

Research Article



Identification of Varroa Mite Species of Honeybee, *Apis mellifera* in Khyber Pukhtunkhawa Peshawar, Pakistan

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Abstract | The study was conducted in the University of Agriculture, Peshawar Pakistan during the year 2014-15. Mite specimens were collected from the honeybee colonies from different regions of Khyber Pakhtunkhwa i.e. Peshawar, Mardan, Kohat and Chitral to discovered Varroa mite species. Identification was done by using key developed by De-Guzman and Fernandez and Coineau, (2007), i.e. body size (length and width), location of seta, shape, size (i.e. bristle hair, stiff) on dorsal shield, chaetotaxy and structure of the sternal, , metapodal, anal, and epigynal shields, peritreme, morphology of setae on the legs and palps and its arrangement and number were observed. Results of the present study showed that the studied specimens were *Varroa destructor*, however, no *Varroa jacobsoni* were recorded during chaetotaxy and morphological studied. The study also confirms that *V. jacobsoni* population is not present in Khyber Pakhtunkhwa region of Pakistan.

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Introduction

Varroa destructor (Anderson and Trueman), is amongst the world's most serious and dangerous pest of European honey bees, *A. mellifera* Linnaeus (Hymenoptera: Apidae). However, according to (Anderson and Trueman, 2000) stated that Varroa mite (*V. destructor*) was most responsible for damage in bee colonies whereas, *V. jacobsoni* resulted less harmful to honeybees (James and Nalen, 2014). It is believed that *A. cerana* is rarely affected and have maximum level of natural defense against varroa mites. When *A. mellifera* colonies were introduced Asian people begin accepted how dangerous these mites could be. As evidence suggested that these mites may taken 50 to 100 years when *Varroa's* host shift to another host and did

not occur instantly, (Webster and Delaplane, 2001).

The genus *Varroa* includes in excess of 18 genetically different strains of mites (Cobey, 2001). It is consider that *Varroa destructor* and *Varroa jacobsoni* (Acari: Varroidae) are closely related and both parasitizing the Asian honey bee (*Apis cerana*) (Zhang, 2000; Delaplane, 2001). Hence in 1904 Oudemans described that *V. jacobsoni*, is not the same species which also attacks *Apis mellifera*. Anderson and Trueman (2000) corrected previous confusion and mislabeling the literature prior to 2000, recognizing *V. destructor* as a separate species.

Accurate estimates of the effect of *Varroa* on the apiculture industry are hard to find, but it is safe to

assume that the mites have killed thousands of colonies of honeybees worldwide, resulting in economic loss of billions of dollars. *Varroa* have caused lower honey production, which ultimately lowering the profit margin in beekeeping. *Varroa* also affected the feral (wild) population of bees in many areas. Since, feral colonies when become unmanageable for *Varroa* and left unprotected. This ultimately results in loss of feral colonies quickly as *Varroa* continued to spread (Webster and Delaplane, 2001).

After creation of Pakistan, mostly researchers mentioned these mites as *V.jacobsoni* but little or no research work has been conducted on this aspect. Therefore, present study of Chaetotaxy of Varroa mite were carried out in different regions of Khyber Pakhtunkhwa by using different keys for identification purpose through detailed and keenly observations. In Khyber Pakhtunkhwa (Peshawar, Mardan, Kohat and Chitral) the infested colonies of *A.mellifera* were attacked by *V.destructor* species not *V.jacobsoni*.

Materials and Methods

The experiment (Varroa Population growth) was conducted in Nursery, Department of Horticulture and microscopic study was carried out in the Department of Pathology, The University of Agriculture, Peshawar, Pakistan. The specimens were collected from different areas of Khyber Pakhtunkhwa (Peshawar, Mardan, Kohat and Chitral) for taxonomic studies of varroa mites on *A.mellifera* during year 2014-15. De-Guzman, Fernandez and Coineau, 2007 keys were used for identification of the mite samples.

