e ISSN–2321–7987 | ●●● Article ●●● |Visit us : *www.researchjournal.co.in*|

Ambarella tree: Considering potentiality needs more focus in Indian agriculture

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The ambarella (as English name) is also known as the hog plum or golden apple is one of the newer fruits on the ever expanding list of exotics which is quickly gaining popularity. Despite being tropical, the ambarella has proven to be quite hardy and is very fast to become established in the sub-tropics and fruit begins to appear after only three years. Ambarella is perennial, deciduous, semi-evergreen plant, can grow in tropical, sub-tropical or mediterranean climate. Ambarella is a fruit of south and south-east Asia. From there, it spread to other tropical parts of the western countries. The green as well as ripe fruits of ambarella are used in a variety of ways.

Origin of the ambarella: Ambarella originates in Melanesia and Polynesia of the South Pacific. When the fruit came to the Caribbean islands, it became well adapted due to the similar climates as its homeland. Today, the fruit grows abundantly in the soils of Sri Lanka and southern India. Other countries growing ambarella include Vietnam, Laos, Cambodia, Zanzibar, and Gabon. Though it's not a major crop, the fruit grows prolifically in Central America and the northern parts of South America. Ambarellas are hobby crops in certain regions of Australia. Among Caribbean islanders, the recognition ambarellas receive is on par with papaya and mango.

Cultivated areas of ambarella in India : Ambarella requires humid tropical and subtropical climates, with the exception of a few types capable of growing at cooler, higher elevations. One example of the latter is the Himalayan ambarella, which grows in the eastern Himalayan regions of India and Nepal. Like other varieties, the Himalayan ambarella also has fibrous flesh and a stringy seed. Tropical ambarella cultivars thrive in the southern states of India, including Tamil Nadu, Kerala, Karnataka, Maharashtra, and Goa. India doesn't cultivate many ambarellas, though a few markets in South India carry them when in season. Despite the country's suitable growing conditions, ambarellas are not popular here like they are in Sri Lanka and the Caribbean. Most Indian farmers have ambarellas as shade trees for other crops, and not for their fruit.

Description : The semi-evergreen, perennial tree is rapid growing, attaining a height of 60 ft (18m) in its homeland; generally not more than 30 or 40 ft (9-12m) in other areas. Ambarella has deciduous, pinnate leaves, 20–60 cm (8–24 in) in length, composed of 9 to 25 glossy, elliptic or obovate-oblong leaflets 9–10 cm (3.5–3.9 in) long, which are finely toothed toward the apex. The tree produces small, inconspicuous white flowers in terminal panicles. Its oval fruits, 6–9 cm (2.4–3.5 in) long, are borne in bunches of 12 or more on a long stalk. Over several weeks, the fruit fall to the ground while still green and hard, then turn golden-yellow as they ripen.

Scientific classification:

Kingdom-Plantae
(Unranked)- Angiosperms
(Unranked)- Eudicots
(Unranked)- Rosids
Order- Sapindales
Family- Anacardiaceae
Sub-family- Sapondioideae
Genus- Spondias
Species-dulcis
Botanical name- *Spondias dulcis*

Related species : Related species of *Spondias dulcis* are the followings (1)*Spondias pinnata,* (2)*Spondias mombin,* (3) *Spondias testudinis, (4) Spondias cytherea,* (5) *Spondias haplophylla,* (6) *Spondias indica,* (7) *Spondias lakonensis,* (8) *Spondias purpurea, (9) Spondias tuberosa,* (10) *Spondias venulosa*. The *Spondias* genus has 10 varieties of edible fruits; ambarella being one of them.

Vernacular names : (1) Telegu-Adavi Mamidi, (2) Tamil-Amra Kai, (3) Konkani-Ambado, (4) Caribbean Hindustani-Amrah, (5) Bengali-Amra, (6) Kannada-Amte Kai, (7) Malay-Buah Amra, (8) Cameroon-Cas Mango, (9) Barbados-Golden Apple, (10) Belize-Golden Plum, (11) Jamaica- June Plum, (12) Indonesian-Kedondong, (13) Assamese-Omora

Various uses of ambarella:

– It is most commonly used for its fruit. The fruit

may be eaten raw; the flesh is crunchy and a little sour.

