Ecological Distribution Of The Genus Crotalaria In Nigeria

Odewo, S.A., Ajani, B. A., Soyewo. L.T, Omiyale O. A.

Abstract: Geographical distribution and morphological features of the genus Crotalaria were studied. Methods follow conventional practice as reported by previous studies. Thirty six species of the genus Crotalaria were shown to be distributed in Nigeria. The genera were allopathic in nature. The species such as *C. bongensis, C. atrorubens , C. cleomifolia , C. anthyllopsis, C. cuspidata, C. bamendul, C. calycina, C. hyssopifolia, C. incana, C. graminicola* and *C. macrocalyx* were prominent in savannah zones while *C. acervata, C. cylindrical, C. cephalotes, C. comosa, C. retusa, C.doniana, C. glauca, C. falcata , C. goreensis* among others were common in cultivated areas in forest zone of Nigeria. Qualitative leaf morphological features of selected crotalaria species in Nigeria were also revealed. It shows that the leaf margin, leaf surface and leaf base are similar in features except in leaf shape that vary from lanceolate (*C. comosa and C. bongensis), oblanceolate (C. retusa, C. goreensis, C. ononoidea and C. lachnosema*) to obovate (*C. mucronata* and *C. naragutensis*). This implies that most of the genus *Crotalaria* displays similar characteristic and the features among them shows overlap.

Keywords: Morphology, Allopathic, Qualitative and Lanceolate

Introduction

The genus *Crotalaria* L. belongs to the family leguminosae, the third largest genus in the family. It consist of 600 species worldwide (Polphill, 1982), mostly found in the tropic and sub-tropic regions. Some species of *Crotolaria* are grown as ornamental, commonly known as rattle pod, rattle box, shake-shake or devil-bean. They are erect, herbaceous, variably hairy plant and may be annual or perennial. The leaves are simple or one to three foliate, alternate, lanceolate to obovate, with a finely hairy under surface. *Crotolaria* in general, is adapted to a tropical climate and only a restricted number of species occur in temperate region (Samba *et al*, 2002). It has a wide tolerance of edaphic conditions. The majority of the species have a high requirement, therefore they are absent from forests interior but are relatively common in clearing and forest margins (Polphil, 1982). These species are conserved through micro propagations which is advantageous over traditional plant breeding methods as it helps in the mass production of plant (Nuhul *et al.,* 1999).

Economic importance of Crotolaria Species

The world health organization (WHO, 1988) reported that many species of this genus are toxic with epidemic outbreak in some parts of the world .This occurred due to the accumulated pyrrolozidine alkaloids which occur at the flowering and seed formation stage (Nuhu *et al.,* 2009). Despite these, *Crotolaria* species play an important role in veterinary pharmacy and also as important etiological factors (preventive measures) in liver diseases (Nwude and Ibrahim, 1980: and Nuhu, 1999) . Nuhu *et al.*, (2009) reported the traditional uses of some *Crotolaria* species in Zaria, Nigeria , among which are *C. retusa* L ., *C. lachnosema* Stap f., *C. naragutensis* Hutch and many others for feeding of sheep and cattle. In Tanzania , *Crotalaria comosa* Bak . provides nitrogen to the crops , intercropped with and assist in the control of weeds and nematodes (Mukurasi , 1986); he also emphasised on the usefulness of the species in the management of soil fertility. Thomas (2003), reported that *Crotalaria recta* L. are used as food source by larvae of *Lepidoptera* species such as *Utetheisa ornatrix*; *Eteilla zinckenella* and *Endoclita sericeus*, also serve as their defence against predators. Cook and White (1996) revealed *C. retusa* L. seeds as source of fibres, silage and green manure when removed from pods by pounding. According to Akintayo, (1997) oils derived from *Crotalaria bongensis* Bak*, C. naragutensis* Hutch and *C. lachnophora* Desu. Seeds are not suitable for use as edible oil and soap production but many however, are useful for the production of paint and shampoos. *Crotalaria* is also used in the treatment of diabetics (Pullaiah and handrasekhar- Naidu, 2003), skin infection, snake bit and stomach ache prevention (Verdhana, 2008). Due to the medicinal importance and unrestricted large scale exploitation to meet increased demands by the pharmaceutical industries, coupled with limited cultivation and insufficient attempts for its reforestation, genus *Crotolaria* has been marked depleted and disappeared (Saurabh, et al, 2000). Therefore, this paper is focused on the ecological distribution and diversity of the genus across the country, Nigeria.

