HONEYBEE FLORA AND BEEKEEPING IN KARNATAKA STATE, INDIA

V. Sivaram

Dept. of Botany, Bangalore University, Post – Graduate Centre, Kolar – 563101, India
Tele: 91-(080)-3102695, Fax: 91-(080)-3219295, E.mail: sivaram900@yahoo.co.uk

SUMMARY: The investigations on the bee-flora and their identification, classification was undertaken during the years 1993- 1999 in the selected regions of south Karnataka. The identified bee-flora was further grouped into pollen, nectar, and both pollen and nectar yielding plants, and the forage value of the bee plants has been provided. The study revealed that more than 340 plants are useful to honeybees. However, the present paper lists about 192 bee plant species, which are well distributed and common in the study area. The identified bee flora comprises of ornamentals, timber, medicinal, fruits, vegetables and other commercial important plants like spices, pulses, cereals, oil yielding, fibre, fodder etc. Because of economic importance of the bee plants, they are not only protected but also propagated. Some of the common and important bee forage plants are, the species of *Syzygium, Cassia, Citrus, Pongamia, Azadirachta, Brassica, Areca, Cocos, Guizotia, Hilianthus, Albezia, Lagerstroemia*, *Polinathus, Sapindus, Tecoma* etc.

The percent nectar sugar concentration (NSC) of all the nectar yielding plants was determined, and the NSC ranges from 16.24 and 58.50 in *Tecoma stans* and *Syzygium cumini* respectively. Also, the paper reports that the bee-flora is diversified in the region and consists of both wild and cultivated, flowering during different months of the year. The flowering duration for each of the bee plant is provided to know the peak blooming period by the beekeeper.

The state has all the four species of honeybees, i.e. *Apis dorsata, Apis florea, Apis cerana indica* and *Apis mellifera.* However, *A. mellifera is* very recently introduced in the state. In Karnataka, since pre-historical times beekeeping is practiced with *Apis cerana indica*. During the year 1992 the Thai sac brood disease (TSBV) was very severe in the state and the beekeepers lost most of their colonies. This prompted the state government to introduce *A.mellifera* with a view to rehabilitate the people who were entirely depending on the beekeeping occupation. In addition to this, Khadi Village Industries Commission (KVIC) of the Ministry of Small Scale Industries, Government of India, and the Department of Industries and Commerce, Government Karnataka have taken up several measures to revive *Apis cerana* beekeeping in the interest of the poor beekeepers and to strengthen beekeeping for crop pollination of large number of economically important crops through honeybees. The present status of beekeeping in the state is discussed.

The paper suggests, the measures to be undertaken for integrated beekeeping development in the state. The results indicates that, the area has rich bee-flora and suitable for commercial beekeeping.

Proceedings of the 37th International Apicultural Congress, 28 October – 1 November 2001, Durban, South Africa APIMONDIA 2001
To be referenced as: *Proc. 37th Int. Apic. Congr., 28 Oct – 1 Nov 2001, Durban, South Africa* ISBN: 0-620-27768-8
Produced by: Document Transformation Technologies Organised by: Conference Planners

INTRODUCTION: The bees and plants are co-evolved during middle cretaceous period (Michener, 1974). The bees are depending on flowering plants as they provide food in the form of pollen and nectar. Similarly, plants are depending on the bees for pollination. The mutual interdependence of the anthrophilous insects and entomophilous angiosperms hastened their co-evolution (Suryanarayana, 1986). The relationship between bees and plants stems from cretaceous times, roughly 100 million years ago (Velthius, 1992). The bees (Apoidea) constitute a group of 20000 species with representatives at every level from solitary and non-social to community and true social like modern honeybees, *Apis* (Hargasim, 1974).

The flowering plants of several plant families are blossoming at different time intervals of the year. Pollen and nectar availability to foraging bees fluctuated with time of the year and flowering of different species of plants (Free, 1970). The phase of the blooming period does not commence simultaneously in all the honey-flora participating in the main honey-flow. Depending on the soil type, climatic factors and the habitat of the vegetation, the time of blooming may change for even and the same nectar plant (Rodionov and Shabanshov, 1986). The honey plants participating in the main honey-flow do not confine every where; each of them has restricted to quite definite climatic conditions and particular regions or area. Therefore, the types of honey harvest not similar in all the area and regions of a country. The flowering dates of some of the important honey plants in Poland has been studied and made a list of plants useful for honeybees(Gromisz, 1993).

