

**MORPHOMETRICS OF WORKER BEES OF EUROPEAN HONEYBEE,
Apis mellifera L. IN GUJARAT**

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ABSTRACT

The study on the morphometrics of worker bees of European honey bee, Apis mellifera Linnaeus was made at Navsari Agricultural University, Navsari, Gujarat. The honeybee foragers were collected from the hive entrance, preserved in alcohol and care fully dissected to study the various morphometric parameters. Total twenty four morphological parameters were studied. The mean body length was 14.38 mm, head length was 4.20 mm, antennal length was 3.98 mm, tongue length was 5.10 mm, postmentum length was 0.39 mm, prementum length was 1.57 mm, thorax length was 4.67 mm and thorax breadth was 3.96 mm, forewing length was 9.33 mm and forewing breadth was 3.33 mm, hindwing length was 6.11 mm and hindwing breadth was 2.15 mm, extent of hamuli was 1.37 mm, number of hamuli was 21.96, hindleg length was 10.16 mm and hindleg breadth was 1.18 mm and abdomen length was 7.17 mm. The length of abdominal sterna I to VI was 1.14, 1.21, 1.32, 1.63, 1.69 and 1.93 mm, respectively. The sting length was 2.77 mm.

KEY WORDS: *Apis mellifera*, morphological characters

INTRODUCTION

The western honeybee or the European honeybee, *A. mellifera* comprises of three races (European, African and Oriental) and 24 subspecies. The Mediterranean region is supposed to be a centre of origin of *A. mellifera*. The various geographical races are distributed widely throughout Europe, Africa and parts of Eastern Asia as well as in the America (Abrol, 2009). This species was successfully introduced in India through interspecific queen introduction method by Atwal and Sharma at Nagrota Bhavan, Himachal Pradesh in 1962 (Atwal, 1962). It also constructs parallel combs in dark places and store

sealed ripe honey like *A. cerana*. The various parameters on morphometrics of *A. mellifera* have been studied across the world by different workers like Bottcher (1977), Mattu and Verma (1984), Ruttner, (1988), Mishra and Kumar (1998), Makhoo and Ahmad (1998) and Rahimi and Asadi (2010). The information on the various morphological parameters of *A. mellifera* for Gujarat is not available. Therefore, to generate the data base on morphological parameters of *A. mellifera* this study has been undertaken at Navsari Agricultural University, Navsari, Gujarat.

MATERIALS AND METHODS

The study on the morphometrics of worker bees of European honey bee, *A. mellifera* L. was made at Navsari Agricultural University, Navsari, Gujarat. For the purpose, fifty worker bees were collected from their hive entrance. The collected bees were killed in acetone to ensure full extension of external parts of the body and preserved in 70 per cent alcohol. The samples were carefully dissected in the Bio-control Laboratory, Department of Agricultural Entomology, N. M. College of Agriculture, NAU, Navsari for studying their morphometrics. In the present study, various 24 morphological characters observed by Kshirsagar and Ranade (1981) were measured with the help of standardized ocular micrometer placed in one of the eyepiece of a stereoscopic binocular microscope after due calibration with stage micrometer. The size of the bigger parts was measured with the help of graph paper. The measurement of length of body, antennae, tongue, prementum, postmentum, abdominal sterna I to VI and sting; length and breadth of thorax, forewing, hind wing and hind leg as well as extent and number hamuli were recorded.

RESULTS AND DISCUSSION

The data on the measurements of various parts of the worker bees of the *A. mellifera* are presented in Table 1.