Materials and Methods

Plant materials

Collection of herbarium specimens of the genus *Crotalaria* were examined and studied in the Forest Herbarium Ibadan (FHI). The ecological data that were obtained includes; name of the specimen, town/locality of collection, collectors name/number and FHI number. The geographical records in different locations were used to draw up geographical distribution maps for the *Crotalaria* species in Nigeria. Qualitative micro morphological characters of some selected species such as leaf type, leaf shape, leaf apex type, leaf base and leaf surface were also assessed.

Results and discussion

- *Odewo, S.A., Ajani, B. A., Soyewo. L.T, Omiyale O. A.*
  Forestry Research Institute Of Nigeria P. M. B. 5054, Ibadan, Oyo State Nigeria, akinodewo@gmail.com

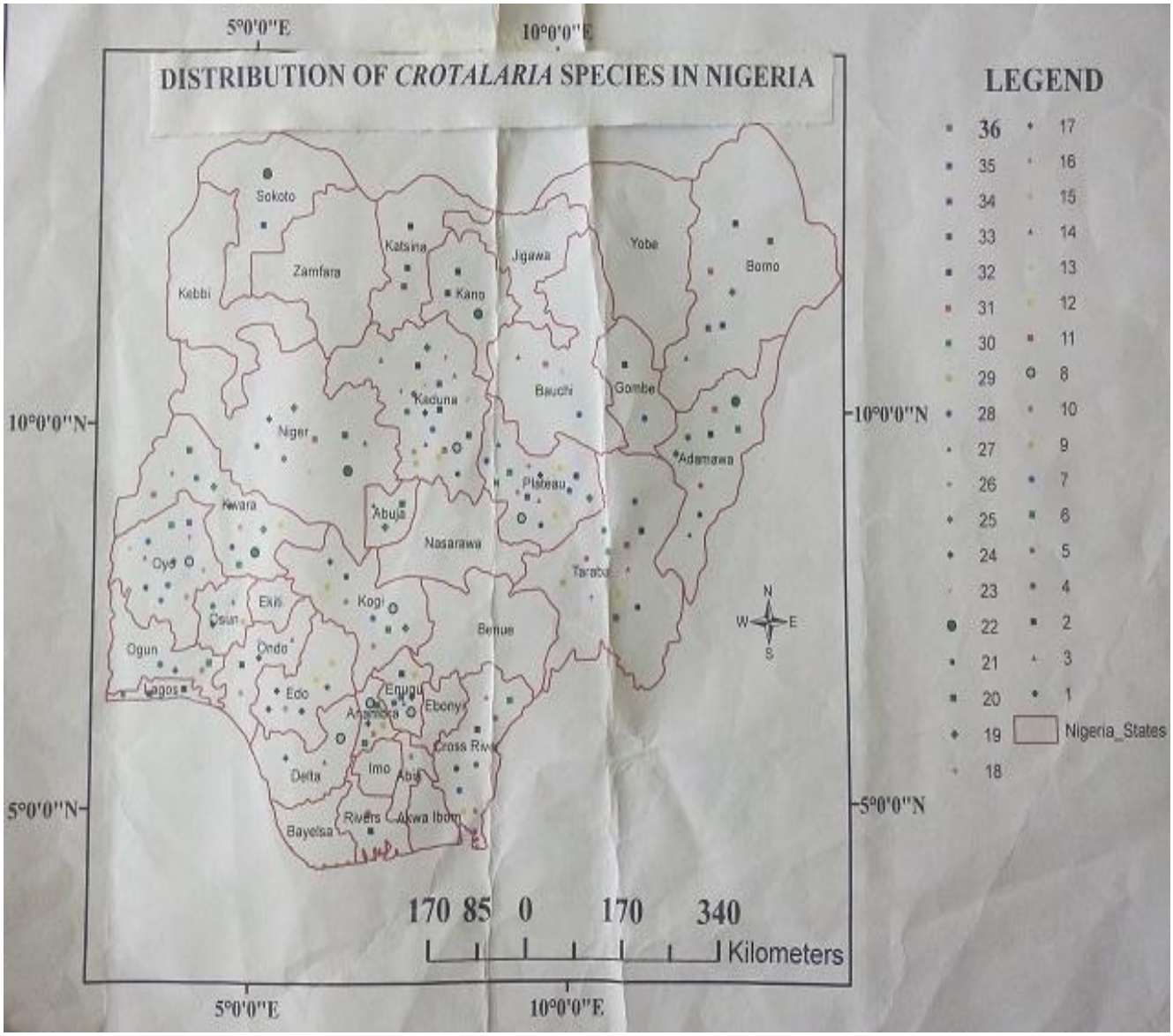

Fig 1: *Map showing the distribution of the genus Crotolaria in Nigeria*

KEYS

C. acervata
C. glauca
C harmsiana
C.mucronata
C. ononoides
C. bamendul
C. cylindrical
C. anthyllopsis
C. cylindrocarpa
C. cephalotes
C.comosa
C.doniana
C.graminicola
C. lanchnosema
C. macrocalyx
C. obovata
C. senegalensis
C.juncea
C. atrorubens
C. falcate
C.incana
C. ochroleuca
C. retusa
C. Bongensis
C.cleomifolia
C. cuspidata
C. bamendul
C. calycina
C.confusa
C. goreensis
C. lachnophora
C. ledermannii
C. naragutensis
C. spectabilis
C. vogeli

Table 1: *Lists of the genus Crotalaria found in Nigeria.*

Taxa	Town and locality	Collectors name/number	FHI number
C. acervata Bak.F.	Cross River Mambila hill area	Gbile / 29 Latilo/ 45	102146 77361
C. bamendul Hepper	Manbila / P/hortcort Ntugi farmland	Latilo	77401