– The fruit is made into preserves and flavorings for sauces, soups, and stews.

– Used for making delicious jelly, pickles and other relishes.

– The fruits yield a delicious juice, which can be made into drinks and sherbets or mixed with other tropical fruit juices to enhance flavour, aroma and taste.

– A versatile tree, the young ambarella leaves can be consumed raw.

– Fruits are also consumed by herbivorous mammals such as deer etc.

– It yields a delicious juice for cold beverages.

– Young ambarella leaves are appealingly acid and consumed raw in south-east Asia.

– Young leaves are sometimes cooked with meat to tenderize it.

– The wood is light-brown and buoyant and in the Society islands has been used for canoes (a boat made of the hollowed trunk of the tree).

– The wood is also used for floats, matches etc.

– Unripe fruit is much used in green salads and curries.

– Young steamed leaves are eaten as a vegetable.

– The fruit is also fed to pigs.

Various recipes : Several countries utilize ambarellas in local dishes, few are cited here:

– Srilanka: (a) Make pickled chutney from raw ambarella, (b) eating raw ambarellas with a bit of chilli powder and salt (c) prepare curry by cutting the ambarella in halves.

– Malaysia : Have a penchant for eating ambarella wedges with fish sauce.

– Vietnam : Soak ambarellas in liquid and then artificially sweeten them.

– Jamaica : They juice the fruit and add ginger and sugar.

– India : In south India, curry recipe entails simmering the fruit in coconut milk with other vegetables.

– Trinidad: - Make classic ambarella chutney.

– Fiji : It is made into jam.

– Cambodia : Made into a salad.

– Suriname : Fruit is dried and made into a spicy chutney, mixed with garlic and pippers

– Indonasia : Have a penchant for eating ambarella wedges with fish sauce.

Nutritional value of Ambarella:-According to the Sri Lanka Agriculture Department, the edible portion of an ambarella contains the following nutritional value per 100g:46 kcal, 0.2g protein (negligible), 0.1g fat (negligible), 12.4 g carb, 56 mg calcium: 5.7 per cent RDI, 67 mg phosphorus: 6.7 per cent RDI, 0.3 mg of iron: 1.6 per cent RDI, 205 µg carotene (Vitamin A): 4.1 per cent RDI, 0.05 µg Thiamine (B1): 1 per cent RDI, .02 µg of Riboflavin (B2): negligible and 36 mg Vitamin C: 60 per cent RDI(Recommended Daily Intake).

Food value per 100 g of edible portion (According to analyses made in the Philippines and Hawaii): (Calories-157.30), (Total Solids- 14.53-40-35%), (Moisture-59.65-85.47%), (Protein-0.50-0.80%), (Fat-0.28-1.79%), (Sugar as sucrose-8.05-10-54%), (Acid -0.47%), (Crude Fibre-0.85-3-60%) and (Ash-0.44-0.65%).

Growing conditions : Like the mango, the tree thrives in humid tropical and subtropical areas growing upto 2 metres in a single growing season. It grows on all types of soil, as long as they are well drained. It has been noted that some trees can suffer from some nutritional disorders if the soil is too alkaline. Trees are cold sensitive when small and should be protected from serious frost and strong wind. Trees do best in full sun, but will produce some fruit in light shade. As a large and vigorous tree they prefer not be planted underneath other large trees and unlike some mango varieties they are not too fussed on salt spray.

Propagation : Usually by seeds which can fruit in 2-4 years. The tree is easily propagated by seeds, which germinate in about 4 weeks, or by large hardwood cuttings, or air-layers. It can be grafted on its own rootstock, but in India it is usually grafted on the native *S. pinnata.* Use non-petioled, slender, mature, but green and smooth budwood; cut large buds with ample wood-shield, 1.5-1.75 inch (4-4.5 cm) long; insert the buds in the stock at a point of approximately the same age and appearance as the scion.

Climate : The tree flourishes in humid tropical and subtropical areas, being only a trifle tenderer than its close relative, the mango. It succeeds up to an altitude of 2,300 ft (700 m). In Israel, the tree does not thrive, remaining

small and bearing only a few, inferior fruits.

Soil : The ambarella grows on all types of soil, including oolitic limestone in Florida, as long as they are well-drained.

