly	Murthy et al. (2003); Basha et al. (2009)
262	*Cordia monoica* Roxb.	Fr.	Ripe fruits edible	Murthy et al. (2003)
263	*Coriandrum sativum* L.	L, S	Used as spice	Singh (2013)
264	*Corallocarpus epigaeus* Benth. & Hook.f.	T	Used as vegetable	Samydurai et al. (2012)
265	*Cosmostigma racemosa* Wight	Fl	Flowers eaten as raw	Murthy et al. (2003)
266	*Crataeva adansonii* DC.	L	Used as vegetable	Murthy et al. (2003)
267	*Crateva magna* (Lour.) DC.	L	Used as vegetable	Murthy et al. (2003)
268	*Crotalaria pulchra* Andr.	L	Used as vegetable	Murthy et al. (2003)
269	*Cucumis melo* L.	Fr., S, L	Used as vegetable. Ripe fruits eaten as raw. Seeds roasted and eaten.Tender leaves are cooked and eaten.	Misra and Misra (2013) Singh (2013); Rajasab and Isaq (2004)
270	*Cucumis melo* L. var. *agrestis* Naud.	Fr.	Used as vegetable	Singh (2013)
271	*Cucumis sativus* L.	Fr., S	Used as vegetable. Ripe fruits eaten raw. Seeds roasted and eaten.	Singh (2013)
272	*Cucurbita maxima* Duchesne ex Lam.	Fr., S, L	Fruits are used as vegetable curry. Seeds roasted and eaten. Leaves and young stems roasted then eaten	Naidu and Khasim (2010); Misra and Misra (2013)
273	*Cucurbita pepo* L.	Fr., S	Used as vegetable. Ripe fruits eaten as raw. Seeds roasted and eaten	Singh (2013)
274	*Cuminum cyminum* L.	S	Used as spice	Rao (2014)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
275	*Curculigo orchioides* Gaertn.	T	Used as vegetable. Burnt in embers and consumed as snacks by teenage girls before or during monthly periods to regularize menstruation; Tubers are used for preparation of local drinks.	Samydurai et al. (2012); Misra et al. (2013); Deepa et al. (2014); Murthy et al. (2003)
276	*Curculigo trichocarpa* (Wight) Bennet et Raizada	T	Burnt and consumed with salt as nut by children and old men	Misra et al. (2013)
277	*Curcuma aeruginosa* Roxb.	Rh	Used as vegetable	Misra and Misra (2014)
278	*Curcuma amada* Roxb.	Rh	Sliced and put in stale rice to enhance flavor and taste and consumed in morning. Ground and added with a pinch of sugar and salt and made in to sherbet frequently during summer. It is also pickled and used as condiment in fresh/stale foods.	Misra et al. (2013); Singh (2013)
279	*Curcuma angustifolia* Roxb.	Rh	Rhizome is rubbed on stone, dissolved in sufficient water, filtered and allowed to evaporate. The starch powder obtained after sun-drying is cooked into pudding (khiri) along with sugar.	Reddy et al. (2007); Misra et al. (2013); Misra and Misra (2014)
280	*Curcuma aromatica* Salisb.	Rh	Rhizome is ground or rubbed on the stone and dissolved in water, filtered and allowed to evoperate. The starch powder obtained after drying is cooked along with sugar and made into Khiri (pudding) or cake. Powder is made into sherbet with sugar and taken during summer	Misra et al. (2013); Murthy et al. (2003)
281	*Curcuma caesia* Roxb.	Rh	Edible	Murthy et al. (2003)
282	*Curcuma harita* Mangaly & Sabu	Rh	Edible	Murthy et al. (2003)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
283	*Curcuma longa* L.	Rh	Used as spice	Naidu and Khasim (2010); Singh (2013)
284	*Curcuma montana* Roxb.	Rh	Burnt and consumed as snacks. Sliced and used as substitute of spice	Misra et al. (2013)
285	*Curcuma pseudo-montana* Salisb.	St, L	Tender shoots and leaves used as vegetable	Murthy et al. (2003)
286	*Curcuma zedoaria* Rosc.	Rh, St	Ground into a paste and added to curry to enhance taste and digestion. Cut into pieces and made pickles	Murthy et al. (2003); Misra et al. (2013)
287	*Cyamopsis tetragonoloba* L.	Fr.	Used as vegetable	Rao (2014)
288	*Cyanotis tuberosa* Roxb.	Rh	Used as vegetable. Tuberous roots cooked and eaten	Samydurai et al. (2012)
289	*Cycas beddomei* Dyer	P, L	Cut the plant and take out the pith and make it into pieces and used in their diet in case of debility. Tender leaves used as vegetable.	Murthy et al. (2003); Reddy et al. (2006)
290	*Cycas sphaerica* Roxb.	P	Pith pieces are used to make '*sago*' flour.	Reddy et al. (2006)
291	*Cynodon dactylon* (L.) Pers.	St, L	Used to prepare chutney	Reddy et al. (2007)
292	*Cyperus bulbosus* Vahl	T	Roasted tubers are eaten	Murthy et al. (2003)
293	*Cyperus esculentus* L.	T	Tubers used as vegetable	Murthy et al. (2003)
294	*Cyperus rotundus* L.	T	Tubers eaten after boiling. Burnt or roasted and consumed as snacks like nuts. Also consumed raw	Samydurai et al. (2012); Misra et al. (2013)
295	*Cyphomandra betacea* (Cav.) Sendtn.	Fr.	Used in curries	Rekka and Senthil Kumar (2014)
296	*Cyphostemma auriculatum* (Roxb.) P. Singh & B.V. Shetty	L, St	Cooked and eaten	Misra and Misra (2013)
297	*Cyphostemma setosum* (Roxb.) Alston	T, L	Tubers and leaves used as vegetable	Murthy et al. (2003)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
298	*Dactyloctenium aegyptium* (L.) Beau.	S	Seeds used as grains	Singh (2013)
299	*Datura metel* L.	Wp	Taken as food to treat cough	Ramakrishna et al. (2014)
300	*Daucas carota* L.	T	Roots boiled, cooked, roasted and consumed as vegetable. Tubers also taken as raw.	Misra and Misra (2014)
301	*Debregeasia longifolia* (Burm.f.) Widd.	L	Used as vegetable	Murthy et al. (2003)
302	*Decalepis hamiltonii* Wight & Arn.	R	Root pieces pickled. Rhizomes are boiled and eaten; roots boiled in preparation of cool drinks in summer season	Murthy et al. (2003); Reddy et al. (2007);Samydurai et al. (2012); Rekka and Senthil Kumar (2014); Deepa et al. (2014);
303	*Decaschistia cuddapahensis*Paul & Nayar	L	Used as vegetable	Singh (2013)
304	*Delonix regia* Hook.f.	Fl.	Edible	Rajasab and Isaq (2004)
305	*Dendrocalamus strictus* (Roxb.) Nees	Rh, St	Tender culms, rhizome used as vegetable	Murthy et al. (2003); Reddy et al. (2007); Misra and Misra (2013, 2014)
306	*Dentella repens* (L.) J.R. Forst. & G. Forst.	L, Fr.	Ripe fruits edible; young leaves used as vegetable	Murthy et al. (2003)
307	*Derris scandens* (Roxb.) Benth	L	Leaves used as vegetable	Murthy et al. (2003)
308	*Digera muricata* (L.) Mart.	L	Leaves boiled and squeezed, then add groundnut powder and eaten along with boiled rice or roties	Murthy et al. (2003); Reddy et al. (2007); Sadasivaiah (2009); Prabakaran et al. (2013); Singh (2013); Deepa et al. (2014)
309	*Dillenia aurea* Sm.	Fl, Fr.	Edible	Murthy et al. (2003); Sinha and Lakra (2005);
310	*Dillenia indica* L.	Fl, Fr.	Fruits edible	Murthy et al. (2003); Sinha and Lakra (2005); Rout (2007)
311	*Dillenia pentagyna* Roxb.	Fl, Fr.	Used as vegetable, raw fruits edible	Reddy et al. (2007); Rout (2007); Sinha and Lakra (2005); Murthy et al. (2003)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
312	*Dimocarpus longan* Lour.	Fr.	Fruits are edible	Hebber et al. (2010);
313	*Dioscorea alata* L.	T	Tuber edible, raw or boiled. Used as vegetable	Samydurai et al. (2012); Misra and Misra (2014); Rekka and Senthil Kumar (2014)
314	*Dioscorea belophylla* (Prain) Haines	R, T	Eaten as raw or cooked as vegetable with pulses.	Murthy et al. (2003); Misra et al. (2013); Misra and Misra (2014)
315	*Dioscorea bulbifera* L. var. *vera* Prain & Burkill	T	Used as vegetable.Tuber sliced, boiled and kept overnight in running tap water, further boiled to remove bitterness, cooked then taken as curry	Murthy et al. (2003); Reddy et al. (2007): Naidu and Khasim (2010); Samydurai et al. (2012); Singh (2013); Misra et al. (2013); Misra and Misra (2014)
316	*Dioscorea esculenta* (Lour.) Burkill	T	Tubers eaten	Samydurai et al. (2012)
317	*Dioscorea glabra* Roxb.	T	Tubers eaten as raw or burnt as snacks or cooked with other vegetables	Misra et al. (2013); Misra and Misra (2014); Panda (2014)
318	*Dioscorea hamiltonii* Hook. f.	T	Fresh tuber is slimy and tasty and eaten raw by children	Murthy et al. (2003); Misra et al. (2013)
319	*Dioscorea hispida* Dennst.	T	Tuber sliced soaked in running water and boiled successively with the leaves of Tamarind. The excess water is filtered out further cooked as curry and eaten as such	Murthy et al. (2003); Samydurai et al. (2012); Misra et al. (2013); Misra and Misra (2014)
320	*Dioscorea oppositifolia* L.	T	Tuber peeled and eaten raw or sliced cooked with other vegetable and onion and consumed as curry	Murthy et al. (2003); Reddy et al. (2007); Samydurai et al. (2012); Misra et al. (2013); Misra and Misra (2014); Deepa et al. (2014); Rekka and Senthil Kumar (2014)
321	*Dioscorea pentaphylla* L.	T	Tubers eaten after boiling. Tuber and bulbils are thoroughly washed then boiled, sliced and cooked with onion and spice and eaten	Murthy et al. (2003); Reddy et al. (2007); Naidu and Khasim (2010); Samydurai et al. (2012); Misra et al. (2013); Deepa et al. (2014); Misra and Misra (2014); Rekka and Senthil Kumar (2014)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
322	*Dioscorea puber* Blume	T	Tubers and bulbils cooked as curry by frying with oil and spice. It is boiled with salt and taken as chutney	Murthy et al. (2003); Misra et al. (2013); Misra and Misra (2014)
323	*Dioscorea tomentosa* Koen. ex Spreng.	T	Tuberous roots eaten after boiling. Tubers are successively boiled and cooked as vegetable curry	Murthy et al. (2003); Reddy et al. (2007); Samydurai et al. (2012); Misra et al. (2013)
324	*Dioscorea wallichii* Hook.f.	T	Cooked, boiled and used as vegetable. Rhizome, tubers and bulbils are sliced and cooked as curry after successive boiling to remove the acrid principle. Tuber dried, powdered and made into sherbet with sugar.	Sinha and Lakra (2005); Misra et al. (2013); Misra and Misra (2014);
325	*Dioscorea dodecaneura* Vell.	T	Roasted and eaten	Panda (2014)
326	*Diospyros chloroxylon* Roxb.	Fr.	Ripe fruits eaten raw	Murthy et al. (2003); Reddy et al. (2007)
327	*Diospyros ebenum* Koen.	Fr.	Ripe fruits eaten raw	Murthy et al. (2003); Prabakaran et al. (2013)
328	*Diospyros exsculpta* Buch.-Ham.	Fr.	Ripe fruits eaten raw	Murthy et al. (2003)
329	*Diospyros malabarica* (Desr.) Kostel	Fr.	Fruits edible	Rout (2007)
330	*Diospyros melanoxylon* Roxb.	Fr., S	Ripe fruits eaten raw. Seeds are edible	Murthy et al. (2003); Sinha and Lakra (2005); Reddy et al. (2007); Basha et al. (2009)
331	*Diospyros montana* Roxb.	Fr.	Ripe fruits eaten raw.	Murthy et al. (2003)
332	*Diospyros ovalifolia* Wight	Fr.	Ripe fruits eaten raw.	Murthy et al. (2003)
333	*Diospyros peregrina* (Gaertn.) Guerke	Fr., S	Ripe fruits eaten raw. Seeds are edible	Murthy et al. (2003); Sinha and Lakra (2005); Reddy et al. (2007)
334	*Diospyros sylvatica* Roxb.	Fr.	Ripe fruits eaten raw.	Murthy et al. (2003)
335	*Diospyros vera* (Lour.) A.Chev.	Fr.	Ripe fruits eaten raw	Murthy et al. (2003); Basha et al. (2009); Prabakaran et al. (2013)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
336	*Diplazium esculentum* (Retz.) Sw.	L	Tender folded leaves are cooked as vegetable	Sanyasi Rao et al. (2014)
337	*Diplocyclos palmatus* (L.) Jeffrey	L, Fr.	Leaves and unripe fruits are used as vegetable.	Murthy et al. (2003); Rajasab and Isaq (2004)
338	*Disporum cantoniense* (Lour.) Merr.	R	Sliced, well boiled, cooked as vegetable	Misra et al. (2013)
339	*Dodonaea viscosa* L.	S	Seeds eaten	Murthy et al. (2003)
340	*Dolichos trilobus* L.	L, T	Used as vegetable	
341	*Drymaria cordata* (L.) Willd. ex Roem. & Schult.	L	Leaves used as vegetable	Murthy et al. (2003)
342	*Drynaria quercifolia* (L.) J. Sm.	Rh	Rhizomes soup drunk to get relief from rheumatic complaints. Boiled and made into soup	Samydurai et al. (2012); Deepa et al. (2014); Rekka and Senthil Kumar (2014)
343	*Drypetes sepiaria* (Wight & Arn.) Pax & Haffm.	Fr., S	Ripe fruits and seeds eaten raw	Murthy et al. (2003)
344	*Echinochloa colonum* (L.) Link	S	Grains used as food	Murthy et al. (2003); Naidu and Khasim (2010); Singh (2013)
345	*Echinochloa crus-galli* (L.) Beauv.	S	Grains used as food	Murthy et al. (2003); Singh (2013, 2014)
346	*Echinochloa frumentacea* (Roxb.) Link.	S	Used as food grains	Singh (2013)
347	*Eclipta prostrata* (L.) L.	L, R	Prepared chutney and eaten along with boiled rice.	Murthy et al. (2003); Samydurai et al. (2012); Rekka and Senthil Kumar (2014); Deepa et al. (2014)
348	*Ehretia acuminata* R. Br.	Fr.	Fruits eaten as raw	Murthy et al. (2003);
349	*Ehretia canarensis* (Cl.) Gamble	Fr.	Ripe fruits edible	Reddy et al. (2007); Misra and Misra (2013)
350	*Ehretia laevis* Roxb.	Fr., Br.	Ripe fruits edible; bark of the stem cooked and eaten	Murthy et al. (2003); Reddy et al. (2007); Misra and Misra (2013)
351	*Ehretia microphylla* Lam.	L	Leaves used as vegetable	Naidu and Khasim (2010)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
352	*Eleocharis dulcis* Trin.	T	Tubers used raw	Murthy et al. (2003)
