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Study on Identification of Pasturage Sources of Stingless Bee (*Trigona iridipennis* Smith.)

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A B S T R A C T

Total of 107 plant species belong to 45 families were found to yield pollen or nectar or both to the *T. iridipennis*. 13 field crops comprising 6 family, 2 spices and condiments (2-family), 10 vegetable crops (4-family), 14 fruits and plantation crops (13-family), 12 ornamental plants (10-family), 19 medicinal plants (11-family), 10 weeds (7-family) and 27 trees (14-family). Worker bees of *T. iridipennis* were collected resin from four plants viz., jack fruit, drumstick, mango and perivinkle at Bangalore region.

Introduction

Stingless bees are social insects that have existed for over 100 million years, nesting in dark places consist of hundreds to thousands of individuals, both adults and brood, the responsibility of bringing food depends on small group of workers (Wille, 1983). They can be domesticated by transferring natural colonies to manmade bee hives for production of honey, pollen, resin and pollination of crops. The stingless bees are generalist flower visitors and their foraging range is very shorter than true honeybees. The frequency of bee visitation is more on plants which are very nearer to the colony. The information on foraging for the pollen, nectar or collection of both from various flowering plants is very much limited. Hence, study on identification of different pasturage source of stingless bees has carried out at Regional Research Station, UAS, GKVK, Bangaluru.

Materials and Methods

In situ observations were made while stingless bees were foraging on plants to find out pasturage sources that provided nectar and pollen. The sources that provide resin to stingless bees were also recorded. The plant was judged as nectar source when bees inserted proboscis into flower for sipping nectar and as pollen source when corbiculae got loaded with pollen during foraging. When both the activities observed on the same plant was considered as a source for both nectar

and pollen. Similarly, the plant was regarded as a resin source when the corbiculae of stingless bees got loaded with sticky material.

Results and Discussion

Trigona iridipennis was found to forage on 107 plant species belonging to 45 families, of which 62 plants provided pollen, 8 plants offered nectar and 37 plants offered both. Among 107 plants, 13 field crops, 2 spices and condiments, 10 vegetables crops, 14 fruit and plantations crops, 12 ornamental plants, 19 medicinal plants, 10 weeds and 27 trees (Table 1). The family wise distribution of pasturage sources is presented in Table 2. Among forage plants of *Trigona iridipennis*, the members of the family Fabaceae topped the list followed by Asteraceae and Cucurbitaceae. The members of these families being highly cross pollinated, they seem to have co-evolved with the bees by providing nectar and pollen and in turn getting pollinated by them. Species of genus *Scaptotrigona* showed special preference to eucalyptus flowers for collection of both pollen and nectar even though they visited hundred plants (Ramalho *et al.,* 1980). *Trigona iridipennis* attracted to both minute flowers (ex. *Bidens pilosa*) and large showy flower (ex. *Delonix regia*). Few generalization could be made regarding flower preferred by stingless bees viz. *Vitex* spp., *Lawsonia inermis* flowers were very attractive to these bee as they preferred small flowers, dense inflorescence with corolla tube shorter than their tongue length and flowers with white corolla tube permitting their entry inside ex. *Sesamum indicum* (Heard, 1999). *Trigona iridipennis* preferred by white and yellow flowers like copper pod, mango, etc., rather than pink flowers.

Table.1 Pasturage sources of *Trigona iridipennis* at GKVK, Bangalore

Sl. No.	Common name	Scientific name	Local name	Family	Source	Method of evaluation
I.	**Field crops**					
a.	**Cereals**					
01	Finger millet	*Eleusine coracana* Gaertn.	Ragi	Poaceae	P	MA
02	Pearl millet	*Pennisetum typhoides* Stapt an Hubb.	Sajje	Poaceae	P	VO
03	Maize	*Zea mays* L.	Musukina jola (Mekkejola)	Poaceae	P	VO
04	Sorghum	*Sorghum bicolor* Linn. Mocch.	Jola	Poaceae	P	VO
b.	**Pulses**					
01	Cowpea	*Vigna catjung* Walp.	Alasandhi (Thadagani)	Fabaceae	N	VO
02	Blackgram	*Phaseolus mungo* L.	Uddhu	Fabaceae	N	VO
03	Greengram	*Vigna radiate* var. Nilezek	Hesaru	Fabaceae	N	VO
04	Redgram	*Cajanus cajan* L.	Thogari	Fabaceae	NP	VO
c.	**Oil seeds**					
01	Sunflower	*Helianthus annuus* L.	Suryakanti	Compositae	NP	VO
02	Niger	*Guizotia abyssinica* Cass.	Huchchellu	Compositae	NP	VO
03	Seasamum	*Sesamum indicum* L.	Ellu	Pedaliaceae	N	VO/MO
04	Mustard	*Brassica juncea* Corr.	Sasive	Brassicaceae	NP	VO
05	Castor	*Ricinus communis* L.	Haralu	Euphorbiaceae	P	VO
II.	**Spices and condiments**					