The observations on body length of workers of *A. mellifera* indicated that, it varied from 14.00 to 15.00 mm with an average of 14.38 ± 0.399 mm. The head length varied from 4.12 to 4.38 mm with an average of 4.20 ± 0.25 mm. The antennal length varied from 3.96 mm to 4.01 mm with an average of 3.98 ± 0.012 mm. The tongue length varied from 5.08 to 5.12 with an average of $5.10 \pm$

0.006. Mattu and Verma (1984) reported that the tongue length of *A. mellifera* was 5.303 mm and 6.298 mm at Shimla and Mandi, respectively in Himachal Pradesh; Makhoor and Ahmad (1998) reported it as 5.01 mm in Jammu region and Mishra and Kumar (1998) reported it as 5.7 to 7.2 mm, which is more or less similar to present findings. The observations on the postmentum length indicated that it varied from 0.38 mm to 0.41 mm with a mean of 0.39 ± 0.014 mm while the prementum length varied from 1.56 mm to 1.58 mm with an average of 1.57 ± 0.008 mm.

The observations on the thorax length of *A. mellifera* indicated that the thorax length varied from 4.66 to 4.69 with an average of 4.67 ± 0.009 mm, while thorax breadth varied from 3.94 mm to 3.96 mm with an average of 3.95 ± 0.007 mm. The forewing length varied from 9.30 to 9.36 mm with an average 9.33 ± 0.010 mm. The present findings on length of forewing confirm the findings of Mishra and Kumar (1994), who reported that the forewing length varied from 9.11 to 9.33 mm in Haryana and Mattu and Verma (1984), who recorded that the forewing length was 8.561 mm and 9.130 mm, respectively at Shimla and Mandi in Himachal Pradesh. Makhoor and Ahmad (1998) reported that the mean forewing length was 8.83 mm in Jammu which differ slightly from present findings. The forewing breadth varied from 3.29 to 3.36 mm with an average of 3.33 ± 0.009 mm. Rahimi and Asadi (2010) recorded the mean forewing breadth as 3.07 mm from West of Iran which is close to present findings. The hindwing length varied from 6.07 to 6.15 mm with an average of 6.11 ± 0.251 mm. More or similar length of hindwing is reported by Makhoor and Ahmad (1998) at Jammu region and Rahimi and Asadi (2010) in

West of Iran. The hindwing breadth varied from 2.01 to 2.24 with an average of 2.15 ± 0.23 mm. The present findings differ from those reported by Rahimi and Asadi (2010), who recorded the mean hind wing breadth as 1.84 mm in West of Iran. The variation may be due to geographical variations.

The observations on the extent of hamuli indicated that it varied from 1.36 to 1.38 mm with an average of 1.37 ± 0.008 mm, while the number of hamuli of *A. mellifera* varied from 21 to 23 with an average of 21.96 ± 0.59 mm. The present findings differ from those reported by Makhoor and Ahmad (1998), who reported the mean number of hooks as 19.00 in Jammu region. The hindleg length varied from 10.00 to 10.50 mm with an average of 10.16 ± 0.231 mm. As per report of Rahimi and Asadi (2010), the hindleg length of *A. mellifera* varied from 7.24 to 7.68 with a mean of 7.56 mm, which differ from present observations. The hindleg breadth varied from 1.09 to 1.22 mm with an average of 1.18 ± 0.173 mm.

The observations on the abdomen length of *A. mellifera* workers revealed that the abdomen length varied from 7.08 to 7.42 mm with an average of 7.17 ± 0.235 mm. The length of abdominal sterna I varied from 1.13 mm to 1.14 mm with an average of 1.14 ± 0.02 mm; sterna II varied from 1.20 to 1.22 with an average of 1.21 ± 0.007 mm; sterna III varied from 1.32 to 1.33 mm with an average of 1.32 ± 0.007 mm; sterna IV varied from 1.62 mm to 1.64 mm with an average of 1.63 ± 0.007 mm; sterna V varied from 1.69 mm to 1.69 mm with a mean of 1.69 ± 0.24 mm and sterna VI varied from 1.92 to 1.94 mm, while the average length was 1.93 ± 0.007 mm. The sting length varied from 2.76 mm to 2.78 mm with an average of 2.77 ± 0.013 mm.

CONCLUSION

From the results, it can be concluded that some variation was observed in the morphometric observations of *A. mellifera* in Gujarat, which might be due to geographical variation.

