

# SEASONAL VARIATION OF ECTOPARASITE MITE *Tropilaelaps clareae* and *Varroa jacobsoni* ON *Apis mellifera*



## Zoology

**KEYWORDS :** *Apis mellifera*, *Varroa jacobsoni* and *Tropilaelaps clareae*

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### ABSTRACT

Present studies were undertaken to study the seasonal variation of ectoparasite mite, *Varroa jacobsoni* Oudemans and *Tropilaelaps clareae* Delfinado and Baker on European honeybee, *Apis mellifera* L. in Palampur, Himachal Pradesh. Each experimental apiary of *A. mellifera* colony consists of different number of frames. For these studies annual seasonal cycle was divided into winter, spring and early summer, summer, rainy and autumn. Data on seasonal variations in population of ectoparasitic mites on *A. mellifera* colonies revealed that population of *V. jacobsoni* was maximum during the month of April ( $14.20 \pm 2.82$ ), whereas, peak period of *T. clareae* infestation was observed in the months of September ( $28.80 \pm 9.21$ ) and October ( $25.70 \pm 8.52$ ) than other months of the year.

### INTRODUCTION

Honeybees are highly social and cosmopolitan insects of economic value that provide hive products like honey, beeswax, royal jelly, bee venom and ecosystem services by cross pollination of several cultivated and wild plant species that results in increased productivity. These services are at risk due to declining bee populations resulting from exposure of bees to parasites, pathogens and environment chemicals such as pesticides and other anthropogenic substances (vanEngelsdorp *et al.*, 2009, Ellis *et al.*, 2010). Different pests and predators attack the honeybee colonies because of their living together in a tightly knit social group. Among pests honeybee colony is infested by wide diversity of mites, largely because of diverse food and micro-habitat it offers (Woo and Lee, 1993). Honeybee mites can be broadly classified into three groups: parasitic, predatory and phoretic. The primary problem causing ectoparasite mites are *Tropilaelaps clareae* and *Varroa jacobsoni*. *Tropilaelaps clareae* is a light brown colour mite feeding on both brood and adult bees whereas *Varroa jacobsoni* is a large dors-oventrally flattened mite of reddish brown colour visible to naked eye. It feeds on haemolymph of brood as well as adult (Mattu, 1992). The fitness and virulence of the mite depends not only upon the ability of mites to reproduce and spread within the colony, but also on the ability to spread between colonies. Vertical transmission occurs with the transfer of parasites from parents to their offspring, the vertical transmission of mites is achieved by swarming. However, horizontal transmission occurs with the transfer from one host to another host and infested to uninfested individuals (Fries and Camazine, 2001). The horizontal transmission of a pathogen contributes much more to virulence than the vertical transmission (Schmidt- Hempel, 1998).

### MATERIAL AND METHODS

The present studies were conducted in Himachal Pradesh which is mainly a hilly state lying between  $30^{\circ}22'$  to  $33^{\circ}12'$  North latitude and  $75^{\circ}47'$  to  $79^{\circ}04'$  East longitude in the lap of the Northwest Himalayas. For experimentation, *A. mellifera* colonies were selected in Palampur, (Altitude, 1287m, latitude  $32^{\circ}06'N$  and longitude  $76^{\circ}31'E$ ), of Himachal Pradesh. The studies were conducted on population dynamics of ectoparasitic mite, *V. jacobsoni* and *T. clareae* on *A. mellifera*. In this apiary, ectoparasitic mite *V. jacobsoni* and *T. clareae*, were investigated during May 2014 to April 2015. For these studies, annual cycle of Palampur was divided into winter (December-January), spring and early summer (February-April), summer (May-June), rainy (July-August), autumn (September-November).

For analysis of hive debris the debris present on the bottom board of bee hives of *A. mellifera* was collected regularly and floated in 80 per cent alcohol. The mites and pieces of chitin floated, while wax and other heavy materials was drained off in separate Petri dishes and the mite specimens were picked up with the help of a fine camel hair brush (Ritter and Ruttner, 1980).

Analysis of brood mites was done by examining 50-100 capped drone brood cells in each colony of *A. mellifera*. Only brood cells with perforations on caps or having sunken caps were selected (Aggarwal, 1988; Wongsiri *et al.*, 1989).

Examination of adult bee mites was done by brushing 250-300 adult worker bees from an infested colony into a transparent container that contains 70% ethyl alcohol. The container was shaken vigorously for about 1 minute. Then mites were collected from the bottom of container and transferred into container containing fresh 70% ethyl alcohol (Dietemann *et al.*, 2013).

### RESULTS

#### PARASITIC MITES

Studies on seasonal fluctuations in population dynamics of ectoparasitic mites, *Varroa jacobsoni* and *Tropilaelaps clareae* mites infesting *A. mellifera* colonies were carried out at Palampur, Himachal Pradesh from May, 2014 to April, 2015. The results are summarized as follows:

#### i) Summer Season (May-June)

Acarological data on *A. mellifera* colonies revealed more population of *V. jacobsoni* in June ( $11.80 \pm 0.12$ ) than May ( $10.50 \pm 0.10$ ). However, *T. clareae* was more in May ( $6.20 \pm 0.50$ ) than June ( $4.75 \pm 0.20$ ) in *A. mellifera* colonies. But the differences were statistically non-significant ( $P > 0.05$ ) (Table 1).