C. bongensis Bak.F.	Manbila / Bauchi Gashaka Game Reserve Gasaka forest Reserve	Gbile, Olorunfemi and Emwiogbo/1029 OlorunfemiEkwuno / 56 Latilo/ 2	64603 56945 76995 77291
C. atrorubens Hochst Ex.Benth.	Manbila/ forest farm land area Kano Gombe Gongola / Yola Kastina Adamawa Enugu Cross River/ Obudu Borno / Konduga Kaduna/ Brinin Gwari/Gashaka Ondo / Oka	Ekwene /Gbile and Daramola Latilo Daramola D. Clayton Latilo Daramola / J.A Emwiogbon Ariwaodo Fagbemi / Ekwuno Soladoye/Ekwuno/Ihe Latilo Daramola	77000 63638 63466 89997 41890 63489 72391 99446 93811 84416 73591 90147
C. cylindrical Pa. D.C	Niger Onisha	Oguntayo, Oyayomi A. P. D. Joues	79994 625
C. cleomifolia Bak.	Kaduna / Afaka Gongola Jos	Oyayomi, Fagbemi, Onijamowo Ekwuno -	81214 93229 1182
C. anthyllopsis Welw.	Bauchi Zaria	_ M.G.latilo	13127 37987
C.cuspidata Taub.	Kaduna Igbetti Kaduna	Jackson G.geerling Daramola H.D onyeachusim Daramola	54364 4597 3343 57205 61821
C.cylindrocarpa D.C	Kaba/isanlu Mopo Kwara Anambra Okeogun/ oyo Bebdel/Edo	M.G Latilo Latilo and Eimujeze Ariwodo D.P slew James Adejimi	61328 65649 89018 55633 82547
C.bamendul Hepper	Manbila/Jos	Latilo	77401
C.cephalotes Steud.	Bornu/Mungunu Niger/ Abuja Kwara/ lokaja Platu/ Jos Ilorin/ Kwara Zaria/Igabi	Ekwuno/Fagbemi Gbile Daramola Fagbemi D.P slew Latilo	93874 80051 90179 79935 60740 45493
C. calycina Schrank	Niger/ Abuja Zaria/kaduna Kwara/Borgu	Olorunfemi J.R catarrh Latilo/Fagbemi	54993 35203 70597
C. comosa Bak	Zaria/ Amara F.R kangini Kwara Plateu/northside of forest school Jos Kaba/Kogi Oyo/ Okeogun cattle	Olorunfemi Latilo Latilo/45 Latilo Latilo R.H. Brown/63 Ekwena/237	24361 65609 40731 61344 55632 57319 93123

