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MITE PESTS OF HONEYBEE (*APIS MELLIFERA* L.) AND THEIR SEASONAL INCIDENCE IN JAMMU DIVISION OF JAMMU AND KASHMIR, INDIA

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ABSTRACT
Mites are serious enemies of honeybees. The studies on mites infesting honeybee *Apis mellifera* in Jammu region revealed the occurrence of Ectoparasitic mite *Varroa destructor* Anderson and Truemann**,** *Tropilaelaps clareae* Delfinado and Delfenado-Baker*, Varroa jacobsoni* Oudemans**,** *Tropilaelaps koenigerum* Delfinado and Delfenado-Baker., Phoretic mites *Neocypholaelaps indica* (Evans) and stored product mites *Caloglyphus indica Tyrophagus longior* (Gervais), *Glyciphagus destructor and hypopus stages*. However, endoparasitic *Acarapis woodi* (Rennie) was not detected in the present studies. Population dynamics of mites varied with different seasons of the year. The ectoparasitic mite *Varroa destructor* was found throughout the year with maximum abundance during March. However, stored product and the phoretic mites were observed during certain parts of the year.

INTRODUCTION

Honeybees like other insects and animals suffer from various diseases and disorders. Honeybees are parasitized by various organisms and among some of the most serious pest, are the parasitic mites (De Jong *et al.,* 1982**)**. The mites (Acari) that parasitize honeybees have become a global problem that threatens the survival of managed and feral honeybee colonies as well as agricultural crops that depend on pollination. Several species of mites are known to be associated with honeybees and their hives. Some are free living predators (Mesostigmatoides) feeding on other invertebrates living in the hives and others are Astigmatoides. In addition to these there are some species that feed on the stored products. Sammataro *et al*. (2000) have listed 19 mesostigmatid mites parasitizing bee including species of *Euvarroa; Tropilaelaps* and *Varroa*.

The State of Jammu and Kashmir represents one of the potential areas of beekeeping in the country which comprise all the four agro-climatic zones ranging from low altitude subtropical and intermediate to temperate and cold arid alpine zone. It offers great potential for both migratory and non-migratory beekeeping. The economy of Jammu and Kashmir state depends upon quality fruit production and the loss of honeybees which are pollinating agents for quality and quantity fruit production shall be at cross roads. To save the fruit industry and beekeeping industry, monitoring of honeybee diseases and management thereof, is urgently required. Hence studies were conducted to determine the mites associated with honeybee colonies and their seasonal incidence, in Jammu region so that management practices could be initiated well in advance.

MATERIALS AND METHODS

Survey studies on honeybee mites were conducted during 2006-07 and 2007-08 in different apiaries of honeybee *Apis mellifera* of Jammu division. An infestation of the mites can often be detected observing various stages of honeybees including the adult stage. Examination of debris observed under naked eye or under microscope collected from the bee hive also plays an important role in the detection of honeybee mites. Deformed winged bees, bees with distorted abdomen, missing legs and bees crawling rather than flying indicates the presence of mites in the bee colony (Sharma *et al.,* 2011). Samples of larvae, pupae, developing brood, adult bees and debris were collected randomly from at least 10 colonies of each apiary in the 1st week of every month. Each sample consisted of minimum of 50 larvae, pupae and adults at least five from each colony and 100g debris from 10 colonies. The collected samples were analyzed in the laboratory for the presence of mites and associated pathogens if any. Tracheae of bees were dissected to determine the presence of tracheal mites if any. The mites were identified with the help of available literature and the identification later got confirmed from the mite taxonomists.