#### ii) Rainy Season (July-August)

Population of *V. jacobsoni* was significantly more ( $P < 0.05$ ) on *A. mellifera* colonies in August ( $4.60 \pm 0.20$ ) as compared to July ( $3.90 \pm 0.30$ ). Although, the number of *T. clareae* were significantly ( $P < 0.01$ ) more in August ( $20.40 \pm 7.30$ ) than July ( $12.35 \pm 3.55$ ) in *A. mellifera* colonies (Table 1).

#### iii) Autumn Season (September-November)

In *A. mellifera* colonies, population of *V. jacobsoni* was more during the month of November ( $6.80 \pm 0.30$ ) as compared to September and October ( $5.60 \pm 0.23$  and  $5.10 \pm 0.43$ ), but the differences were statistically non significant. However,

in *T.clareae*, infestation was recorded significantly ( $P<0.01$ ) more in September and October ( $28.80\pm9.21$  and  $25.70\pm8.52$ ) than November ( $7.90\pm2.45$ ) (Table 1).

**iv) Winter Season (December-January)**

Acarological data revealed significantly ( $P<0.05$ ) more population of *V. jacobsoni* in December ( $6.30\pm0.47$ ) than January ( $4.40\pm0.52$ ). Mean population of *T.clareae* in the month of December was  $5.50\pm0.55$ , but no infestation of *T. clareae* was observed in the month of January (Table 1).

**v) Spring and early Summer Season (February-April)**

Seasonal variation data revealed significantly ( $P<0.05$ ) more population of *V. jacobsoni* in the month of April ( $14.20\pm2.82$ ) as compared to March and February ( $7.50\pm1.26$  and  $4.70\pm0.66$ ). However, in case of *T. clareae*, the population was more in March ( $4.80\pm0.20$ ) than April ( $4.60\pm1.55$ ) but no infestation of *T.clareae* was observed in the month of February (Table 1).

Data on seasonal variations in population of ectoparasitic mites on *A. mellifera* colonies at Palampur apiary in Himachal Pradesh revealed that population of *V. jacobsoni* was maximum during the month of April, whereas, peak period of *T. clareae* infestation was observed in the months of September and October than other months of the year.

**DISCUSSION**

Studies on seasonal variations in the population of *V. jacobsoni* in *A. mellifera* colonies showed that the maximum infestation occurs during the month of April ( $14.20\pm2.82$ ) (Table 1). Present results on *V. jacobsoni* support the earlier

findings of Fries *et al.* (1994) and Tibor and Szabo (2003) who also observed peak period of infestation by *Varroa* sp. between September to December in different parts of the World. Recently, Deosi and Chhuneja (2012) reported *Varroa* sp. on adult bees maximum in the second week of May and the minimum in the end of October.

Similarly, the Acarological data on seasonal variations in the population of parasitic mite, *T. clareae* revealed September ( $28.80\pm9.21$ ) and October ( $25.70\pm8.52$ ) as the peak period of the infestation in *Apis mellifera* colonies (Table 1). High population of *T. clareae* on *A. mellifera* during autumn may be due to favourable conditions of temperature and humidity. These findings were comparable with earlier worker like Chahal *et al.* (1986) who observed two peaks period of *T. clareae* infestation i.e. February to May (33.7-51.7%) and September to November (26.8-42.0%), coinciding with peak of brood rearing activity in Ludhiana, Punjab. Whereas, Aggarwal and Kapil (1988) reported high infestation rate of *T. clareae* from March to April (21.75-29.80%) and October to November (13.80 & 14.23%) at Hisar, Haryana. In 2003, Nagaraja and Rajagopal showed that peak period of brood infestation by *T. clareae* mite were between September to November at Bangalore. Recently Sharma 2011, reported September and October as peak period of *T. clareae* infestation on *Apis mellifera* in Shivalik hills of Himachal Pradesh.

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**Table 1: Seasonal fluctuations in population of ectoparasitic mites (*Varroa jacobsoni* and *Tropilaelaps clareae*) infesting *Apis mellifera* colonies at Palampur, Himachal Pradesh (2014-15)**

<i>Varroa</i> mite in <i>A. mellifera</i> colonies	$\bar{X} \pm SE$	10.50±0.10 (9.254)	11.80±0.12 (10.568)	3.90±0.30 (2.249)	4.60±0.20 (4.324)	5.60±0.23 (5.357)	5.10±0.43 (6.290)	6.80±0.30 (7.658)	6.30±0.47 (8.486)	4.40±0.52 (4.205)	4.70±0.66 (4.458)	7.50±1.26 (9.547)	14.20±2.8 2(18.648)
<i>T. clareae</i> in <i>A. mellifera</i> colonies	$\bar{X} \pm SE$	6.20±0.50 (3.456)**	4.75±0.20 (2.354)	12.35±3.55 (9.984)	20.40±7.3 0(18.359)	28.80±9.21 (27.246)	25.70±8.52 (23.125)	7.90±2.45 (4.325)	5.50±0.55 (1.532)	Nil	Nil	4.80±0.20 (1.621)	4.60±1.55 (1.256)

Population expressed in terms of number of mites/hive/day.

\*\* : Figures in parenthesis indicate per cent population

X ± SE: Mean ± Standard error about mean

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