353	*Eleusine coracana* (L.) Gaertn.	S	Make powder and prepare soup and balls. Nutritious syrup is called "*Ambali*" prepared from powder of grains	Naidu and Khasim (2010); Singh (2013)
354	*Eleusine indica* Steudel	S	Used as food grains	Singh (2013)
355	*Embelia ribes* Burm. f.	S	Eaten as raw	Murthy et al. (2003)
356	*Emilia sonchifolia* (L.) DC.	L, St	Prepared chutney and eaten along with boiled rice	Murthy et al. (2003); Misra and Misra (2013)
357	*Entada rheedii* Spreng.	S	Seeds as pulse	Panda (2014)
358	*Erioglossum rubiginosum* (Roxb.) Blume	St	Tender shoots used as vegetable	Murthy et al. (2003)
359	*Erycibe paniculata* Roxb.	Fr.	Ripe fruits are edible	Sinha and Lakra (2005); Panda (2014)
360	*Eryngium foetidum* L.	L	Leaves used as flavoring agent	Murthy et al. (2003); Misra and Misra (2013)
361	*Erythrina suberosa Roxb.*	L, S	Tender leaves used as vegetable. Seeds are edible	Murthy et al. (2003)
362	*Erythrina variegata* L.	L, fr, St	Tender leaves and shoots used as vegetable. Fruits edible	Reddy et al. (2007)
363	*Erythroxylon monogynum* Roxb.	L, Fr.	Leaves boiled along with dal and fried with oil and ground nut powder and eaten. Ripe fruits eaten as raw	Murthy et al. (2003); Reddy et al. (2007); Basha et al. (2009); Prabakaran et al. (2013); Deepa et al. (2014)
364	*Eugenia roxburghii* DC.	Fr.	Fruits edible	Murthy et al. (2003); Nayak and Basak (2015)
365	*Euphorbia caducifolia* Haines	L	Leaves used as vegetable	Murthy et al. (2003)
366	*Euphorbia heterophylla* L.	L	Leaves used as vegetable	Reddy et al. (2007)
367	*Euphorbia hirta* L.	L	Whole plant is used as vegetable, leaf and curry is eaten as galactogogue	Murthy et al. (2003); Reddy et al. (2007); Naidu and Khasim (2010); Deepa et al. (2014)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
368	*Euphorbia thymifolia* L.	St, L	Tender leaves and shoots are cooked then eaten	Murthy et al. (2003); Misra and Misra (2013);
369	*Ficus auriculata* Lour.	Fr.	Unripe fruits used as vegetable	Murthy et al. (2003)
370	*Ficus benghalensis* L.	Fr., Gum, L	Ripe fruits edible.Tender leaves used as vegetable	Murthy et al. (2003); Basha et al. (2009); Deepa et al. (2014)
371	*Ficus carica* L.	Fr.	Ripe fruits edible	Sinha and Lakra (2005)
372	*Ficus hispida* L.f.	Fr.	Ripe fruits edible	Murthy et al. (2003); Reddy et al. (2007); Basha et al. (2009); Panda (2014)
373	*Ficus microcarpa* L.f.	Fr.	Ripe fruits edible	Deepa et al. (2014)
374	*Ficus palmata* Forssk.	Fr.	Ripe fruits edible	Murthy et al. (2003)
375	*Ficus racemosa* L.	Fr.	Ripe fruits edible	Murthy et al. (2003); Reddy et al. (2007); Basha et al. (2009); Prabakaran et al. (2013); Deepa et al. (2014)
376	*Ficus religiosa* L.	Fr., L	Ripe fruits edible. Young leaves and shoots are used as vegetable	Murthy et al. (2003); Basha et al. (2009); Dhore et al. (2012); Deepa et al. (2014)
377	*Ficus rumphii* Bl.	Fr.	Ripe fruits edible	Murthy et al. (2003)
378	*Ficus semicordata* Buch.-Ham. ex J.E. Smith	Fr.	Ripe fruits edible	Murthy et al. (2003)
379	*Ficus virens* Ait.	Fr., L	Ripe fruits edible. Young leaves used as vegetable	Murthy et al. (2003); Deepa et al. (2014)
380	*Flacourtia indica* (Burm. f.) Merr.	Fr.	Ripe fruits eaten raw; fruits are used to make pickle	Murthy et al. (2003); Reddy et al. (2007); Basha et al. (2009); Prabakaran et al. (2013); Deepa et al. (2014)
381	*Flacourtia jangomas* (Lour.) Raeusch.		Ripe fruits edible	Murthy et al. (2003); Sinha and Lakra (2005)
382	*Foeniculum vulgare* Miller	S	Used as spice	Rao (2014)
383	*Garcinia cowa* Roxb. ex Choisy	Fr.	Ripe fruits edible	Sinha and Lakra (2005); Panda (2014)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
384	*Garcinia spicata* (Wight & Arn.) Hook.f.	Fr.	Fruits edible	Murthy et al. (2003)
385	*Garcinia xanthochymus* T. And.	Fr.	Fruits edible	Murthy et al. (2003)
386	*Gardenia gummifera* L. f.	Fr.	Unripe and ripe fruits edible	Murthy et al. (2003); Basha et al. (2009); Deepa et al. (2014)
387	*Gardenia latifolia* Ait.	Fr.	Ripe fruits edible	Murthy et al. (2003); Reddy et al. (2007); Basha et al. (2009)
388	*Gardenia resinifera* Roth	Fr.	Ripe fruits edible	Murthy et al. (2003); Reddy et al. (2007)
389	*Garuga pinnata* Roxb.	Fr.	Ripe fruits edible	Murthy et al. (2003); Sinha and Lakra (2005); Reddy et al. (2007); Basha et al. (2009)
390	*Gisekia pharnaceoides* L.	L	Used as vegetable	Murthy et al. (2003)
391	*Givotia moluccana* (L.) Sree.	S	Eaten as raw	Basha et al. (2009)
392	*Glinus lotoides* L.	L	Tender shoots and leaves used as vegetable	Murthy et al. (2003)
393	*Glinus oppositifolius* (L.) DC.	L	Used as vegetable	Misra and Misra (2013, 2014)
394	*Globba marantina* L.	T	Rhizome used as vegetable	Misra and Misra (2014)
395	*Glycosmis mauritiana* (Lam.) Tanaka	Fr	Edible raw	Murthy et al. (2003)
396	*Glycosmis pentaphylla* (Retz.) DC.	Fr.	Edible raw	Hebber et al. (2010); Nayak and Basak (2015)
397	*Glycyrrhiza glabra* L.	R	Cooked as vegetable	Samydurai et al. (2012)
398	*Gmelina arborea* Roxb.	Fr.	Ripe fruits edible	Panda (2014)
399	*Gnaphalium polycaulon* Pers.	L	Used as vegetable	Reddy et al. (2007)
400	*Gouania leptostachya* DC.	L	Used as vegetable	Murthy et al. (2003)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
401	*Grewia abutilifolia* Juss.	Fr.	Ripe fruits edible	Murthy et al. (2003)
402	*Grewia asiatica* L.	Fr.	Ripe fruits edible	Murthy et al. (2003); Rekka and Senthil Kumar (2014)
403	*Grewia damine* Gaertn.	Fr.	Ripe fruits edible	Murthy et al. (2003); Basha et al. (2009)
404	*Grewia elastica* Royle	Fr.	Ripe fruits edible	Reddy et al. (2007)
405	*Grewia flavescens* Juss.	Fr.	Ripe fruits edible	Murthy et al. (2003); Reddy et al. (2007); Basha et al. (2009)
406	*Grewia hirsuta* Vahl	Fr.	Ripe fruits edible and also used as vegetable	Murthy et al. (2003); Reddy et al. (2007); Basha et al. (2009); Deepa et al. (2014)
407	*Grewia nervosa* (Lour.) Panigrahi	Fr.	Fruits edible	Hebber et al. (2010)
408	*Grewia rhamnifolia* Roth	Fr.	Ripe fruits edible	Murthy et al. (2003)
409	*Grewia rothii* DC.	Fr.	Ripe fruits edible	Murthy et al. (2003)
410	*Grewia tenax* (Frossk.) Fiori	Fr.	Ripe fruits edible	Murthy et al. (2003); Basha et al. (2009)
411	*Grewia tiliifolia* Vahl	Fr.	Ripe fruits are edible and also used as vegetable	Murthy et al. (2003); Reddy et al. (2007); Basha et al. (2009); Deepa et al. (2014)
412	*Grewia villosa* Willd.	Fr.	Ripe fruits edible	Murthy et al. (2003); Reddy et al. (2007); Basha et al. (2009)
413	*Guazuma ulmifolia* Lam.	Fr.	Fruits edible	Reddy et al. (2007)
414	*Guizotia abyssinica* (L.f.) Cass.	S	Seeds for edible oil	Singh (2014)
415	*Gymnema sylvestre* R. Br.	R, L	Roots and leaves cooked as vegetable to cure Diabetes	Murthy et al. (2003); Samydurai et al. (2012); Deepa et al. (2014)
416	*Habenaria plantaginea* Lindl.	T	Burnt and consumed as snacks; preferred by children due to its sweet taste	Misra et al. (2013)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
417	*Hedychium coccineum* Buch.-Ham. ex Sm.	Rh	Sliced into pieces, cooked with other vegetables and made in to a curry and eaten	Misra et al. (2013)
418	*Hedychium coronarium* Koen.	Rh	Sliced, peeled and made into curry. Also boiled and consumed during food scarcity	Misra et al. (2013); Misra and Misra (2014); Murthy et al. (2003)
419	*Hedyotis auriculata* L.	L	Leaves used as vegetable	Murthy et al. (2003)
420	*Helianthus annuus* L.	Fr.	Raw or roasted and eaten; roasted and made into powder with chillies	Singh (2013)
421	*Hemidesmus indicus* (L.) R. Br.	R	Roots are roasted, cooked, then consumed. Roots boiled several times and make it into a jelly, it is used in preparation of cool drinks in summer season. Powder of the roots used in coffee, etc.	Rajasab and Isaq (2004); Reddy et al. (2007); Samydurai et al. (2012); Deepa et al. (2014); Misra and Misra (2014)
422	*Heritiera littoralis* Aiton	S	Seeds eaten	Murthy et al. (2003)
423	*Hibiscus aculeatus* Walt.	L	Used as leafy vegetable	Singh (2013)
424	*Hibiscus cannabinus* L.	L, S	Leaves used as vegetable and dried seeds roasted and eaten	Singh (2013)
425	*Hibiscus rosa-sinensis* L.	Fl.	Flowers used to prepare chutney	Reddy et al. (2007)
426	*Hibiscus sabdariffa* L.	L	Tender leaves are cooked with tamarind pulp or chutney is prepared from raw leaves and the eaten	Misra and Misra (2013)
427	*Hibiscus surattensis* L.	Fr.	Used in curries to get sour taste	Murthy et al. (2003); Sadasivaiah (2009)
428	*Holarrhena pubescens* Wall.	Fl.	Used as vegetable	Sinha and Lakra (2005); Panda (2014)
429	*Holoptelia integrifolia* Planch.	Fl.	Flowers are used as vegetable	Murthy et al. (2003)
430	*Holostemma adakodien* Schultes	Rh, Fl., Fr., L	Cooked as vegetable; flowers eaten raw; fruits edible. Leaves used as vegetable	Murthy et al. (2003); Reddy et al. (2007); Samydurai et al. (2012)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
431	*Homonoia riparia* Lour.	L	Tender leaves used as vegetable	Murthy et al. (2003); Reddy et al. (2007)
432	*Hordeum vulgare* L.	S	Cereal	Sahu et al. (2013)
433	*Hugonia mystax* L.	Fr.	Fruits edible	Murthy et al. (2003)
434	*Hydrolea zeylanica* (L.) Vahl	WP	Used as vegetable	Reddy et al. (2007); Misra and Misra (2013)
435	*Hygrophila auriculata* (Schum.) Heine	L	Used as vegetable	Murthy et al. (2003); Reddy et al. (2007); Misra and Misra (2013)
436	*Hygrophila salicifolia* Nees	L	Used as vegetable	Murthy et al. (2003)
437	*Hyptis suaveolens* (L.f.) Wall.	L	Used as vegetable	Murthy et al. (2003)
438	*Impatiens balsamina* L.	L, S	Leaves and seeds eaten raw	Murthy et al. (2003)
439	*Indigofera glabra* Roxb.	L	Used as vegetable.	Murthy et al. (2003)
440	*Indigofera glandulosa* Roxb. ex Willd.	L	Used as vegetable	Rajasab and Isaq (2004)
441	*Indigofera pulchella* Roxb.	Fl.	Flowers edible	Sinha and Lakra (2005)
442	*Ipomoea aquatica* Forssk.	L, St	Leaves and tender shoots are cooked and eaten	Murthy et al. (2003); Sinha and Lakra (2005); Reddy et al. (2007); Misra and Misra (2013)
443	*Ipomoea batatas* (L.) Lam.	T	Used as vegetable and also eaten raw	Samydurai et al. (2012); Dhore et al. (2012); Misra and Misra (2014)
444	*Ipomoea cairica* (L.) Sweet	T	Underground fleshy tubers are first boiled and then consumed as vegetable	Misra and Misra (2014)
445	*Ipomoea eriocarpa* R.Br.	L, St	Leaves and young shoots used as vegetable	Murthy et al. (2003)
446	*Ipomoea staphylina* Roem. & Schult.	R	Eaten as raw	Mohan and Kalidass (2010)
447	*Ixora arborea* Smith	Fr.	Ripe fruits edible	Reddy et al. (2007)
448	*Ixora undulata* Roxb.	Fr.	Ripe fruits edible	Panda (2014)
449	*Jasminum auriculatum* Vahl	L, St	Used as vegetable	Murthy et al. (2003)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
450	*Jatropha heynei* Balakr.	L	Tender leaves used as vegetable	Murthy et al. (2003)
451	*Justicia betonica* L.	L	Tender leaves used as vegetable	Misra and Misra (2013)
452	*Justicia glauca* Rottl.	L	Tender leaves used as vegetable	Murthy et al. (2003)
453	*Justicia tranquebariensis* L.f.	L	Tender leaves used as vegetable	Deepa et al. (2014)
454	*Kalanchoe pinnata* (Lam.) Pers.	L	Leaves are used to prepare sauce along with other ingredients.	Rajasab and Isaq (2004)
455	*Kedrostis foetidissima* (Jacq.) Cogn.	T, L	Tubers used as vegetable, leaves eaten raw	Murthy et al. (2003)
456	*Lablab purpureus* (L.) Sweet	Fr.	Used as vegetable	Singh (2013)
457	*Lactuca runcinata* DC.	Wp	Used as vegetable	Murthy et al. (2003)
458	*Lactuca scariola* L.	L	Leaves used as vegetable, eaten raw (salad) or cooked.	Rajasab and Isaq (2004)
459	*Lagenaria siceraria* (Molina) Standly	Fr.	Tender fruits used as vegetable	Naidu and Khasim (2010); Singh (2013)
460	*Lannea coromandelica* (Houtt.) Merr.	Fr., L	Ripe fruits eaten raw. Leaves used as vegetable	Murthy et al. (2003); Reddy et al. (2007); Basha et al. (2009)
461	*Lantana camara* L. var. *aculeata* (L.) Moldenke	Fr.	Ripe fruits are edible	Murthy et al. (2003); Rajasab and Isaq (2004); Basha et al. (2009)
462	*Lantana montevidensis* (Spreng.) Briq.	Fr.	Ripe fruits are edible	Rekka and Senthil Kumar (2014)
463	*Lasia spinosa* (L.) Thwaites	T, Rh, L	Rhizome properly washed, spines are peeled, cut into small pieces, fried with tamarind, salt and chilly then consumed. Leaves are roasted and taken as food	Murthy et al. (2003); Reddy et al. (2007); Misra et al. (2013); Misra and Misra (2013); Misra and Misra (2014)
464	*Lathyrus odoratus* L.	S	Used to prepare curry	Singh (2013)
465	*Launaea procumbens* (Roxb.) Ramayya & Rajagopal	L	Leaves cooked as curry	Rajasab and Rajshekhar (2012)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
466	*Leea asiatica* (L.) Ridsdale	L, Fr.	Leaves and fruits edible	Murthy et al. (2003)
467	*Leea indica* (Burm.) Merr.	L, Fr.	Leaves and fruits edible	Murthy et al. (2003)
