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Flower Visiting Flies of Fruit Crops in Himachal Pradesh

RAJPAL SINGH and R C MISHRA*
Department of Entomology and Apiculture,
Dr Y S Parmar University of Horticulture and Forestry, Nauni– Solan, H.P.

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Abundance of the Indian honeybee (*Apis cerana indica* F.) and fly species visiting fruit blossoms at Solan (1200 m.a.s.l.), Kotkhai (1550 m.a.s.l.), Kotgarh (1950 m.a.s.l.) and Narkanda (2725 m.a.s.l.) was recorded in order to know the role of honeybees and flies as pollinators under different agro-climatic conditions of Himachal Pradesh. Observations showed that irrespective of fruit species and locations, *A. c. indica* was the most frequent visitor (5.14 per branch/10 min) of fruit blossoms followed by *Musca* spp. (3.40), other *Diptera* (3.19), *Eristalis tenax* (1.26) and *Eristalis* sp. (0.95). Least frequent visitors were *Episyrphus balteatus* (0.46), *Orthellia* sp. (0.43), *Melanostoma* sp. (0.37) and *E. angustimarginalis* (0.29) which were at par with each other. Dipteran flies, clubbed together, were found to outnumber *A. c. indica* at all locations on all fruit blossoms except on peach at Solan where fly : bee ratio was 0.98:1 Insect visitors were highest at Narkanda on apple as compared to other crops and locations. Differences in abundance of fly species were observed with crops and locations

Key Words: Flies, Honeybees, Fruit tree blossom

Introduction

Hymenoptera embraces a vast multitude of pollinating insects and includes the most efficient pollinators like honeybees and bumble bees which pollinate a large number of field and fruit crops. Beside, various dipterans e.g., Syrphidae, Calliphoridae, Bibionidae and Muscidae have also been found visiting *Prunus* and *Pyrus* trees (Hutson 1925, Atwood 1933, Brittain 1933, Vansell 1942, Webster et al. 1949, Brown 1951, Lewis & Smith 1969). Bohart (1952) believed that flies were important in some localities for pollinating pears. Brown (1951) reported that flies belonging to Calliphoridae seemed to be very effective pollinators of plum. Ko et al. (1977) reported considerable differences in abundance of flower visitors of peach, plum and apple trees at Seoul and Suweon (Korea). Honeybees cannot be maintained throughout the year in temperate fruit growing areas and keeping this in view, the present investigations were carried out to know the abundance of flower visiting flies on peach, plum, apricot and apple at different altitudes with varying agroclimatic conditions in Himachal Pradesh.

Materials and Methods

The present investigations were carried out during 1983 on peach, plum, apricot and apple at SNS Nagar, Solan (1200 m.a.s.l.) and on apple at Kotkhai (1550 m.a.s.l.), Kotgarh (1950 m.a.s.l.)

**Present address:* Project Co-Ordinator, All India Co-ordinated Project on Honeybee Research and Training, Central Bee Research Institute, 1153, Ganeshkhind Road, Pune-411 016

and Narkanda (2725 m.a.s.l.) to know the role of honeybees and files as pollinators.

Flower visiting flies were collected and got identified from Division of Entomology, Indian Agricultural Research Institute, New Delhi. Observations on the abundance were recorded for seven fly species viz. *Musca* spp., *Melanostoma* sp., *Orthellia* sp., *Eristalis* sp., *E. tenax* L., *E. angustimarginalis* Burn. and *Episyrphus balteatus* (De Geer). Less frequent visitors were grouped as 'other Diptera' which included *Scaeva pyrastri* L., *Metasyrphus corollae* Fab., *Macrosyrphus* sp., *Sphaerophoria indiana* Bigot, *Eristalis arvorum* Walker, techinids, bombylids and other syrphids. Honeybee (*Apis cerana indica* F.) population was also recorded to compare their abundance with that of flies. *A. mellifera* L. is present in Himachal Pradesh but has not been introduced in the localities surveyed.

In an orchard of each fruit observations were recorded on randomly selected trees. Bee colonies were not moved to any of the orchards for pollination and there were only natural populations. Counts on insect visitors were made per branch (1 meter long) for ten minutes. The observations were replicated on three different trees for each day hour. The branches were visually kept constant in number of flowers. Abundance of each species and honeybees was recorded at 1000–1100, 1300–1400 and 1500–1600 hr for ten minutes with three branch/tree replicates. Mean population (3 observations each day) was calculated for each visitor on different days. Data were statistically analysed by two way analysis of variance using randomised block design.

Results

Abundance of Indian honeybee and fly species visiting fruit bloosom at Solan, Kotkhai, Kotgarh and Narkanda is given in table 1. Average number of visitors (of all crops and locations) show that *A. c. indica* was the most frequent visitor of fruit blossoms (5.14) followed by *Musca* spp. (3.40 per branch/10 min), other Diptera (3.19), *E. tenax* (1.26) and *Eristalis* sp. (0.95) which were at par with each other. Significantly least frequent visitors were *Episyrphus balteatus* (0.46), *Orthellia* sp. (0.43), *Melanostoma* sp. (0.37) and *E. angustimarginalis* (0.29) which were non-significantly different.