Flowers are the main stay of bee's life. The bees are automated micromanipulators by which man can harvest floral sources that would be otherwise unobtainable (Kevan, 1984). Flower duration and main blooming time is an essential information for sound management of beekeeping. Beekeeping is an agri-horticultural and forest based industry and as such it is of great importance for farmers. By investing limited expenses beekeeping can be practiced to obtain maximum subsidiary income with other agricultural activities. The practice of beekeeping is not only depend on the better strain of honeybees but also on the abundance and occurrence of pollen and nectar sources with in the surrounding area of an apiary (Free, 1970; Akrathanakal, 1987).

The present study has been undertaken to study the bee-flora in south Karnataka for determining the honey and pollen flow seasons, and also the present beekeeping practice in the area.

MATERIALS AND METHODS:

The study area comprising of four revenue districts viz., Kolar, Tumkur, Hassan and Bangalore were selected for studying bee-flora and beekeeping. The study covering an area of 33, 640 sq.kms. For the purpose of collection of data 34 study sites were selected.

Identification of bee-flora: The identification of bee flora in the region was mainly by observing the bee visitation. The flower species were identified as a bee plant only after visual conformation and collection of food by honey bees (Sivaram, 1995, Naim and Phadke, 1976). The specimens of the bee visited flower species in each of the study sites were collected dried and preserved by following standard procedure for further reference.

Melissopalynogy: Pollen analysis of honey samples collected from the bee colonies of A. dorsata, A.cerana and *A.florea* were carried out by following methods of Louveaux et al. (1978). The identified bee flora was further classified as pollen plant, nectar plant, and both pollen and nectar plants. Based on the bee visits and the type of food collected by them.

The information on the present status of beekeeping in the state was obtained from the bee keeping cooperative societies and also from the concerned department of the state government.

RESULTS AND DISCUSSION:

The survey on the flowering plants with special reference to apicultural importance during the study period revealed that more than 340 plant species of both cultivated and wild ones are useful to honeybees as food sources. The most important and common bee plant species, their family, flower duration, nectar sugar concentration (NSC) and economic importance are show in **Table 1**. The genera like *Syzygium, Cassia, Citrus, Pongamia, Azadirachta, Albezia, Brassica, Areca, Cocos, Guizotia, Hilianthus, Lagerstroemia*, *Polinathus, Sapindus, Tecoma* are some of the important plants considered as good sources for honeybees.

The bee-flower species in the study area are of great economic importance. Results showed that the bee-flora consists of mostly ornamentals, timber, medicinal, fruits, vegetables and other commercially important plants like spices, pulses, cereals, oil yielding, fibre, fodder etc. Because of economic importance the bee plants are not only protected but also propagated. The economically important bee plants provides substantial quantity of pollen and nectar for bees during different months of the year, and their number also increased year after year as farmers carried propagation every year. The flowering plants of an area having good value as bee pasture are necessary to maintain bee colonies (Baptist and Punchihewa, 1980).

The percent nectar sugar concentration (NSC) in most of the nectar yielding plants identified was determined and the results showed that, there is variation in the percent NSC and differ from plant to plant or within the species. The data revealed that, majority of the nectar yielding plants are secreting nectar with reasonably good sugar concentration **(Table 1)** Also, results showed that the area has innumerable number of plants yielding both pollen and nectar than the pollen or nectar yielding. The region has more number of perennials and their distribution, blooming period is very essential in predicting the pollen and nectar flow for successful beekeeping. The knowledge of blooming season is important factor for sustainable management of bee colonies and for good honey harvest. The flowering duration of any given region helps in migratory beekeeping practice.

