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Research article

CORRELATION BETWEEN HYMENOPTERANS AND *LEUCAS* SPP. (*LAMIACEAE*) OF SOUTH INDIA

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ABSTRACT : Lamiacean flowers have specific floral features adapted to particular pollinators. The lower lip act as a flag to attract, and also as a landing place, while the upper lip shelters the essential organs, which are usually placed so as to touch the insect's back in order to result in nototriby. This paper indented to bring out the correlation between Hymenopterans and *Leucas* sp.The lower lip of corolla length compare with insect body length and corolla tube length correlated with insect proboscis length. The measurements show that positive correlation between *Leucas* and Hymenopterans. Lower lip of corolla of *Leucas* members specifically modified for Hymenopterans and proboscis length also shows direct correlation. This result indicated that Hymenopterans were well modified for bilabiate *Leucas* members.

Key words: Correlation, Hymenopterans, *Leucas sp*

INTRODUCTION

The family Lamiaceae has long been associated with cross-pollination with vectors playing a crucial role in the pick –up and delivery of pollen from flower to flower. The intricate methods by which the process is accomplished reflect a long history of adaptive co-evolution between plants and pollinators. Pollinators of the Lamiaceae are bees, flies, and wasps, butterflies and hawakmoths as indicated in the previous study. Beetles are apparently not often observed. Bees, by far, are the most commonly observed pollinators of this family. The Anthophoridae, Xylocopidae and Megachilidae are all bee families observed as pollinators on the *Lamiaceae* (Huck, 1992). Potgieter et al. (2009) propose that the sigmoid-shaped corolla in many members of genus *Plectranthus* it's a adaptation to the curved mouthpart of genus their bee pollinators. The history of pollination studies of the Lamiaceae follows general patterns in other families as discussed by Baker (1983). *Plectranthus* species, some of which are specialized for pollination either by bees or long proboscid flies (Potgieter et al. 1999). Management of Pollinators for pollination services in Western countries, the problem of insufficient pollination is being effectively overcome by careful management of pollinators particularly honeybees for pollination services K.R. Shivanna (2011).

MATERIALS AND METHODS

Field observations and collections were made during flowering seasons (August-May) of 2010 and 2011.

Study sites: Field work was conducted at Wayanad region of Southern western Ghats (Vythiri, Kalpetta) and garden plants also used as a study material.

Observations: Flowers of *Leucas sps* were observed during the day time and notes were made of the types of insect visitors, type of floral reward utilized and insect behavior on the flowers.

Length Measurements: Measurements of proboscis length were done from the tip up to the attachment of the proboscis to the face of insect. Corolla tube –lengths of the selected species were measured from the base (at the junction to the calyx) to the mouth of corolla**.** Lower lip of corolla (selected species) also measured and correlated with insect body length (all the measurements in a cm scale).

RESULTS

Table.1. Visitors of *Leucas* spp

PLANT SP	ORDER	VISITORS OF LAMIACEAE	COMMON NAME	REWARD
L. aspera L. angularis L. chinenis L. ciliata L. indica L. ceibaldiana L. biflora	**Hymnoptera**	*Apis cerana*	Honey bee	POLLEN+NECTAR
		Apis dorsata	Honey bee	POLLEN+NECTAR
		Apis florea	Honey bee	POLLEN+NECTAR
		Amegilla sp	Solitary bee	POLLEN+NECTAR
		Megachile sp	Cutila bee	POLLEN+NECTAR
		Trigona iridipennis	Bee	NECTAR
		Vespa affinis	Paper wasp	NECTAR
		Componotus parius		NECTAR
	Lepidoptera	*Neptis hylas*	Common sailer	NECTAR
		Junonia atlites	Grey pansy	NECTAR
		Bibasis sena	Bibasis sena	NECTAR
		Pseudocladenia indrana	Tricolour pied flat	NECTAR
		Ampittia discorides	Bush hopper	NECTAR
		Borbo cinnara	Rice swift	NECTAR
		Papilio helenus	Red Helen	NECTAR
		Delias eucharis	Common jezebel	NECTAR
		Papilio polytes	Common mormon	NECTAR
		Eurema hecabe	Common grass yellow	NECTAR
		Suatus gremius	Indian palm bob	NECTAR
		Tirumala limniace	Blue tiger	NECTAR
		Hypolimnas	Danaid eggfly	NECTAR
		Macroglossum corythus	Hawk moth	NECTAR
	Diptera	*Panganis*	Fly	NECTAR

Table 2.Correlation between lower lip of corolla and insect's body length. SD-standard deviation

LEUCAS SP	LOWER LIP OF COROLLA (mean)	SD	HYMNOPTERA SP	BODY LENGTH (mean)	SD
L. aspera	0.9 (5)	0.05477	Apis cerana	0.9 (5)	0.05477
L. angularis	0.9 (5)	0.05477	Apis florea	1.00 (3)	0.08366
L. chinenis	0.9 (5)	0.05477	Apis indica	1.00 (3)	0.08366
L. ciliata	0.8 (6)	0.1140	Amegilla	0.9 (5)	0.1949
L. indica	0.9 (5)	0.05477	Ceratina sp	0.9 (5)	0.1140
L. ceibaldiana	0.9 (5)	0.05477	Megachila sp	0.8 (5)	0.05477
L. biflora	0.8 (5)	0.05477	Unidentified ant	0.9 (3)	0.05477