When different fruit crops and locations are compared, the data in the table reveal that number of insect visitors was highest on apple at Narkanda. No. of fly insect was 2.03, 2.05, 1.44 and 1.32 on apple, peach and apricot at Solan and on apple at Kotkhai, respectively with no signifi-

Table 1 *Relative abundance* of flower visiting* A.c. indica *and flies on different fruit crops at different elevations*

Location	Host	Flies Bees ratio	Flies all spp.	*A.c. indica*	*Musca spp.*	Other Diptera	*E. tenax*	*Eristalis* sp.	*Epi. balteatus*	*Orthellia* sp.	*Melanoptoma* sp.	*E. angustimarginalis*	Average (bees + flies)
Solan (SNS Nagar)	Peach	0.98	9.08	9.33 (3.11)	4.17 (1.86)	4.37 (2.13)	0.08 (0.74)	0.21 (0.81)	0.00 (0.71)	0.17 (0.78)	0.08 (0.74)	0.00 (0.71)	2.05 (1.29)
	Plum	32.66	10.78	0.33 (0.88)	1.83 (1.47)	3.28 (1.90)	1.56 (1.38)	2.50 (1.65)	0.00 (0.71)	0.83 (1.09)	1.78 (1.03)	0.00 (0.71)	1.23 (1.20)
	Apricot	3.32	9.97	3.00 (2.08)	4.56 (2.10)	4.06 (2.01)	0.56 (0.99)	0.18 (.80)	0.00 (0.71)	0.28 (0.85)	0.33 0.88)	0.00 (0.71)	1.44 (1.24)
	Apple	1.10	9.62	8.66 (3.03)	2.48 (1.68)	3.50 (1.92)	0.91 (1.07)	0.71 (0.96)	1.57 (1.31)	0.02 (0.74)	0.43 (0.90)	0.00 (0.71)	2.03 (1.37)
Kotkhai	Apple	6.08	10.19	1.66 (1.46)	3.50 (1.99)	2.11 (1.58)	0.94 (1.11)	1.33 (1.30)	1.20 (1.35)	0.61 (0.99)	0.50 (0.96)	0.00 (0.71)	1.32 (1.27)
Kotgarh	Apple	8.67	8.67	1.00 (1.17)	1.94 (1.52)	2.18 (1.58)	2.00 (1.50)	1.33 (1.27)	0.33 (0.88)	0.22 (0.82)	0.28 (0.85)	0.39 (0.91)	1.07 (1.17)
Narkanda	Apple	1.18	14.23	12.00 (3.49)	5.33 (2.32)	2.83 (1.80)	2.79 (1.65)	0.39 (0.90)	0.11 (0.76)	0.89 (1.13)	0.22 (0.82)	1.67 (1.39)	2.91 (1.58)
Average				5.14 (2.17)	3.40 (1.85)	3.19 (1.85)	1.26 (1.21)	0.95 (1.10)	0.46 (0.92)	0.43 (0.91)	0.37 (0.88)	0.29 (0.84)	

*Number of individuals per branch per 10 min. Values in parentheses are $\sqrt{n + 0.5}$ transformations

$CD_{0.05}$	Pollinators	= 0.16
	Fruit crops/Locations	= 0.14
	Interaction	= 0.42

cant differences between them. Fly species visits were significantly low on plum blossom at Solan and apple at Kotgarh.

All fly species taken together outnumbered *A. c. indica* at all locations on all fruit blossoms except on peach at Solan where fly: bee ratio was 0.98:1. Flies were 32.66 times more on plum at Solan. On apple the abundance of flies was 1.10, 6.08, 8.67 and 1.18 times more than honeybees at Solan, Kotkhai, Kotgarh and Narkanda, respectively.

From the data it is interesting to note that *E. angustimarginalis* was not present on fruit blossom at lower elevations i.e. Solan and Kotkhai. The number of this efficient pollinator was significantly higher (1.67) on apple at Narkanda than at Kotgarh (0.39) which is at a lower altitude. *Episyrphus baltealus* also did not visit peach, plum, and apricot flower at Solan but were observed visiting apple bloom at Solan as well as at places at higher elevations.

Discussion

Syrphid and Muscid flies have been found to be the common flower visitors of fruit trees and this has been observed by other workers (Gilbert 1980). Abundance, foraging behaviour and body characters (size, hairyness) are considered important for determining the pollination efficiency (Anderson et al. 1982) of a flower visiting insect. But various workers (Free 1970, Kapil et al. 1971, McGregor 1976) have expressed the relative effectiveness of insect pollinators on the basis of abundance alone. If not the sole factor, their abundance is an important criterion. Keeping in view the known importance of flies as pollinators the present study gives an inkling on the role of flies as pollinators of fruit crops. Total number of fly species outnumbered *A. c. indica* on blooming *Pyrus* and *Prunus* fruit trees at all localities except peach at Solan. Number of flies per 10 minutes was 8.67 at Kotgarh, 9.62 at Solan, 10.19 at Kotkhai and 14.23 at Narkanda per branch in apple and it shows that the abundance and availability of flower visitors depended upon the suitability of different regions to them as has been reported by Kevan (1972). The present study is suggestive of the fact that fruit growing areas from 1200 m.a.s.l. to 2725 m.a.s.l. support fly population for pollination, particularly because wastelands and forest areas around orchards present sufficient hibernating and nesting places for them.

In the present study different fly species differed with locations and crops in abundance which receive support from similar report by Gilbert (1980). In Himachal Pradesh, honeybees are normally not moved to the fruit orchards for pollination and the hypothesis that most of the pollination in temperate areas is brought about by wild pollinators is supported by the present study on flies vis-a-vis honeybee where flies have been found to outnumber honeybees on fruit blossom.

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