



**Morphometric studies on Indian honey bee, *Apis cerana* and little bee, *Apis florea*
in Tamil Nadu**

A. Manivannan^{1*}, B. Madhumitha², M. Maheshwari³ and P.M.M. David⁴

*Department of Agricultural Entomology, AC & RI, Killikulam,
Tamil Nadu Agricultural University, Vallanad, Tuticorin, India – 628252.*

*Corresponding author

ABSTRACT

*The present investigation on morphometric variations in *Apis cerana* and *A. florea* was conducted in the Department of Agricultural Entomology, Killikulam, TNAU during 2012-13. Reddish honey bees are said to possess resistance to diseases. We screened the Indian bees, *Apis cerana* and the little bees, *Apis florea* available on the campus for any morphological colour variation besides hamuli number on the hind wings. They were examined for the colour variation in abdominal tergites and sternites and the thoracic scutellum. The number of hamuli present on the hind wing were also examined. The results indicated no significant variation in colour and hamuli. All bee colonies sampled in the campus were yellowish in colour, except for the black scutellum in *A. florea*. The number of hamuli averaged 18.0 in *A. cerana* and 11.0 in *A. florea*.*

KEY WORDS: *Apis cerana, Apis florea, colour variation, tergites, sternites, scutellum, hamuli*

I. INTRODUCTION

Diseases are major problem in beekeeping. Among this Thaisac brood Virus (TSBV) which affects the Indian bee, *Abis cerana* Feb. is endemic to South india. It is suspected that reddish coloured bees are free from the disease. Different geographical races of *A. cerana* occur in china (Peng *et al.*, 1989; Ken *et al.*, 2013) and in the Philippines (Tilde *et al.*, 2000). Already two colour morphs are available in South India, the yellow 'Plain' morph and the black 'Hill' morph and both are reproductively isolated (Oldroyd *et al.*, 2006). In this study we screened the local *A. cerana* and the little bees, *Apos florea* for morphometric variation, especially in colour and the hamuli or wing hooks present on the hind wings (Hepburn and Redloff, 2004).

II. MATERIALS AND METHODS

Honey bee samples were collected from the colonies available on the cambus of AC & RI, Killikulam. For *A. cerana* 10 colonies were selected from the college insectary and only one feral colony was identified. Little bees were collected from 6 nests that occurred in the wild. Polythene bags and test tube are used to collect the samples from the hives or nests. On each sampling day 20 bees were collected from each colony, killed and preserved in alcohol. Colour of the body parts (abdominal tergite 3 and 4, sternite and scutellum was observed under a stereo zoom microscope. A 6-point grate was adopted todetermine the colour (Fig.1) as described by Tsuruta *et al.* (1989). The number of wing hooks was recorded as the number per wing.

III. RESULTS AND DISCUSSION

Apis cerana

The results on the variation in the colour of the abdominal tergites 3 and 4, sternites and the number of hamuli are presented in Table 1. The abdomen was yellowish in colour with the

tergite 3 showing a mean grade of 1.09 ± 0.36 , ranging between 1.1 and 2.3. The tergite 3 exhibited a mean grade of 2.3 ± 0.35 , ranging between 1.8 and 2.9. The scutellum and the sternite were also yellowish in colour with a mean grade of 1.0 ± 0.15 and 1.0 ± 0.04 , respectively. The number of wing hooks averaged 18.0 ± 0.84 , showing a range of 16.4 to 19.3.

Apis florea

The little bee *A.florea* was also yellowish in colour from the abdominal character (Table 2). The tergite 3 was of the mean grade of 1.0 ± 0.07 . Its grade varied from 1.0 to 1.2. The tergite 4 exhibited a mean grade of 2.3 to 0.83, ranging between 1.5 ± 0.60 and 3.4 ± 1.23 . The colour of the sternite was also yellow with a mean grade of 2.0 ± 0.92 . Its colour grade ranged from 1.1 ± 0.30 to 3.5 ± 0.68 . However, the scutellum was all black in *A.florea* showing a mean grade of 6.0 ± 0.0 . The average number of hooks in the wing coupling apparatus was 11.0 ± 0.57 , ranging between 10.3 ± 0.81 and 11.7 ± 0.96 .

Though *A.cerana* exhibits a wide variation in morphometric characters, productivity and behavior in different parts of Asia (Tilde *et al.*, 2006), this study shows that this is likely to occur over a wide area geographical expanse. Both *A.cerana* and *A.florea* did not show much variation both in body colour and hamuli number. Only two colour morphs are known from India in *A.cerana*. Both morphs, described as plain yellow and hill black, are reported to be reproductively isolated from DNA analysis (Oldroyd *et al.*, 2006). Seasonal colour dimorphism has also been reported in *A.cerana japonica* workers (Tsuruta *et al.*, 1989). In Japan a predominantly yellow type appear in summer at temperature higher than 34°C and a black type appear in winter at temperature lower than 30°C . This may explain why the plain morph is yellow and hill morph is black. The mean number of hamuli in *A.cerana* varies from 17.2 to 19.3 in different parts of Asia and that of *A.florea* is 11.8 (Hepburn and Radloff, 2004). More colour variation may be encountered if the investigation is made over a wide geographical area with more number of colonies in future.