	reserve Jos /jos water works Gongola/jenbu Njger/Cattle ranch plot mokwa	Oguntayo,fagbemi and Oyayomi/33	80006
C. confuse Hepper	Niger/ Agaie Kwara Ilorin/borgu kanji Kano/Daura Congula/Yola Borgu game reserve Sokoto	Oguntayo, fagbemi Soladayo/Daramola H.D. Onyeachusin and Binuyo Daramola Odewo Afolayan Latilo	80106 86068 58103 61378 96888 25423 43803
C.doniana Backer	Ondo/Akure Oyo/Ibadan Zaria/Jermila	Olorunfemi - Olorunfemi	91946 23966 55652
C. glauca Willd	Asaba/Enugu Cross-river/Ogbudu Kaduna/Zaria Plateu/Jos	Zamierowski Daramola Soladayo,Ekwuno Olorunfemi	57589 37985 83382 56942
C.falcata Vahl.ex DC.	Lagos/Badagry Oshun/Ijebu Crossriver/Akassa Zaria/Kore village	Daramola D.P.shifild Adebusuyi Daramola	82378 54344 58690 78750
C.hyssopifolia Kwtzch	Kaduna Niger	Soladoye Ekwuno and Ihe	83628 79724
C. incana L.sub Sp.	Gongolla Mambila Jos	Odewo Ekwuno	97383 77029
Pwpuiascens(Lam) Mi/ ne/Redh	Cross rivers	Gbile/ daramola	94110
C. juncea	Ibadan/ Oyo	Daramola	24145
C.graminicola Taub.ex Bak.	Zaria Bornu Bauchi Niger/ Abuja	R.G.lowe Onochie Daramola and P.Wit Gbile	48411 38454 38454 80050
C.lachnophora Hochst and A. Rich	Oyo/ Shaki Plateau Gongolla/Gembu Mambila /Plateau Gongola Oyo	Sofoluwe R.W.S keay Daramola - Daramola D.P Shilied	38185 21022 86156 46063 85587 44437
C. lanchnosema Stapf.	Zaria / anara N.A Forest Reserve Jos/ Jos water works Gongola/ Jembu Niger/ Cattle ranch plot mokwa Bauchi/ Darazo grazing research Anambra/ Nsuka? Olido Mambila/ maisamari glaa land Kaduna / Nimbi Forest reserve Osun/ igbajo community	Latilo R.H. Brown/63 Ekwuno/337 Oguntayo, Fagbemi and Oyayomi/33 Mogaji/201 Ariwaodo/ 190 Latilo/73 Oguntayo, Fagbemi and Onijaimowo/386 Latilo/77	37978 57319 93123 80006 17988 90823 77362 80126 05714
C. ledermanni Bark.F	Mambilla Jos	Ekwuno Daramola	77162 46841
C. macrocalyx Benth	Niger Zaria Bornu/ Xerwa	- Lowe Daramola	23467 42688 45540

	Bauchi Kwara Adamawa Oyo	- Adedeji,Ibhanesebor Ekwuno Jackson/69	37146 100935 34368 19183
C. mucronata Desu.	Kwara Zaria Nsuka Oban/ Cross river Cross River Bauchi Ogun/ Abeokuta Gongola	Jonathan Gbile and Daramola/ 74 Okafor/ Emiogbon Latilo/Daramola Onijamowo and Ibhanesebor Osanyin lusi/ Emwinogbon 265/77 Emwinogbon Onochie Daramola and Ohaeri	80115 76929 72257 72257 71847 87227 65390 35982 98975
C.naragutensis Hutch	Abu/ Zaria Katsina Borno Kaduna Plateau Lagos/ Badagry Bornu/ Yarwa Rivers Kano Sokoto Plateau	Latilo Soladoye,Ekwuno and Ihe Soladayo,Ekwuno and Ihe Olorunfemi, Binuyo, Babayemi Fagbemi, Osanyinusi Musa Gbile and Daramola Jackson Latilo Gbile	79570 43771 83792 84418 94369 94915 23005 93042 52640 62793 77041
C. ochroleuca G.Don.	Anambra/ Nsuka Calabar Bendel Oyo Kabba/ Kotonkarfi Zaria	Ariwaodo Ariwodo Fagbemi/ Osanyinlusi D.P shild Daramola Daramola	89048 100502 87761 55625 61271 54368
C. ononoides Benth	Enugu/ Miori ocha Bendel/Benin/Okomu Jos/Nguroje Zaria/ Bot.garden Abu Kwara/ Lokoja Calabar/Akpabuyo	Daramola Ekwuno/Fagbemi andOsanlusi/57 Ibhanesbhor/159 Ohaeri/ 1183 Chopma	55153 55153 88982 77814 102018 31328
C.obovata S. dru.	Ikoyi/ Lagos	Ikoyi/ Lagos	18842
C.recta ex A.Rich	Plateau	-	70895
C. retusa Linn	Kabba/Kotonkartiu Adejena road Umuahia/afara Umuahia Rain Forest Cross River/ Ogoja-IKOm road OndO/kao Kwara/ lokoja Ajaokuta-Okena road side Ogun/ Ilara Oyo/ Iwo-Ibadan road Anambra/ Nsuka Bendel/ Owan Oyo	Daramola and Binuyo/ 455 Ariwodo/271 Osanyinlusi, Emwiogbon/ 57/77 Daramola and Binuyo/28 Daramola/87 Oyayomi and Osanyinlusi/2 Odewo, Adedeji and Osanyinlusi/57 Ariwaodo/79 Odewo and Oni Tanajong	61286 73220 87019 1106 90196 82915 101811 90803 78981 16789
C. Spectabilis Roth	Ibadan	Gbile	73310
C. Senegalensis (Pers) Bacle	Oyo/Ibadan	Jackson	77548

