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Comparative Collection of Natural Pollen by Honey Bees in Gwalior & Panchkula (India)

Rajesh Kumar Entomology Research Unit, School of Studies in Zoology, Jiwaji University, Gwalior-474011 (M.P.) India

O. P. Agrawal Entomology Research Unit, School of Studies in Zoology, Jiwaji University, Gwalior-474011 (M.P.) India

ABSTRACT

Honey bees obtain their nutrition in form of pollen & nectar from flowering plants. The present study was conducted to ascertain the availability of pollen rich flora & amount of pollen collected by honey bees during pollen flow season. Natural pollen was collected by installing wooden pollen traps on the entrance of bee hives. The data of pollen collection for two different locations indicates that the amount of pollen rich bee flora was more or less similar at both locations. In Panchkula, maximum pollen (880.2 gm per colony) was collected in the month of February, while in Gwalior maximum quantity of pollen was collected in January month (1033.1 gm per colony).

KEYWORDS Honey bee, pollen, Panchkula, Gwalior

Introduction

Honey bees requires balanced diet (sugar, protein, vitamins and minerals) for their growth & development. Nectar is source of energy for bees and is extremely important for growth, breeding, flying and keeping hive warm. Pollen is main source of protein which is required for muscle growth in brood and young adult bees as well as production of royal jelly (Herbert and Shimanuki, 1978b). The availability of pollen is the major determining factor for honey bees. The input of pollen through pollen forager bees rapidly declines during dearth period. Already existing stores of pollen (bee bread) and honey in the hive are exhausted as a result of which sequential reduction in egg laying by queen bee, brood rearing by nurse bees and bee population of the colony get reduced. A condition may arrive when there is no egg laying and if immediate action is not taken, the colony gets perished due to attack of enemies (black ants, wasps & wild bees), heavy mortality of bees due to starvation, death of queen due to stoppage of supply of royal jelly and absconding of bee colony etc. Recording the number of pollen foragers bees, determination of amount of pollen store in the hive and amount of pollen collected through pollen traps attached to the bee colonies can be used as suitable methods to know the net availability of pollen rich bee flora around the year in a specified area. This information plays a vital role in successful beekeeping at any location. Present study was planned & conducted to assess the amount of pollen collected by Apis mellifera bees at two different locations i.e. Gwalior (M.P.) and Panchkula (Haryana). It is well reported and documented that honey bees depend upon natural pollen in several ways (Stanley and Linskens, 1974; Wille et al., 1985). Pollen is used primarily as a source of essential amino acids required by honey bees in protein synthesis (De Groot, 1953). In the present study, wooden pollen trap were used to collect pollen from bee hives. The use of pollen trap in pollen studies is not a new phenomenon. Wille et al. (1985) reported that the weight of pollen collected by a colony, calculated from amounts collected in pollen traps, varies from 10 to 25 kg/year.

Material and Methods

Harvesting of pollen was done by installing of pollen trap on the entrance of bee hive (Detroy & Harp, 1976; Chhuneja et al., 1990). The wooden pollen trap was attached at the hive entrance during pollen flow season, i.e. in the months of October to March (Figure 1).



Figure 1: Pollen trap installed on the hive entrance

It was decided to remove the pollen traps after every three days interval giving one day gap so that some pollen quantity keeps on passing inside the hives. All the incoming bees, including those, loaded with pollen in their pollen baskets pass through a screen having bee sized holes. Pollen loads get dislodged and dropped into the collecting tray. Pollen grain aggregates were removed from the collecting tray of the pollen trap. Improperly stored pollen may get infected with micro-organisms, particularly fungi and they may alter and degrade pollen nutrients and may produce toxins. If such pollen is used in bee feeding, it may have negative impact on the growth and brood rearing (Levin and Haydak, 1957; Haydak, 1963; Hagedom and Moeller, 1968). In the present study, pollen was dried to reduce moisture content to less than 10% as soon as possible after the harvesting using following two methods: In first method, pollen was manually cleaned to remove the foreign particles, dead bees or their body parts and dust or hay etc. Then grains were was gently spread over the blotting paper to dry up at room temperature, away from direct sunlight (Figure 2).

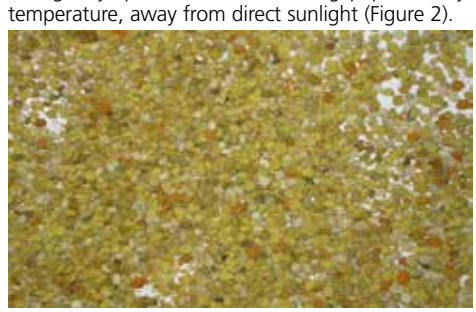

Figure 2: Drying of bee collected pollen at room temperature

Another simple method used to dry the collected pollen was, a regular light bulb (20^{0}W and 220V) was suspended at the height of about 20 cm above a cardboard carton containing uniformly spread cleaned pollen so that the pollen does not heat up more than 40^{0}C (Krell, 1996). After drying, pollen grains were sealed in air tight plastic containers. Data collected during the experiment was tabulated, transformed & subjected to randomized block design test following One Way Anova. Significance was tested at 0.05% level.