Culture : Seedlings may fruit when only 4 years old. Expert recommends that the young trees be given light shade. Mature trees are somewhat brittle and apt to be damaged by strong winds; therefore, sheltered locations are preferred.

Season : In Hawaii, the fruit ripens from November to April; in Tahiti, from May to July. In Florida, a single tree provides a steady supply for a family from fall to midwinter, at a time when mangos and many other popular fruits are out of season. The best time of planting in India is spring. This exciting fruit tree plant will amaze you with its ability to flower and fruit at a young age. It fruits in winter and holds the fruit upto 6-8 months, long after the leaves have dropped.

Pests and diseases : In Indonesia the leaves are severely attacked by the larvae of the kedongdong spring-beetle (*Podontia affinis).* In Costa Rica, the bark is eaten by a wasp, causing necrosis which leads to death. In Jamaica, the tree is subject to gummosis and is consequently short-lived. In Indian condition, aphid and fruit fly cause damage upto a certain extent.

Checking an ambarella for ripeness : Unripe ambarellas are hard and green with no hints of sweetness in its tough, fibrous flesh. Though some people enjoy eating sour, unripe fruits with a pinch of salt, others prefer to wait until they have become golden yellow. In this condition, ambarellas lose their acidic bite and become more palatable. The pit, however, hardens upon ripening. The best ambarella has a waxy, glossy skin with no signs of bruises. Slight discoloration is natural, as is the occasional small dark spot. The aroma should be pleasant, tropical, floral and slightly musky at peak ripeness.

Storage : If ambarellas need further ripening, keep them at room temperature; over the course of a week, the fruits will reach maturity. Ambarellas keep for an additional two weeks when placed in the refrigerator. Though the taste will not be adversely affected, expect the fruits to lose their golden luster during cool storage. Let ambarellas sit at room temperature for an hour before consuming: they will have a more robust flavor profile compared to cold fruits. Do not chill the fruits below 5C, as ambarellas are highly susceptible to chilling injury. When frozen, ambarellas show deep pits in their skin, and some develop fungal decay.

Taste of ambarella : Ambarellas possess a sour taste with a distinct crunch for a bite. The Encyclopedia of Fruits and Nuts euphemistically describes the taste as "crisp and juicy… sub acid with a pineapple fragrance and flavor."Similar to pickles, ambarella's thin, lime-green skin is edible. However, ambarellas are a much more high-maintenance snack because of their large pit and its floss-like threads. Given the pit's overbearing size, don't expect much flesh from this fruit. When ambarellas ripen to a golden yellow, the taste is similar to an unripe mango: crunchy, fibrous and mildly sweet.

Where to find ambarella in India : Ambarellas aren't a staple in Indian pantries, though it's a beloved souring agent in the cities along the Konkan coast. Instead, shoppers stumble upon the fruit while going for drives or when picking up tamarind paste—perhaps an ambarella is hanging in an unsuspecting garden with other ancient trees, or may be it's nestled behind a bold, colourful mango tree. When sellers pawn off this sour-tasting fruit, it will likely be sitting next to chow chow in a rickety shop. Or, it's languishing on a faded blue pushcart parked on dusty crossroad. If an ambarella junkie seeks the fruit's piquant, zesty juice, it's best to come after mango season in late summer-ambarella season shines in the fall and winter months. The best bet of finding ambarella is coming to Kerala or Karnataka and asking a well-established local for its whereabouts. Not only will she have a spicy ambarella curry recipe passed down to her by her great-grandmother, but she'll also know which neighbors grow a tree or two in their yard.

Health benefits of ambarella:

– *Preventing heart disease* : The presence of calcium in the fruit plays an important role in maintaining cardiovascular health. By regularly consuming the fruit, heart diseases will be overcome.

– *Eye health* : The presence of vitamin-A in the fruit plays an important role in the health of human visual perception.

– *Increase endurance* : Nutrients present in fruit sugar in form of sucrose is certainly very important as the vitality and endurance.

– *As an antioxidant* : Presence of vit. A and vit. C in fruit acts as antioxidant that can counteract free radicals from the body oxidation as well as pollution from outside.

– *Wound healing* : With the content of vit.A in fruit helps to maintain healthy tissues in our bodies.