468	*Leea macrophylla* Roxb. ex Hornem	L, Fr.	Leaves and fruits edible	Murthy et al. (2003)
469	*Lens culinaris* Medikus	S	Used as vegetable	Singh (2013)
470	*Lepisanthes tetraphylla* (Vahl) Radlk.	Fr.	Fruits edible	Murthy et al. (2003)
471	*Leptadenia reticulata* (Retz.)Wight & Arn.	L	Leaves used as vegetable	Nagalakshmi (2014)
472	*Leucas aspera* (L.) Link.	L, St	Leaves and young shoots are roasted and taken as food	Murthy et al. (2003); Reddy et al. (2007); Misra and Misra (2013, 2014)
473	*Leucas cephalotes* Spreng.	L	Leaves used as vegetable.	Sinha and Lakra (2005)
474	*Leucas decemdentata* (Willd.) Sm.	L, St	Leaves and young shoots are roasted and taken as food	Misra and Misra (2013)
475	*Limnophila indica* (L.) Druce	St, L	Leaves and young shoots are cooked and eaten	Murthy et al. (2003); Misra and Misra (2013);
476	*Limonia acidissima* Groff	L, Fr.	Leaves used to make pickles. Ripe fruits are edible with sugar or candy	Basha et al. (2009); Prabakaran et al. (2013); Singh (2013); Rekka and Senthil Kumar (2014); Deepa et al. (2014)
477	*Lippia nodiflora* Roxb.	L	Leaves edible	Murthy et al. (2003)
478	*Litsea glutinosa* C.B. Robins.	Fr.	Fruits edible	Murthy et al. (2003)
479	*Litsea monopetala* (Roxb.) Pers.	L	Leaves edible	Murthy et al. (2003)
480	*Lobelia alsinoides* Lam.	L	Leaves as vegetable	Murthy et al. (2003)
481	*Ludwigia adscendens* (L.) Hara	L, St	Young leaves and tender shoots as vegetable	Murthy et al. (2003)
482	*Luffa acutangula* (L.) Roxb.	Fr., L	Fruits as vegetable; tender leaves are mixed with fish and cooked as curry	Misra and Misra (2013)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
483	*Luffa cylindrica* (L.) M. Roemer	Fr.	Used as vegetable	Singh (2013)
484	*Luffa hermaprodita* Singh & Bhandari	Fr.	Used as vegetable	Pandravada et al. (2014)
485	*Luffa tuberosa* Roxb.	Fr.	Used as vegetable	Murthy et al. (2003)
486	*Lycopersicon esculentum* Mill.	Fr.	Used as vegetable	Sadasivaiah (2009)
487	*Maclura cochinchinensis* (Lour.) Corner	L	Young leaves used as vegetable	Murthy et al. (2003)
488	*Macrotyloma uniflorum* (Lam.) Verdc.	S	Seeds are cooked and eaten	Naidu and Khasim (2010); Singh (2013)
489	*Madhuca indica* Gmel.	Fr., Fl, S	Ripe fruits and flowers used to prepare arrack. Seeds are edible.	Sinha and Lakra (2005); Reddy et al. (2007); Basha et al. (2009); Prabakaran et al. (2013)
490	*Madhuca longifolia* (Koen.) Macbr.	Fr., L	Ripe fruits edible. Leaves are roasted and taken as food. Flowers used as vegetable. Seeds edible.	Sinha and Lakra (2005); Misra and Misra (2013)
491	*Malva sylvestris* L.	L	Leaves used as vegetable	Murthy et al. (2003)
492	*Malvastrum coromandelianum* (L.) Garcke	L	Tender leaves used as vegetable	Reddy et al. (2007)
493	*Mangifera indica* L.	Fr.	Green fruits used to prepare pickles, chutnies, dal and ripe fruits edible	Murthy et al. (2003); Basha et al. (2009); Prabakaran et al. (2013); Deepa et al. (2014); Singh (2013, 2014)
494	*Manihot esculenta* Crantz	T	Fleshy swollen/tuberous roots are consumed raw or after boiling	Samydurai et al. (2012); Misra and Misra (2014); Rekka and Senthil Kumar (2014)
495	*Manilkara hexandra* (Roxb.) Dubard.	Fr.	Ripe fruits edible	Murthy et al. (2003); Reddy et al. (2007); Basha et al. (2009)
496	*Manilkara roxburghii* (Wight) Dubard.	Fr.	Ripe fruits edible	Basha et al. (2009)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
497	*Maranta arundinacea* L.	Rh	Cooked as vegetable	Samydurai et al. (2012)
498	*Marsilea polycarpa* Hook. & Grev.	L	Used as vegetable	Misra and Misra (2013)
499	*Marsilea quadrifolia* L.	L	Used as vegetable	Murthy et al. (2003); Sinha and Lakra (2005); Misra and Misra (2013); Deepa et al. (2014)
500	*Maytenus emarginatus* (Willd.) Ding Hou	Fr.	Ripe fruits edible	Murthy et al. (2003); Mukesh Kumar et al. (2013)
501	*Melastoma malabathricum* L.	L, Fr.	Tender leaves used as vegetable. Fruits edible	Murthy et al. (2003); Reddy et al. (2007); Nayak and Basak (2015)
502	*Melia azedarach* L.	Fr.	Ripe fruits edible	Prabakaran et al. (2013)
503	*Melicope lunu-ankenda* (Gaertn.) T.G. Hartley	L	Leaves used as flavoring agent	Murthy et al. (2003)
504	*Melochia corchorifolia* L.	L	Used as vegetable	Murthy et al. (2003); Ramakrishna et al. (2014)
505	*Memecylon edule* Roxb.	Fr.	Edible	Murthy et al. (2003); Basha et al. (2009)
506	*Memecylon umbellatum* Burm.f.	Fr.	Edible	Murthy et al. (2003); Basha et al. (2009)
507	*Mentha arvensis* L.	L	Used as leafy vegetable and spice	Rao (2014)
508	*Mentha spicata* L.	L	Used as vegetable and spice and used to prepare chutney	Sanyasi Rao et al. (2014)
509	*Menya laxiflora* Robyns	L	Used vegetable	Sinha and Lakra (2005)
510	*Merremia emarginata* (Burm.f.) Hallier f.	L, St	Leaves and tender shoots cooked and eaten	Murthy et al. (2003); Misra and Misra (2013)
511	*Merremia gangetica* (L.) Cuf.	L	Used as vegetable	Rajasab and Isaq (2004)
512	*Merremia vitifolia* (Burm.f.) Hall.f.	L	Tender leaves used as vegetable	Murthy et al. (2003)
513	*Mesua ferrea* L.	Fr.	Ripe fruits are edible	Panda (2014)
514	*Metroxylon sagu* Rottb.	P	Prepare juice, kheer	Rao (2014)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
515	*Miliusa tomentosa* (Roxb.) Sinclair	Fr.	Ripe fruits eaten as raw	Murthy et al. (2003); Reddy et al. (2007)
516	*Miliusa velutina* (Dunal) Hook.f. & Thoms.	Fr.	Ripe fruits eaten as raw	Murthy et al. (2003)
517	*Mimosa intsia* L.	Fr.	Fruits are edible	Prabakaran et al. (2013)
518	*Mimusops elengi* L.	Fr.	Ripe fruits are edible	Murthy et al. (2003); Nayak and Basak (2015)
519	*Mollugo cerviana* (L.) Ser.	St, L	Tender shoots and leaves used as vegetable	Murthy et al. (2003)
520	*Mollugo pentaphylla* L.	L	Cut into small pieces and cooked with salt, chilly and with oil	Murthy et al. (2003); Misra and Misra (2013)
521	*Momordica charantia* L.	Fr., L	Fruits used as vegetable; Leaves eaten after frying	Misra and Misra (2013); Singh (2013)
522	*Momordica cymbalaria* Hook.f.	Fr.	Used as vegetable.	Rajasab and Isaq (2004)
523	*Momordica dioica* Roxb. ex Willd.	T, Fr.	Used as vegetable; Tender fruit curry is utilized as blood purifer	Murthy et al. (2003); Sinha and Lakra (2005); Reddy et al. (2007); Naidu and Khasim (2010)
524	*Monochoria hastata* (L.) Solms	L	Leaves are eaten after roasting	Misra and Misra (2013)
525	*Morchella esculenta*	Wp	Whole plant is edible (Mushroom)	Vasundhra (2009)
526	*Morinda citrifolia* L.	Fr.	Fruits edible	Nayak and Basak (2015)
527	*Morinda pubescens* J.E. Smith	Fr.	Ripe fruits edible	Murthy et al. (2003); Reddy et al. (2007); Deepa et al. (2014)
528	*Morinda umbellata* L.	L	Used as vegetable	Murthy et al. (2003)
529	*Moringa concanensis* Nimmo ex Gibs.	L, Fr.	Fruits and leaves used as vegetables	Murthy et al. (2003); Basha et al. (2009); Deepa et al. (2014)
530	*Moringa oleifera* Bedd.	L, Fr.,	Fruits and leaves used as vegetables	Murthy et al. (2003); Reddy et al. (2007); Naidu and Khasim (2010); Misra and Misra (2013, 2014)
531	*Morus alba* L.	Fr.	Ripe fruits edible	Rao (2014)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
532	*Mucuna atropurpurea* DC.	S	Eaten raw	Singh (2013)
533	*Mucuna pruriens* (L.) DC.	Fr., S	Unripe fruits roasted and consumed	Murthy et al. (2003); Reddy et al. (2007)
534	*Mukia maderaspatana* (L.) Roemer	L, Fr.	Leaves and seeds used to prepare curries. Fruits are edible	Murthy et al. (2003); Rajasab and Isaq (2004); Deepa et al. (2014)
535	*Muntigia calabura* L.	Fr.	Ripe fruits eaten as raw	Rao (2014)
536	*Murraya koenigii* (L.) Spreng.	L, Fr.	Leaves used in curries and made into powder; ripe fruits are edible	Murthy et al. (2003); Reddy et al. (2007); Basha et al. (2009); Misra and Misra (2013, 2014); Singh (2013)
537	*Musa* X *paradisiaca* L.	Rh, Fr.	Fruits edible. Rhizome boiled and cooked then eaten as vegetable	Naidu and Khasim (2010); Misra and Misra (2014); Singh (2014)
538	*Naravelia zeylanica* (L.) DC.	T	Used as vegetable	Murthy et al. (2003)
539	*Naringi crenulata* (Roxb.)	Fr.	Ripe fruits are edible	Prabakaran et al. (2013)
540	*Nelsonia canescens* (Lam.) Spreng.	L	Used as vegetable	Murthy et al. (2003)
541	*Nelumbo nucifera* Gaertn.	Rh, Fl, S	Rhizome boiled and cooked then eaten. Stamens and thalamus eaten raw. Rhizomes used as vegetable	Murthy et al. (2003); Reddy et al. (2007); Samydurai et al. (2012); Misra and Misra (2014)
542	*Neptunia oleracea* Lour.	L	Tender leaves and young pods used as vegetable	Murthy et al. (2003); Reddy et al. (2007); Misra and Misra (2013)
543	*Nervilia aragoana* Gaud.	T	Burnt and taken as snacks, also boiled and taken with salt	Misra et al. (2013)
544	*Nervilia discolor* (Bl.) Schltr.	T	Tuber burnt and eaten	Misra et al. (2013)
545	*Nothopegia heyneana* (Hook.f.) Gamble	Fr.	Ripe fruits edible.	Murthy et al. (2003)
546	*Nothosaerva brachiata* (L.) Wight & Arn.	L	Used as vegetable	Murthy et al. (2003); Reddy et al. (2007)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
547	*Nymphaea nouchali* Burm. f.	Rh, Fr.	Rhizome is eaten after boiling. Fruits edible raw	Murthy et al. (2003); Misra and Misra (2014);
548	*Nymphaea pubescens* Willd.	Rh, S	Sliced and cooked as curry with potato and onions. Rhizome locally called madhi is eaten after boiling.	Murthy et al. (2003); Basha et al. (2009); Misra et al. (2013); Misra and Misra (2014)
549	*Ocimum americanum* L.	Wp	Used as vegetable	Murthy et al. (2003)
550	*Olax imbricata* Roxb.	Fr.	Aril is edible	Hebber et al. (2010)
551	*Olax scandens* Roxb.	St, L	Tender stems used as vegetable; Leaves are roasted then eaten	Murthy et al. (2003); Sinha and Lakra (2005); Reddy et al. (2007); Misra and Misra (2013)
552	*Oldenlandia trinervia* Retz.	L	Leaves used as vegetable	Misra and Misra (2013)
553	*Operculina turpethum* (L.) Silva Manso	L	Leaves with rice is made into cake and eaten	Murthy et al. (2003); Misra and Misra (2013)
554	*Opuntia dillenii* (Ker-Gawl.) Haw.	Fr.	Ripe fruits eaten raw and used to prepare jelly and is used as coloring agent for cool drinks	Murthy et al. (2003); Rajasab and Isaq (2004); Reddy et al. (2007); Basha et al. (2009); Deepa et al. (2014)
555	*Opuntia elatior* Mill.	Fr.	Ripe fruits edible	Rekka and Senthil Kumar (2014)
556	*Opuntia vulgaris* Mill.	Fr.	Ripe fruits edible	Basha et al. (2009)
557	*Oroxylum indicum* (L.) Vent.	Fl.	Used as vegetable	Murthy et al. (2003); Reddy et al. (2007)
558	*Orthosiphon rubicundus* (D.Don) Benth.	R	Sliced pieces are ground along with broken rice, made flour and fried into cakes.	Murthy et al. (2003); Misra et al. (2013)
559	*Oryza jeyporensis* Govindasw. & Chandrasekh.	S	Used as food grains	Reddy et al. (2006)
560	*Oryza rufipogon* Griff.	S	Used as food grains	
561	*Oryza sativa* L.	S	Food grains	Singh (2014)
562	*Osbeckia stellata* Buch.-Ham. ex Ker Gawl	L	Used as vegetable	Murthy et al. (2003)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
563	*Ottelia alismoides* (L.) Pers.	Fr.	Eaten raw	Murthy et al. (2003); Sadasivaiah (2009)
564	*Oxalis corniculata* L.	L	Cut into small pieces and cooked with salt, chilly and with oil and eaten along with boiled rice	Murthy et al. (2003); Reddy et al. (2007); Misra and Misra (2013); Rekka and Senthil Kumar (2014); Deepa et al. (2014)
565	*Oxalis latifolia* HBK	L	Used as vegetable	Rekka and Senthil Kumar (2014)
566	*Oxystelma esculentum* R.Br.	L	Used as vegetable	Murthy et al. (2003)
567	*Paederia foetida* L.	L	Leaves used as vegetable	Reddy et al. (2007)
568	*Pandanus tectorius* Parkinson ex Du Roi	St	Tender shoots used as vegetable	Murthy et al. (2003)
569	*Panicum miliaceum* L.	S	Used as food grains	Sadasivaiah (2009); Singh (2013)
570	*Panicum sumatrense* Roem. & Schult.	S	Food grains	Murthy et al. (2003)
571	*Papaver somniferum* L.	S	Used as spice	Rao (2014)
572	*Paracalyx scariosus* (Roxb.) Ali	S, T	Seeds used as pulse	Murthy et al. (2003); Murthy and Sambasiva Rao (2009)
573	*Parkinsonia aculeata* L.	S	Seeds eaten raw and roasted and eaten	Murthy et al. (2003)
574	*Paspalum scrobiculatum* L.	S	Used as food grains	Sadasivaiah (2009); Singh (2013)
575	*Passiflora edulis* Sims	Fr.	Ripe fruits are eaten. Juice prepared from ripe fruits	Rekka and Senthil Kumar (2014)
576	*Passiflora foetida* L.	Fr.	Ripe fruits edible directly	Murthy et al. (2003)
577	*Pavetta indica* L.	Fl., Fr.	Flowers used to prepare curry; tender unripe fruits are edible	Murthy et al. (2003); Reddy et al. (2007)
578	*Pavonia odorata* Willd.	L	Eaten raw	Murthy et al. (2003)
579	*Pelatantheria insectifera* (Reichb. f.) Ridley	AR	Stripped off the skin, burnt and taken as snacks	Misra et al. (2013)
580	*Pennisetum glaucum* (L.) R. Br.	S	Food grains	Naidu and Khasim (2010); Singh (2013, 2014);