The study area, south Karnataka is typically a plain area, which includes a considerable area of natural forest and tree plantations, besides large extent of land is under the cultivation of agri-horticultural crops. The presence of large number of bee-flower species in the area suggests that the plains of south Karnataka is undoubtedly suitable for commercial beekeeping. The diversified bee-flora of the area supports beekeeping throughout the year. The result supports the views expressed by Zamarlicki (1984). Who reported that the knowledge of honey plants is the most important factor in bee management and that the survival of honeybees is related to the abundance of honey plants. The success of honey plants in a given area including botanical and palynological aspects provides information on floral and beekeeping potential (Sharma, 1972).

The Karnataka State has all the four species of honeybees, viz. *Apis dorsata, A. cerana*, *A. florea* and *A. mellifera*. However, *A. mellifera* is newly introduced into the state after the bekeepers lost *A. cerana* colonies due to sudden outbreak of Thai sac brood disease (TSBV) during late 1980's. The giant bee*, A. dorsata* is well distributed in both hilly and plain regions of the state. The wild bees are considered as effective pollinators of various agri-horticultural crops. Though beekeeping is not new to the area it has not achieved expected progress due to various reasons. As per the latest available information the number of beekeepers and bee colonies are 55680 and 52750 respectively. Most of the beekeepers who were entirely depending on beekeeping industry are finding it difficult to manage their economy with out bee colonies. There are several such people have taken-up other agricultural related activities and labour work. By considering all the facts, both state and national agencies concerned as well as the international organizations involved in apiculture development must share their experiences with the local beekeepers and farmers to develop beekeeping in a sustainable way.

Also, the paper suggests that, the Governmental, non-governmental and beekeeping cooperatives must arrange a regular awareness camps in rural parts of the state to enlighten the farmers and the people about the importance of beekeeping for multiple economic benefits. The media should play a role in broadcasting regularly on the role of honeybees in enhancing rural economy and pollination of various economically important crops.

Acklowledgement: The author is highly thankful Dr. C. C. Reddy, Dept. of Zoology and Dr. T.R.B. Naidu, Dept. of Botany for suggesting the topic of research and for their critical comments during the course of investigation.:

REFERENCES:

Akratanakal, P. (1987) Beekeeping in Asia. *FAO, United Nations*.

Baptist, B.A. and R.W.K. Punchihewa (1980). A preliminary analysis of the principal factors which will affect apiary honey production in Sri Lanka. *Proceedings of the 2nd Conference of Apiculture in Tropical Climates,* New Delhi: 75-81

Free, J.B. (1970) Insect pollination of crops. *Academic press,* London, 544 pp.

Gromisz, M. (1993). Flowering dates of some important honey plants in Poland in the years 1946 – 1986. *Pszczelnicze Zeszyty Naukowe*, 37: 89-101.

Hargasim, O. (1974). Bees as pollinators of entomophilous crops. *Bee world*, 55 (4): 137-140.

Kevan, P.G. (1984). Bee botany: pollination, foraging and floral calendar. Expert committee on beekeeping with *Apis mellifera* in tropical and sub-tropical Asia, FAO: Rome, 51-55 pp.

Louveaux, T.; Maurizio, A. and **Vorwhol, G.** (1978). Methods of melittopalynology. *Bee world* 51: 125 – 138.

Michener, C. D. (1974). The social behavior of the bees. *Bilknap press of Harvard University*, Cambridge (UK).

Naim , N. and **Phadke, R.P.** (1976). Bee flora and seasonal activity of Apis cerana indica at Pusa (Bihar). *India Bee Journal*, 38(1-4):13 –19.

Rodinov, V. V. and Shabanshov, (1986). The Fascinating world of bees. *Mir Publishers*, Moscow (Russia).

Sharma, M. (1972). Studies in the flower of *Datura stramonium* Linn. In relation to bee-botany. *Journal of Palynology,* 8: 17-21.

Sivaram, V. (1995). Bee flora, honey flow and beekeeping in the plains of Karnataka. *Doctoral thesis, Bangalore University,* Bangalore, India.

Suryanarayan, M. C. (1986). Honeybee – flower relationship. *Bulletin of Botanical Survey of India,* 28(1-4): 55 – 62.

Velthius, H.H.W. (1992). Pollen digestion and the evolution of sociality in bees. *Bee world*, 73(2): 77-89.