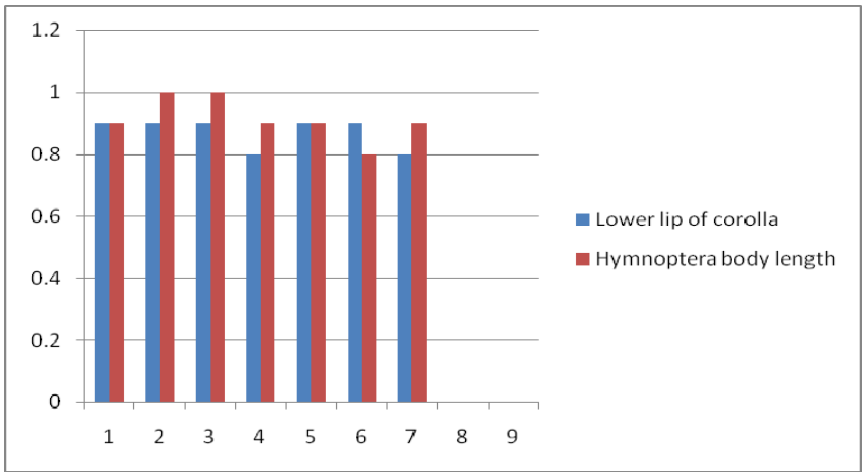
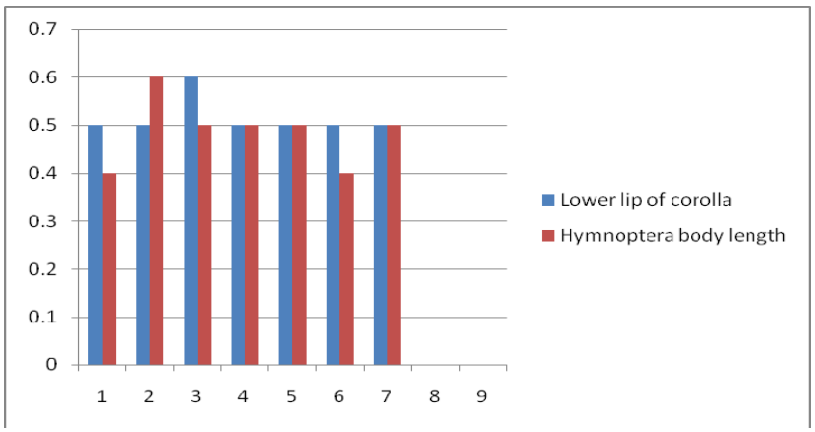


Fig.1. Correlation between lower lip of corolla and insect's body length

Table.3. Correlation between insect's proboscis length and corolla tube length. SD-standard deviation

LEUCAS SP	COROLLA TUBE LENGTH (mean)	SD	HYMNOPTERAN'S	PROBOSCIS LENGTH (mean)	SD
L. aspera	0.5(5)	0.05477	Apis cerana	0.4(5)	0.0707
L. angularis	0.5(5)	0.05477	Apis dorsata	0.6(3)	0.0447
L. chinenis	0.6(5)	0.0447	Apis florea	0.5(3)	0.05477
L. ciliata	0.5(5)	0.0707	Apis indica	0.5(5)	0.05477
L. indica	0.5(5)	0.05477	Amegilla	0.5(5)	0.05477
L. ceibaldiana	0.5(5)	0.05477	Ceratina sp	0.4(5)	0.0707
L. biflora	0.5(5)	0.05477	Megachila sp	0.5(5)	0.0707

Fig.2. Correlation between insect's proboscis length and corolla tube length



Leucas visiting Hymenopteran members. a. *Ceratina* sp on *L.aspera,*b. Ant feeding nectar on *L. chinensis,* c&d *Amegilla* foraging on *L.chinensis*. Lower lip acting as a landing place for these visitors.

DISCUSSION

Our result indicated that Hymnopterans are significant pollinator of *Leucas* spp . Proboscis lengths correspond well to corolla- tube length of Leucas spp. Similarly Insects body lengths correspond to lower lip of corolla. Upper lip of corolla of *Leucas* spp shelters the essential organs, which are usually placed so as to touch the insect's back in order to result in nototriby

(Hymnopterans bears pollen sticking hairs in that region).

CONCLUSION

The present study gives the idea that Hymenopterans highly adapted for Leucas spp. The proboscis length, body length, and arrangement of reproductive characters all suited for *Leucas* spp. Data shows that lower lip act as a landing place for Hymenopterans. when insect inserted proboscis the anthers touching the back of the insects and insects back some area covers with hairs so pollen grains stick in that region (nototriby). Position, arrangement and construction of flower characters major concern of pollination biology, these characters highly suited for Hymenopterans here.

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