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
581	*Pergularia daemia* (Frossk.) Chiov.	L	As vegetable	Nagalakshmi (2014); Murthy et al. (2003)
582	*Persea americana* Mill.	Fr.	Juice prepared from ripe fruits	Rekka and Senthil Kumar (2014)
583	*Persicaria barbata* (L.) H. Hara	L, St	Tender leaves and shoots are cooked then eaten	Misra and Misra (2013);
584	*Persicaria glabra* (Willd.) M.Gomez	Rh, St	Rhizome consumed as vegetable.	Murthy et al. (2003); Misra and Misra (2014)
585	*Phoenix acaulis* Buch.-Ham. ex Roxb.	R, Fr.,	Fruits are edible; peeled and eaten raw as snacks by children	Reddy et al. (2007); Misra andMisra (2013); Misra et al. (2013)
586	*Phoenix loureiroi* Kunth.	Fr., P	Ripe fruits eaten raw; pith also eaten raw	Reddy et al. (2007); Basha et al. (2009); Rekka and Senthil Kumar (2014); Deepa et al. (2014)
587	*Phoenix pusilla* Gaertner	Fr., P	Ripe fruits eaten raw; pith eaten raw	Rao (2014)
588	*Phoenix sylvestris* (L.) Roxb.	Fr., P	Ripe fruits eaten raw; pith eaten raw	Murthy et al. (2003); Reddy et al. (2007); Basha et al. (2009); Naidu and Khasim (2010); Singh (2013)
589	*Phyla nodiflora* Lour.	L	Leaves used as vegetable	Misra and Misra (2013);
590	*Phyllanthus acidus* (L.) Skeels	Fr.	Unripe fruits used in preparation of pickle and ripe fruits edible	Rao (2014); Nayak and Basak (2015)
591	*Phyllanthus emblica* L.	Fr.	Unripe fruits used in preparation of pickle and ripe fruits eat directly	Murthy et al. (2003); Reddy et al. (2007); Basha et al. (2009); Prabakaran et al. (2013); Singh (2013); Deepa et al. (2014)
592	*Phyllanthus indofischeri* Bennet	Fr.	Unripe fruits used in preparation of pickle and ripe fruits eaten raw	Reddy et al. (2006)
593	*Phyllanthus reticulatus* Poir.	Fr.	Ripe fruits edible	Murthy et al. (2003); Deepa et al. (2014)
594	*Phyllanthus virgatus* Forst.f.	Fr.	Ripe fruits edible	Murthy et al. (2003)
595	*Physalis angulata* L.	Fr.	Ripe fruits edible	Reddy et al. (2007)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
596	*Physalis minima* L.	L, Fr.	Ripe fruits edible, leaves used as vegetable	Murthy et al. (2003); Reddy et al. (2007); Basha et al. (2009); Deepa et al. (2014)
597	*Physalis minima* L. var. *indica* Clarke	Fr.	Ripe fruits edible	Reddy et al. (2007)
598	*Pilea melastomoides* Bl.	L	Leaves used as vegetable	Murthy et al. (2003)
599	*Pimpinella heyneana* (DC.) Benth.	S, L	Used as spices	Murthy et al. (2003)
600	*Piper longum* L.	S	Used as spice	Naidu and Khasim (2010)
601	*Piper nigrum* L.	Fr.	Used as condiment	Deepa et al. (2014); Sanyasi Rao et al. (2014)
602	*Pistia stratiotes* L.	L	Used as vegetable	Nagalakshmi (2014)
603	*Pisum sativum* L.	S	Unripe seeds edible, ripe seeds as pulse	Rao (2014)
604	*Pithecellobium dulce* (Roxb.) Benth.	Fr.	Aril edible	Murthy et al. (2003);Reddy et al. (2007); Basha et al. (2009); Prabakaran et al. (2013); Deepa et al. (2014)
605	*Plantago asiatica* L.	L	Pot herb	Murthy et al. (2003)
606	*Plectranthus barbatus* Andr.	T	Used as vegetable	Murthy et al. (2003)
607	*Plectronia didyma* Kurz.	Fr.	Ripe fruits eaten as raw	Rekka and Senthil Kumar (2014)
608	*Plumbago zeylanica* L.	R	Cooked as vegetable	Samydurai et al. (2012)
609	*Polyalthia cerasoides* (Roxb.) Bedd.	Fr.	Ripe fruits edible	Reddy et al. (2007); Basha et al. (2009); Prabakaran et al. (2013); Murthy et al. (2003)
610	*Polyalthia suberosa* (Roxb.) Thw.	Fr.	Ripe fruits eaten raw	Nayak and Basak (2015)
611	*Polygala arvensis* Willd.	L	Used as vegetable	Misra and Misra (2013)
612	*Polygonum chinense* L.	L	Used as vegetable	Murthy et al. (2003)
613	*Polygonum hydropiper* Willd.	L	Used as vegetable	Murthy et al. (2003)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
614	*Polygonum plebeium* R. Br.	L, Fl	Used as vegetable	Murthy et al. (2003); Sinha and Lakra (2005); Panda (2014)
615	*Polygonum pulchrum* Bl.	L	Used as salads	Murthy et al. (2003)
616	*Portulaca oleracea* L.	L, St	As leafy vegetable, tender leaves and shoots are roasted and eaten	Murthy et al. (2003); Reddy et al. (2007); Misra and Misra (2013); Deepa et al. (2014)
617	*Portulaca quadrifida* L.	L, S	Boiled, squeezed and mixed with Ground nut powder and eat with boiled rice	Murthy et al. (2003);Rajasab andIsaq (2004); Reddy et al. (2007)
618	*Portulaca tuberosa* Roxb.	L	Used as vegetable	Murthy et al. (2003)
619	*Pouteria sapota* (Jacq.) H.E.Moore & Stearn	Fr.	Ripe fruits are edible	Rekka and Senthil Kumar (2014)
620	*Pouzolzia zeylanica* (L.) Benn.	Rh	Rhizome consumed as vegetable	Reddy et al. (2007); Misra and Misra (2014)
621	*Premna latifolia* Roxb.	L	Leaves used to prepare curries	Murthy et al. (2003); Reddy et al. (2007); Misra and Misra (2014)
622	*Premna mollissima* Roth	L	*Ambila* (liquid curry) is prepared from leaves with tamarind pulp	Misra and Misra (2013)
623	*Premna tomentosa* Willd.	Fr., L	Ripe fruits are edible; tender leaves used as vegetable	Murthy et al. (2003); Reddy et al. (2007); Prabakaran et al. (2013); Deepa et al. (2014)
624	*Protium serratum* (Colebr.) Engl.	Fr.	Fruits eaten raw	Murthy et al. (2003)
625	*Prunus jenkinsii* Hook.f.	Fr.	Fruits eaten raw	Murthy et al. (2003)
626	*Pseudarthria viscida* (L.) Wight & Arn.	Fr.	Fruits eaten raw	Murthy et al. (2003)
627	*Psidium guajava* L.	Fr.	Ripe fruits edible	Deepa et al. (2014)
628	*Pterolobium hexapetalum* (Roth) Santapu & Wagh	L, Fr.	Tender leaves used as vegetable, fruits are eaten raw	Prabakaran et al. (2013); Deepa et al. (2014)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
629	*Pueraria tuberosa* (Roxb. ex Willd.) DC.	T	Dried powder is taken with water. Also consumed raw or burnt as snacks	Reddy et al. (2007); Misra et al. (2013); Singh (2013)
630	*Punica grantum* L.	Fr.	Ripe fruits edible directly	Murthy et al. (2003); Rao (2014); Singh (2014)
631	*Pupalia lappacea* (L.) Juss.	L	Tender leaves are cooked then eaten	Misra and Misra (2013); Murthy et al. (2003)
632	*Pyrus communis* L.	Fr.	Ripe fruits are edible	Rekka and Senthil Kumar (2014)
633	*Radermachera xylocarpa* (Roxb.) K. Schum.	Fr.	Tender fruits used as vegetable	Murthy et al. (2003)
634	*Raphanus raphanistrum* L. ssp. *sativus* (L.) Domin	Rh, L	Rhizomes sliced, roasted or cooked with spice then consumed; leaves fried along with other vegetable and eaten	Misra and Misra (2013, 2014)
635	*Remusatia vivipara* (Roxb.) Schott	C	Sliced, boiled successively till irritation disapperas and cooked with spice	Misra et al., 201
636	*Rhaphidophora pertusa* (Roxb.) Schott.	Fr.	Fruits eaten raw	Murthy et al. (2003)
637	*Rhizophora mucronata* Lam.	St, Fl,	Used as vegetable	Murthy et al. (2003)
638	*Rhus mysorensis* G. Don	Fr.	Ripe fruits eaten raw	Rao (2014); Murthy et al. (2003)
639	*Rhynchosia bracteata* Benth.	S	Seeds used as pulses	Murthy and Emmanuel (2011)
640	*Rhynchosia cana* DC.	S	Eaten raw	
641	*Rhynchosia filipes* Benth.	S	Eaten Raw	
642	*Rhynchosia heynei* Wight & Arn.	Fr.	Eaten Raw	Murthy et al. (2003);
643	*Rhynchosia rufescens* (Willd.) DC.	S	Eaten Raw	
644	*Rhynchosia suaveolens* (L.f.) DC.	S	Eaten Raw	
645	*Ricinus communis* L.	S	Seeds used in masala curries	Singh (2013)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
646	*Rivea hypocrateriformis* (Desr.) Choisy	L, Fr.	Tender leaves and fruits are used as vegetable or raw.	Murthy et al. (2003)
647	*Rivea ornata* Choisy	L	Cooked as vegetable	Reddy et al. (2007)
648	*Rothia indica* (L.) Druce	L	Leaves used as vegetable	
649	*Rubus ellipticus* Sm.	Fr.	Ripe fruits edible	Murthy et al. (2003)
650	*Rumex vesicarius* L.	L	Used as vegetable	Rao (2014)
651	*Rungia pectinata* (L.) Nees	L	Tender leaves cooked and eaten	Misra and Misra (2013)
652	*Saccharum officinarum* L.	St	Edible raw, sugar and jaggery edible, candy is prepared from juice	Singh (2013, 2014)
653	*Salacia chinensis* L.	Fr.	Fruits edible	Reddy et al. (2007)
654	*Salvadora persica* L.	L	Used as vegetable	Murthy et al. (2003)
655	*Santalum album* L.	Fr.	Ripe fruits edible	Rajasab and Isaq (2004)
656	*Sapindus emarginatus* Vahl	S	Seeds roasted and eaten raw	
657	*Schleichera oleosa* (Lour.)Oken	Fr.	Edible	Murthy et al. (2003); Reddy et al. (2007); Prabakaran et al. (2013)
658	*Schrebera swietenioides* Roxb.	Fr.	Fruits are edible	Murthy et al. (2003); Reddy et al. (2007)
659	*Scolopia crenata* Clos.	Fr.	Fruits are edible	Murthy et al. (2003)
660	*Scutia myrtina* (Burm.f.) Kurz.	Fr.	Ripe fruits edible	Murthy et al. (2003); Reddy et al. (2007); Basha et al. (2009); Prabakaran et al. (2013); Deepa et al. (2014)
661	*Sechium edule* (Jacq.) Sw.	Fr.	Used as vegetable	Rao (2014)
662	*Securinega leucopyrus* (Willd.) Muell.-Arg.	Fr.	Ripe fruits edible	Murthy et al. (2003); Reddy et al. (2007); Basha et al. (2009); Rekka and Senthil Kumar (2014)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
663	*Semecarpus anacardium* L.f.	Fr., S	Ripe fruits eaten raw. Seeds also edible.	Murthy et al. (2003); Sinha and Lakra (2005); Reddy et al. (2007); Basha et al. (2009); Naidu and Khasim (2010); Prabakaran et al. (2013); Rekka and Senthil Kumar (2014)
664	*Senna alexandrina* Mill.	L	Tender leaves used as vegetable	Deepa et al. (2014)
665	*Senna occidentalis* (L.) Link	Fr., L, St	Fruits used as vegetable; leaves and young shoots fried then eaten	Misra and Misra (2013)
666	*Senna sophera* (L.) Roxb.	L	Leaves are cooked and then taken as food	Misra and Misra (2013);
667	*Sesamum indicum* L.	S	Used as oil seed, raw seeds eaten	Sadasivaiah (2009); Singh (2013)
668	*Sesbania grandiflora* (L.) Poir.	L, S, Fl.	Leaves, flowers and seeds used as vegetables	Misra and Misra (2013); Rajasab and Isaq (2004)
669	*Sesbania sesban* (L.) Poir.	L	Leaves used as vegetable	Murthy et al. (2003)
670	*Sesuvium portulacastrum* L.	L	Leaves used as vegetable	Murthy et al. (2003)
671	*Setaria italica* (L.) P. Beauv.	S	Used as food grains	Naidu and Khasim (2010); Singh (2013)
672	*Setaria verticillata* (L.) P. Beauv.	S	Used as food grains	Singh (2013)
673	*Shorea robusta* Gaertn.	S, Fr.	Raw fruit and seed are used as vegetable	Murthy et al. (2003); Sinha and Lakra (2005); Panda (2014)
674	*Sida cordata* Burm.f	L	Leaves used as vegetable	Panda (2014)
675	*Smilax zeylanica* L.	R, Fr., S	Roots cooked with other vegetable. Ripe fruits edible. Young seedlings used as vegetable	Misra et al. (2013); Misra and Misra (2014); Murthy et al. (2003)
676	*Solanum americanum* Mill.	L	Cooked with redgram and eaten	Nagalakshmi (2014)
677	*Solanum anguivi* Lam.	Fr.	Fruits cooked and eaten	Murthy et al. (2003)
678	*Solanum erianthum* D. Don	Fr.	Unripe fruits used as vegetable	Murthy et al. (2003)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
679	*Solanum indicum* L.	Fr.	Unripe fruits used as vegetable	Murthy et al. (2003)
680	*Solanum melongena* L.	Fr.	Used as vegetable	Singh (2013)
681	*Solanum melongena* L. var. *incanum* (L.) Kuntze	Fr.	Used as vegetable	Sadasivaiah (2009)
682	*Solanum melongena* L. var. *insanum* (L.) Prain	Fr.	Unripe fruits as vegetable	Sadasivaiah (2009)
683	*Solanum nigrum* L.	Fr., L	Ripe fruits eaten raw; leaves used as vegetable; unripe fruits as vegetable	Murthy et al. (2003); Reddy et al. (2007); Basha et al. (2009); Deepa et al. (2014); Ramakrishna et al. (2014)
684	*Solanum pubescens* Willd.	Fr.	Unripe fruits used as vegetable and ripe fruits eaten directly	Murthy et al. (2003); Basha et al. (2009); Deepa et al. (2014)
685	*Solanum surattense* Burm. f.	Fr.	Used as vegetable and cooked as curries	Murthy et al. (2003)
686	*Solanum torvum* Sw.	Fr., L, St	Leaves and young shoots are cooked with salt and chilly and eaten. Green fruits salted, dried, roasted in oil and eaten	Murthy et al. (2003); Misra and Misra (2013); Rekka and Senthil Kumar (2014); Nayak and Basak (2015)
687	*Solanum trilobatum* L.	L, T, Fr.	Underground fleshy tubers and fruits sliced, boiled, cooked as curry then consumed as vegetable. Leaves also used as vegetable	Deepa et al. (2014)
688	*Solanum tuberosum* L.	T	Underground fleshy tubers sliced, boiled, cooked as curry then consumed as vegetable.	Misra and Misra (2014)
689	*Solanum viarum* Dunal	Fr.	Fruit used as vegetable.	Panda (2014)
690	*Solanum virginianum* L.	Fr.	Fruits used as vegetable	Reddy et al. (2007); Mukesh Kumar et al. (2013)
691	*Solena amplexicaulis* (Lam.) Gandhi	T, L, Fr.	Tubers eaten raw or burnt; cooked as curry with other vegetables. Leaves are roasted and taken as food	Murthy et al. (2003); Sinha and Lakra (2005); Hebber et al. (2010); Misra et al. (2013); Misra and Misra (2013, 2014)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
692	*Sorghum bicolor* (L.) Moench.	S	Used as food grains	Naidu and Khasim (2010); Singh (2013, 2014)
693	*Sorghum halepense* Pers.	S	Seeds used to prepare flour, which is mixed with flour of sorghum	Rajasab and Isaq (2004)
694	*Soymida febrifuga* A. Juss.	Fr.	Fruits edible	Dhore et al. (2012)
695	*Spermacoce articularis* L.f.	L	Leaves used as vegetable	Murthy et al. (2003)
696	*Spermacoce hispida* L.	L	Young leaves are fried, then eaten	Murthy et al. (2003); Misra and Misra (2013)
697	*Sphenoclea zeylanica* Gaertn.	St	Younger shoots used as vegetable	Murthy et al. (2003)
698	*Sphaeranthus indicus* L.	L, St, S	Seedlings, leaves and tender shoots used as vegetable	Murthy et al. (2003); Misra and Misra (2013);
699	*Spinacea oleracea* L.	L	Used as vegetable	Murthy et al. (2003)
700	*Spondias pinnata* (L.f) Kurz.	Fr.	Ripe fruits are edible, made into pickle. Leaves used to prepare chutney.	Rao (2014)
701	*Stemona tuberosa* Lour.	T	Tubers eaten after cooking	Samydurai et al. (2012)
702	*Sterculia guttata* Roxb. ex DC.	S	Roasted and eaten	Hebber et al. (2010)
703	*Sterculia urens* Roxb.	G, S	Gum used in preparation of sweet. Seeds and gum consumed directly	Murthy et al. (2003)
704	*Sterculia villosa* Roxb.	S	Seeds roasted and eaten	Murthy et al. (2003)
705	*Streblus asper* Lour.	Fl, Fr.	Flowers are used as vegetable. Ripe fruit is edible.	Murthy et al. (2003); Sinha and Lakra (2005); Panda (2014); Nayak and Basak (2015)
706	*Streblus taxoides* (Roth) Kurz	Fr.	Ripe fruit is edible.	Nayak and Basak (2015);
707	*Strychnos potatorum* L.f.	Fr., S	Fruit pulp eaten raw	Reddy et al. (2007); Prabakaran et al. (2013); Murthy et al. (2003)
708	*Suaeda maritima* (L.) Dunn.	L	Leaves used as vegetable	Murthy et al. (2003)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
709	*Suaeda monoica* Forsk. ex Gmel.	L	Leaves used as vegetable	Murthy et al. (2003)
710	*Suregada multiflora* (A. Juss.) Baill.	Fr.	Fruits edible	Sinha and Lakra (2005)
711	*Synedrella nodiflora* Gaertn.	L	Leaves eaten raw	Murthy et al. (2003)
712	*Syzygium alternifolium* (Wight) Walp.	Fr.	Ripe fruits edible	Murthy et al. (2003); Basha et al. (2009); Singh (2013)
713	*Syzygium aromaticum* (L.) Merr. & Perry	Flb	Used as spice	Singh (2013)
714	*Syzygium cumini* (L.) Skeels	Fr.	Ripe fruits edible	Murthy et al. (2003); KN. Reddy et al. (2007); Basha et al. (2009); Prabakaran et al. (2013); Singh (2013); Deepa et al. (2014)
715	*Syzygium jambos* (L.) Alston	Fr.	Ripe fruits edible	Singh (2013)
716	*Syzygium nervosum* A. Cunn ex DC.	Fr.	Ripe fruits edible	Murthy et al. (2003); Sinha and Lakra (2005)
717	*Syzygium salicifolium* (Wight) J. Graham	Fr.	Ripe fruits edible	Murthy et al. (2003)
718	*Syzygium samarangense* (Bl.) Merr. & Perry.	Fr.	Ripe fruits edible	Murthy et al. (2003)
719	*Tacca leontopetaloides* (L.) O. Kuntze	T	Tubers consumed as vegetable	Reddy et al. (2007)
720	*Tali minor* (Gaertn.) Almeida	Fr.	Aril is edible	Hebber et al. (2010)
721	*Talinum portulacifolium* (Forsk.) Asch.& Schweinf	L	Leaves used as vegetable	Murthy et al. (2003)
722	*Tamarindus indica* L.	L, Fl., Fr., S	Tender leaves and flowers, tender fruits used as vegetable. Ripe fruits yield tamarind which is used in most of the curries. Seeds roasted and soaked in water for two days and eaten; green fruits are used in pickles	Murthy et al. (2003); Basha et al. (2009); Prabakaran et al. (2013); Misra and Misra (2013); Deepa et al. (2014)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
723	*Tamilnadia uliginosa* (Retz.) Tirveng.	Fr.	Fruits used in preparation of curry. Unripe fruits roasted and eaten.	Murthy et al. (2003); Reddy et al. (2007); Hebber et al. (2010)
724	*Tarenna asiatica* (L.) Kunize ex Schumann	Fr.	Tender unripe fruits edible	Murthy et al. (2003); Prabakaran et al. (2013); Deepa et al. (2014)
725	*Tephrosia purpurea* (L.) Pers.	L	Leaves used as vegetable	Misra and Misra (2013)
726	*Teramnus labialis* (L. f.) Spreng	S, L	Eaten as raw and Vegetable	Murthy et al. (2003)
727	*Terminalia alata* Heyne ex Roth	Gum	Gum is edible	Sinha and Lakra (2005)
728	*Terminalia bellirica* (Gaertn.) Roxb.	Fr., S	Fruits edible; Seeds and kernal eaten raw	Murthy et al. (2003); Prabakaran et al. (2013); Deepa et al. (2014); Sanyasi Rao et al. (2014)
729	*Terminalia catappa* L.	S	Seeds eaten raw	Rao (2014)
730	*Terminalia chebula* Retz.	S, Fr.	Seeds and kernal eaten as raw. Pickle is made from fruits	Deepa et al. (2014)
731	*Terminalia citrina* Roxb. ex Fleming	Fr.	Fruits edible	Nayak and Basak (2015)
732	*Tetrastigma lanceolarium* Planch.	L, Fr.	Leaves and fruits used as raw	Murthy et al. (2003)
733	*Theobroma cacao* L.	Fr.	Ripe fruits edible	Prabakaran et al. (2013)
734	*Theriophonum indicum* (Dalz.) Engler	T	Tubers are edible	Sinha and Lakra (2005)
735	*Tinospora cordifolia* (Willd.) Hook.f. & Thoms.	L	Leaves used as vegetable	Reddy et al. (2007)
736	*Toddalia asiática* (L.) Lam.	L, Fr.	Leaves used as vegetable. Ripe fruits are edible	Murthy et al. (2003);Reddy et al. (2007); Misra and Misra (2013); Deepa et al. (2014); Nayak and Basak (2015)
737	*Toona ciliata* Roem.	L	Tender leaves used as vegetable	Murthy et al. (2003)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
738	*Trachyspermum ammi* (L.) Sprague	S	Used as spice	Rao (2014)
739	*Trema orientalis* (L.) Bl.	Fr.	Fruits consumed directlly	Murthy et al. (2003)
740	*Trianthema decandra* L.	L	Used as vegetable – Leaves used in preparation of Dall	Murthy et al. (2003); Sinha and Lakra (2005); Reddy et al. (2007)
741	*Trianthema portucastrum* L.	L, St	Leaves and young shoots used as vegetable	Murthy et al. (2003); Reddy et al. (2007); Misra and Misra (2013); Deepa et al. (2014)
742	*Tribulus terrestris* L.	L, Ts	Leaves and tender shoots are boiled and squeezed, add groundnut powder and eat with boiled rice	Reddy et al. (2007); Deepa et al. (2014); Rajasab and Isaq (2004)
743	*Trichodesma indicum* (L.) R. Br. ex Lehm.	L	Leaves used as vegetable	Murthy et al. (2003); Misra and Misra (2013)
744	*Trichosanthes anguina* L.	Fr.	Used as vegetable	Rao (2014)
745	*Trichosanthes cucumerina* L.	Fr.	Fruits used as vegetable	Prakash Kumar et al. (2014)
746	*Tridax procumbens* (L.) L.	L, St	Leaves and tender shoots used as vegetable	Misra and Misra (2013, 2014)
747	*Trigonella foenum-graecum* L.	L, S	Leaves used as leafy vegetable and seeds as condiment	Misra and Misra (2013)
748	*Triticum aestivum* L.	S	Used as food grains	Singh (2013, 2014)
749	*Triticum dicoccum* Schubl.	S	Used as food grains	Singh (2013)
750	*Typha angustata* Bory & Chaub.	R, St, In	Flour extracted from roots is used with Sorghum powder. Young male spike is a delicious vegetable. Young shoots eaten raw or boiled	Rajasab and Isaq (2004)
751	*Vallisneria spiralis* L.	L	Young leaves used as vegetable	Murthy et al. (2003)
752	*Vanda tessellata* (Roxb.) Hook. ex G.Don	AR	Burnt and consumed by children as snacks	Misra et al. (2013)
753	*Vernonia cinerea* (L.) Less.	L	Leaves eaten raw	Murthy et al. (2003)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
754	*Vicoa indica* (L.) DC.	L	Leaves used vegetable	Murthy et al. (2003)
755	*Vigna aconitifolia* (Jacq.) Marechal	S	Seeds used as pulse	Naidu and Khasim (2010)
756	*Vigna mungo* (L.) Hepper	S	Seeds used as pulse	Naidu and Khasim (2010)
757	*Vigna radiata* (L.) Wilczek	S, L, St	Seeds used as pulse; leaves and young shoots are cut into small pieces cooked with salt and chilly and eaten	Naidu and Khasim (2010); Misra and Misra (2013); Singh (2013)
758	*Vigna radiata* (L.) Wilczek var. *subolata* (Roxb.) Verdc.	Fr., S	Fruits as vegetable and seeds as pulse	Singh (2013)
759	*Vigna trilobata* (L.) Verdc.	Fr., S	Fruits as vegetable and seeds as pulse	Murthy et al. (2003)
760	*Vigna unguiculata* (L.) Walp.	Fr., S	Fruits as vegetable and seeds as pulse	Naidu and Khasim (2010)
761	*Vitex glabrata* R.Br.	Fr.	Fruits edible	Sinha and Lakra (2005)
762	*Vitex leucoxylon* L.f.	Fr.	Fruits edible	Murthy et al. (2003)
763	*Vitis heyneana* Roem.et Schult.	T	Boiled, cooked and consumed	Misra et al. (2013);
764	*Vitis vinifera* L.	Fr.	Ripe fruits edible	Singh (2013, 2014);
765	*Wattakaka volubilis* (L.f.) Stapf	L	Used as vegetable	Murthy et al. (2003); Deepa et al. (2014); Panda (2014)
766	*Withania somnifera* (L.) Dunal	Fr.	Fruits eaten raw	Murthy et al. (2003)
767	*Woodfordia fruticosa* (L.) Kurz.	St	Tender shoots as vegetable	Murthy et al. (2003)
768	*Wrightia arborea* (Dennest.) Mabb.	Fr.	Tender fruits are edible	Murthy et al. (2003)
769	*Xanthium strumarium* L.	St	Young shoots are used as vegetable	Murthy et al. (2003)
770	*Xantolis tomentosa* (Roxb.) Raf.	Fr.	Fruits used as vegetable	Murthy et al. (2003)
771	*Ximenia americana* L.	Fr.	Ripe fruits are edible	Reddy et al. (2007); Sanyasi Rao et al. (2014); Murthy et al. (2003)