Zamarlicki, C.C. (1984). Evaluation of honeybee plants in Burma – A case study. *Proceedings of the FAO (UN) expert committee*: 57-76.

Table: 1. Honeybee flora duration and flowering duration in Karnataka.

Sl.No	Name	Family	Forage value	Flower duration	% NSC	Economic importance
1	*Abelmoschus esculentus*	Malvaceae	P1N2	Aug – Nov	46.20	Vegetable
2	*Abutilon indicum*	Malvaceae	P2N2	Jan – Feb	29.65	Fibre
3	*Acacia auriculiformis*	Fabaceae	P2N3	Mar-May	38.50	Ornamental
4	*Acacia leucophloea*	Fabaceae	P1N3	Aug-Nov	39.56	Fibre
5	*Acacia nilotica*	Fabaceae	P2N2	Jul-Oct	49.62	Medicinal
6	*Acacia polycantha*	Fabaceae	P1N3	June-Sep	38.60	Fodder
7	*Aegle marmelos*	Rutaceae	P2	Apr-May	-	Medicinal
8	*Ailanthus excelsa*	Simaroubaceae	P1N3	Jan-Mar	36.86	-
9	*Albezia amara*	Fabaceae	P1N1	Feb-Apr	46.50	Timber
10	*Albezia chinensis*	Fabaceae	P2N2	Mar-May	52.63	Timber
11	*Albezia lebbeck*	Fabaceae	P1N1	Mar-May	44.52	Timber
12	*Allium cepa*	Liliaceae	P1	Jan-Mar	-	Vegetable
13	*Alstonia scholaris*	Apocyanaceae	P1	Oct-Nov	-	Medicinal
14	*Amaranthus gracilus*	Amaranthaceae	P1	Feb-Mar	-	Vegetable
15	*Amaaranthus spinosus*	Amaranthaceae	P1	Sep-Oct	-	Vegetable
16	*Anacardium occidentale*	Anacardiaceae	P2N2	Feb-Apr	36.45	Fruit /nut
17	*Annona reticulata*	Annonaceae	P2N1	Apr-May	47.25	Fruit
18	*Antigonon leptopus*	Polygonaceae	P1N2	Apr-May	44.60	Ornamental
19	*Arachis hypogaea*	Fabaceae	P2	Sep-Nov	-	Oil
20	*Areca catechu*	Arecaceae	P2N2	Jun-Dec	52.90	Narcotic
21	*Argemone maxicana*	Papavaraceae	P3	Sep-Dec	-	Oil
22	*Aster sp.*	Asteraceae	P2N3	Jan-Dec	30.25	Ornamental
23	*Azadirachta indica*	Meliaceae	P1N1	Mar-Apr	56.85	Medicinal
24	*Barleria buxifolia*	Acanthaceae	P3N2	Oct-Jan	36.28	-
25	*Barleria prattensis*	Acanthaceae	P3N2	Sep-Oct	33.25	Ornamental
26	*Barleria cristata*	Acanthaceae	P3N2	Sep-Nov	42.50	-
27	*Bauhinia purpurea*	Fabaceae	P2	Oct-May	-	Ornamental
28	*Bauhinia recemosa*	Fabaceae	P2	Feb-July	-	Fibre
29	*Bidens biternata*	Asteraceae	P1N3	Jul-Feb	27.50	Ornamental
30	*Bombax ceiba*	Bombacaceae	P2N3	Feb-Mar	18.50	Fibre
31	*Borreria sp.*	Rubiaceae	P2N2	Aug-Jan	53.50	Weed
32	*Brassica sp.*	Brassicaceae	N1	Oct-Nov	42.06	Spices
33	*Cajan cajan*	Fabaceae	N2	Dec-Mar	33.29	Pulse
34	*Callistemon linearis*	Myrataceae	N2	Feb-Apr	38.50	-
35	*Capparis sepiaria*	Capparidaceae	P2	Mar-May	-	Ornamental
36	*Capparis zeylanica*	Capparidaceae	P2	Feb-Mar	-	Medicinal
37	*Capsicum sp.*	Solanaceae	P3	Jul-Feb	-	Spices
38	*Carissa carandas*	Apocynaceae	P2N2	Mar-Apr	46.50	Fruit
39	*Cassia mimoisoides*	Fabaceae	P1	Jul-Oct	-	Medicinal
40	*Cassia montana*	Fabaceae	P2	Feb-Jul	-	Ornamantal
41	*Cassia italica*	Fabaceae	P2	May-Sep	-	Ornamental
42	*Cassia occidentalis*	Fabaceae	P1	Mar-Jun	-	Ornamental
43	*Casia tora*	Fabaceae	P2	Sep-Nov	-	Ornamental
44	*Casuarina equisetifolia*	Casuarinaceae	P2	Feb-Jul	-	Timber
45	*Celosia argentia*	Amaranthaceae	P3	Jan-Jun	-	Vegetable
46	*Caesalpinia pulcherima*	Fabaceae	P2	Mar-May	-	Ornamental
47	*Chenopodium amrosoides*	Chenopodiaceae	P2N2	Jan-Dec	52.65	Medicinal
48	*Chenopodium murale*	Chenopodiaceae	P2N2	Mar-Jun	53.25	Medicinal
49	*Chrysanthemun indicum*	Asteraceae	P1N3	Jan – Dec	43.80	Ornamental
50	*Cinnamomum macrocarpum*	Lauraceae	P2N2	Jan-Jun	54.86	Medicinal
51	*Citrullus lanatus*	Cucurbitaceae	P1	Sep-Oct	-	Fruit
52	*Citrus reticulata*	Rutaceae	P2N1	Mar-Apr	41.75	Fruit
53	*Citru aurantium*	Rutaceae	N1	Mar-May	39.50	Fruit
54	*Citrus medica*	Rutaceae	N1	Mar-Jul	43.08	Fruit
55	*Clerodendrum inerme*	Verbenaceae	P2N3	Mar-Apr	45.50	Ornamental
56	*Clerodendrum viscosum*	Verbenaceae	P2N3	Jan-Mar	53.25	Spices
57	*Coccinia india*	Cucurbitaceae	P2	Jan-Aug	-	Vegetable
58	*Cocos nucifera*	Arecaceae	P1	Jan-Dec	-	Nut/Oil
59	*Coffea arabica*	Rubiaceae	P2N2	Mar-Apr	30.50	Beverage
60	*Commelina sp.*	Commelinaceae	P2N2	Aug-Dec	32.80	Weed
61	*Corchorus aestuans*	Tiliaceae	P2	Nov-Dec	_	Fibre
62	*Corchorus trilocularis*	Tiliaceae	P2	Aug-Dec	-	Fibre
63	*Cordia dichotoma*	Cordiaceae	P2N2	Mar-Apr	44.62	Medicinal

