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Ethnobotanical Utilization and Conservation of Chewing Sticks Plants Species in Ekiti State, Nigeria

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Abstract: Surveys and direct field observation were carried out to determine the endangered chewing stick species in Ekiti State, Nigeria. The survey involved the use of semi-structured interviews which were conducted with a fairly open framework that allowed for focused, conversational and two-way communication. Also group interviews were conducted in order to determine group consensus on the chewing sticks plant species. The relative abundance of the identified species was determined by the time it would take to physically come across the plant specimen in the study area. Results obtained revealed that a total of 49 plant species belonging to 28 different families were observed to be in use as chewing sticks. Most of these species were indigenous species; previous studies had revealed that these species were essentially rich in various natural products. The relative abundance test revealed that, 33, 51 and 16%, respectively, of the chewing sticks species were presently common, frequent and occasional on the abundance scale used in this study. Most of the species were uncultivated species whose wildlings were usually preserved in the study area and were in high demand in the study area. Other products widely derived from these species in the study area were identified. Thus the endangered species required urgent conservation efforts. Features that could enhance their conservation in the study area were defined.

Key words: Ethnobotany, conservation, chewing sticks, Ekiti State, Nigeria

INTRODUCTION

In the recent times, the importance of ethnobotanical knowledge in the management of natural resources is increasingly being stressed (Berkes *et al*., 2000). Study by Reyes-Garcia *et al*. (2007) suggested that the conservation of biological diversity can be more successful by finding allies. Previous studies by Alcorn (1993) and Berkes *et al*. (1995) had asserted that the indigenous people were potential allies in the conservation of biological diversity. Research suggests that forest products provide them with nutrition, medicine, construction materials, forage and income (Peters *et al*., 1989; Godoy and Bawa, 1993). Thus, suggesting a correlation between biological and cultural diversities (Lairal, 2002; Maffi, 2005).

Despite all these, there has been an unprecedented erosion of biological diversity and indigenous knowledge in the recent times. This erosion, according to Cox (2000) and Maffi (2002), represents the irreversible loss of humanity's heritage and diversity.

Chewing sticks constitutes one of the plant medicine derived from the forest, which is widely used for dental care throughout the entire West African region. In Nigeria where deforestation rate is currently unprecedented, there has been little or no efforts made to assess chewing sticks botanicals with a view to determine the endanger species among them and propose strategies that would conserve such. These constitute the aims of this study.

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MATERIALS AND METHODS

Surveys and direct field observation were carried out as done in the previous research (Lipp, 1989; Kayode *et al*., 1997) between June 2006 and May 2007. Ekiti State (Fig. 1, 2) was divided into three zones based on the existing political delineation (Kayode, 2004). The zones were Ekiti Central (EC), Ekiti North (EN) and Ekiti South (ES). In each zone, five rural communities that were still relatively far from urban influence were selected. The communities were, (1) Epe, (2) Ipole-Iloro, (3) Ido-Ile, (4) Aba-Igbogun, (5) Araromi-Obu, (6) Eda, (7) Iro-Oke, (8) Aba-Oyo, (9) Ogbese, (10) Omi-Ogun, (11) Igede, (12) Itapaji, (13) Ipere, (14) Ifinsin and (15) Ewu. In each community, twenty respondents were randomly selected and interviewed. The interviews were conducted with a fairly open framework that allowed for focused, conversational and two-way communication (Moinar, 1989).

Also in each community, group interviews were conducted in order to determine group consensus on the chewing sticks plant species. Four groups, each of which consisted of five individuals were interviewed in each community. Key informants made up of health, community development and forestry officials in each zone as well as dental officials of the Ekiti State Ministry of Health were also interviewed to provide secondary information on the use of chewing sticks in the study area.

Voucher specimens of the botanicals identified as sources of chewing sticks by the respondents were collected identified and relevant information on them were documented. The specimen were later treated and deposited at the herbarium of the Department of Plant Science, University of Ado-Ekiti, Ado-Ekit, Nigeria.