TABLE 6.1 *(Continued)*

S. No.	Name of the plant	Edible Part (s)	Mode of preparation	References
772	*Xylia xylocarpa* (Roxb.) Taub.	S	Seeds used as vegetable	Sinha and Lakra (2005); Murthy et al. (2003)
773	*Xyris pauciflora* Willd.	B	Bulbs eaten raw	Murthy et al. (2003)
774	*Zanthoxylum rhetsa* (Roxb.) DC	L	Used as vegetable	Murthy et al. (2003)
775	*Zea mays* L.	S	Used as food grains	Singh (2013)
776	*Zingiber officinale* Rosc.	Rh	Used as spice; Rhizome used in preparation of masala Tea	Singh (2013); Deshpande and Kulakarni (2013)
777	*Zingiber purpureum* Rosc.	Rh	Sliced rhizome or dry powder is put in to curry to enhance flavour	Misra et al. (2013)
778	*Ziziphus glabrata* Roth	Fr.	Unripe and ripe fruits edible	Rekka and Senthil Kumar (2014)
779	*Ziziphus mauritiana* Lam.	Fr., S	Unripe and ripe fruits edible	Murthy et al. (2003); Sinha and Lakra (2005); Reddy et al. (2007); Basha et al. (2009); Prabakaran et al. (2013); Singh (2013); Deepa et al. (2014); Rekka and Senthil Kumar (2014)
780	*Ziziphus mauritiana* Lam. var. *fruticosa* (Haines) Seb. & Henry	Fr.	Unripe and ripe fruits edible, seeds edible	Reddy et al. (2007); Basha et al. (2009); Prabakaran et al. (2013); Singh (2013); Rekka and Senthil Kumar (2014); Deepa et al. (2014)
781	*Ziziphus nummularia* Wight & Arn.	Fr.	Unripe and ripe fruits edible	Rajasab and Isaq (2004)
782	*Ziziphus oenoplea* (L.) Mill.	Fr.	Unripe and ripe fruits are edible	Murthy et al. (2003); Reddy et al. (2007); Basha et al. (2009); Prabakaran et al. (2013); Deepa et al. (2014); Rekka and Senthil Kumar (2014)
783	*Ziziphus rotundifolia* Lam.	Fr.	Ripe fruits edible	Panda (2014)
784	*Ziziphus rugosa* Lam.	Fr.	Unripe and ripe fruits edible	Murthy et al. (2003); Nayak and Basak (2015)
785	*Ziziphus xylopyrus* (Retz.) Willd.	Fr., S	Unripe and ripe fruits edible	Murthy et al. (2003)

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KEYWORDS

- **Edible Plants**
- **Ethnic Food Plants**
- **Ethnic Food Preparation**
- **Fruits**
- **Vegetables**

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CHAPTER 7

ETHNOMEDICINAL PLANTS OF EASTERN GHATS AND ADJACENT DECCAN REGION

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CONTENTS

ABSTRACT

Ethnomedicinal plants of Eastern Ghats and adjacent Deccan region of India was surveyed with available literature in Google search engine and various published sources. The study revealed that about 54 different ethnic tribal communities used 782 ethnomedicinal plants for their primary health care. These plants are belonging to 132 families and 384 genera. Leguminosae is a largest ethnomedicinal plant yielding family and it is contributing about 67 species of medicinal plants. The plant families like Apocynaceae, Orchidaceae, Solanaceae and Rubiaceae contribute more than 20 species are of local medicinal values. The predominant ethnomedicinal plant genera of Eastern Ghats are *Cassia* and *Solanum* (12 spp.), *Acacia* and *Euphorbia* (11 spp. each), *Ficus* (8 spp.), *Curcuma* (7), *Andrographis* (6), *Bauhinia*, *Habenaria* and *Terminalia* (5 spp. each). The habit-wise distribution of ethnomedicinal plants of Eastern Ghats showed herbs (41%), trees (24%), shrubs (22%) and climbers (13%). Some 75 plant species are endemic to this region. These plants played vital role in health care and local livelihood among the native communities of Eastern Ghats and some these plants are also contributing in codified Indian medicinal systems like Siddha, Ayurvedha and Unani. The present study aimed to compile the tribal medicinal plant wealth of Eastern Ghats for further promotion of utility, screening for clinical potential and enhancing conservation measures.

