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Research Article

PREPARATION OF FLORAL CALENDER/CROP CALENDER BY INDIAN HONEY BEES APIS CERANA INDICA FAB., AT ANNAMALAI NAGAR ECOSYSTEM

S.Pushpalatha

Department of Entomology, Faculty of Agriculture, Annamalai University, Annamalai Nagar-608002

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ABSTRACT

Foraging behaviour of bees is depending upon floral ecosystem. Complex relationships between colony biology and that of individual forager, microclimate of the hive and also the physiology of plants and other biological and environmental factors.

Compared to several native flower visitors as well as the European honey bee, *Apis cerana indica* has been found to start its foraging activity earlier in the mornings and to increase its activity later in the evenings on several tropical, sub tropical and temperate crop plants on several crop plants, visit of *Apis cerana* more or less coincides with the period of pollen release and stigmatic receptivity in the flowers. This benefits the honeybees to compete successfully with the antophils for food and also makes them the most efficient pollinators (Mishra *et al.*; 1976). The number of foragers is corrected with atmospheric temperature, soil temperature, relative humidity, light intensity and nectar sugar concentration but not with wind velocity.

A dual threshold of temperature and light intensity exists for commencement of foraging; The population dynamics was directly temperature of 20 to 35°C and a relative humidity of 26 to 80%. The Indian bee is an efficient forager. It carries pollen load ranging from 2 to 190 mg in weight. Relative humidity and rain fall showed a significant positive relationship with pollen gathering capacity but not with nectar gathering activity. Temperature and wind speed did not affect the foraging activity.

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INTRODUCTION

The number of pollen foragers shows maximum variation during different times of the day and on different days of the year compared to that of the nectar foragers and of the non-foragers (Reddy and Bai 1979). The Indian bee is an efficient forager. It carries pollen load ranging from 2 to 190 mg in weight (Cherian *et al.*, 1946; Punjabi *et al.*, 1969; Dhaliwal, 1970; Naim and Bist, 1979; Rahmen and Rahman, 1993. Singh (1962) and Mishra (1995) gave a good historical account of beekeeping in India. *Apis Cerana Indica* Fab., is found almost in all parts of the country, except perhaps the cold and hot desert because of non availability of flora.

MATERIALS AND METHODS

The study was carried in a small apiary maintained at the Entomology department, Annamalai University 7 – 8 colonies of *Apis Cerana Indica* dept in Newton bee hives were taken for the study. Morning and evening hours foraging efficiency of a colony was measured in terms of number of bees with pollen load entering the hive. The floral sources present near the

colonies of which bees reached for pollen collection were observed. Honey bees play a vital role in foraging behaviour of worker bees such as weather, distance of the food source from the hive, food quality, quantity of nectar and the pollen.

There is usually shortage of floral resources during summer and rainy seasons i.e., from June to August (Mishra and Sharma, 1977). Bees generally forage to a good source with in 3 Km radius. The bees activity is more during the honey flow seasons. In this present investigation, the pollen and nectar yielding plant species has been identified and studied during March, 2012 -15 at the Department of Entomology, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamilnadu. Annamalai Nagar belongs to 11° 24 ' N latitude of equator and 79°41' E longitude and attitude + 5.79msl. the bee hives along with colonies were brought from Marthandam and YMCA (young Men Christian Association). Installing bee colonies were done during January and February months. Colonies were installed near mango tree.

*Corresponding author: S.Pushpalatha

Department of Entomology, Faculty of Agriculture, Annamalai University, Annamalai Nagar-608002

Keeping Sugar Solution

By using coconut shells / plastic containers were filled with sugar solution of sugar syrup. Sugar syrup feeding is given normally in the proportion of 1:1 (Sugar: Water) as a simulative feeding.

Preparation of Floral Calendar

Bee flora of Indian honey bee was studied during the period 2012 – 2015. The different pollinating plants were observed by bees. The list bee pasturing plants includes field crops, vegetable crops, weeds ornamental and road side avenue trees.

Azadiracta Indica Milianceae contain 56.85% nectar source concentration and we obtain the neem oil also. Chenopodium nurale- chenopodiaceae having 53.25% Nectar source concentration. Chrysanthemum indicum Asteroceae contains 43.80n% nectar source concentration. Corairndrum sativum contains 60.29% of nectar source concentration. The malvaccous plant Hibiscus rosainensis contains low level of nectar source concentration, is 26.48%.Fabacceae, Rhamohaceae, Myrtaceae are having maximum nectar source concentration.