ex DC.	Kastina Borno/Maiduguri Zaria Oyo/Igbetti	Musa and Daggash Daramola Latilo C. Geerling	35010 63680 72880 46369
C.vogeli Benth	Onitsha Enugu Kabba Ogun /Egbado Kwara /Ilorin	A.P.D Tower Emwiogbon Boston Ekwuuno Eimonjeze M.C. Ejiofor	5893 66587 52790 68090 19824

Table 2: *Qualitative leaf morphological features of selected crotalaria species in Nigeria*

Species	Leaf apex	Leaf margin	Leaf shape	Leaf surface	Leaf base
C.retusa	Retusa/obtuse	Entire	Oblanceolate	Glabrous	Cuneate
C. goreensis	Obtuse	Entire	Oblanceolate	Glabrous	Cuneate
C.bongensis	Obtuse	Entire	Lanceolate	Glabrous	Cuneate
C.mucronata	Acute	Entire	Obovate	Glabrous	Cuneate
C.ononoideas	Obtuse	Entire	Oblanceolate	Glabrous	Cuneate
C. lancnosema	Obtuse	Entire	Oblanceolate	Glabrous	Cuneate
C.naragutensis	Sub-acute	Entire	Obovate	Glabrous	Cuneate
C.comosa	Obtuse	Entire	Lanceolate	Glabrous	Cuneate

Table 1 and figure 1 shows the list of the genus *Crotolaria* present in Nigeria. It is observed that most of the *crotalaria* species are found in all parts of Nigeria, usually in most places and cultivated on open areas. The study reveals that *C. cleomifolia, C. anthyllopsis, C. hyssopifolia, C. graminicola, C.ledearmamii and C.recta* are commonly found in Northern parts of Nigeria (Kaduna, Gongola, Bauchi, Niger, Bornu and Jos) while species such as *C.spectabilis*, *C. juncea*, *C.obovata* are commonly found in South western parts of Nigeria (Lagos, and Oyo) . However, *crotalaria* species like, C. cylindrocarpa, C. cylindrica, *C. retusa, C. nagutensis, C. micronata, C. ononoidea, C. ochroleuca, C. macrocalyx, C. lanchrosema, C.lacnophora, C. incana, C. glauca, C. goreensis, C. falcata, C.atrorubens, and C. bongensis* are mostly dominated in all ecological zones of Nigeria. Other species such as *C. cephalote, C. comosa, C. calycina, C. confusa, C. doniana and C. senegalensis* are said to be sympatric. Generally, it is observed that most of the genus *crotolaria* are found in waste places, cultivated and open forest areas in the country Sofowora,(1993), Nuhu *et al*,(2000) and Samba *et al*, (2002) that most of these plants are found in savannah and derived savannah while few were found in an open forest areas in Nigeria