7.1 INTRODUCTION

The Eastern Ghats are discontinuous mountain ranges along the east coast of Indian Peninsula running parallel to the Bay of Bengal about 1750 km from Odisha through Andhra Pradesh to Tamilnadu and also passing in some parts of Karnataka. Some perennial rivers originated from Western Ghats and cut through Eastern Ghats ranges especially Mahanadhi, Godavari, Krishna and Cauveri, finally they flow into Bay of Bengal. The rocks of Eastern Ghats are considered Gondwana origin and made up of charnokites, granites gneiss, khondalites, metamorphic gneiss and quartzite. Several hill ranges and hillocks of Eastern Ghats locally divided into three parts viz, northern Eastern Ghats (mostly in Odisha and northern Andhra Pradesh), middle Eastern Ghats (Andhra Pradesh) and southern Eastern Ghats (Tamilnadu). The vegetation of Eastern Ghats characteristically comprised with deciduous and scrub forests interspersed with grassy open canopies.

The Eastern Ghats and adjacent Deccan region is inhabited by about 54 tribal communities, which constitute about 30% of tribal population of India. They depend mostly on various forest resources available locally for their livelihood. In Odisha, major part of the northern Eastern Ghats, many numbers of tribal communities namely Bathudi, Bhottoda, Bhumia, Bhumiji, Dharua, Gadaba, Gond, Khanda, Kandha, Gouda, Kolha, Koya, Munda, Paroja, Omanatya, Santal and Saora (Nayak and Sahoo, 2002) are found. Among them many native communities belong to primitive scheduled tribes like Birhor, Bonda, Didayi, Dogaria Kondh, Hill Kharia, Juang, Kutia Kondh, Lanjia Saora, Mankirdia, Paudi Bhuyan and Saora. The hill tribes of Andhra Pradesh in Eastern Ghats area are Chechus, Gadabas, Savaras, Konda Reddis, Koyas, Khonds, Kolamis, Nayakpods, Valmikis, Bhagatas, Jatayus, Yanadis and Yerukalas and they constitute 6.3% of total population of Andhra Pradesh (Verma, 1998). The typical aboriginal tribes are Yanadis, Chenchus, Koyas and Savaras still live with indigenous habit in Eastern Ghats (Solomon Raju and Jonathan, 2006). Tamilnadu part of Eastern Ghats is inhabited by tribal communities which include Malayalis in Chitteri hills, Kolli hills, Shervarayan hills, Kalrayan hills, Javadhu hills and Jinji hills (Xavier et al., 2011). Paliyans, a small group of scheduled tribe lives in Sirumalai hills of southernmost tip of Eastern Ghats (Karuppusamy and Pullaiah, 2006) (for more details see Chapter 2 of this volume).

During the last few decades, there has been an increasing interest in the study of medicinal plants and their traditional use in different tribal communities of India. According to World Health Organization (WHO) as many as 80% of the world's population depend on traditional medicines and in India about 65% of the population in rural areas uses traditional medicines for their primary health care. Ethnobotany deals with the relationship between human societies and plants. It has been recognized recently as a multidisciplinary science comprising of many interesting and useful aspects of plant science, chemistry, environment, anthropology, history, culture, pharmacology and literature. It gives varied economic uses of plants among the primitive human societies, which are equally beneficial to modern man. The results of the ethnobotanical researches brought out numerous little known and unknown uses of plants (Jain, 1981).

The botanical study of folk drugs in recent years has led to the discovery of large number of new medicinal compounds having potent therapeutic activities. During the last few decades, a succession of so called "wonder drugs", such as reserpine, ajmalicine, quinine, ephedrine, conine, cocaine, emetine, colchicine, digoxin, berberine and artimisine have been

discovered from plants with rich ethnobotanical role in primitive human societies. Currently about 720 active principles isolated from higher plants are utilized in allopathy system after being validated by ethnopharmacology. About 70% of the plant derived allopathy drugs find the same therapeutic applications in original traditional medicine. Unfortunately, traditional knowledge of primitive human societies has only oral or verbal traditions without any written documents. Due to the fast changing life style by urbanization, modernization and intrusion of modern civilization among tribal communities, the traditional knowledge on useful plants acquired and accumulated through generation is gradually getting lost. Hence, documentation of traditional knowledge of wild plants has become imperative lest the vital clues they hold for the quality life of modern man would be lost forever.

7.2 METHODS

In recent years, many of the methods used by ethnobiologists have been compiled into filed manuals, most notably the series titled "People and Plants Conservation Manuals" developed by the World Wildlife Fund, UNESCO and Kew Royal Botanical Gardens as part of the People and Plants Initiative (Cunningham, 2000). Prior to mid-1950s, researcher in ethnobotany was primarily descriptive. A large amount of data was collected regarding traditional names and uses of plants and animals for a number of sociolinguistic groups (for more details see Chapter 3 of this volume). Within ethnobotany, researchers were increasingly becoming concerned with understanding emic perceptions of people and plants. A detailed account of this fascinating history is provided by D'Andrade (1995). Ethnobotanists have been at the forefront of participatory methods, developing innovative strategies for training indigenous collaborators and conservation of local biological resources. Modern studies in ethnobotany are distinguishable from earlier studies of useful plants, in that modern ethnobotanical studies tend to include more information about the ethnic cultural groups that use the plants medicinally or other purposes. It includes formation about cultural beliefs surrounding illness, treatment and healing methods; human ecological relationships and the role of medicinal plants in larger societies; rituals, ceremonies and other uses of medicinal plants; the role of traditional healers, shamans or other ritual specialists who has medicinal plants to treat patients.

Usual data collection of ethnobotanical information and practice within any culture vary by geographical origin, residence, ethnicity, religion, age and gender. After an exhaustive search on ethnobotanical and ethnographical works available online (Google search engine; www.google.com) and various published literature, we compiled the plant list and their ethnomedicinal uses relevant to the Eastern Ghats ranges and Deccan region. It also includes about 782 ethnomedicinal plant species enumerated from about 150 published literature of various sources. All the information in this work therefore refers to wild plants used in medicinal purposes at least during last 50–100 years.

7.3 DIVERSITY OF ETHNOMEDICINAL PLANTS IN EASTERN GHATS AND ADJACENT DECCAN REGION

India has a rich tradition of plant-based knowledge on healthcare since time immemorial. A large number of plants, plant products, decoctions, pastes are equally used by tribals and folklore traditions in India for treatment of several ailments. The present review thus attempt to analyze the ethnomedicinal knowledge base for treatment of all kinds of ailments, methods employed by tribal and folklore practices previously in Eastern Ghats of Peninsular India. Out of 7,500 species of medicinal plants estimated in India, about 1,800 species are known to occur in Eastern Ghats region. At least 800 medicinal and 40 aromatic plants are concentrated in this area which are used in various medicinal systems including codified and folklore. From the present review and a case study enumerated about 782 plants species includes 50 Pteridophytes and two Gymnosperm species (Table 7.1).

These 782 ethnomedicinal plants species belonging to 132 families and 384 genera were recorded from various sources and published literature. Leguminosae (67 spp.), Apocynaceae (29 spp.), Malvaceae (26 spp.), Euphorbiaceae (25 spp.), Orchidaceae (22 spp.), Solanaceae and Rubiaceae (16 spp. each), Asteraceae (15 spp.), Acanthaceae, Asteraceae and Lamiaceae (14 spp. each), Cucurbitaceae and Zingiberaceae (13 spp. each), Rutaceae (12 spp.) and Araceae (10 spp.) were the dominant families of ethnomedicinal plants. *Cassia* and *Solanum* (12 spp.), *Acacia* and *Euphorbia* (11 spp. each), *Ficus* (8 spp.), *Curcuma* (7), *Andrographis* (6), *Bauhinia*, *Habenaria* and *Terminalia* (5 spp. each), *Albizia* and *Dioscorea* (4 spp. each) were the dominant medicinal plant genera (Table 7.1).

TABLE 7.1 Ethnomedicinal Plants of Eastern Ghats and Deccan

S. No.	Name of plant Species	Useful Parts	Medicinal uses against	References
1.	*Abelmoschus esculentus*	Leaves	Dysentery	Padal et al. (2013a)
2.	*Abelmoschus moschatus*	Seed	Fever	Padal et al. (2013b)
3.	*Abrus precatorius*	Leaves, seeds, root	Leucorrhoea, bronchitis, cold, cough, fever, eczema, urinary disorders, hepatitis, snake bite, swelling, skin diseases, menstrual pains, for abortion, contraceptive, poisonous bite	Raja Reddy et al. (1989); Vijayakumar and Pullaiah (1998); Rao and Pullaiah (2001); Chaudhari and Hutke (2002); Pullaiah et al. (2003); Sen and Behera (2003); Basha et al. (2011); Murthy (2012); Lingaiah and Rao (2013); Padal et al. (2013b); Sahu et al. (2013c); Vaidyanathan et al. (2013); Kannan and Kumar (2014); Manikandan and Lakshmanan (2014); Satyavathi et al. (2014); Ramakrishna and Saidulu (2014b); Shanmukha Rao et al. (2014)
4.	*Abrus pulchellus*	Whole plant	Aphrodisiac	Rekha and Senthilkumar (2014)
5.	*Abutilon crispum*	Leaves	Dysentery, jaundice and piles	Manikandan and Lakshmanan (2014)
6.	*Abutilon hirtum*	Leaves	Bronchitis	Reddy et al. (2006)
7.	*Abutilon indicum*	Leaves, root	Jaundice, dental problems, skin problems, epileptic fits, menstrual disorders, scorpion sting, diabetes	Panda (2007); Xavier et al. (2011); Venkata Subbiah and Savithramma (2012); Sahu et al. (2013c); Ramakrishna and Saidulu (2014); Prasanthi et al. (2014); Satyavathi et al. (2014)
8.	*Acacia auriculiformis*	Flowers	Joint pains, rheumatism	Kumar and Pullaiah (1999)
9.	*Acacia caesia*	Stem, bark, leaves	Respiratory troubles, cough, skin diseases, to heal wounds	Raja Reddy et al. (1989); Vijayakumar and Pullaiah (1998); Xavier et al. (2011); Murthy (2012); Venkata Subbiah and Savithramma (2012)
10.	*Acacia concinna*	Pods	Purgative, relieves biliousness	Murthy (2012)
11.	*Acacia farnesiana*	Stem, bark	Diarrhea dysentery, cough, dog bite	Pullaiah et al. (2003); Murthy (2012); Padal et al. (2013b)
12.	*Acacia leucophloea*	Root, stem bark	Abortifacient, arthritis, wounds	Prusti (2007); Padal et al. (2013b); Satyavathi et al. (2014)

TABLE 7.1 *(Continued)*

S. No.	Name of plant Species	Useful Parts	Medicinal uses against	References
13.	*Acacia mangia*	Stem bark	Paralysis	Padal et al. (2013b)
14.	*Acacia nilotica (A.arabica auct non)*	Tender leaves, stem bark, flowers	Leucorrhoea, syphilitic ulcers, dysentery, diarrhea, scabies; snake bite, diabetes	Raja Reddy et al. (1989); Sen and Behera (2003); Parthipan et al. (2011); Xavier et al. (2011); Murthy (2012); Padal et al. (2013b); Satyavathi et al. (2014); Prasanthi et al. (2014)
15.	*Acacia pennata*	Leaves, stem	Asthma, febrifuge	Reddy et al. (2006); Murthy (2012); Senthilkumar et al. (2013); Vaidyanathan et al. (2013)
16.	*Acacia polyacantha*	Root bark	Abortifacient	Prusti (2007)
17.	*Acacia rugata*	Fruit	Leucoderma	Padal et al. (2013a) Padal and Sandhyasri (2013)
18.	*Acacia sinuata*	Fruits	Dandruff	Parthipan et al. (2011)
19.	*Acalypha indica*	Leaves, whole plant	Insanity, skin diseases; get rid of intestinal worms, general tonic, STDs, jaundice	Sen and Behera (2003); Venkataratnam and Raju (2004); Jeevan Ram et al. (2007); Parthipan et al. (2011); Xavier et al. (2011); Murthy (2012); Savithramma et al. (2012); Lingaiah and Rao (2013); Padal et al. (2013b); Shanmukha Rao et al. (2014)
20.	*Acampe carinata*	Leaves	Ear problems	Padal et al. (2013c)
21.	*Acampe praemorsa*	Leaves	Skin disease	Padal et al. (2013c)
22.	*Acanthospermum hispidum*	Leaves	Cuts and wounds	Padal et al. (2013b)
23.	*Achyranthes aspera*	Roots, whole plant, leaves	Diuresis, ringworm, eczema, asthma, delivery, snake bite, scorpion sting, tooth ache, cuts and wounds, jaundice, for bone setting,	Raja Reddy et al. (1989); Sen and Behera (2003); Reddy et al. (2006); Prusti (2007); Parthipan et al. (2011); Murthy (2012); Lingaiah and Rao (2013); Padal et al. (2013b); Kannan and Kumar (2014); Ramakrishna and Saidulu (2014); Koteswara Rao et al. (2014)
24.	*Achyranthes bidentata*	Leaves	Cholera, testis pain and swellings	Dhatchanamoorthy et al. (2013)
25.	*Acorus calamus*	Rhizome	Fever, cough	Padal et al. (2013a, b)
26.	*Acrocephalus indicus*	Root	Leucorrhoea	Venkataratnam and Raju (2004, 2005)