Favourable bee foraging plants

Sl.No	Bee foraging plants	Family	Pollen/ Nectar	Available Blooming Season	% NSC Economic	Importance Of plant
1.	<i>Abelmoschus esculentus</i>	Malvaceae	P1N2	Aug- Nov	46.20	Vegetable
2.	<i>Abutilon indicum</i>	Malvaceae	P2N2	Jan - Feb	29.65	Fibre
3.	<i>Acacia Polycantha</i>	Fabaceae	P1N3	June - Sep	38.60	Fodder
4.	<i>Albezia Chinesis</i>	Fabaceae	P2N2	Mar - May	52.63	Timber
5.	<i>Albezia Lebbeck</i>	Fabaceae	P1N1	Mar - May	44.52	Timber
6.	<i>Allium cepa</i>	Liliaceae	P1	Jan - Mar		Vegetable
7.	<i>Amaaranthus Spinosus</i>	Amaranthaceae	P1	Sep- Oct		Vegetable
8.	<i>Anacardium occidentale</i>	Amaranthaceae	P1	Feb - April	36.45	Fruit/Nut
9.	<i>Arachis hypogaea</i>	Fabaceae	P2N2	Sep - Nov		Fruit
10.	<i>Aster Sp.</i>	Asteraceae	P2N3	Jan - Dec	30.25	Ornamental
11.	<i>Azadirachta indica</i>	Meliaceae	P1N1	Mar - April	56.85	Oil
12.	<i>Cajanus cajan</i>	Fabaceae	N2	Dec - Mar	33.29	
13.	<i>Capsicum sp.</i>	solanaceae	P2	Jul - Feb		Medicinal
14.	<i>Cassia italica</i>	Fabaceae	P2	May - Sep		Ornamental
15.	<i>Casuarina equisetifolia</i>	Casuarinaceae	P2	Feb - Jul		Ornamental
16.	<i>Caesaloinia pulcherima</i>	Fabaceae	P2	Mar - May		Medicinal
17.	<i>Chenopodium amrosoides</i>	Chenopodiaceae	P2N2	Jan - Dec	52.65	Ornamental
18.	<i>Chrysanthemum indicum</i>	Asteraceae	P1N3	Jan - Dec	43.80	Fruit
19.	<i>Citrus medica</i>	Cucurbitaceae	N1	Mar - Jul	43.08	Vegetable
20.	<i>Coccinia india</i>	Rutacea	N1	Mar - Jul		Ornamental
21.	<i>Cocos nucifera</i>	Arecaceae	P1	Jan - Dec		Nut / Oil
22.	<i>Commelina Sp.</i>	Commelinaceae	P2N2	Aug - Dec	32.80	Weed
23.	<i>Crossandra SP.</i>	Acanthaceae	P2N2	Aug - Dec	40.50	Ornamental
24.	<i>Cucumis melo</i>	cucurbitaceac	P!	Sep - Nov		Fruit
25.	<i>Cucumis Sativus</i>	Cucurbitaceae	P!	Oct - Nov		Vegetable
26.	<i>Cucurbita Pepe</i>	Cucurbitaceae	P2N2	Jan - Dec	36.50	Vegetable
27.	<i>Datura SP.</i>	Solanaceae	P3	Feb - Apr		Weed
28.	<i>Erythrina indica</i>	Fabaceae	N2	Feb- Apr	52.06	Ornamental
29.	<i>Eucalyptus Spp</i>	Myrtaceae	P2N1	Nov - Apr	41.96	Timber
30.	<i>Gossypium SP</i>	Malvaceae	P2N3	Dec - Apr	34.06	fibre
31.	<i>Helianthus annuus</i>	Asteraceae	P1N2	Nov - Dec	43.80	Oil
32.	<i>Hibiscus rosa</i>	Malvaceae	P2N3	Jan - Dec	26.48	ornamental
33.	<i>Hibiscus sutrattensis</i>	Malvaceae	P2	Aug - Nov		Fibre
34.	<i>Ipomea batatus</i>	Covoluvaceae	P1 N3	Feb - Mar	36.27	Medicinal
35.	<i>Lycopersicon esculentum</i>	solanaceae	P1	Jul - Sep		Vegetable
36.	<i>Madhuca indica</i>	Sapotaceae	P2N2	Mar - Apr	52.40	Oil
37.	<i>Moringa oleifera</i>	moringaceae	P2N1	Feb - Apr	56.40	Vegetable
38.	<i>Musa sp.</i>	Musaceae	P2N3	Jan - Dec	24.44	Fruit
39.	<i>Mussenda Frondosa</i>	Rubiaceae	N2	Sep - Dec	52.60	Medicinal
40.	<i>Ocimum SP.</i>	Laminaceae	P3N1	Jan - Dec	39.87	Medicinal
41.	<i>Oryza sativa</i>	poaceae	P2	Aug – Sep		Food
42.	<i>Pongamia pinnata</i>	Fabaceae	N1	Feb - Apr	56.30	Oil
43.	<i>Syzygium Cuminin</i>	Myrtaceae	P2N1	Mar - Apr	58.50	Timber/ Fruit
44.	<i>Zizphus xylopyrus</i>	Rhamnaceae	P2N2	Mar - Sep	50.75	Fodder

RESULTS AND DISCUSSION

Malvaceous plants are having 29.65% (low level of nectar source concentration) where as Acacia nilotica (Fabaceae) are having 49.62% nectar source concentration. The neem plant

Tamarind, Teak, prosopis, Fabaceae crops, ber tree, coriander crops, neem flowers, pongamia flowers are having maximum nectar source concentration. Verghese and Prasad (1983) observed that the foragers increased in number with increasing colony strength. The number of incomingly and out going

foragers were not in equilibrium but were pulsating in alternate cycles, i.e., when the outgoing bees were at their peak, the incoming bees were at their lowest and vice – versa. This according to them suggests that foraging bees move almost as a group over a period of few minutes to forage and return to their hive. The number of foragers is correlated with atmospheric temperature, soil temperature, relative humidity, light intensity and nectar sugar concentration, but not with wind velocity. A dual threshold of temperature and light intensity exists for commencement of foraging, but cessation of foraging is governed mainly by light intensity (Dhaliwal and Bhalla, 1983)

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