

Foraging activity of *Apis mellifera* on *Parthenium hysterophorus*.

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Abstract: Present study revealed that during period of highly floral scarcity (May and June) *Apis mellifera* showed foraging activity on *Parthenium hysterophorus* which is considered worst weed for environment and human health. Average foraging activity was recorded 4.9 bees/m²/min. Maximum abundance of foraging bees (13 bees/m²/min.) was observed from 800 to 845 hours. Average foraging frequency of bees was found to be 48.1 flowers/min. but maximum number of flowers visited/ min. was noted to be 60 from 815 to 845 hours. Average pollen load was 5.28 mg/bee. So this weed serves as subsistence flora at very critical time of dearth.

Keywords: *Parthenium hysterophorus*, *Apis mellifera*, Foraging behaviour of bees, pollen collection.

I. Introduction

Availability of enough bee flora provides sufficient amount of pollen and nectar, which ultimately leads to gradual colony build up. So knowledge of foraging behaviour of honeybees and their flora is essential for management of beekeeping. Floral dearth period is a serious problem in beekeeping. This results in dwindling and desertion of bee colonies. Pollen shortage is disastrous to bee colonies. One comb cell of pollen is required for rearing one larva [1].

Pollen substitute and Sugar syrup are given to bee colonies during dearth period. Under such critical conditions bees visit to such flowers to which they neglect during normal conditions. Variety of such minor and subsistence sources serve the important purpose of sustaining bee colonies, but any flora cannot be stated as bee flora because honeybees can not collect nectar or pollen from every type of flower. So it is desirable for beekeepers to identify the subsistence flora during dearth period. There are many weeds from which honeybees collect nectar or pollen or both, however they may provide lesser quantity of forage. These minor sources are utilized by bees during the time of scarcity of major bee flora.

One of such subsistence plants is *Parthenium hysterophorus*, which is fast spreading weed, grows mostly on roadside, waste places, orchards and now introducing in field crops also. It is an erect, aromatic, much branched, hairy herb, about 50-100 cm tall with much branched panicles inflorescence having white flowers [2]. It is in full bloom during May and June. It is one of worst weed for agriculture, environment and human health.

Honeybees are such micromanipulators by which man can harvest floral resources which would be otherwise unobtainable. For practical management of beekeeping, knowledge of foraging behaviour of bees and related flora is of considerable importance. The flowers are the main stay of the bees life, from which they obtain forage. Information on foraging behaviour of honeybees on various weeds like *Parthenium hysterophorus* is very scanty. As honeybees feed on nectar and pollen, therefore, the information on bee flora can better be understood by visual observation at the time of foraging. The present study is such an attempt to reveal foraging activity of *Apis mellifera* on the weed under investigation.

II. Materials And Methods

Waste land with densely growing *Parthenium hysterophorus* and having an apiary of *Apis mellifera* (80 colonies) nearby, 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, was selected for study, during blooming season of the weed (May and June) in Year 2011. Abundance of foraging bees was observed by counting number of bees foraging /m²/ min, from randomly marked areas of one square meter with densely cropped weed. Observations were taken after every 15 minutes starting from 700 to 1900 hours on alternating days for 30 days. On remaining alternating days foraging frequency (number of flowers visited/min.) was noted with the help of stop clock at above mentioned fixed timings of the day. Honeybees with full pollen load were captured with help of forceps during foraging on this weed. Pollen loads were removed from their pollen baskets in watchglass with the help of Camel hair brush and weighted by using electronic balance. Collected data was consolidated. The values of various parameters given in results are the averages of values observed during all the days of observation for particular parameter.

III. Results And Discussion

Apis mellifera commenced its foraging activity on *Parthenium hysterophorus* (fig. 1) on an average at 700 hours, activity remained ceased from 1145 to 1600 hours and after 1700 hours. Early starting of foraging activity during summer under Punjab conditions has already been confirmed [3]. A dual threshold of temperature and light intensity is responsible for commencement of foraging but cessation of foraging is governed mainly by light intensity [4]. The cessation of foraging activity from 1145 to 1600 hours might be due to high temperature as it is well known fact that at extremely high temperature, foraging activity ceases.

Abundance of foraging bees was found minimum (1 bee/m²/ min) at commencing time (700 to 715 hours). This number increased gradually through 3 and 7 bees/m²/ min (at 730 and 745 hours respectively), and reached at peak (13 bees/m²/ min) from 800 to 845 hours, then started decreasing and reached to 7 bees/m²/ min at 900 hours, remained constant (6 bees/m²/ min) from 915 to 1000 hours. This abundance decreased gradually and was found 4 and 2 bees/m²/ min at 1015 and 1030 hours respectively [fig. 2]. Number of forager bees per unit area per minute remained constant (1 bee/m²/ min) for rest hours of the day (1045, 1100, 1115, 1130, 1615, 1630 and 1645 hours).