Morphological characters

The fore mentioned morphological characters were used for the identification of collected samples. Length and width (body size), location of seta, shape, size (i.e. bristle hair, stiff) on dorsal shield, chaetotaxy and structure of the sternal, anal, metapodal, and epigynal shields, peritreme, morphology of setae on the fore leg and palps, its arrangement and number.

Results and Discussion

Results showed that the body length and width of mites collected from Peshawar and Chitral were little different from specimens as Mardan and Kohat (Table 1). Body size i.e. length and width ratio of different specimens from different regions of Khyber

Table1: Chaetotaxy Characters.

Morphological Character	Peshawar	Mardan	Kohat	Chitral
Body size Length and width ratio	1.6 μ m	1.5 μ m	1.5 μ m	1.6 μ m
Size, shape and location of seta (i.e. stiff hair, bristle) of dorsal shield	Stiff hairs $\pm$ 22	Stiff hairs $\pm$ 21	Stiff hairs $\pm$ 22	Stiff hairs $\pm$ 22
Peritreme location	Peritreme not extending beyond the lateral margin of the dorsal shield.	Peritreme not extending beyond the lateral margin of the dorsal shield.	Peritreme not extending beyond the lateral margin of the dorsal shield.	Peritreme not extending beyond the lateral margin of the dorsal shield.
Number of Seta on Metapodal shield	50-60	50-60	50-60	50-60
Number of pore on sternal shield	$\pm$ 16	$\pm$ 18	$\pm$ 18	$\pm$ 18
Number of seta on Epigyneal shield	More than 30	More than 30	More than 30	More than 30
Number of seta on Palp	$\pm$ 16	$\pm$ 16	$\pm$ 16	$\pm$ 18
Number of seta on fore leg	$\pm$ 29	$\pm$ 28	$\pm$ 29	$\pm$ 28

Pakhtunkhwa showed 1.5- 1.6 μ m while this ratio was 1.2-1.3:1 in *V. jacobsoni*. Specimens from Peshawar, Mardan, Kohat and Chitral were short in size and shape of seta have stiff hairs on dorsal shield (Figure 1) under higher magnification microscope. peritreme location was not extending beyond the lateral margin of the dorsal side (Figure 3). Number of setae on epigynal shield was about 30, while setae on palp on Peshawar, Mardan, and Kohat mites were 16 ± 1 , whereas, in Chitral mites the setae were $\pm$ 18. On foreleg the number of setae on Peshawar, Mardan, Kohat and Chitral were 28 ± 2 (Table 1). These findings were similar to those of Fernandez and Coineau (2007). Whereas, number of marginal setae in specimens collected from different regions of Khyber Pakhtunkhwa showed 21 ± 2 , while the marginal setae were 19 ± 0.4 in *V. jacobsoni*. In Species from Peshawar, Mardan, Kohat and Chitral the number of setae on metapodal shield was 50 ± 10 (Figure 2). While in *V.jacobsoni*, it was 22 ± 0.5 . Pores on sternal shield were about 16 ± 2 in Khyber Pakhtunkhwa species. However, in *V. jacobsoni* these

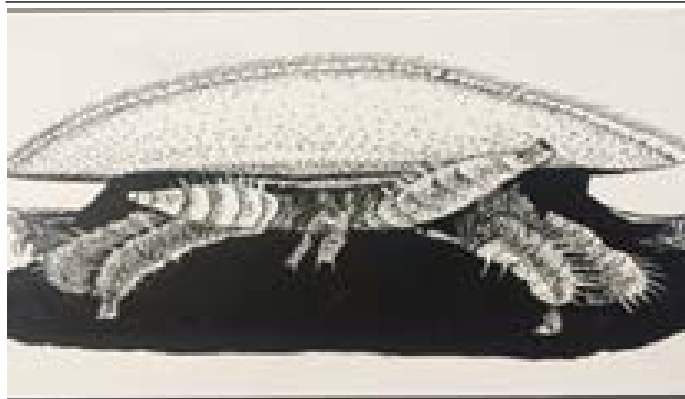


Figure 1: Dorsal View of *V. destructor*.