RESULTS AND DISCUSSION

The present studies revealed the prevalence of several species of mites which included ectoparasitic mites such as *Varroa destructor*, *Tropilaelaps clareae* and *Tropilaelaps koenigerum*. The other mites observed were stored product mites, *Tyrophagus longior, Caloglyphus indica,* phoretic mites *Neocypholaelaps indica* Evans in debris as well as on the bodies of different stages of honeybees such as larval, pupal, developing brood and adult stages. One of the most important discoveries in the present findings was the absence of endopatasitic mite *A. woodi* which has earlier been reported from India (Singh and Adlakha, 1960) and abroad (De Jong, *et al.,* 1982a) as the most serious pest of honeybees. Another important ectoparasitic mite *V. jacobsoni* was also found disappeared. In earlier studies (Abrol and Bhat, 1990; Abrol and Kakroo,1998) , *Varroa jacobsoni* have been reported from different parts of country from Delhi (Phadke *et al*., 1966); Bangalore (Gupta, 1967); Uttar Pradesh (Pandey, 1967); Kashmir (Punjabi and Saraf, 1969); Jammu (Abrol and Putatunda, 1995); Himachal Pradesh (Kumar *et al*., 1988); Haryana (Sihag, 1988); Bihar (Hameed and Singh, 1989) and from Punjab (Chhuneja *et al*., 2002). However, the most serious mite *V. destructor* was observed in the present studies. The size of mites collected in the present study has been found to be 1678.4 μ in width, 1127 μ in length, which is much higher than *V. jacobsoni*. This mite species has earlier been recorded from different parts of India (Abrol *et al*., 2006). *V. destructor sucks the blood from both the adults and the developing brood, weakening and shortening the life span of bees upon which they feed. V. destructor* is found on a range of honeybees, including the Asian honeybee species *A. cerana* and *A. koschevnikovi* and on all races of the European bee, *A. mellifera*. An interesting finding of this study is the simultaneous infestation of *A. mellifera* colonies by *V. destructor* and *T. clareae* and *T. Koenigerum*. The other mites detected in the present studies were the stored product mites *T. longior, C. indica* and *G. destructor* and *Hypoi*. They were found to feed on stored provisions, nectar, pollen and contaminants thereof. De Jong *et al*. (1982b) recorded *T. longior* and *C.indica*

Table 1: Mites associated with honeybee *Apis mellifera* colonies

Category of mites	Mite species	Order	Status
Endoparasitic	*Acarapis woodi* (Rennie)	Prostigmata	Absent
Ectoparasitic	*Varroa destructor* Anderson and Truemann *Tropilaelaps clareae*	Mesostigmata	Present
	Varroa jacobsoni Oudemans	Mesostigmata	Absent
	*Tropilaelaps koenigerum*Delfinado and Delfenado-baker	Mesostigmata	Present
Phoretic	*Neocypholaelaps indica* (Evans)*Caloglyphus indica*	Mesostigmata	Present
Stored Product	*Tyrophagus longior* (Gervais)	Astigmata	Present
	Glyciphagus destructor	Astigmata	Absent
Other mites	*Hypopus*	Astigmata	Present

Table 2: Seasonal infestation in honeybee *A. mellifera* by various species of mites during 2006-07

Month of observation	Ectoparasitic mites				Other mites		
	V.destructor	*T.clareae*	*T.koenigerum*	*Hypopus*	*N.indica*	*C.indica*	*T.longior*
February	34.80	4.64	1.64	0.00	0.00	0.00	0.00
March	40.00	3.08	2.20	2.25	3.32	2.69	3.75
April	36.25	5.00	4.28	0.92	2.26	2.20	3.20
May	27.42	2.24	1.20	2.30	2.32	1.33	2.33
June	21.36	0.00	0.00	0.00	1.72	0.00	0.00
July	18.90	0.00	0.00	1.76	1.43	0.50	0.00
August	19.45	0.74	1.20	0.00	0.50	0.00	0.74
September	22.62	0.38	2.80	3.75	0.00	0.00	0.25
October	23.70	0.75	0.53	2.00	0.00	0.00	0.00
November	24.36	1.75	3.00	3.25	0.00	0.00	0.00
December	29.52	0.25	2.00	1.25	0.00	0.00	0.00
January	29.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 3: Seasonal infestation in honeybee *A. mellifera* by various species of mites during 2007-08