All the foraging bees were pollen gatherers. *Parthenium hysterophorus* provides only pollen has been confirmed by many workers [5]. Maximum foraging activity was noted during morning hours. Similar type of observations have been confirmed by many workers on various crops [6, 7, 8, 9 and 10] Other factors responsible for peak foraging activity might be time related floral physiology of plants, environmental factors and innate responses of honeybees. Bees also regulate their activity according to time of dehiscence [11]. Temperature and hours of day effect foraging activity directly or indirectly. The basic requirement of a colony has to be translated in terms of field activity [12, 13, 14 and 15].

Average foraging frequency was observed to be 48.1 flowers/ min. At starting hours foraging rate was less (45 flowers/min from 700 to 730 hours), it increased gradually (50 and 54 at 745 and 800 hours respectively), became maximum (60 flower/min.) from 815 to 845 hours, after that it started decreasing gradually to 54, 52, 49, 47, 45, 35 flowers per minute from 900 to 915, 930 to 1000, 1015, 1030 to 1100, 1115 to 1130 and 1615 to 1630 hours respectively [fig 3]. Number of flowers visited /min were found to be minimum (26 flowers/min) at activity cessation hours (1645 hours).

Foraging frequency for collection of forage depends upon type of flowers [16], type and quantity of forage [17, 18 and 19]. Shape, size and structure of flowers also dictate foraging behaviour of insect visitors but flower structure differs greatly from plant to plant [20 and 21]. Foraging rate also depends upon a number of other factors including instinctive foraging behaviour of insects, floral structure [22 and 23], environmental factors [24, 25 and 26], type of floral rewards, and density of flowers.

On an average 5.28 mg pollen load per bee was recorded. The size and weight of pollen load varied with different crops and with different bee species [27, 28, 29, 30, 31 and 32].

3.1 FIGURES AND TABLES



Figure 1. *Apis mellifera* bee foraging on *Parthenium hysterophorus* flowers

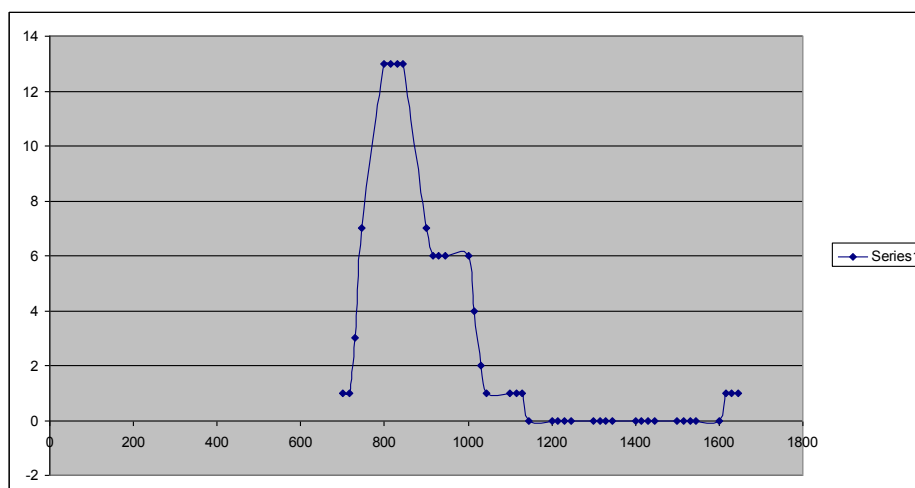


Figure 2. No. of bees/m²/min. at various day hours.

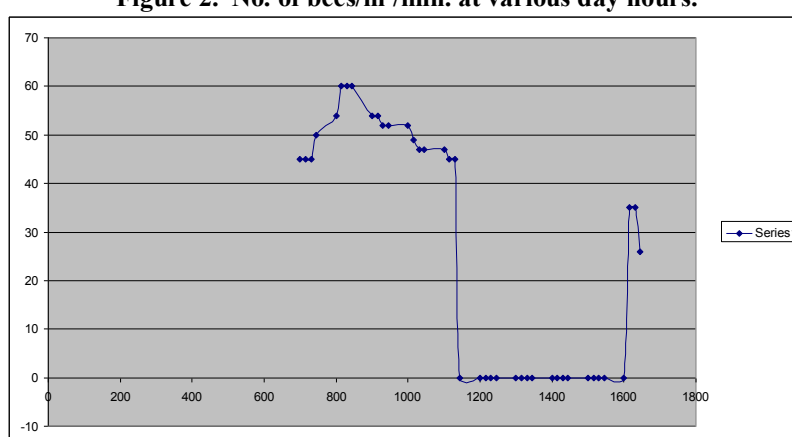


Figure 3. No. of flowers visited/min at various day hours

IV. Conclusion

From the foraging activity of bees and pollen loads collected by them, it may be concluded that *Parthenium hysterophorus* is a good subsistence (minor) flora during the period of highly floral scarcity (dearth period i.e. May to June), thus it is of considerable importance for honeybees. For successful beekeeping it is desirable to study availability, suitability and identification of such weeds which provide forage during such critical time of dearth, when major bee flora is absent. Study may help to frame local floral calendar. However bees may neglect the weed under investigation when major flora is abundant. This weed is considered worst for human beings, pets and environment. Its ill effects on adult honeybees, brood or on hive products if any, is topic of further research.

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