The relative abundance of the identified species in each community was determined by the time it would take to physically come across the plant specimen. Plant specimens that could be sited between 0 min to 1 h were regarded as common (C). Those, which could be seen within 1 to 5 h, were

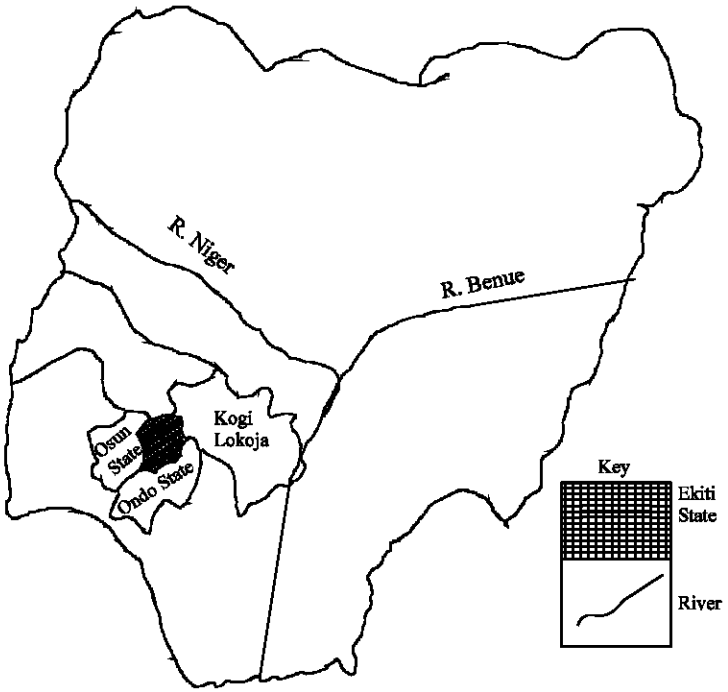

Fig. 1: Map of Nigeria showing Ekiti State of Nigeria

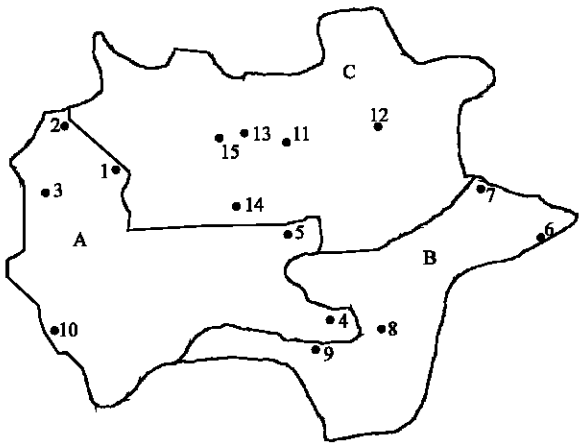

Fig. 2: Map of Ekiti State Showing the study sites used, A: Ekiti Central, B: Ekiti South, C: Ekiti North, (1) Epe, (2) Ipole-iloro, (3) Ido-Ile, (4) Aba-igbogun, (5) Araromi obu, (6) E da, (7) Iro-oke (8) Ipole, (9) Ogbese, (10) Omi-ogun, (11) Igede, (12) Itapaji, (13) Ipere, (14) Ifinsin and (15) Ewu

regarded as frequent (F). Also, those species that would take between 5 to 24 h to be seen were regarded as occasional (O).

Field information was confirmed (Balick and Cox, 1996) and compared with literature (Oliver, 1960; Gbile, 1986; Keay, 1989; Gill, 1992; Kayode, 2006) and the information obtained was analyzed.

RESULTS AND DISCUSSION

Results obtained from the study area revealed that a total of 49 plant species belonging to 28 different families were observed to be in use as chewing sticks (Table 1). Most of these species were indigenous species, only 13 species (27%) were exotic species, thus supporting the previous assertion of Kayode (2004) that in Ekiti State, Nigeria, preference for botanicals were skewed towards the local species than the exotics. Species identified in this study were noted for their folk dental medicinal values whose knowledge have now constituted parts of the peoples culture that is passed from one generation to another. Previous studies had revealed that these species were essentially rich in various natural products (Table 2).

The relative abundance test (Table 3) revealed that, 33, 51 and 16%, respectively, of the chewing sticks species were presently common, frequent and occasional on the abundance scale used in this study. Among the common species, *C. annum* L., *C. aurantifolia* (Christm and Panzer) Swingle, *M. indica* L. and *T. cacao* L. were cultivated for their fruits which are major sources of income in the study area. *A. indica*, *A. Juss* and *S. siamea* (Lam.) Irwin and Barneby were cultivated to serve as windbreakers and shade providers, *G. sepium* (Jacq.) Kunth ex Walp was planted to provide yam stakes and fodder, *J. curcas* L. and *J. gossypiifolia* L. were cultivated to serve as boundary plants and erosion control, *V. amygdalina* Delile was cultivated to provide leafy vegetables, *D. eracta* L. as ornamental plant while *A. laxiflora* (Benth.) Pax and K. Hoffm. and *T. orientalis* (L.) Blume as well as *O. gratissimum* L. though not cultivated but were preserved as sources of timber and medicinal leafy vegetables, respectively.