01	Coriander	*Coriandrum sativum* L.	Dhaniya	Umbelliferae	NP	VO
02	Curry leaves	*Murraya koenigii* Spreng.	Karibevu	Rutaceae	P	VO
III.	**Vegetables**					
01	Drumstick	*Moringa oleifera* Lamk.	Nugge	Moringaceae	P	VO/MA
02	Onion	*Allium cepa* L.	Irulli	Liliaceae	NP	VO
03	Brinjal	*Solanum melongena* L.	Badane	Solanaceae	P	VO/MA
04	Chow-chow	*Sechium edule* (Jacq.) Swartz	Semebadane	Cucurbitaceae	NP	VO
05	Pumpkin	*Cucurbita pepo* Dc.	Kumbalakai	Cucurbitaceae	P	VO
06	Cucumber	*Cucumis sativus* L.	Sauthekai	Cucurbitaceae	P	VO
07	Ridgegourd	*Luffa acutangula* L.	Heerekai	Cucurbitaceae	P	VO
08	Bittergourd	*Momordica charantia* L.	Hagalakai	Cucurbitaceae	P	VO
09	Bottlegourd	*Lagenaria vulgaris* Sr.	Sorekai	Cucurbitaceae	P	VO
10	Ashgourd	*Benincasa hispida* Cogn.	Budugumbala	Cucurbitaceae	P	VO
IV.	**Fruits and plantations**					
01	Mango	*Mangifera indica* L.	Mavu	Anacardiaceae	NP	VO/MA
02	Papaya	*Carica papaya* L.	Parangi	Caricaceae	P	VO
03	Grapes	*Vitis vinifera* L.	Drakshi	Vitaceae	P	VO
04	Pomogranate	*Punica granatum* L.	Dalimbe	Punicaceae	P	VO
05	Simarouba	*Simarouba glauca*	Swargadhamara	Simaraubaceae	NP	VO
06	Jack	*Artocarpus integrifolia* L.	Halasinamara	Moraceae	P	VO
07	Banana	*Musa paradisiacal* L.	Bale	Moraceae	N	VO
08	Arecanut	*Areca catechu*	Adike	Arecaceae	NP	VO
09	Coconut	*Cocos nucifera* L.	Thengu	Arecaceae	NP	VO
10	Guava	*Psidium guazava* L.	Sebekai	Myrtaceae	P	VO
11	Gooseberry	*Phyllanthus emblica*	Kiruneeli	Euphorbiaceae	NP	VO
12	Acid lime	*Citrus meica* var. acida	Nimbe	Rutaceae	NP	VO
13	Singapur cherry	*Muntingia calabora*	Gasagase mara	Eleocarpaceae	NP	VO/MA
14	Tamarind	*Tamarindus indica* D.C.	Hunase	Caesalpinaceae	NP	VO/MA
V.	**Ornamentals**					
01	Tuberose	*Palianthus tuberose* Linn.	Sugandaaraju	Agaraceae	NP	VO
02	Bottlebrush	*Callestemon lanceolus* D.C.	Bottlebrush	Myrtaceae	NP	VO
03	Railway creeper	*Ipomea cairica*	Bekkenahejje	Convolvulaceae	NP	VO
04	Rangoon creeper	*Quisqualis indica* L.	Beeplant	Combretaceae	N	VO
05	Berleria	*Berleria cristata* L.	Spatikadahoo	Acanthaceae	NP	VO/MA
06	Hibiscus	*Hibiscus rosa sinensis*	Dhasavala	Malvaceae	P	VO
07	Rose	*Rosa indica* L.	Gulabi	Rosaceae	P	VO
08	Salvia	*Salvia splendenus*	Salvia	Lamiaceae	P	VO
09	Garden balsam	*Impatiens balsamina* L.	Karnakundala	Balsaminae	P	VO
10	Marigold	*Aster* sp.	Chenduhoo	Asteraceae	P	VO
11	Cosmos	*Cosmos suphureas* Cav.	Cosmos	Asteraceae	P	VO
12	Golden rod	*Salidago* sp.	Goldenrod	Asteraceae	P	VO
VI.	**Medicinal plants**					
01	Honey plant	*Ammi majus*	Madhugida	Umbelliferae	NP	VO