IV. ACKNOWLEDGEMENT

The authors wish to thank the Dr.P.M.M.David, Professor of Agricultural Entomology, Agricultural College & Research Institute, Killikulam for guidance and the Professor and Head, Department of Plant Protection and the Dean of the college for providing facilities.

BIBLIOGRAPHY

- [1] Hepburn, H.R. and Radloff, S.E., 2004. The wing coupling apparatus and the morphometric analysis of honey bee populations. *South African J. Sci.*, **100**:565-570.
- [2] Ken, T., S. Fuchs, Koeniger, N and Ruiguang, Z., 2003. Morphological characterization of *A.cerana* in the Yunnan Province of China. *Apidologie*, **34**:553-561.
- [3] Oldroyd, B.P., Reddy, M.S., Chapman, N.C., Thompson G.J. and Beekman, M., 2006. Evidence for reproductive isolation between two colour morphs of cavity nesting honey bees (*Apis*) in South India. *Insect. Soc.*, **53**:428-434.
- [4] Peng, Y.S., Nasr, M.E. and Locke, S.J., 1989. Geographical races of *Apis cerana* Fabricius in China and their distribution. *Apidologie*, **20**:9-20.
- [5] Tilde, A.C., Fuchs, S., Koeniger, N. and Cervancia, C.R., 2000. Morphometric diversity of *Apis cerana* Fabr. within the Phillipines. *Apidologie*, **31**:249-263.
- [6] Tsuruta, T., Matsuka, M. and Sasaki, M., 1998. Temperature as a causative factor in the seasonal colour dimorphism of *Apis cerana japonica* workers. *Apidologie*, **20**:149-155.

Fig. 1. The 6-grade scale used to determine the colour variation in Scutellum, abdominal tergites 3 and 4 and Abdominal sternite




















Grade	Pigmentation			Colour Variation
	Scutellum	dominal tergites 3 and 4	dominal sternite	
1				Yellow  Black
2				
3				
4				
5				
6				

Table 1. Morphometric variation in colour and hamuli in *Apis cerana*

Colony No.	*Morphometric variation in colour and hamuli (Mean ± SD)				
	Tergite 3	Tergite 4	Scutellum	Sternite	Hamuli
1	2.1±0.48	2.6±0.58	1.1±0.36	1.0±0.22	18.5±1.27
2	2.3±0.65	2.9±0.78	1.5±0.76	1.1±0.30	18.9±1.07
3	2.0±0.45	2.4±0.60	1.0±0.00	1.0±0.00	17.8±0.87
4	2.2±0.52	2.4±0.51	1.0±0.00	1.0±0.00	16.4±1.43
5	2.0±0.60	2.6±0.74	1.0±0.00	1.0±0.00	17.9±1.19
6	1.8±0.30	2.0±0.00	1.0±0.00	1.0±0.00	17.2±1.33
7	1.3±0.47	1.8±0.41	1.0±0.00	1.0±0.00	19.3±2.66
8	1.1±0.44	1.8±0.36	1.0±0.00	1.0±0.00	18.4±1.05
9	2.1±0.44	2.5±0.51	1.0±0.00	1.0±0.00	18.2±1.34
10	2.1±0.64	2.5±0.60	1.0±0.00	1.0±0.00	18.5±1.76
Wild colony	1.9±0.68	2.1±0.52	1.0±0.00	1.0±0.00	17.0±1.73
Mean	1.9±0.36	2.3±0.35	1.0±0.15	1.0±0.04	18.0±0.84

*Mean of 20 observations

Table 2. Morphometric variation in colour and hamuli in *Apis florea*

Colony No.	*Morphometric variation in colour and hamuli (Mean ± SD)				
	Tergite 3	Tergite 4	Scutellum	Sternite	Hamuli
1	1.0±0.22	3.4±1.23	6.0±0.0	2.6±0.82	10.5±1.14
2	1.2±0.40	2.9±1.25	6.0±0.0	2.2±0.61	10.8±1.13
3	1.0±0.22	2.9±0.82	6.0±0.0	3.5±0.68	10.3±0.81
4	1.0±0.00	1.3±0.48	6.0±0.0	1.4±0.51	11.7±0.96
5	1.1±0.307	2.0±0.00	6.0±0.0	1.2±0.44	11.0±0.68
6	1.0±0.00	1.5±0.60	6.0±0.0	1.1±0.30	11.6±0.81
Mean	1.0±0.07	2.3±0.83	6.0±0.0	2.0±0.92	11.0±0.57

*Mean of 20 observations