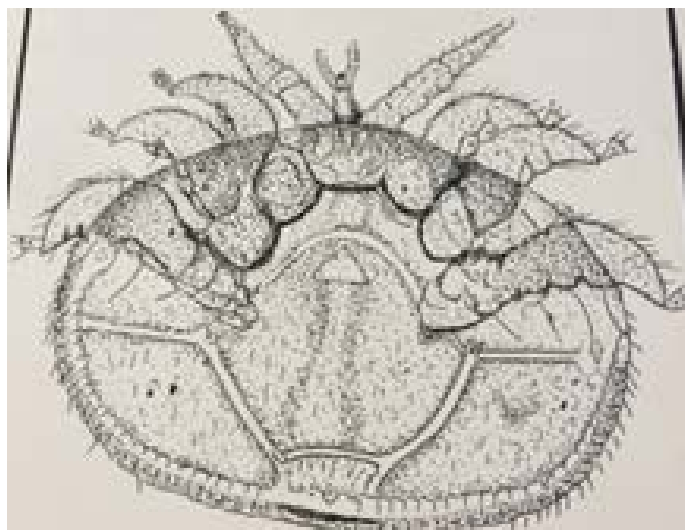


Figure 2: Ventral view of *V. destructor*.

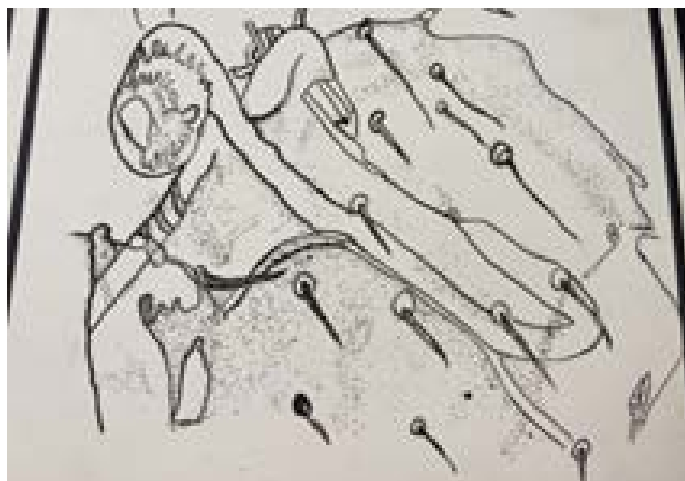


Figure 3: Peritreme.

were 11 ± 0.4 . The findings were in line with the results of De-Guzman, who conducted molecular studies on species identification of *Varroa* in which he treated only two species i.e. *V. jacobsoni* and *V. rinderi*. At the same time, he also provided morphological characters of these two species. On comparison he observed that there was complete difference in different shield (epigyneal setae, number of setae on palp (Figure 4), number of seta on fore leg).



Figure 4: Palp and hypostome.

Conclusions and Recommendations

Mite specimens were collected from *A. mellifera* colonies from different locations of Khyber Pakhtunkhwa. The collected specimens were identified by observing different morphological and Chaetotaxy characters. The study revealed that *V. destructor* is recorded from all the studied areas whereas no specimen of *V. jacobsoni* was recorded in the present collection. From the present study findings it can be concluded that *V. destructor* is the main pest of *A. mellifera* colonies in different regions of Khyber Pakhtunkhwa. Further studies should be conducted in other regions of Khyber Pakhtunkhwa for exact identification of these destructive pests to minimize the losses.

Author's Contribution

Mahwish Rehman: Conceived the idea, conducted the research and wrote the article.

Sajjad Ahmad: Supervised the study and provide technical guidance.

Maqsood Shah: Helped in improving the manuscript.

Inamullah Khan: Proof-read the article and removed the technical and grammatical errors in the manuscript.

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