02	Bishops weed	*Ammi vasnaga*	-	Umbelliferae	NP	VO
03	Ajwan	*Trachysprmum amni*	Omum	Umbelliferae	P	VO
04	Indian acalypha	*Acalypha indica*	Acalypha	Euphorbiaceae	NP	VO
05	Physic nut	*Jatropha curcas*	Ritha	Euphorbiaceae	P	VO
06	Kalama dye	*Mallotus philippensis*	Kunkuma	Euphorbiaceae	P	VO
07	Indian liquorice	*Arbus precororius*	Jestiamadhu	Fabaceae	P	VO
08	Babchi	*Psoralea corylifolia*	Baranchi gida	Fabaceae	P	VO
09	Neeligida	*Indigofera tinctoria*	Neeligida	Fabaceae	P	VO
10	Alfalfa	*Medicago sativa*	Kudarer masale	Fabaceae	P	VO
11	Tube flower	*Clerodendrum serratum*	Tube flower	Verbanaceae	P	VO
12	Dioscorea	*Dioscorea composita*	Dioscorea gadde	Diascoreaceae	P	VO
13	Prim rose	*Ocnothera lamarkiana*	Kadu garagalu	Onagrceae	P	VO
14	Sweet worn wood	*Artemisia annua*	Artemisia	Asteraceae	P	VO
15	Sylibium	*Sylibum marianmum*	Holithesal	Asteraceae	P	VO
16	Rauvolfia	*Rauvolfia tetraphylla*	Sarpagandha	Apocyanaceae	P	VO
17	Ocimum	*Ocimum sanctum*	Tulasi	Lamiaceae	NP	VO
18	Lea	*Lea indica*	Andilu	Vitaceae	P	VO
19	Garden	*Ruta graveolens*	Nagadali	Rutaceae	P	VO
VII. Weeds						
01	Tenners cassia	*Cassia auriculata*	Tangadi	Ceasalphinaceae	P	VO
02	Lecuas	*Leucas aspera*	Thumbe	Lamiaceae	N	VO
03	Tridax	*Tridax procumbens*	Sanna sevanthi	Asteraceae	P	VO
04	Congress weed	*Parthenium hysterophorus*	Thurike gida	Asteraceae	P	VO
05	Ageratum	*Ageratum conyzoides*	Ageratum	Asteraceae	P	VO
06	Bidens	*Bidens pilosa*	Bidens gida	Asteraceae	NP	VO/MA
07	Touch me not	*Mimosa pudica*	Muttidare muni	Fabaceae	P	VO
08	Brahmi	*Bacopa monniera*	Brahmi	Scrgshulariaceae	P	VO
09	Mexican poppy	*Argemone Mexicana* L.	Arasine umatti	Papavaraceae	P	VO
10	Lantana	*Lantana camera*	Beligida	Verbanaceae	P	VO
VIII. Trees						
01	Eucalyptus	*Eucalyptus globosa*	Nilagiri	Myrtaceae	NP	VO/MA
02	Jamun	*Syzgyium fruticosum*	Nerale	Myrtaceae	NP	VO/MA
03	Jakaranda	*Jacaranda acutifolia*	Neeligulmohr	Bignoniaceae	NP	VO
04	Tecoma	*Tecoma stans*	Obbattina gida	Bignoniaceae	NP	VO/MA
05	Indian coral tree	*Erythrina indica*	Halavana	Fabaceae	P	VO
06	Babul	*Acacia arabica* W.II.d.	Karijali	Fabaceae	P	VO
07	Gulmohr	*Delonix regia* Ref.	Kattikai	Fabaceae	NP	VO/MA
08	Dhiancha	*Sesbania grandiflora* Pers.	Agase	Fabaceae	NP	VO
09	Mesquite	*Prosopis juliflora* DC	Jali	Fabaceae	NP	VO/MA
10	Pride of India	*Lagerstromia indica* L.	Telangana cheeni	Lythraceae	P	VO
11	Camel foot	*Bahunia purpurea*	Basavana pada	Lythraceae	NP	VO/MA