REFERENCES

- Abrol, D. P. (2009). Distinguishing Characters of the Cavity Nesting Honeybees. In Bees and Beekeeping in India. Kalyani Publishers, Ludhiana. pp 80-81.
- Atwal, A. S. (1962). The introduction of *Apis mellifera* queens in to *Apis indica* colonies and the associated behaviour of the two species. *Indian Bee J.*, **30** : 41 – 56.
- Bottcher F. K. (1977). Comparative studies on proboscis length of worker, queen and drone honeybees. *Apidologiae*, **8**(2): 69-203.
- Kshirsagar, K. K. and Ranade, D. R. (1981). Morphometric characters of Indian hive bee. *Apis cerana indica* F. (Apidae: Hymenoptera) worker. *J. Univ. Pune. Sci. Tech. Section*, **54**: 101-120.
- Makhoor, H. D. and Ahmad, H. (1998). Biometric studies on four species of honey bee in Jammu region, India. *Indian Bee J.*, **60**(3): 141-142.
- Mattu, V. K. and Verma, L. R. (1984). Morphological characteristics of *Apis mellifera* L. in Himachal Pradesh. In "Pollination Biology and Analysis", New Delhi. pp. 115-123.
- Mishra, R. C. and Kumar Y. (1998). *A. mellifera* L. for Indian apiculture. In. (Perspective of Indian Apiculture, Eds. Mishra, R. C. and Kumar, R.

- Eds.) *Agro Botanica*,
Bikaner Publication, p 123.
- Rahimi, A. and Asadi, M. (2010).
Morphological
characteristics of *A.*
mellifera in Saghez (West of
Iran). *Natua Montenegrina*,
Podgorica, **10**(2):101-107.
- Ruttner, F. (1988). Biogeography and
Taxonomy of Honeybees,
SpringerVerlang, Berlin.

Table 1 : Morphometrics of worker bee of European honeybee, *A. mellifera* in Gujarat

Sr. No.	Character	Min (mm)	Max (mm)	Mean $\pm$ S.D. (mm)
1	Body length	14.00	15.00	14.38 $\pm$ 0.399
2	Head length	4.12	4.38	4.20 $\pm$ 0.250
3	Antennal length	3.96	4.01	3.98 $\pm$ 0.012
4	Tongue length	5.08	5.12	5.10 $\pm$ 0.006
5	Postmentum length	0.38	0.41	0.39 $\pm$ 0.014
6	Prementum length	1.56	1.58	1.57 $\pm$ 0.008
7	Thorax length	4.66	4.69	4.67 $\pm$ 0.009
8	Thorax breadth	3.94	3.96	3.95 $\pm$ 0.007
9	Forewing length	9.30	9.36	9.33 $\pm$ 0.010
10	Forewing breadth	3.29	3.36	3.33 $\pm$ 0.009
11	Hindwing length	6.07	6.15	6.11 $\pm$ 0.252
12	Hindwing breadth	2.01	2.24	2.15 $\pm$ 0.230
13	Extent of hamuli	1.36	1.38	1.37 $\pm$ 0.008
14	Number of hamuli	21.00	23.00	21.96 $\pm$ 0.592
15	Hind leg length	10.00	10.50	10.16 $\pm$ 0.231
16	Hind leg breadth	1.09	1.22	1.18 $\pm$ 0.173
17	Abdomen length	7.08	7.42	7.17 $\pm$ 0.235
18	Abdomen sterna length-I	1.13	1.15	1.14 $\pm$ 0.023
19	Abdomen sterna length-II	1.20	1.22	1.21 $\pm$ 0.007
20	Abdomen sterna length-III	1.31	1.33	1.32 $\pm$ 0.007
21	Abdomen sterna length-IV	1.62	1.64	1.63 $\pm$ 0.007
22	Abdomen sterna length-V	1.68	1.69	1.68 $\pm$ 0.243
23	Abdomen sterna length-VI	1.92	1.94	1.93 $\pm$ 0.007
24	Sting length	2.76	2.78	2.77 $\pm$ 0.013

[MS received: April 2, 2014]

[MS accepted: May 28, 2014]