TABLE 7.1 *(Continued)*

S. No.	Name of plant Species	Useful Parts	Medicinal uses against	References
27.	*Actiniopteris radiata*	Root	Snake bite, To promote fertility	Vijayakumar and Pullaiah (1998); Padal et al. (2013) b
28.	*Adansonia digitata*	Leaves	Dysentery	Padal et al. (2013b)
29.	*Adhatoda vasica (*Syn.: *A. zeylanica)*	Leaves	Tuberculosis, cough	Raja Reddy et al. (1989); Murthy (2012); Padal et al. (2013) b
30.	*Adiantum lunulatum*	Rhizome	Snake bite	Prusti (2007)
31.	*Adiantum philippense*	Leaves, root	Eczema, cough	Padal and Sandhyasri (2013); Padal et al. (2013b)
32.	*Adiantum raddianum*	Leaves	Stomach problems	Karuppusamy et al. (2009)
33.	*Aegle marmelos*	Fruit, leaves, bark	Piles, dysentery, asthma, jaundice, diabetes, diarrhea, cuts and wounds, scabies, pimples, itches, skin rashes	Vijayakumar and Pullaiah (1998); Girach (2001); Pullaiah et al. (2003); Reddy et al. (2003); Sen and Behera (2003); Venkataratnam and Raju (2004); C.S. Reddy et al. (2006); Murthy (2012); Padal et al. (2013a, b); Vaidyanathan et al. (2013); Satyavathi et al. (2014); Koteswara Rao et al. (2014); Shanmukha Rao et al. (2014)
34.	*Aerva lanata*	Whole plant, flowers, leaves, root	Kidney stones, urinary disorders, stomach problems, fever, diabetes, snake bite	Goud and Pullaiah (1996); Rao and Pullaiah (2001); Prusti (2007); Parthipan et al. (2011); Senthilkumar et al. (2013); Kannan and Kumar (2014); Prasanthi et al. (2014); Shanmukha Rao et al. (2014)
35.	*Aganosma cymosa*	Root	Cobra bite	Raja Reddy et al. (1989)
36.	*Agave americana*	Leaves	Rheumatism	Rekha and Senthilkumar (2014)
37.	*Agave cantula*	Leaf	Leucoderma	Padal et al. (2013a)
38.	*Agave sisalana*	Leaf	Ear drop for ear ache	Xavier et al. (2011)
39.	*Ageratum conyzoides*	Leaves	Skin infections, itching; cuts and wounds	Sen and Behera (2003); Padal et al. (2013a, b); Anandakumar et al. (2014); Koteswara Rao et al. (2014)
40.	*Ageratum racemosus*	Root	Snake bite	Kannan and Kumar (2014);

TABLE 7.1 *(Continued)*

S. No.	Name of plant Species	Useful Parts	Medicinal uses against	References
41.	*Ailanthes excelsa*	Stem bark, root, leaves	Skin infections; leucorrhoea and menorrhoea, snake bite, abscess, cough, swellings	Jeevan Ram and Raju (2001); Reddy et al. (2003); Venkata Subbiah and Savithramma (2012); Padal et al. (2013a, b); Lingaiah and Rao (2013); Ramakrishna and Saidulu (2014a, b)
42.	*Ajuga macrosperma*	Stem	Bodyache	Girach (2001)
43.	*Alangium hexapetalum*	Stem bark, leaves	Improve sexual potency	Rekha and Senthilkumar (2014)
44.	*Alangium salvifolium*	Root, leaves, seeds, stem bark, cotyledons	Snake bites, rabies, bone fracture, fever, paralysis, skin diseases, diarrhea, menorrhoea, diabetes, to remove poison, aphrodisiac	Goud and Pullaiah (1996); Vijayakumar and Pullaiah (1998); Jeevan Ram and Raju (2001); Jeevan Ram et al. (2007); Prusti (2007); Karuppusamy et al. (2009); Xavier et al. (2011); Murthy (2012); Padal et al. (2013)
45.	*Albizia amara*	Stem bark. Leaves, roots	Wound, Inflammation, snake bite, scorpion sting, skin diseases	Vijayakumar and Pullaiah (1998); Reddy et al. (2003); Senthilkumar et al. (2013); Vaidyanathan et al. (2013)
46.	*Albizia chinensis*	Leaves, roots	Cuts and wounds	Kumar and Pullaiah (1999);
47.	*Albizia lebbeck*	Stem bark, leaves	Neck pains, diarrhea tooth ache, snake bite, scorpion sting, eye injury, stomachache	Raja Reddy et al. (1989); Pullaiah et al. (2003); Jeevan Ram et al. (2007); Prusti (2007); Vaidyanathan et al. (2013); Manikandan and Lakshmanan (2014); Ramakrishna and Saidulu (2014)
48.	*Albizia odoratissima*	Stem bark	Skin diseases, cough, diabetes	Reddy et al. (2006); Murthy (2012)
49.	*Albizia thompsonii*	Leaves, bark, stem	Ulcers, skin diseases	C.S. Reddy et al. (2006); Vaidyanathan et al. (2013)
50.	*Allium cepa*	Bulb	Stomach problems	Pullaiah et al. (2003); Xavier et al. (2011)
51.	*Allium sativum*	Bulb	Wound healing, swelling, snake bite	Sen and Behera (2003); Karuppusamy et al. (2009); Kannan and Kumar (2014); Ramakrishna and Saidulu (2014b); Koteswara Rao et al. (2014)

TABLE 7.1 *(Continued)*

S. No.	Name of plant Species	Useful Parts	Medicinal uses against	References
52.	*Aloe barbadensis*	Stem	Skin allergy, leucorrhoea	Lingaiah and Rao (2013)
53.	*Aloe vera* (Syn.: *Aloe barbadensis*)	Leaves	Conjunctivitis, antifertility, skin diseases; cuts and wounds	Raja Reddy et al. (1989); Karuppusamy et al. (2009); Murthy (2012); Koteswara Rao et al. (2014)
54.	*Alpinia calcarata*	Rhizome	Stomach problems	Karuppusamy et al. (2009)
55.	*Alpinia galanga*	Rhizome	Indigestion, rheumatism	Xavier et al. (2011); Padal et al. (2013b)
56.	*Alseodaphne semecarpifolia*	Stem bark	Poisonous bites	Karuppusamy et al. (2009)
57.	*Alstonia scholaris*	Stem bark, whole plant	Lice, fever, rheumatism	Reddy et al. (2011); Sahu et al. (2013c)
58.	*Alstonia venenata*	Stem bark	Snake bite	Karuppusamy et al. (2009)
59.	*Alternanthera pungens*	Leaves	Kidney stones	Parthipan et al. (2011)
60.	*Alternanthera sessilis*	Leaves, root	For lactation, leucorrhoea	Raja Reddy et al. (1989); Lingaiah and Rao (2013)
61.	*Alysicarpus vaginalis*	Leaves	Cough	Reddy et al. (2006)
62.	*Ammania baccifera*	Leafy shoots	Poisonous bites	Parthipan et al. (2011)
63.	*Ammi majus*	Leaves	Dysentery	Padal et al. (2013b)
64.	*Amorphophallus campanulatus*	Corm	Piles, abdominal pain, asthma and tumors	Ramanathan et al. (2014)
65.	*Amorphophallus peonifolius*	Corm	Piles, asthma and bronchitis	Ramanathan et al. (2014)
66.	*Amorphophallus sylvaticus*	Corm	Piles	Anandakumar et al. (2014)
67.	*Ampelocissus latifolia*	Leaves, root	Dental troubles, dysentery	Murthy (2012)
68.	*Ampelocissus tomentosa*	Root tuber, bark	Aphrodisiac, fever, check bleeding	Vijayakumar and Pullaiah (1998); Prusti (2007)
69.	*Andrographis echioides*	Whole plant	Liver diseases	Sabjan et al. (2014)

TABLE 7.1 *(Continued)*

S. No.	Name of plant Species	Useful Parts	Medicinal uses against	References
70.	*Andrographis elongata*	Whole plant	Snake bite, scorpion sting, diabetes, jaundice and constipation	Alagesaboopathi (2012)
71.	*Andrographis lineata*	Leaves	Snake bite	Xavier et al. (2011)
72.	*Andrographis nallamalayana*	Root	Leucorrhea	Venkataratnam and Raju (2004, 2005)
73.	*Andrographis ovata*	Leaves	Scabies	Girach (2001)
74.	*Andrographis paniculata*	Leaves, whole plant, roots	Snake bite, cold, cough, diabetes, fevers, malaria, scabies, warts, snake bite	Raja Reddy et al. (1989); Vijayakumar and Pullaiah (1998); Girach (2001); Jeevan Ram and Raju (2001); Xavier et al. (2011); Murthy (2012); Sahu et al. (2013c); Kannan and Kumar (2014); Shanmukha Rao et al. (2014)
75.	*Andrographis serpyllifolia*	Leaves	Epiepsy,	Raja Reddy et al. (1989)
76.	*Angiopteris evecta*	Leaves	Diarrhea	Panda et al. (2012)
77.	*Anisochilus carnosus*	Leaves, shoots	Sores, bronchitis	Raja Reddy et al. (1989); C.S. Reddy et al. (2006)
78.	*Anisomeles malabarica*	Leaves	Fever, wound healing	Jeevan Ram and Raju (2001); Parthipan et al. (2011); Xavier et al. (2011)
79.	*Annona squamosa*	Seed paste, root, bark leaf	To kill lice, dysentery, inflammation, carbuncle, scorpion sting	Rao and Pullaiah (2001); Pullaiah et al. (2003); Sen and Behera (2003); Parthipan et al. (2011); Vaidyanathan et al. (2013)
80.	*Anogeissus latifolia*	Stem bark, gum, leaves	Scabies, asthma, stomachache, cancer, wounds, skin infections, cough	Jeevan Ram and Raju (2001); P.R. Reddy et al. (2003); Venkataratnam and Raju (2004); C.S. Reddy et al. (2006); Murthy (2012); Vaidyanathan et al. (2013)
81.	*Ardisia solanacea*	Stem bark	Toothache, cough, skin diseases	Girach (2001); Reddy et al. (2006); Karuppusamy et al. (2009)
82.	*Areca catechu*	Seeds	Chronic wounds	Karuppusamy et al. (2009)
83.	*Argemone mexicana*	Shoot, seeds, leaf, root, latex	Skin allergies, leucorrhea; eczema, leucoderma, syphilis, scorpion sting	Goud and Pullaiah (1996); Pullaiah et al. (2003); Sarangi and Sahu (2004); Venkata Ratnam and Raju (2005); Basha et al. (2011); Kumar et al. (2012); Vaidyanathan et al. (2013)

TABLE 7.1 *(Continued)*

S. No.	Name of plant Species	Useful Parts	Medicinal uses against	References
84.	*Argyreia cymosa*	Root, leaves	Micturition, Wound healing	Girach (2001); Karuppusamy et al. (2009)
85.	*Argyreia kleiniana*	Leaves	Tonsillitis	Vijayakumar and Pullaiah (1998);
86.	*Argyreia nervosa*	Stem, root	Syphilis, rheumatism, filaria, wound healing, paralysis	Sarangi and Sahu (2004); Panda (2007); Padal et al. (2013b); Sahu et al. (2013c)
87.	*Arisaema tortuosum*	Tuber	Kidney problems; curing headache	Padal et al. (2013c); Satyavathi et al. (2014)
88.	*Aristida funiculata*	Whole plant	Dantruff	Padal et al. (2013c)
89.	*Aristolochia bracteolata*	Leaves, while plant, root	Poisonous bites, nackache, colic, wounds, menstrual pains, dysmenorrhoea, chest pain, diabetes, abortifacient	Raja Reddy et al. (1989); Kumar and Pullaiah (1999); Rao and Pullaiah (2001); Sarangi and Sahu (2004); Xavier et al. (2011); Murthy (2012)
90.	*Aristolochia indica*	Roots, leaves	Snake bite, diarrhea, rash, cholera, leucorrhea; skin infection, abortifacient, impetigo, rash	Goud and Pullaiah (1996); Kumar and Pullaiah (1999); Jeevan Ram and Raju (2001); Pullaiah et al. (2003); Venkata Ratnam and Raju (2005); Jeevan Ram et al. (2007); Venkata Subbiah and Savithramma (2012); Murthy (2012); Lingaiah and Rao (2013); Kannan and Kumar (2014)
91.	*Artabotrys odoratissimus*	Leaves	To treat antifertility	Ranganathan et al. (2012)
92.	*Artemisia nilagirica*	Leaves	Respiratory disorder	Karuppusamy et al. (2009)
93.	*Artocarpus heterophyllus*	Root, latex	Skin diseases, ulcer and asthma, delayed delivery	Prusti (2007); Manikandan and Lakshmanan (2014)
94.	*Artocarpus hirsutus*	Fruits	Stomach problems	Karuppusamy et al. (2007)
95.	*Artocarpus integrifolia*	Stem bark	Head ache by a nasal drops	Das and Misra (1988)
96.	*Asclepias curassavica*	Latex	Inflammation	Senthilkumar et al. (2013)

TABLE 7.1 *(Continued)*

S. No.	Name of plant Species	Useful Parts	Medicinal uses against	References
97.	*Asparagus racemosus*	Root tubers	Diuresis, sun stroke, somach-ache, urinay problems, migraine, dyspepsia, itching, aphrodisiac, galactogogue, nervine tonic, for fertility, lactation	Raja Reddy et al. (1989); Panda (2007); Prusti (2007); Girach (2001); Rao and Pullaiah (2001); Chaudhari and Hutke (2002); Sarangi and Sahu (2004); Murthy (2012); Manikandan and Lakshmanan (2014); Shanmukha Rao et al. (2014)
98.	*Aspidoptrys cordata*	Root	Cough	Vijayakumar and Pullaiah (1998)
99.	*Asplenium aethiopicum*	Leaves	Venereal diseases	Karuppusamy et al. (2009)
100.	*Atalantia monophylla*	Leaves, fruits, stem bark, root	Allergic and skin diseases, cough, phlegm, rheumatism, post natal complaints	Jeevan Ram and Raju (2001); Jeevan Ram et al. (2007); Murthy (2012); Ranganathan et al. (2012); Vaidyanathan et al. (2013)
101.	*Azadirachta indica*	Leaves, root bark	small pox, scabies, itching, dysentery, menorrhea, snake bite, stomach pain	Raja Reddy et al. (1989); Pullaiah et al. (2003); Venkata Ratnam and Raju (2005); Lingaiah and Rao (2013); Vaidyanathan et al. (2013); Kannan and Kumar (2014)
102.	*Bacopa monnieri*	Leaves	Dysentery	Rao and Pullaiah (2001)
103.	*Balanites roxburghii*	Roots	Asthma, leprosy, eye infection, hernia, tonic, to avoid conception	Satyavathi et al. (2014); Dinesh and Balaji (2015)
104.	*Bambusa arundinacea*	Stem, tender shoots, scrapings of stem	Pimples, cuts and wounds, abortive, indigestion	Raja Reddy et al. (1989); Vijayakumar and Pullaiah (1998); P.R. Reddy et al. (2003); Anandakumar et al. (2014); Senthilkumar et al. (2013); Sahu et al. (2013)
105.	*Barleria cristata*	Leaves	Asthma	Reddy et al. (2006)
106.	*Barleria longiflora*	Roots	Dropsy, cystitis	Jeevan Ram et al. (2007);
107.	*Barleria prionitis*	Leaves, fruits	Earache, asthma, toothache, cold, fever, whooping cough, for fertility	Raja Reddy et al. (1989); Sarangi and Sahu (2004); Padal and Sandhyasri (2013); Sahu et al. (2013c); Satyavathi et al. (2014)
108.	*Barleria strigosa*	Root	Blood purifier	Prusti (2007)
109.	*Barringtonia acutangula*	Stem bark	Eczema, body pain	Jeevan Ram and Raju (2001); Reddy et al. (2007)