Plate 1: *Photograph of Crotalaria retusa*

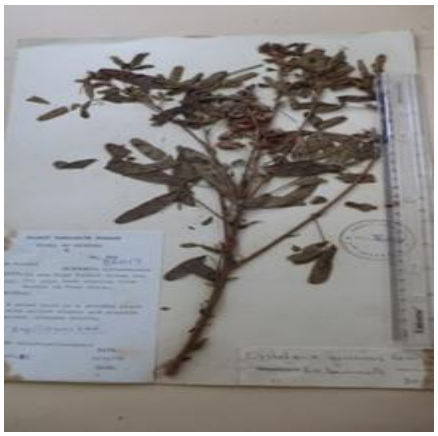

Plate 2: *Photograph of Crotalaria lachnosema*

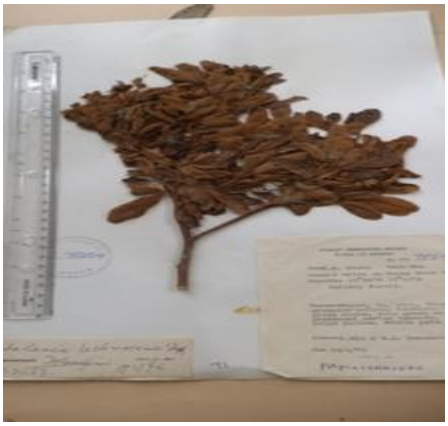

Plate 3: *Photograph of Crotalaria mucronata*

Table 2 indicates qualitative leaf morphological features of selected *crotalaria* species. The selected species are *C. retusa, C. gorensis, C. bongensis, C. mucropnata, C. ononoidea, C. lachnosema, C. naragutensis* and *C. comosa*. The leaf apexes of the species studied are similar except in *C. mucronata* and *C. naragutensis* that are sub-acute and acute. The leaf margin, leaf surface and leaf base are similar in features except in leaf shape that vary from lanceolate (*C. comosa* and *C. bongensis*), oblanceolate (*C. retusa, C. goreensis, C. ononoidea* and *C. lachnosema*) to obovate (*C. mucronata* and *C. naragutensis*). This implies that most of the genus *Crotalaria* displays a similar characteristic and the features shown among them do overlap. Stace (1965) reported that the leaf characters of the species are most varied anatomical and morphological features in angiosperm.

Conclusion

The genus *Crotalaria* is distributed throughout the ecological zones in Nigeria. Besides, their availability occurs in all the states of the country. They could be found in savanna and open forest areas usually waste places, cultivated and an open areas, species such as *C. cephalote, C. comosa, C. calycina, C. confusa, C. doniana and C. senegalensis* are allopatric in nature. The leaf margin , leaf apexes, leaf surface and leaf base of the species show a similar characteristic except in leaf shape that vary from lanceolate to obovate.

References

[1] E.T.Akintayo, Chemical composition physitochemical properties of fluted pumking (Teifaria occidentalis) seed and seed oil. R. Vista Italian sos tanze Grasse, 1997. 74: 13-16p.

[2] C. G.Cook and G. A.White, Crotalaria juices:A potential multipurpose fiber crop in J. Janic (ed). Fast and accurate phylogeny reconstruction alogorithms based on the minimum-evolution principle 1996, J. Computation Biol.9.687-705p.

[3] N.J.Mukurasi, Agricultural attributes of Crotalaria zanzibaries, UgoleAgric Centre, Mbeya 6Tanzania, 1986. Journal of Agricultural Research vol. 47 no 2, 617-625p.

[4] H.Nuhu. Pharmacognostic evaluation and toxicity studies of three Crotalaria species (Leguminosae). Ph.D Thesis. Dept. of Pharmacognosy and Drug Development, 1999. Ahmadu Bello University, Zaria 40p.

[5] H.Nuhu, M.Shock, , E.M.Abdurahman and N.D.G.Ibrahim. Alkaloida composition and toxicity studies of three Nigerian Crotalaria species. 2000. Nigeria Journal of Natural Products and Medicine 4(1). 40p.

[6] Nwude and M.A.Ibrahim. Plants used in traditional veterinary practice in Nigeria. 1980. J. vet. Pharmacol. 3: 281 – 272p.

[7] R.M.Polhill. Crotalaria in African and Madagascar. Royal Botanic Gardens kew . 89. 1982.

[8] T.C.Pullaiah, and N.K.Chandrasukha. Antidiabetic plants in in India and herbal based research;Edl, 2008. regency publication, New Delhi:125p.

[9] R.T.Samba, S.N.Sylla, M.Neyra, M.Eueye, B.Dreyfus, and I.Ndoye. Biological Nitrogen fixation inCrotalaria species estimated using the isotype dilution method 2002. African Journal of Biotechnology 1(2): 17-22p

[10] C.Saurabh, F.Sunita, S.B.Virendra, and K.SAshok. Bioprocess consideration for production of secondary metabolites by plant cell suspension culture 2000. In Biotechnology and bio process Engineering,7:138-149p.

[11] A.Sofowora. Medicinal plants and traditional medicine in Africa 2nd Edition, 2000. Spectrum Boo ltd. 387-390p.

[12] C.A.Stace. The taxonomic importance of leaf surface current concept of plant taxonomy 1965. Bulletin of British Museum (Natural History) Botany 4:3-78p.

[13] E.Thomas. For the love of insects. 2003. Belknap Press ISBN 978-0-674-01827-3. 324p.

[14] W.H.O.Guidelines for the practice of traditional medicine 1988. TRM/Geneva, 1988. 6p.