Month of observation	Ectoparasitic mites			Other mites			
	V.destructor	*T.clareae*	*T.koenigerum*	*Hypopus*	*N.indica*	*C.indica*	*T.longior*
February	22.62	3.25	2.45	0.00	0.00	0.00	0.00
March	31.84	1.70	0.80	2.25	0.00	1.25	2.00
April	26.00	0.75	1.20	0.78	2.26	2.80	2.10
May	21.25	2.20	1.74	1.75	2.50	3.50	3.64
June	18.10	0.00	0.00	0.00	1.25	0.00	0.00
July	14.50	0.00	0.35	0.00	1.70	0.50	0.00
August	12.32	1.00	2.10	0.00	0.50	0.00	0.74
September	16.74	0.40	1.20	0.00	0.00	0.00	0.25
October	16.82	0.25	1.50	1.50	0.00	0.00	0.00
November	19.46	1.00	1.75	3.25	0.00	0.00	0.00
December	20.30	0.75	2.35	1.00	0.00	0.00	0.00
January	21.15	0.00	0.00	0.75	0.00	0.00	0.00

associated with *A. mellifera*. Abrol and Kakroo (1998) have recorded *T. longior* associated with *a mellifera, A. cerana A. dorsata* colonies. Some unidentified mites in the hypopial stages were also found in *A.cerana* colonies. Hypoi are immature stages in the life of astigmated mites and are believed to live symbiotically with bees (Delfinado and Baker, 1974).They have a special nymphal stage, called the hypopus, which is modified for phoresy. This special phenotype of a deutonymph can survive bad environmental influences much better than the normal form. The hypopus has no head or mouthparts but has special structures for hanging on a bee to the nest and are thus transported to new environments or hosts (phoresis) where it jumps off and makes itself at home in a larval cell. After it matures, it rapidly produces a small number of parthenogenic young that may feed on the bee egg or larva, usually killing it. These mites then reproduce, some sexually and begin to feed on the bee hosts' pollen ball. The population grows explosively and within a few months can turn the bee food into a solid writhing mass of mites.

The mite *N. indica* was found associated with *A. mellifera* colonies. Similar observations were made by Percy *et al.* (1968), who found large populations of mites on *Apis cerana* bees as well as on flowers of *Eucalyptus* species. The phoretic mites, although harmless to bees, reduce their nectar, pollen carrying capacity thereby affecting honey production and pollination.

Population dynamics of mites varied during different months of the year. The average number of *Varroa destructor* mites (Table 2) ranged from a minimum of 18.90 per cent (July) to a maximum of 40.00 percent (March) during 2006-07. *Tropilaelaps clareae* and *T. koenigerum* on the other hand ranged from a minimum of 0.00 (June, July) to a maximum of 5.00 and 4.28 per cent (April), respectively. Stored product mites were observed only during certain parts of the year. Their number ranged from 0.00 to 2.69 per cent (*C. indica*), 0.00 to 3.75 per cent (*T. longior*) and from 0.00 to 3.75 per cent (*Hypopus)* per g debris. Similarly, phoretic mites (*N. indica*) were not observed throughout the year. They were observed in colonies as well as on the bodies of *A. mellifera* from January to July, their number ranged from a minimum of 0.00 to a maximum of 3.32 per cent

A depleting trend in the seasonal infestation was observed during 2007-2008. The average number of *V. destructor* mites (Table 3) ranged from a minimum of 12.32 per cent (August) to a maximum of 31.84 per cent (March) during 2007-08. *Tropilaelaps clareae* on the other hand ranged from a minimum of 0.00 (January, June, July,) to a maximum of 3.25 per cent during February. In case of *T. koenigeerum* maximum infestation of 2.45 (February) to a minimum of 0.00 per cent (Jan, June,). Stored product mites were observed to be ranged from 0.00 to 3.50 (*C. indica*), 0.00 to 3.64 per cent (*T.longior*) and from 0.00 to 3.25 per cent (*Hypopus)* per gram debris. Phoretic mites (*N. indica*) were observed in range of 0.00 to a maximum of 2.50 per cent. The peak infestation was observed during February-April. Of all the mite species *Varroa destructor* was found to be most serious pest of the honeybee colonies and caused considerable damage. In conclusion, studies must be continued so that preventive and management measures could be initiated well in advance.

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