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Foraging behaviour of *Apis mellifera* on *Trianthema portulacastrum*

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Abstract

One of the major problems in beekeeping is presence of floral dearth periods. So it is desirable to study subsistence flora during these periods. A study was conducted on foraging behaviour of *Apis mellifera* on *Trianthema portulacastrum*, which is a very common weed of summer season under Punjab conditions. Foraging activity took place during morning (0730 to 1020 hours) time only and reached a peak at 0830 to 0850 hours. Average abundance of bees on this weed was 5.89 bees/m²/min, while maximum foraging activity was noted to be 13 bees /m² / min from 0830 to 0840 hours. Mean foraging frequency was 18.22 flowers/min. Maximum number of flowers visited / min. was 25 (at 0820 to 0830 hours). Average pollen load observed was 2 mg/ bee. This weed is minor source but provide subsistence forage and serve an important purpose of sustaining bee colonies at critical time of floral scarcity.

Keywords: *Apis mellifera*, foraging behaviour, foraging frequency, *Trianthema portulacastrum*.

1. Introduction

Honey bees are such micromanipulators by which man can harvest floral resources which would otherwise be unobtainable but they cannot collect pollen or nectar from every type of flower. For practical management of beekeeping knowledge of foraging behaviour of bees and related flora is of considerable importance. The flowers are the mainstay of the bees life, from which they obtain forage.

Summer is very harsh for bees, more especially May and June, a period of floral scarcity (dearth period) in Malva belt of Punjab. Most of the beekeepers have to provide pollen substitute and sugar syrup to bee colonies as pollen and nectar are required for sustenance, growth and development of brood. Dwindling may occur due to insufficient food sources. It is desirable to identify the subsistence flora during dearth period, which are invariably weeds.

There are many weeds from which honeybees collect nectar and pollen. These minor sources are utilized by bees during the time of scarcity of major bee flora. At such critical time some weeds are very useful for bees. *Trianthema portulacastrum* is one of such weeds, which is annual herb having prostrate, glabrous and succulent stem with forked branches. It is very common weed of Kharif field crops, orchards and all vegetable crops grown during summer season. It is abundantly growing weed of cotton fields in Malva region, which is well known cotton belt of Punjab. This herb grows and blooms with rise of temperature. ^[1]

Information about different weeds as bee flora under various agroclimatic zones is very scanty. The present study will help to investigate foraging behaviour of *Apis mellifera* on *T. portulacastrum*.

2. Materials and Methods

Field with abundantly growing *T. portulacastrum* near Budhlada (Longitude 75°-34'-00" E, Latitude, 29°-55'-00" N and elevation above sea level is 219 meter) in Mansa district of Punjab, having an apiary of *A. mellifera* nearby, was selected for study. Observations were taken during full flowering season of the weed (May and June) in year 2010. Abundance of *A. mellifera* bees (number of bees/ m² /min.) was noted from randomly marked plots of one square meter of this weed after every 10 minutes starting from 0730 up to 1930 hours on each alternating day for 30 days. On remaining alternating days, number of flowers visited/ min. (foraging frequency) was recorded with the help of stop clock at above mentioned fixed timings of the day. Data of windy days was recorded separately. Honeybees with maximum pollen load were captured with help of forceps during foraging activity. Pollen loads were collected from their pollen baskets with help of camel hair brush in watch glass and weighted with help

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of electronic balance. Collected data was consolidated, tabulated and analysed statistically. The values of various parameters given in results are the average values (along with standard Error) of all the days of observation.

3. Results and Discussion

A. mellifera bees foraged on flowers of this weed (fig. 1) during morning (0730 to 1020 hours) only. No foraging activity of these bees was noticed during remaining hours of the day. Average abundance during the time of activity was recorded to be 5.89 bees/m²/min. Minimum foraging activity (1 bee/m²/min.) was noticed at initiation (0730 hours) and cessation (1020 hours) time. Peak foraging activity (number of bees/m²/min.) was recorded between 0830 to 0850 hours (fig. 2 and table 1). Maximum foraging activity during morning hours was recorded by many workers in case of various crops or weeds. [2, 3, 4, 5].