Table 1: List of chewing sticks botanicals in Ekiti State, Nigeria

Local name	Botanical name	Family	Part used
Adodo yelo	Duranta eracta L.	Verbenaceae	Stem
Afefe	*Trema orientalis* (L.) Blume	Ulmaceae	Stem
Agunmaniye	*Gliricidia sepium* (Jacq.) Kunth ex Walp	Papilionaceae	Stem
Ahuun	*Alstonia boonei* De Wild	Apocynaceae	Stem
Ajekobale	*Croton zambesicus* Mull. Arg	Euphorbiaceae	Stem
Akomu	*Pycnanthus angolensis* (Welw.) Warb.	Myristicaceae	Stem
Aliofera	*Aloe vera* (L.) Burm. f.	Asphodelaceae	Stem
Arasa	*Bridelia micrantha* (Hochst.) Baill.	Euphorbiaceae	Stem
Arumu	*Cynometra vogelii* Hook. f.	Caesalpiniaceae	Stem
Arunje	*Harungana madagascariensis* Lam ex Poir.	Clusiaceae	Stem
Ata	*Capsicum annuum* L.	Solanaceae	Stem
Atampara	*Phaulopsis imbricata* (Forssk.) Sweet	Acanthaceae	Stem
Atori	*Glyhaea brevis* (Spring) Monach.	Tiliaceae	Stem
Ayin	*Anogeissus leiocarpus* (DC.) Guill. and Perr.	Combretaceae	Stem
Dongoyaro	*Azadirachta indica* A. Juss	Meliaceae	Stem
Efirin	*Ocimum gratissimum* L.	Asteraceae	Stem
Eguneja	*Diospyros monbuttensis* Gurke	Ebenabaceae	Stem
Eesin	*Alchornea cordifolia* (Schumach. and Thonn.) Mull. Arg.	Euphorbiaceae	Stem
Ewuro	*Vernonia amygdalina* Delile	Asteraceae	Stem/roots
Ogege	*Jatropha multifida* L.	Euphorbiaceae	Stem
Guafa	*Psidium guajava* L.	Malvaceae	Stem
Hibisicosi	*Hibiscus rosa-sinensis* L.	Malvaceae	Stem
Ifon	*Olax subscorpoidea* Oliv.	Olacaceae	Stem
Isin eye	*Blighia sapida* K.D. Koenig	Sapindaceae	Stem
Iseketu	*Sida acuta* Burm. f.	Malvaceae	Stem
Ito	*Milletia thonningii* (Schmach. and Thonn.) Baker	Papilionaceae	Stem
Iya/pepe	*Alchornea laxiflora* (Benth.) Pax. and K. Hoffm.	Euphorbiaceae	Stem
Iyeree	*Zanthoxylum xanthoxyoides* (Lam.) Zepern. and Timber	Rutaceae	Stem/root
Kaju	*Anacardium occidentale* L.	Anacardiaceae	Stem
Kasia	*Senna siamea* (Lam.) Irwin and Barneby	Caesalpiniaceae	Stem
Koko	*Theobroma cacao* L.	Sterculiaceae	Root
Lapalapa funfun	*Jatropha curcas* L.	Euphorbiaceae	Stem
Lapalapa pupa	*Jatropha gossypiifolia* L.	Euphorbiaceae	Stem
Mangoro	*Mangifera indica* L.	Anacardiaceae	Stem
Ogan	*Combrentum racemosum* P. Beauv.	Combretaceae	Stem
Ogbase	*Sarcocephalus latifolius* (Sm.) E.A. Bruce	Rubiaceae	Stem
Okuta	*Garcina mannii* Oliv.	Clusiaceae	Stem
Orogbo	*Garcinia kola* Heckel	Clusiaceae	Stem
Orombo lemonu	*Citrus aurantifolia* (Christm. and Panzer) Swingle	Rutaceae	Stem
Orokoro	*Mallotus oppositifolius* (Geiseler). Mull. Arg.	Euphorbiaceae	Stem
Otomporo	*Sida corymbosa* R. E. Fr.	Sterculiaceae	Stem
Otupe	*Carpolobia lutea* G. Don	Polygalaceae	Stem
Pako-Ijebu	*Massularia acuminate* (G. Don.) Bullock	Rubiaceae	Stem
Piaa	*Persea gratissima* Gaertn.	Lawraceae	Stem
Udi	*Termilia schimperiana* Hochst.	Combretaceae	Stem
Uoo	*Buchholyiia coriacea* Engl.	Capparaceae	Stem
Ule	*Calliandra portoricensis* (Jacq.) Benth	Mimosaceae	Stem
Ura	*Bridelia ferruginea* Benth.	Euphorbiaceae	Stem
Ure	*Clerodendrum buchholzii* Gurke	Verbenaceae	Stem