Sl.No	Name	Family	Forage value	Flower duration	% NSC	Economic importance
64	*Coriandrum sativum*	Apiceae	P2N1	Sep-Dec	60.29	Spices
65	*Cosmos caudatus*	Asteraceae	P1	Nov-Dec	-	Ornametal
66	*Crossandra sp.*	Acanthaceae	P2N2	Aug-Dec	40.50	Ornamental
67	*Cucumis melo*	Cucurbitaceae	P1	Sep-Nov	-	Fruit
68	*Cucumis sativus*	Cucurbitaceae	P1	Oct-Nov	-	Vegetable
69	*Cucurbita maxima*	Cucurbitaceae	P2	Jan-Dec	-	Vegetable
70	*Cucurbita pepo*	Cucurbitaceae	P2N2	Jan- Dec	36.50	Vegetable
71	*Cynodon dactylon*	Poaceae	P3	Aug-Oct	-	Fodder
72	*Dahlia variabilis*	Asteraceae	P1N2	Jan-Dec	35.00	Ornamental
73	*Dalbergia sisoo*	Fabaceae	P2N2	Feb-Apr	54.96	Timber
74	*Datura sp.*	Solanaceae	P3	Apr-Dec	-	Weed
75	*Delonix regia*	Fabaceae	P3N2	Mar-May	56.24	Ornamental
76	*Dicoma tomentosa*	Asteraceae	P1N2	Jun-Jan	36.50	Medicinal
77	*Diospyros melanxylon*	Ebenaceae	P2N2	Mar-May	56.50	Ornamental
78	*Diospyros montana*	Ebenaceae	P2N2	Jan-Dec	49.24	Ornamental
79	*Dodonaea viscosa*	Sapindaceae	N1	Jan-Dec	49.55	Ornamental
80	*Ellettaria cardamomum*	Zingeberaceae	N2	Jul-Nov	37.48	Spices
81	*Erythrina indica*	Fabaceae	N2	Feb-Apr	52.06	Ornamental
82	*Eucalyptus spp*	Myrtaceae	P2N1	Nov-Apr	41.96	Timber
83	*Eupatorium odoratum*	Asterceae	P3N2	Jul-Aug	30.25	Weed
84	*Gossypium sp.*	Malvaceae	P3N3	Dec-Apr	34.06	Fibre
85	*Grewia hirsuta*	Tiliaceae	P2N2	Mar-Jul	44.38	Timber
86	*Grewia orientalis*	Tiliaceae	P2N2	Apr-Sep	43.40	Timber
87	*Grewia tiliaefolia*	Tiliaceae	P2N2	Apr-Aug	42.09	Timber
88	*Guizotia abyssinica*	Asteraceae	P1N1	Sep-Nov	36.00	Oil
89	*Helianthus annuus*	Asteraceae	P1N2	Nov-Dec	43.80	Oil
90	*Hibiscus rosa-sinensis*	Malvaceae	P2N3	Jan-Dec	26.48	Ornamental
91	*Hibiscus ovalifolius*	Malvaceae	P2	Jan-May	-	Ornamental
92	*Hibiscus sutrattensis*	Malvaceae	P2	Aug-Nov	-	Fibre
93	*Hygrophilia auriculata*	Acanthaceae	P2N2	Jul-Dec	29.64	Medicinal
94	*Impatiens balsaminia*	Balsaminaceae	P3N3	Aug-Oct	21.50	Medicinal
95	*Impatiens trichocarpa*	Balsaminaceae	P3N3	Aug-Dec	16.75	Medicinal
96	*Ipomea alba*	Convoluvaceae	P1N3	Oct-Dec	37.25	Ornamental