Factors responsible for peak foraging activity during morning hours are time related floral physiology of plant, environmental factors and innate responses of honeybees. When dehiscence of anthers takes place at appropriate time of the day, which is a characteristic of a plant species then flowers have more pollen, accordingly bees regulate their activity for pollen collection [6]. Day hours determine foraging

activity of bees directly or indirectly and need of colony is also a basic factor in this respect [7, 8, 9].

Average foraging rate (number of flowers visited per minute) was recorded to be 18.22 flowers/min. Foraging rate depends upon number of factors including instinctive foraging behaviour of insects, floral structure [10, 11], environmental factors [12, 13, 14], type of floral rewards, density of flowers, quantity and quality of floral rewards. Maximum foraging rate was (25 flowers/ min.) noted at 0820 to 0830 hours and minimum foraging frequency (10 flowers/ min) was at initiation time i.e. 0730 to 0750 hours (Table 1 and fig.3)

Average pollen load observed was 2mg/ bee. The size and weight of pollen load differed greatly with different crops and with bee species [15, 16, 17, 18, 19, 20, 21, 22, 23].

From foraging activity and abundance of honeybees on the weed under experiments, it may be concluded that it is good subsistence forage for *Apis mellifera* during time of highly scarcity (dearth period i.e. May to June) of bee flora, thus is of considerable importance for beekeeping practices. For successful beekeeping it is desirable to study availability, suitability and identification of minor and subsistence flora during dearth period which is possible by studying foraging behaviour of honeybees on weed flora like *T. portulacastrum*. This study may help to frame local floral calendar.

Table 1: Foraging behaviour of *A. mellifera* on *T. portulacastrum*

| Day hours | 730 | 740 | 750 | 800 | 810 | 820 | 830 | 840 | 850 | 900 | 910 | 920 | 930 | 940 | 950 | 1000 | 1010 | 1020 |
|---|------------|------------|------------|-----------|-----------|-----------|-----------|------------|------------|------------|------------|------------|-----------|-----------|-----------|-----------|-----------|-----------|
| No. of bees/m ² /min (average) | 1 ± 0.001 | 4 ± 0.001 | 5 ± 0.002 | 6 ± 0.02 | 8 ± 0.036 | 9 ± 0.03 | 11 ± 0.02 | 13 ± 0.145 | 13 ± 0.20 | 8 ± 0.002 | 7 ± 0.021 | 6 ± 0.072 | 5 ± 0.031 | 3 ± 0.001 | 2 ± 0.002 | 2 ± 0.002 | 2 ± 0.001 | 1 ± 0.001 |
| No. of flowers visited/min (average) | 10 ± 0.002 | 10 ± 0.001 | 10 ± 0.001 | 17 ± 0.02 | 21 ± 0.06 | 25 ± 0.39 | 25 ± 0.06 | 21 ± 0.022 | 21 ± 0.001 | 21 ± 0.001 | 21 ± 0.001 | 21 ± 0.002 | 21 ± 0.32 | 21 ± 0.36 | 21 ± 0.40 | 18 ± 0.30 | 12 ± 0.30 | 12 ± 0.36 |