Also among the frequently occurring species, *A. occidentale* L., *B. sapida* K.D. Koenig, *P. guajava* L. and *P. gratissima* Gaertn. were cultivated for their fruits. *A. vera* (L.) Burm. F., *H. rosa-sinensis* L. were cultivated for medicinal and ornamental respectively while *J. multifida* L. was cultivated as boundary plant and for the control of erosion. Other plant species in the frequent categories were not cultivated but their wildlings were usually preserved in the study area.

Table 2: Folk-medicinal value and chemical compositions of the chewing sticks plant species identified in Ekiti State, Nigeria

Botanical name	Folk-medicinal value	Chemical composition
Alchornea cordifolia	Healing of teeth ache and mouth wound	Inulin, tannins, alchornin, alkaloid
Alchornea laxiflora	Posses antimicrobial agents	Tannins,
Aloe vera	Healing of cough and diabetes	Antraquinone, glycosides, aloin, resin
Alstonia boonei	Curing of fever, asthma, rheumatic pains, dizziness	Alkaloids, echitamine, inulin, echitamidine, tannins and saponins
Anacardium occidentale	Curing of tooth ache, sore gums and cough	Tannins, sitosterin, phenols, anacardic acid, cardol, gallic acid, resorcinal derivatives
Anogeissus leiocarpus	Used for oral hygiene	Tannins, phenolic substances
Azadirachta indica	Teeth and gum maintainance, curing of fever	Quercetin-3-rhamnoside, aurcetim-3-rhamnoside, qurcetin-3-rutinoside, nimbin
Blighia sapida	Curing of mouth wounds	Saponin, hypoglycin, tannins, steroidal, alkaloids
Bridelia ferruginea	Healing of mouth wounds	Tannins
Bridelia micrantha	Curing of headache	Tannins
Buchholzia coriacea	Used as anti-fungal and anti-bacteria agents	Hupeol and Sitosterol
Calliandra portoricensus	Curing of headache, gonorrhea, lumbago, possess analgestic substances	Anticonvulsant agents
Capsicum annuum	Curing of fever, cold and dysentery, act as stimulant	Capsaicin oil, ascorbic acid
Carpolobia lutea	Curing of stomach ache, used for oral hygiene	Tannins, saponins, flavonoids, cardiac glycosides, antthraquinones
Citrus aurantifoliia	Used for oral hygiene	Essential oils
Clerodendrum buchholziii	Curing of fever	Sterols, glucosides, flavonoids, chirettin, opheliac acids, tannis, hydroqinone, diiterpene, uncinatone
Combretum racemosum	Curing of fever and cough	Flavonic heterosides, gum
Croton zambesicus	Curing of malaria	Crotonic acid, saponins
Cynometra vogellii	Used for oral hygiene	Tannins, saponins
Diospyros monbuttensis	Used as anti-fungal and anti-bacteria agents	Tannins, saponins, alkaloids
Duranta erecta	Used for oral hygiene	Alkaloids
Garciniia kola	Curing of cough, tooth ache fever and diabetes	Kolaviron, flavonoids, saponins, ametoflavone, resin
Garcinia mannii	Curing of cough	Alkaloids
Gliricidiia sepium	Clearing microbes in mouth	Gliriicidin-6A, Gliiricudol-9A, Afrormosin, formononctin Medicurpin, 7,4'-dihydroxy-3'-methypxysiso-flavin 2'-0-methulsepiol
Glyhaea brevis	Curing of fever	Tannins, alkaloids
Hibsiscus rosa-sinensis	Curing of cough	Tannins, alkaloids
Harunganamada-gascariensis	Curing of fever, cough, dysentery, asthma, jaundice, diahhoea, sore throat	Alkaloids, tannins, gum
Jatropha curcas	Curing of gum bleeding	Tetramethyl pyrazine, fixed oil, resin, cursin, saponins, inulin, tannins
Jatropha gossypiifolia	Healing of mouth cancer	Tetramethyl pyrazine, curcin, jatrophone
Jatropha multifida	Healing of mouth wounds, mouth microbial infections	Curcin, hell oil, pin neon oil, oleum, ricini, majoris, crotonoieic acid, alkaloids, glycoside
Mallotus oppositifolius	Healing of mouth cancer	Rottlerin
Mangifera indica	Curing of malaria, sore gum	Tannins, resins, volatile oil, cyanogenic, glycosides, Methysalicylate, quereelin
Masscularia acuminate	Used for oral hygiene, curing of cough and lumbago	Tannis