Results & Discussion

During favourable periods (October to March) of two consecutive years 2008-09 and 2009-10, pollen traps were fixed to a number of moderately strong colonies of A. mellifera at two different locations i.e. Panchkula & Haryana. The amount of pollen collected was determined and depicted in table 1 & 2. Average pollen collection during 2008-09 was recorded to be 648.8 g/colony/month. The maximum / highest average value (939.5 gm per colony) was recorded in the month of February followed by 816.0 gm per colony in March, 601.8 gm per colony in December, 595.0 gm per colony in January and 546.2 gm per colony during the month of November. The collection of pollen was recorded to be minimum (391.5 gm per colony) in the month of October when enough floral sources were not available (Table 1).

Table 1: Collection of pollen by Apis mellifera bees in Panchkula region

Month	Quantity collected During 2008-09	Quantity collected During 2009-10	Mean
October	391.5 (2.59)	456.5 (2.65)	423.5 (2.62)
November	546.0 (2.73)	484.0 (2.68)	515.0 (2.71)
December	601.7 (2.77)	535.7 (2.72)	568.5 (2.75)
January	595.0 (2.77)	549.0 (2.74)	572.0 (2.75)
February	939.5 (2.97)	821.0 (2.91)	880.2 (2.92)
March	816.7 (2.79)	871.7 (2.94)	843.5 (2.99)
Mean	648.8 (2.79)	619.3 (2.77)	
$CD_{0.05}$	T (Quantity) 0.68 I (Month) 0.30 T X I (Quantity X Month) 0.92		

*** Values in parentheses are log transformed value**

In the year 2009-10, average pollen collection was 619.3 gm/colony, a value slightly lower than the previous year. However highest amount of pollen collection (871.8 gm/colony) was recorded to be in the month of March rather than in February. This figure was statistically higher than the amount of pollen collected during October to February. The respective values of collected pollen were 821.0, 549.1, 535.8 and 484.0 gm/colony in the month of February, January, December & November respectively. The least quantity of pollen (456.5 gm/colony), was collected in the month of October (Table 1). The perusal of table 2 shows that average pollen collection during 2008-09 in Gwalior was recorded to be 696.9 gm. The maximum / highest average value (1012.3 gm) was recorded in the month of January followed by 946.0 gm per colony in February, 812.3 gm per colony in December, 740.0 gm per colony in March and 399.0 gm per colony during the month of November. The collection of pollen was recorded to be minimum (314.0 gm per colony) in the month of October when enough floral sources were not available (Table 2). In the year 2009-10, average pollen collection was 719.2 gm/colony, a value slightly higher than the previous year. However highest amount of pollen collection i.e. 1054.0 gm/colony was recorded to be in the month of January followed by 972.7, 776.7, 757.3 and 465.3 gm/colony in the month of February, December, March and November, respectively. The least quantity of pollen (289.0 gm/colony), was collected in the month of October (Table 2).

Table 2: Collection of pollen by Apis mellifera bees in Gwalior region

Month	Quantity collected During 2008-09	Quantity collected During 2009-10	Mean
October	314.0 (2.10)	289.0 (2.02)	301.5 (2.04)
November	399.0 (2.61)	465.3 (2.68)	432.1 (2.40)
December	812.3 (2.88)	776.7 (2.51)	749.5 (2.37)
January	1012.3 (3.16)	1054.0 (3.40)	1033.1 (3.21)
February	946.0 (2.99)	972.7 (3.08)	959.3 (3.02)
March	740.0 (2.34)	757.3 (2.47)	748.6 (2.36)
Mean	696.9 (2.87)	719.2 (2.23)	
$CD_{0.05}$	T (Quantity) 0.64 I (Month) 0.33 T X I (Quantity X Month) 0.94		

*** Values in parentheses are log transformed value**

Results obtained for collection of pollen are in accordance with that of Todd and Bishhop (1940), Chhuneja et al. (1990) who stated that maximum amount of pollen is collected in the pollen flow period. Stephen and Robert (2001) indicated that honeybees respond to deficiencies in the quantity or quality of their pollen reserves by increasing the gross amount of pollen returned to the colony, rather than by specializing in collecting pollen with greater pollen content. Reason for maximum collection of pollen during February and March month can be, availability of flowers, favorable climatic conditions due to which forager bees are more active and collect maximum amount of pollen. Improper storage of pollen leads to the loss of few particular amino acids (Dietz, 1975). Collected pollen was stored in freezer till further use as it has been reported that pollen may be frozen for many years without quality loss as tested by feeding to honey bee colonies and recording brood rearing rate (Dietz and Stevenson, 1975 & 1980).

At the end of study, it can be concluded that maximum pollen is available for honeybees during February and March months when there was heavy pollen flow from the Mustard, vegetable and fruit crops and also from wild plantation and gardening.

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