12	Mehandi	*Lawsonia inermis*	Goranti	Lythraceae	NP	VO/MA
13	Henna	*Lawsonia inermos*	Goranti	Lythraceae	NP	VO
14	Copper pod	*Peltophorum petrocarpum* (DC & Baker)	Bettadha hunese	Caesalpenaceae	NP	MA
15	Pongamia	*Pongamia glabra*	Honge	Ceaesalpinaceae	N	VO/MA
16	Cassia	*Cassia javanica*	Doddathangadhi	Ceaesalpinaceae	P	VO
17	Sandal wood	*Santalum album* L.	Gandhada mara	Santalaceae	P	VO/MA
18	Teak	*Tectona grandis* Linn.	Tega	Verbanaceae	NP	VO
19	Nevuladi	*Vitex peduncularis*	Lakki	Verbanaceae	NP	VO
20	Seme Nevuladi	*Vitex trifolis*	Lakki	Verbanaceae	NP	VO
21	Country almond	*Terminalia catappa*	Dadami	Combretaceae	P	VO
22	Kodasege gida	*Holarrhena antidenterica*	Kodasege gida	Apocyanaceae	NP	VO
23	Ber	*Zygypus nauritiana*	Elachi	Rhamnaceae	NP	VO
24	White silk cotton	*Ceiba pentandra* L. Gaertn	Doodhihatti	Bombaceae	P	VO
25	Neem	*Azadirichta indica* Juss	Bevu	Meliaceae	N	VO/MA
26	Silver oak	*Gravellia robusta*	Silver oak	Proteaceae	P	VO
27	Rain tree	*Samanea samon*	Samane	Mimosaceae	P	MA

@ P= Source of pollen, N= Source of nectar, VO=Visual observation, MA= Microscopic analysis

Table.2 Family wise distribution of pasturage source of *T. iridipennis*

Sl. No.	Family	No. of plants	Sl. No.	Family	No. of plants
01	Fabaceae	14	24	Solanaceae	1
02	Verbanaceae	5	25	Caricaceae	1
03	Lythraceae	4	26	Punicaceae	1
04	Cucurbitaceae	7	27	Simaroubaceae	1
05	Asteraceae	9	28	Eleocarpaceae	1
06	Myrtaceae	4	29	Agavaceae	1
07	Euphorbiaceae	5	30	Convolulaceae	1
08	Ceasalpinaceae	5	31	Acanthaceae	1
09	Vitaceae	2	32	Malvaceae	1
10	Compositae	2	33	Rosaceae	1
11	Umbelliferae	4	34	Balsaminae	1
12	Apocyanaceae	2	35	Diascoreaceae	1
13	Bignoniaceae	2	36	Onagraceae	1
14	Poaceae	4	37	Scrgshulariaceae	1
15	Lamiaceae	3	38	Papavaraceae	1
16	Rutaceae	3	39	Meliaceae	1
17	Brassicaceae	1	40	Proteaceae	1
18	Anacardiaceae	1	41	Mimosaceae	1
19	Moraceae	2	42	Santalaceae	1
20	Arecaceae	2	43	Combretaceae	2
21	Pedaliaceae	1	44	Rhamnaceae	1
22	Moringaceae	1	45	Bombaceae	1
23	Liliaceae	1			

Table.3 Plants identified for resin sources of *Trigona iridipennis*

Sl. No.	Common name	Scientific name	Local name	Family	Source of resin
01	Jack fruit	*Artocarpus heterophyllus* Lam.	Halasu	Moraceae	Cut branches, fruit stalk
02	Drum stick	*Moringa olifera* (Lamk)	Nugge	Moringaceae	Stem, bark, cut branches
03	Mango	*Mangifera indica*	Mavu	Anacardiaceae	Cut branches
04	Perivinkle	*Vinca rosea* L.	Kasikanagalu	Apocyanaceae	Leaf lamina

Stingless bees required a large quantity of resin for nest building and was found to collect resin or latex from four species of plant which cut branches of mango, cut branches and fruit stalk of jack fruit, stem, bark and cut branches of drumstick and leaf lamina of perivinkle (Table 3).

Similar to pollen, resin was loaded in corbiculae and transported to back to the nest. In addition, these bees were found to collect fruit juice from cracked grape, mango and papaya. While foraging for resin they followed the method of group foraging. Such strategy with aggressiveness was also reported by Howard (1985).

Information on various pasturages sources will provide basis for evolving floral calendar of particular region and bee species.

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