Table 2: Continued

Botanical name	Folk-medicinal value	Chemical composition
Milletia thonningii	Curing of fever and sore throat	Tannins, saponins
Ocimum gratissimum	Curing of cough, cold Fever, chest pain, diarrhea	Terpenoids, eugenol thymol. saponins, alkaloids
Olax subscorpoidea	Curing of tooth ache	Saponins
Persea gratissima	Curing of hypertension	Tannins
Phaulopsis imbracata	Used for mouth hygiene	Alkaloids, saponins, tannins
Psidium guajava	Curing of stomach ache, cough	Tannins, resins, essential oil, quercetin, eugenol
Pycnanthus angolensis	Clearing of white tongue	Alkaloids, tannins
Sarcocephalus latifolius	Curing of malaria fever, for oral hygiene, has antibacterial agents	Tannins
Senna siamea	Curing of fever	Tannins
Sida acuta	Used for oral hygiene	Tannins, saponins, postaglardin
Sida corymbosa	Used for oral hygiene	Alkaloids, tannins
Terminalia schimperiana	Curing of sickle cell anemia,	Alkaloids, tannins
Theobroma cacao	Acts as stimulant	Alkaloids, steroid, sitosterol, stigmasterol, tannins
Trema orientalis	Provides remedy for fever, black tongue, cough, bronchitis, dysentery	Saponins, tannins, inulin, alkaloids
Vernomia amygdalina	Curing of cough, diabetes	Vernodalin, vernomydin, saponin
Zanthoxylum xanthoxyloides	Curing of tooth ache sickle cell anemia	Alkaloids, benzoic acid, vannillia acid, inulin, saponnin

Table 3: Relative abundance of chewing sticks plant species in the study area

Abundance	Plant species
Common	*A. laflora*, *A. indica*, *C. annuum*, *C. aurantifolia*, *D. monbuttensis*, *G. sepium*, *D. eracta*, *J. curcas*, *J. gossypiifolia*, *M. indica*, *O. gratissimum*, *S. acuta*, *S. siamea*, *T. cacao*, *T. orientalis*, *V. amygdalina*
Frequent	*A. cordifolia*, *A. occidentale*, *A. vera*, *B. ferruginea*, *B. micrantha*, *B. sapida*, *C. buchholzii*, *C. lutea*, *C. racemosum*, *C. vogellii*, *G. brevis*, *G. kola*, *G. mannii*, *H. rosa-sinensis*, *J. multifida*, *M. oppositifolius*, *M. thonningii*, *O. subscorpoidea*, *P. angolensis*, *P. gratissima*, *P. guajava*, *P. imbricate*, *S. corymbosa*, *S. latifolus*, *T. schimperiana*
Occasional	*A. boonei*, *A. leiocarpus*, *B. coriacea*, *C. portoricensis*, *C. zambesicus*, *H. madagascariensis*, *M. acuminate*, *Z. xanthoxyloides*

Table 4: Chewing sticks plant species perceived to require conservation in the study area

Plant species	Conservation status and description in the study area
A. boonei	It is an indigenous species that is not cultivated in the study area, wildlings are however preserved, leaves, roots and stems bark are used for medicine, use as a major source of timber and fuel wood
A. leiocarpus	It is an indigenous species that is not cultivated in the study area, wildlings are however preserved, stems bark and seeds are used for medicine, use as a major source of fuel wood
B. coriacea	It is an indigenous species that is not cultivated in the study area, wildlings are however preserved, use as a major source of fuel wood
C. portoricensis	It is an introduced species that is not cultivated in the study area, wildlings are however preserved, leaves and roots are used for medicine, use as a major source fuel wood
C. zambesicus	It is an indigenous species that is not cultivated in the study area, wildlings are however preserved, all parts of the plant are used for medicine
H. madagascariensis	It is an indigenous species that is not cultivated in the study area, wildlings are however preserved, all parts of the plant are used for medicine, use as a major source of timber and fuel wood
M. acuminata	It is an indigenous species that is not cultivated in the study area, wildlings are however preserved, leaves, roots and stems bark used for medicine, use as a major source of timber and fuel wood
Z. xanthoxyloides	It is an indigenous species that is not cultivated in the study area, wildlings are however preserved, Its stems and roots are used for medicine