97	*Ipomea batatas*	Covoluvaceae	P1N3	Feb-Mar	36.27	Medicinal
98	*Ipomea eriocarpa*	Covoluvaceae	P1N3	Dec-Jan	27.46	Vegetable
99	*Ixora coccinea*	Rubiaceae	P3	Feb-Mar	-	Ornamental
100	*Jacaranda sp.*	Bignoniaceae	P2N2	Feb-Mar	44.63	Ornamental
101	*Justicia betonica*	Acanthaceae	P2N2	Jan-Dec	48.25	Medicinal
102	*Justicia glabra*	Acanthaceae	P2N2	Jan-Sep	43.80	Ornamental
103	*Justicia simplex*	Acanthaceae	P2N3	Jan-Dec	36.57	Ornamental
104	*Kigelia pinnata*	Bignoniaceae	P3N2	Jul-Nov	33.46	Medicinal
105	*Lagscea mollis*	Asteraceae	P1N3	May-Nov	36.66	Medicinal
106	*Lagenaria leucantha*	Cucurbitaceae	P2N2	Aug-Nov	46.65	Medicinal
107	*Lagerstoemia reginae*	Lythraceae	P2	May-Jul	_	Timber
108	*Lagerstromia speciosa*	Lythraceae	P2N2	May-Jul	52.64	Timber
109	*Lagerstroemia microcarpa*	Lythraceae	N3	Mar-Apr	39.00	Timber
110	*Lagetroemia passiflora*	Lyrthraceae	P2N3	Feb-Aug	44.26	Timber
111	*Lawsonia inermis*	Lythraceae	P2	Mar-May	-	Medicinal
112	*Leonotis nepetifolia*	Lamiaceae	P2N3	Sep-Nov	51.20	Medicinal
113	*Lepedogathis cristata*	Acanthaceae	N2	Jan-Feb	26.43	Medicinal
114	*Leucas aspera*	Lamiaceae	P2N2	Jan-Aug	38.92	Medicinal
115	*Leucas lavendulaefolia*	Lamiaceae	P2N2	Sep-Mar	43.99	Medicinal
116	*Linum mysorensis*	Linaceae	P3N3	Sep-Nov	29.67	Ornamental
117	*Lycopercicon esculentum*	Solanaceae	P1	Jul-Sep	_	Vegetable
118	*Madhuca indica*	Sapotaceae	P2N2	Mar-Apr	52.40	Oil
119	*Medicago sativa*	Fabaceae	P2N2	Sep-Nov	48.50	Fodder
120	*Melia azardirachta*	Meliaceae	P2	Feb- May	-	Medicinal
121	*Melia dubia*	Meliaceae	P3	Mar-May	-	Medicinal
122	*Millettia peguvensis*	Fabaceae	P2N1	Jan-Mar	46.25	Ornamental
123	*Memecylon umbellatum*	Melaystomaceae	P2N2	Jan-May	23.30	Medicinal
124	*Mimosa pudica*	Mimosaceae	P1N2	Jan-Dec	30.50	Medicinal
125	*Momordica charantia*	Cucurbitaceae	N2	Aug-Oct	-	Vegetable
126	*Moringa oleifera*	Moringaceae	P2N1	Feb-Apr	56.40	Vegetable
127	*Muntingia calabura*	Tiliaceae	P1	Dec-Feb	-	Ornamental
128	*Murraya paniculata*	Rutaceae	P2N1	Apr-Jun	51.66	Spices