TABLE 7.1 *(Continued)*

S. No.	Name of plant Species	Useful Parts	Medicinal uses against	References
110.	*Basella rubra*	Leaves	Dyspepsia, piles	Padal et al. (2013a, b)
111.	*Bauhinia purpurea*	Seeds, bark	Lice, dysentery, leucorrhoea	Sahu et al. (2013); Padal et al. (2013b) Satyavathi et al. (2014)
112.	*Bauhinia racemosa*	Stem bark, leaves, fruits	Menorrhea, spermatorrhoea, diorrhoea, dysentery, malaria, to kill intestinal worms	Vijayakumar and Pullaiah (1998); Pullaiah et al. (2003); Venkata Ratnam and Raju (2004, 2005); Murthy (2012)
113.	*Bauhinia tomentosa*	Flowers	Diarrhoea, dysentery	Ranganathan et al. (2012)
114.	*Bauhinia vahlii*	Seeds, stem bark, leaves	Ulcers on tongue, blood dysentery, arthritis	Raja Reddy et al. (1989); Pullaiah et al. (2003); Panda et al. (2012); Murthy (2012); Padal et al. (2013a, b); Satyavathi et al. (2014)
115.	*Bauhinia variegata*	Leaves, stem bark, flowers	Stomach disorders, diarrhea, dysentery, asthma	Panda (2007); Pullaiah et al. (2003); Reddy et al. (2006)
116.	*Begonia malabarica*	Leaves	Wound healing	Senthilkumar et al. (2013)
117.	*Benincasa hispida*	Stem, fruit	Skin diseases, reduce stomach ache and ulcer pain	Sen and Behera (2003); Padal et al. (2013a, b)
118.	*Benkara malabarica* (Syn.: *Xeromphis malabarica)*	Root	Snake bite	Raja Reddy et al. (1989)
119.	*Beta vulgaris*	Tuber	Extract is given blood purifier	Ramanathan et al. (2014)
120.	*Benkara malabarica*	Stem bark	Asthma	Reddy et al. (2006)
121.	*Bidens pilosa*	Leaves	Whitlow	Padal et al. (2013b)
122.	*Biophytum candolleanum*	Leaves	Scorpion sting	Vaidyanathan et al. (2013)
123.	*Biophytum sensitivum*	Plant, root	Eczema, gonorrhea, poisonous bite	Vaidyanathan et al. (2013); Rekka and Senthil Kumar (2014); Ramakrishna and Saidulu (2014b)
124.	*Bixa orellana*	Roots, seeds, leaves	Fever, sprain, jaundice	Chaudhari and Hutke (2002); Padal et al. (2013b); Satyavathi et al. (2014)

TABLE 7.1 *(Continued)*

S. No.	Name of plant Species	Useful Parts	Medicinal uses against	References
125.	*Blepharis maderaspatensis*	Whole plant	Poisonous bites, jaundice and malaria	Prabu and Kumuthakalavalli (2012)
126.	*Blepharis repens*	Leaves	Syphilis, dysentery	Vijayakumar and Pullaiah (1998); Jeevan Ram et al. (2007)
127.	*Blepharispermum subsessile*	Roots	Leucorrhoea, rheumatism	Venkata Ratnam and Raju (2004); Prusti (2007)
128.	*Blumea eriantha*	Root	Rabies	Goud and Pullaiah (1996)
129.	*Boerhavia chinensis*	Root	For strength and vigor	Goud and Pullaiah (1996)
130.	*Boerhavia diffusa*	Root	Anti-emetic, pimples, jaundice, skin diseases, jaundice	Raja Reddy et al. (1989); Sen and Behera (2003); Padma Rao et al. (2007); Xavier et al. (2011); Padal et al. (2013b); Shanmukha Rao et al. (2014)
131.	*Bombax ceiba*	Root, fruits, stem bark	Menorrhagia, pimples, urinary problems, leucorrhoea, spermatorrhoea, diarrhea, diabetes, fertility	Raja Reddy et al. (1989); Sen and Behera (2003); Sarangi and Sahu (2004); Murthy (2012); Padal et al. (2013a, b)
132.	*Borassus flabellifer*	Ramentum, stem sap	Cuts, skin diseases and ulcer	Raja Reddy et al. (1989); Manikandan and Lakshmanan (2014)
133.	*Borreria articularis*	Root	Delayed delivery	Prusti (2007)
134.	*Borreria hispida*	Stems, seeds	Gingivitis	Raja Reddy et al. (1989)
135.	*Borreria verticillata*	Root	Leucorrhea	Manikandan and Lakshmanan (2014)
136.	*Boswellia ovalifoliolata*	Resin	Scorpion sting	C.S. Reddy et al. (2006)
137.	*Boswellia serrata*	Resin, stem bark, leaves	Skin eruptions, fever, dysentery, diarrhea, skin allergies, scorpion sting, cuts and wounds	Jeevan Ram and Raju (2001); Rao and Pullaiah (2001); Pullaiah et al. (2003); Padal et al. (2013b); Vaidyanathan et al. (2013); Ramakrishna and Saidulu (2014); Koteswara Rao et al. (2014)
138.	*Boucerosia umbellata* (Syn: *Caralluma umbellata)*	Stem	Diabetes	Anandakumar et al. (2014)

TABLE 7.1 *(Continued)*

S. No.	Name of plant Species	Useful Parts	Medicinal uses against	References
139.	*Bougainvillea spectabilis*	Leaves	Diabetes	Prasanthi et al. (2014)
140.	*Brassica juncea*	Seeds, leaves	Diarrhoea, snake bite, ear wound	Padal et al. (2013b); Vaidyanathan et al. (2013); Kannan and Kumar (2014)
141.	*Brassica nigra*	Seed oil	Rheumatoid arthritis	Padal et al. (2013a)
142.	*Breynia retusa*	Root	Nervous trouble	Padal et al. (2013d)
143.	*Breynia rhamnoides*	Root bark	For eye problem	Das and Misra (1988)
144.	*Bridelia crenulata*	Stem bark	Cuts, wounds	Prabakaran et al. (2013)
145.	*Bridelia montana*	Stem bark	Skin diseases, jaundice	Padal and Sandhyasri (2013); Padal et al. (2013b)
146.	*Bridelia retusa*	Stem bark	Asthma, chest pain	Reddy et al. (2006); Satyavathi et al. (2014)
147.	*Bryophyllum calycinum*	Leaves	Dysentery	Panda et al. (2012)
148.	*Bryophyllum pinnatum*	Leaf	Abdominal pain	Prusti (2007)
149.	*Buchanania axillaris*	Stem bark	Bone fracture	Rekka and Senthil Kumar (2014)
150.	*Buchanania cochinchinensis*	Stem bark	Diarrhea	Satyavathi et al. (2014)
151.	*Buchanania lanzan*	Leaves, gum, stem bark	Heart pain, diarrhea, indigestion	Vijayakumar and Pullaiah (1998); Girach (2001); Jeevan Ram and Raju (2001); Murthy (2012); Panda et al. (2012)
152.	*Buddleja asiatica*	Leaves	Wound healing	Karuppusamy et al. (2009)
153.	*Bulbophyllum neilgherrense*	Pseudo-bulb	Aphrodisiac	Karuppusamy et al. (2009)
154.	*Bupleurum mucronatum*	Seeds	Indigestion	Karuppusamy (2007)
155.	*Butea monosperma*	Resin, seeds, leaves, stem bark	Jaundice, cough, ringworm, as contraceptive, pain, wounds, itches. Leucorrhoea,	Vijayakumar and Pullaiah (1998); Jeevan Ram and Raju (2001); Venkata Ratnam and Raju (2004); Sarangi and Sahu (2004); Reddy et al. (2006); Padma Rao et al. (2007); Lingaiah and Rao (2013); Padal et al. (2013a, b); Manikandan and Lakshmanan (2014)

TABLE 7.1 *(Continued)*

S. No.	Name of plant Species	Useful Parts	Medicinal uses against	References
156.	*Butea superba*	Root, shoots, seeds	Diarrhea, arthritis, piles, anthelmintic	Murthy (2012); Panda et al. (2012); Satyavathi et al. (2014)
157.	*Byttneria herbacea*	Rhizome, whole plant	Ulcers, nervous disorders	Sen and Behera (2003); Savithramma et al. (2012)
158.	*Cadaba fruticosa*	Leaves, fruit	Leucoderma, eczema, itching, bone fracture	Jeevan Ram and Raju (2001); Pullaiah et al. (2003); Padal et al. (2013b); Vaidyanathan et al. (2013)
159.	*Caesalpinia bonduc*	Leaves, seeds	Hydrocele, asthma, boils	Raja Reddy et al. (1989); Vijayakumar and Pullaiah (1998); Sen and Behera (2003); Reddy et al. (2006); Jeevan Ram et al. (2007)
160.	*Caesalpinia pulcherrima*	Flower	Fever	Padal et al. (2013b)
161.	*Cajanus cajan*	Leaves	Toothache	Raja Reddy et al. (1989)
162.	*Cajanus scarabaeoides*	Whole plant	Skin itching	Pullaiah et al. (2003)
163.	*Caladium bicolor*	Tuber	Snake bite	Padal et al. (2013a, b)
164.	*Calamus rotang*	Seeds, leaf	Cold and cough	Manikandan and Lakshmanan (2014); Satyavathi et al. (2014)
165.	*Calophyllum inophyllum*	Seeds	Scabies	Manikandan and Lakshmanan (2014)
166.	*Calotropis gigantea*	Leaves, roots, flower, latex	Earche, rheumatism, tonsilites, snake bite, cramps, pain, arthritis, to induce abortion, purulous skin affections, syphilitic ulcers	Raja Reddy et al. (1989); Vijayakumar and Pullaiah (1998); P.R. Reddy et al. (2003); Sen and Behera (2003); Parthipan et al. (2011); Lingaiah and Rao (2013); Kannan and Kumar (2014)
167.	*Calotropis procera*	Root, Latex, shoots	Scorpion sting, mumps, skin diseases, migraine	Raja Reddy et al. (1989); Venkata Ratnam and Raju (2004); Jeevan Ram et al. (2007); Senthilkumar et al. (2013)
168.	*Calycopteris floribunda*	Leaves, Stem bark	Wound healing	P.R. Reddy et al. (2003); Padal et al. (2013b)
169.	*Canarium strictum*	Bark	Rheumatic pains, skin diseases	Vaidyanathan et al. (2013)
170.	*Canavalia gladiata*	Leaves, root	Antifertility, anthelmintic, liver enlargement	Venkataratnam and Raju (2004); Rao and Pullaiah (2001); Sabjan et al. (2014)

TABLE 7.1 *(Continued)*

S. No.	Name of plant Species	Useful Parts	Medicinal uses against	References
171.	*Canavalia virosa*	Flower	Asthma	Vaidyanathan et al. (2013)
172.	*Canna edulis*	Tuber	Throat pain	Padal et al. (2013b)
173.	*Canna indica*	Roots, tuber	Cuts and wounds, ringworm	Padal et al. (2013b); Koteswara Rao et al. (2014)
174.	*Cannabis sativa*	Leaves	Diarrhoea, cuts and wounds	Padal et al. (2013b); Koteswara Rao et al. (2014)
175.	*Canscora decussata*	Whole plant	Mouth ulcers	Rao and Pullaiah (2001)
176.	*Canthium dicoccum*	Leaves	Stomach pain	Anandakumar et al. (2014)
177.	*Canthium parviflorum*	Leaves, root	Fever, boils, anthelmintic, ringworm	Goud and Pullaiah (1996); P.R. Reddy et al. (2003); Venkata Subbiah and Savithramma (2012)
178.	*Capparis divaricata*	Root, stem bark	Asthma, bronchitis, jaundice; chest pain	Goud and Pullaiah (1996); Anandakumar et al. (2014); Rekka and Senthil Kumar (2014)
179.	*Capparis grandis*	Leaves	Skin eruptions, diarrhea, dysentery	Jeevan Ram and Raju (2001); Pullaiah et al. (2003)
180.	*Capparis sepiaria*	Root, leaves, root bark	Cooling, skin problems, post delivery pains, lactation	Raja Reddy et al. (1989); Vijayakumar and Pullaiah (1998); Jeevan Ram et al. (2007); Padal et al. (2013b)
181.	*Capparis zeylanica*	Leaves, stem bark, root bark, root, fruits	Piles, haematuria, jaundice, syphilis, urinary calculi, earache, furits, improves immunity	Raja Reddy et al. (1989); Girach (2001); Sarangi and Sahu (2004); Jeevan Ram et al. (2007); Murthy (2012); Satyavathi et al. (2014)
182.	*Capsicum annuum*	Ripe fruits	Cuts	P.R. Reddy et al. (2003)
183.	*Caralluma adscendens*	Stem	Abdominal pains, cough	Goud and Pullaiah (1996); Reddy et al. (2006)
184.	*Caralluma attenuata*	Stem	Bone fracture	Dhatchanamoorthy et al. (2013)
185.	*Cardiospermum halicacabum*	Leaves	Ear ache, for treating fits	Raja Reddy et al. (1989); Xavier et al. (2011); Vaidyanathan et al. (2013)
186.	*Cardiospermum luridum*	Leaves, whole plant	Laxative, diuretic, dandruff, dysentery	Ranganathan et al. (2012)

TABLE 7.1 *(Continued)*

S. No.	Name of plant Species	Useful Parts	Medicinal uses against	References
187.	*Careya arborea*	Stem bark, leaves	Cough, skin diseases	Pullaiah et al. (2003); Reddy et al. (2006); Murthy (2012)
188.	*Carica papaya*	Leaves, young fruits, fruit, latex	Jaundice, indigestion, cuts and wounds, galactogogue, used for abortion;	Raja Reddy et al. (1989); Kumar and Pullaiah (1999); Sen and Behera (2003); Parthipan et al. (2011); Padal et al. (2013b); Koteswara Rao et al. (2014)
189.	*Carmona retusa*	Leaves	Wounds	Jeevan Ram et al. (2007);
190.	*Caryota urens*	Seed, toddy	Dandruff, urinary problems	Prusti (2007); Murthy (2012); Satyavathi et al. (2014)
191.	*Cascabela thevetia*	Latex, leaves	Muscle pains, ringworm and scabies, skin diseases, boils	Rao and Pullaiah (2001); P.R. Reddy et al. (2003); Sen and Behera (2003); Padal et al. (2013b)
192.	*Casearia elliptica*	Stem bark	To heal wounds	Murthy (2012); Koteswara Rao et al. (2014)
193.	*Cassia absus*	Leaves	Stomachache, itches, fever, conjunctivitis	Raja Reddy et al. (1989); Jeevan Ram and Raju (2001), Jeevan Ram et al. (2007); Padal et al. (2013b)
194.	*Cassia alata*	Leaves	Bronchitis, eczema, snake bite	Padal et al. (2013a, b); Vaidyanathan et al. (2013)
195.	*Cassia auriculata*	Leaves, flowers, flower buds, seeds	Snake bite, scorpion sting, menorrhoea, leucorrhoea, diabetes, dysentery	Raja Reddy et al. (1989); Venkataratnam and Raju (2004, 2005); Padal et al. (2013b); Vaidyanathan et al. (2013); Ramakrishna and Saidulu (2014b); Prasanthi et al. (2014)
196.	*Cassia fistula*	Fruit, leaves, bark, shoots, seeds, flowers	Intestinal worms, cataract, labor pain, wounds, burns, mad dog bite, indigestion, menstrual disorders, skin diseases, tonic, jaundice, dog bite, diarrhea, heart pain, leprosy, fever	Vijayakumar and Pullaiah (1998); Jeevan Ram and Raju (2001); P.R. Reddy et al. (2003); Venkataratnam and Raju (2004); Panda (2007); Parthipan et al. (2011); Murthy (2012); Kumar et al. (2012); Padal et al. (2013a, b); Vaidyanathan et al. (2013); Sahu et al. (2013c)
197.	*Cassia italica* (Syn.: *C. obtusa)*	Leaves	Constipation, jaundice	Raja Reddy et al. (1989); Jeevan Ram et al. (2007);
198.	*Cassia montana*	Stem bark	Leucorrhea	Venkata Ratnam and Raju (2005)