The species occurring occasionally, with the exception of *C. portoricensis* (Jacq.) Benth, were indigenous but uncultivated species (Table 3) whose wildlings were usually preserved in the study area. There is a high demand for these species. Table 4 gives the description of other products widely derived from these species in the study area. Thus these species could be said to be endangered in the study area. They require urgent efforts towards their conservation. Some of the species already possessed features that could enhance their conservation (Table 5-11). However, further research activities are still required to develop deep understanding of the life cycles, pollination and dispersal mechanisms in most of these plants. Shinwari and Khan (2000) had advocated similar strategies in a

Table 5: Perceived conservation features of *A. boonei* in the study area

Features	Description	Implications for conservation of the species in the study area
Ecology	Found in the forest and tolerate wide range of sites	Suitable for cultivation in all parts of the Ekiti State, Nigeria
Reproductive biology	Flowers in October to March, fruits in December to May	Seeds are ready for planting at the onset of rains in the study area
	Seeds dispersed by wind	Wide seeds dissemination, enhancement of the development of numerous wildlings
	Germination takes 15 to 25 days	Enhance early replacement of non-viable seeds
	High germination rate	Seedling demands could be easily attained
	No pre-treatment required for germination	Enjoy economy of time and labour
Growth management	Rapid growth	Enhance early delivery of dividends
	Ready coppicing ability	Enhance replacement after use
Germplasm management	Seeds storable in dry and cool places	Ensure seeds availability when planting is to be done

Table 6: Perceived conservation features of *A. leiocarpus* in the study area

Features	Description	Implications for conservation of the species in the study area
Ecology	Found in the savanna	Suitable for cultivation in the savanna area of the study area
Reproductive Biology	Flowers in July to November, fruits in August to January	Suitable for cultivation at the onset of rain in the study area

Table 7: Perceived conservation features of *B. curiacea* in the study area

Features	Description	Implications for conservation of the species in the study area
Ecology	Found in the forest	Suitable for cultivation in most parts of the study area
Reproductive Biology	Flowers in most seasons	Seeds available at most seasons

Table 8: Perceived conservation features of *C. portoricensis* in the study area

Features	Description	Implications for conservation of the species in the study area
Ecology	Found in the forest	Suitable for cultivation in most parts of the study area
Reproductive Biology	Propagated from seeds	Seeds are available for cultivation at the onset of rains

Table 9: Perceived conservation features of *C. zambesicus* in the study area

Features	Description	Implications for conservation of the species in the study area
Ecology	Found in the savanna and forest margins	Suitable for cultivation in most parts of the study area
Reproductive Biology	Flowers in May to August, fruits in November to March	Seeds are available for planting at onset of the rain

Table 10: Perceived conservation features of *H. madagascariensis* in the study area

Features	Description	Implications for conservation of the species in the study area
Ecology	Found in the forest	Suitable for cultivation in most parts of the study area
Reproductive Biology	Flowers in July to April, fruits in September to April	Seeds are available for planting at the onset of the rain
	Flowers profusely	Ensures availability of seeds
	High germination rate	Seedlings demand could be met
	Rapid germination	Enjoys economy of time and enhances easy replacement of non-viable seeds
	No pre-treatment required	

Table 11: Perceived conservation features of *Z. xanthoxyloides* in the study area

Features	Description	Implications for conservation of the species in the study area
Ecology	Found in the forest and savanna	Suitable for cultivation in all parts of the study area
Reproductive Biology	Flowers in January to February May to August, fruits in July to September	Seeds are available for planting during the prevailing rainy season in the study area

study conducted in Islamabad. The maintenance of the original self-perpetuating populations, as previously advocated by Moore (1990) would also serve as a sustainable *in situ* conservation method. The conservation of these chewing sticks plant species especially those identified as being endangered is now desirable. All these strategies would slow down and/or circumvent the present rate of biodiversity loss. Swanson (1992) had previously warned that the loss of biodiversity means the loss of options for all of us and for future generations. The loss of species identified as been endangered in this study should be prevented.

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