Sl.No	Name	Family	Forage value	Flower duration	% NSC	Economic importance
129	*Musa sp.*	Musaceae	P2N3	Jan-Dec	24.44	Fruit
130	*Mussenda frondosa*	Rubiaceae	N2	Sep-Dec	52.60	Medicinal
131	*Neolitsea zeylanica*	Lauraceae	P2N2	Jan-May	41.50	Timber
132	*Nymphaea pubescens*	Nymphaceae	P2N2	Jan-Apr	23.75	Ornamental
133	*Ocimum sp.*	Lamiaceae	P3N1	Jan-Dec	39.87	Medicinal
134	*Opuntia monocantha*	Cactaceae	P2N2	Oct-Nov	46.75	Fruit
135	*Oryza sativa*	Poaceae	P2	Aug-Sep	-	Food
136	*Oxalis corniculata*	Oxalidaceae	P2N2	Mar-May	50.26	Medicinal
137	*Passiflora foetida*	Passifloraceae	P1N2	Jan-Jul	44.56	Fruit
138	*Peltaphorum pterocarpus*	Fabaceae	P2N1	Jan-Jun	44.50	Ornamental
139	*Petrea volubilis*	Verbenaceae	P2	Feb-Apr	-	Ornamental
140	*Phaseolus vulgaris*	Fabaceae	N3	Dec-Feb	34.86	Pulses
141	*Phaseolus aurens*	Fabaceae	N3	Dec-Feb	28.30	Pulses
142	*Phoenix sylvestris*	Arecaceae	P2N2	Dec-Feb	49.45	Timber
143	*Polianthus tuberosa*	Agavaceae	P2N1	Oct-Dec	44.28	Timber
144	*Polygonum sp.*	Polygonaceae	P3N2	Jun-Aug	33.86	Ornamental
145	*Pongamia pinnata*	Fabaceae	N1	Feb-Apr	56.30	Oil
146	*Portulaca oleracea*	Portulaceae	P2	Jan-Feb	-	Medicinal
147	*Prosopsis cineraria*	Fabaceae	P2N2	Jun-Sep	52.45	Vegetable
148	*Psidium guajava*	Myrtaceae	P2N1	Mar-Jun	39.66	Fruit
149	*Pterocarpus indicus*	Fabaceae	P2N2	Feb-Apr	43.60	Timber
150	*Pyrostegia venusta*	Bignoniaceae	P3	Dec-Mar	-	Ornamental
151	*Ricinus comunis*	Euphorbiaceae	P2N3	Feb-Apr	22.50	Oil
152	*Rosa sp.*	Rosaceae	P1N2	Jun-Jul	26.55	Ornamental
153	*Samanea saman*	Fabaceae	P1N2	Mar-Jun	38.50	Ornamental
154	*Santalum album*	Santalaceae	P2N2	Jan-Jul	48.60	Wood/oil
155	*Sapindus laurifoilus*	Sapindaceae	P2N1	Dec-Jan	40.50	Medicinal
156	*Schefflera venulosa*	Araliaceae	P2N2	Apr-May	56.55	Ornamental
157	*Seasamum orientale*	Pedaliaceae	P2N1	May-Sep	-	Oil
158	*Sechium edule*	Cucurbitaceae	P2N2	Jan-Dec	44.50	Vegetable
159	*Sida acuta*	Malvaceae	P2	Jan-Dec		Weed
160	*Sida cordata*	Malvaceae	P3N3	Oct-Dec	33.45	Weed