– *Overcome anemia* : Iron content in 100 g of fruit is 30 mg can assist in the formation of red blood cells. In addition, presence of vit. B_1 can help the production of red blood cells and increases the flow of oxygen throughout the body and prevent anemia.

– *Prevent premature aging* : The content of vit. C in fruit can protect important molecules, such as carbohydrates, proteins, fats and nucleic acids (DNA and RNA) from damage caused by free radicals, toxins or pollutants. Free radicals are one of the causes of premature aging.

– *Controlling cholesterol levels* : Presence of vit. C in fruit helps metabolize cholesterol into bile acids, hence control cholesterol levels in body.

– *Recovery of body* : Presence of vit. C in fruit helps to keep the immune system and helps the athletes in their recovery process after a strenuous workout.

– *Maintaining healthy bones and teeth* : Presence of phosphorus in fruit helps to maintain healthy bones and teeth.

– Consumption of ambarella fruit checks diabetes, indigestion, urinary tract infections, hypertension and hemorrhoids.

– Leaves and bark treat dysentery, cracked tongue and thrush.

– Decoction of the leaves used as a wash for sore eyes.

– The roots are used as contraceptive.

– Ambarella fruit and leaves extract exhibit strong antimicrobial, antioxidant, cytotoxic and thrombolytic activity.

– The astringent bark is used as a remedy for diarrhea.

– Water content and fibre from fruits is helpful to prevent dehydration.

– Fruits contain acids and vit. C, it is able to reduce or eliminate cough.

– Leaves extraction and fruit juice help to treat sore throat.

– Bark extraction is good for stomach pain.

– Eating fruit brings down fever or cool down the body.

Conclusion : In 1950-51, the foodgrain production was 50.8 million tonnes and in 2015-16, the foodgrain production is 252.23 million tonnes. Apparently increased the production but still we have deficit in foodgrain production to make a balance (demand and supply) with increasing demand for ever-increasing population of our country. Our government system, private system and individual efforts through technological discoveries, inventions and modifications, are trying to bring expected change in agricultural scenario though we are still incapable to reach at ultimate destination. In this respect, green revolution really had brought a revolution in Indian agricultural history. But the emphasis was confined on few major cereal crops only. In contemporary time, to feed the millions of mouth, to give emphasis on cereal crops was appropriate. But in time respect, presently we need cereal crops, vegetable crops, fruit crops, pulse crops, oilseed crops and others for nutritional security. Provide nutritional security to every countryman in recent time really a challenge. Therefore presently we need better production in cereal crop for food security, simultaneously other crops for nutritional security. Introduction of green revolution to still date, heavy application of fertilizers, pesticides have gifted us two major challenges-soil deterioration and environmental pollution. On the other hand, irrigation water is driving force of agriculture though day by day we are lacking sufficient amount of irrigation water along with due to pressure of population, industrialization, making roads and other infrastructural development –per capita land holding is decreasing at increasing rate. Due to privatization, liberalization and globalization as well as WTO's expansion –there is another challenge to make agricultural products competitive through qualitative development. In this background, we must have a venture to find out new ways of agricultural development. Hence time has come to give importance on several less important crops of our country (*i.e.* ambarella, elephant apple, fig, ber etc.) and their value addition obviously one of strong ways of agricultural development and profit maximization. Ambarella is a less important crop in our country but has full potential for value addition. Availability of fruits for a long period is (on an average more than six months) surely a ray of hope for commercial gain. We Indians with our staple food use several curries and ambarella offers a surety for a curry for major part of the year as chutney or pickle or sour curry (with fish also). Ambarella is a potential crop for day to day uses as well as medicinal uses. Hence, it is the need of the hour to focus on this crop more particularly as well as other less important crops in general in our country's respect. Therefore extension agencies who are working at grass root levels must aware the farmers through proper extension teaching methods especially exposing on mass media and motivate them to change their mindset for cultivation of this crop. Every farmer is the unit of our country, if all the units become economically strong-our country will be economically strong and in that direction united efforts are needed to do that.

"By uniting we stand, by dividing we fall." –John Dickinson

Received : *15.09.2016* ***Revised :*** *16.10.2016* ***Accepted :*** *01.11.2016*