Fig 1: *Apis mellifera* bee foraging on *Trianthema portulacastrum*

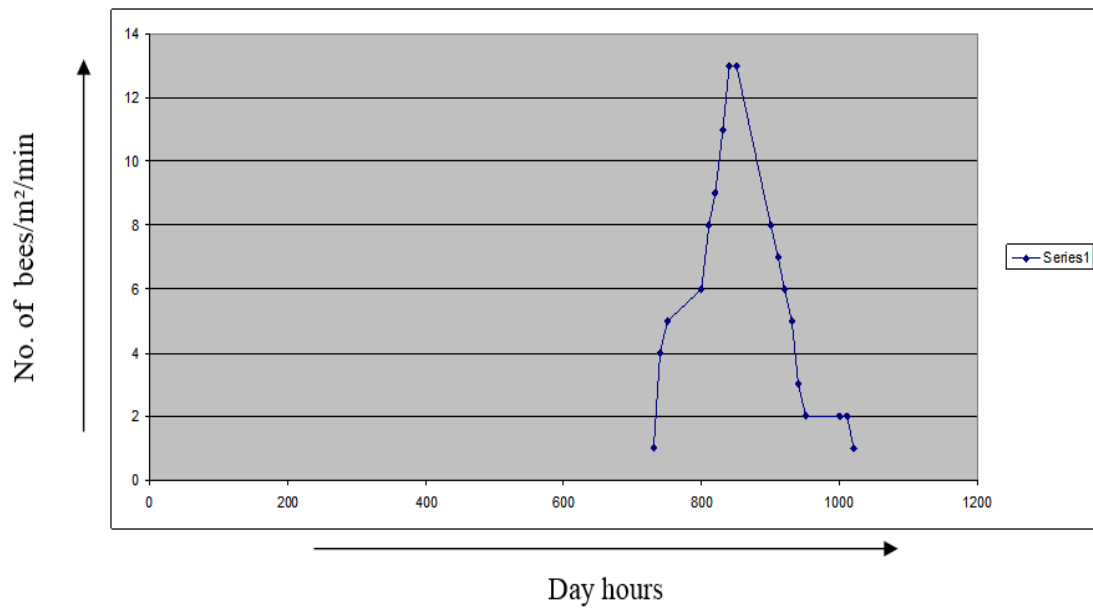


Fig 2: No. of bees/m²/min. at various day hours

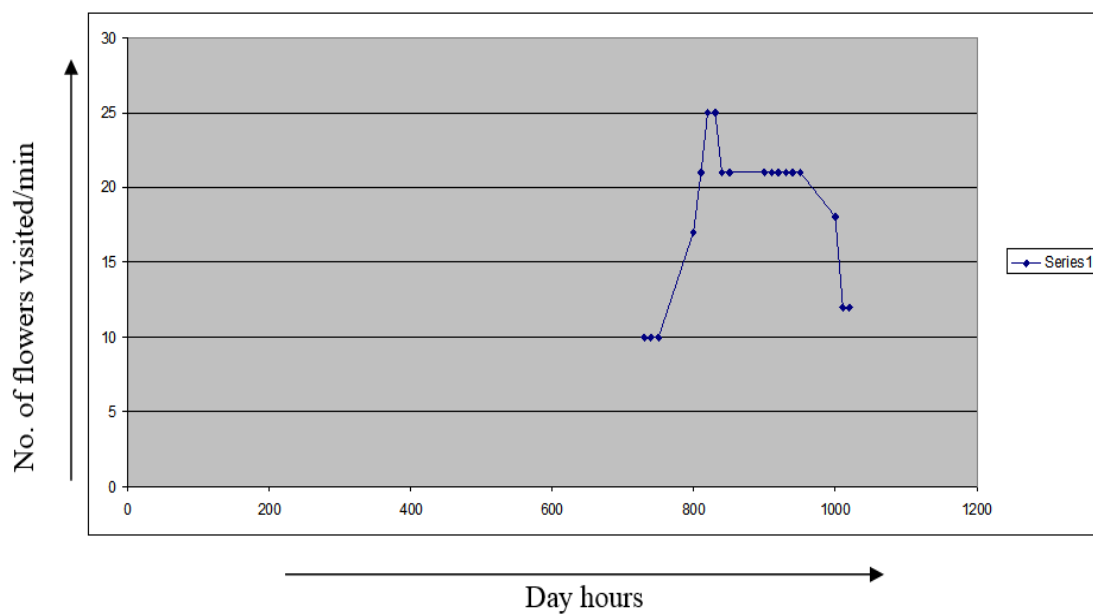


Fig 3: No. of flowers visited/min at various day hours

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