161	*Sida cordifolia*	Malvaceae	P3N3	Jan-Dec	42.00	Weed
162	*Solanum indicum*	Solanaceae	P3N3	Sep-Jan	24.58	Medicinal
163	*Solanum melongena*	Solanaceae	P3	Sep-Jan	-	Vegetable
164	*Solanum nigrum*	Solanaceae	P2N3	Jun-Dec	25.64	Medicinal
165	*Solanum tuberosum*	Solanaceae	P2N2	Mar-Jun	19.36	Vegetable
166	*Solidago sp.*	Asteraceae	N2	Nov-Dec	49.20	Ornamental
167	*Spathodea compannulata*	Bignoniaceae	P2	Nov-Mar	-	Ornamental
168	*Syzygium cuminin*	Myrtaceae	P2N1	Mar-Apr	58.50	Timber/fruit
169	*Syzygium jambos*	Myrtaceae	P2N1	Mar-Jun	49.65	Fruit
170	*Tabebuia argentea*	Bignoniaceae	P2N1	Dec-Feb	42.40	Ornamental
171	*Tabebuia rosea*	Bignoniaceae	P2N1	Aug-Sep	38.58	Ornamental
172	*Tagetus sp.*	Asteraceae	P1N3	Jan-Dec	28.50	Ornamental
173	*Tamarindus indicus*	Fabaceae	P2N1	Apr-Jun	56.74	Timber/spice
174	*Tecoma stans*	Bignoniaceae	N1	Sep-Nov	16.24	Ornamental
175	*Tectona grandis*	Verbenaceae	P2N2	Jun-Sep	56.25	Timber
176	*Terminalia arjuna*	Combetaceae	P2N1	Mar-May	46.60	Timber
177	*Terminalia chebula*	Combetaceae	P2N1	Mar-Apr	58.23	Timber
178	*Terminalia tomentosa*	Combetaceae	P2N1	May-Jun	57.29	Timber
179	*Thespesia populnea*	Malvaceae	P2	Jan-Feb	-	Timber
180	*Todalia asiatica*	Rutaceae	P2N2	Feb-Sep	44.80	Medicinal
181	*Toona ciliata*	Meliaceae	P2	Jan-Feb	-	Timber
182	*Trichosanthes anguina*	Cucurbitaceae	P2N2	Jan-Mar	39.50	Vegetable
183	*Tridax procumbens*	Asteraceae	P1N2	Jan-Dec	29.58	Weed
184	*Vernonia albicans*	Asteraceae	P2	Aug-De	-	Weed
185	*Vitex negundo*	Verbenaceae	P2N3	Sep-Nov	20.50	Medicinal
186	*Wendlandia thyrsoidum*	Rubiaceae	P1N2	Mar-Apr	44.66	Timber
187	*Xeromorphis spinosa*	Rubiaceae	P2	Mar-Nov	-	Timber
188	*Zea mays*	Poaceae	P2	Jan-Dec	-	Cereal
189	*Zinnia elegars*	Asteraceae	P2N2	Jul-Jan	30.50	Ornamental
190	*Ziziphus jujuba*	Rhamnaceae	P3N2	Jul-Oct	48.00	Fruit
191	*Ziziphus oenopila*	Rhamnaceae	P2N2	Mar-Aug	44.64	Fruit
192	*Ziziphus xylopyrus*	Rhamnaceae	P2N2	Mar-Sep	50.75	fodder