



MORPHOLOGICAL CHARACTERISTICS OF *Apis mellifera meda* (Hymenoptera: Apidae) IN SAGHEZ (WEST OF IRAN)

Ataollah RAHIMI¹ and Mahdieh ASADI^{2*}

1 Young Researchers Society, Shahid Bahonar University of Kerman, Kerman, Iran.

E-mail: rahimi.ata.1@gmail.com

2 Horticultural Research institute, Shahid Bahonar University of Kerman, Kerman, Iran.

* Corresponding author. E-mail: m.asadi@mail.uk.ac.ir

SYNOPSIS

Key words:

Honey bee,
morphological
characters,
strain,
Iran,
Saghez

A random sample of honey bee workers (400) has been taken from 40 colonies from different regions of Saghez. Eleven morphological characters (i.e. proboscis length, hind wing length, forewing length, third & forth tergite length, forewing width, hind wing width, scutellum color, third tergite color, thinness coefficient, hind wing length and cubital index) have been measured and analyzed. The results have been compared with previous studies done in Iran. Results of this study show that the honey bee mass in Iran is completely diverse (at least morphologically) and has many subspecies which secondarily adapted to diverse climatic conditions in the country and can be considered as a valuable genetic store for strain improvement.

INTRODUCTION

Nowadays, the classification of organisms is done on the basis of population concept; in fact, systematics is used based on the statistics. In order to compare one trait, many samples of one region can be measured and statistical analysis is done on obtained results from these samples. This action is very common especially in the level of strains identification. External morphology is not sufficient nowadays, and other sciences, such as physiology, ecology and ethology, genetics and cytology are used. Owing to the special characteristics of honey bees, extensive physiological, biological, genetic and morphological studies have been conducted on this insect. The greatest studies of identification of the strains species have been

done on this insect (TAHMASBI, 1996).

Two species of honeybees, *Apis florea* and *Apis mellifera* occur in Iran. Distribution of *Apis florea* includes the southwest – southern belt of Iran. The dominant strain of Iran honeybees is *Apis mellifera meda* and this subspecies has several sub-communities throughout the country. RUTTNER et al. (1985) studied the distribution of *Apis mellifera meda* in Iran. They wrote that this species is native to Iran and has similarities with *Apis mellifera ligusta*, *Apis mellifera anatolica* and honey bees in the north of Iraq. Different climatic conditions have caused biological, behavioral and morphological differences of honeybees in the region which are the origin of ecological types and strains generation (TAHMASBI, 1996). Wing morphological differences in division of masses and strains of honeybees are extensive, although morphological differences in this insect are not influenced only by climatic and geographical conditions, but some other factors such as sampling time, pollution by varroa mite, hive cell size, larva nutrition, the altitude of bees habitat can play a role in making these differences. Morphological characters have been studied in some parts of Iran (TAHMASBI, 1996). There is no published report concerning the morphological diversity of honey bees in Saghez and this is the first study in this regard. It is necessary to explain that Saghez is one of the most important centers for apiculture on the west of Iran. It has the majority of colonies in west and apicultural industry in this area is completely modern. So, in this study we investigated Saghez honey bees morphologically and compared them with other Iranian populations.

MATERIALS AND METHODS

In June 2009, 40 colonies from four apiaries located in different points of Saghez were sampled, 10 colonies were selected randomly from each apiary and 10 honey bee workers sampled from each colony. The sampling was done on the combs using the open mouth jar containing the cotton soaked in ether (when using ether to anesthetize the bees their proboscis straightens so that the measurement is done easily). The anaesthetized bees were immediately transported to the jars containing Pampel solution. This solution causes the taxonomic characteristics of harvested bees to stay fixed and their color and sizes unchanged. Then the code of colony from which samples were taken, was recorded on the McCarty jars labels. 400 workers were dissected and 11 characteristics were measured and recorded in the tables separately for each colony. Table 1 shows the external characteristics used in this study. All parts which are symmetrical in the honeybee body (such as wing and leg) are measured on the right organ.

Table 1: Morphological characters measured in Saghez honey bee.

Variable (reference)	abbreviation
Proboscis length (Alpatov, 1929)	PL
Hind wing length (-)	HWL
Leg length (Alpatov, 1929)	HLL
Width of forewing (Alpatov, 1929)	WF
Width of hind wing (-)	HWW
Third & forth tergite length (Alpatov, 1929)	TFTL
Third tergite color (Goetze, 1940)	TTC
Scutellum color (Ruttner, 1988)	SC
Length of forewing (Alpatov, 1929)	FWL
Cubital index (Alpatov, 1929)	CI
Sternite index (Ruttner, 1988)	SI

RESULTS AND DISCUSSION

The results obtained from 11 external characteristics measured in the Saghez honeybees are provided in Table 2. The maximum and minimum sizes obtained for each characteristic are given in this table. Table 3 indicates the comparison of some external characteristics of honey bees from Saghez with other regions of the country.

Table 2: Mean characteristic of 11 morphological characters of Saghez honey bee.

	LF	WF	HWL	HWW	CI	HLL	PL	TL	TI	NC	TTC
Mean	9.07	3.07	6.35	1.84	2.38	7.56	6.16	4.42	0.84	8.33	7.58
Max	9.13	3.15	6.46	2	2.45	7.68	6.90	4.72	0.88	9	8.20
Min	9	3.02	4.37	1.77	2.25	7.24	6.06	4.30	0.75	7.20	7.10
S.T.D.	0.03	0.03	0.32	0.04	0.05	0.09	0.13	0.07	0.02	0.49	0.30

Table 3: Comparison of some external characteristics of honeybees in Saghez with other regions of the country.

City	LF	WF	CI	HWL	PL	TFTL	TI	SC	TTC
Sari, Ghaemshahr	9.53	3.16	2.54	7.86	6.16	4.35	0.86	5.08	6.64
Mazandaran (Tahmabi)	9.13	3.11	2.37	7.71	6.33	4.37	0.8009	7.803	6
Neka, joibar (Yosefi)	9.05	3.01	2.46	7.34	6.094	4.05	0.75	7.26	6.87
Babolsar (Koozegari)	9.23	3.04	2.54	7.26	5.86	3.97	0.71	8.01	7.74
South of Iran (Tahmasbi)	9.06	3.092	2.5	7.77	6.13	4.29	0.801	8.48	7.57
Zan Jan (Tahmasbi)	9.11	3.17	2.54	7.85	6.26	4.29	0.801	8.48	7.57
Salmas (Dehghan)	9.08	3.1	2.4	7.72	6.23	4.31	0.84	8.68	7.53
Saghez	9.07	3.07	2.38	7.56	6.16	4.42	0.84	8.33	7.58
Mean	9.16	3.47	2.47	7.63	6.15	4.26	0.80	7.83	7.22
Max	9.53	6.01	2.54	7.86	6.33	4.42	0.86	9	7.82
Min	9.05	3.04	2.37	7.26	5.86	3.97	0.71	5.08	6
Std	0.16	1.03	0.07	0.23	0.14	0.16	0.05	1.24	0.56

Comparison of Saghez bees with other Iranian masses: To compare the results obtained with the results of previous studies in some regions of Iran nine characteristics were considered for comparison. TAHMASBI study from 1996 is the greatest and the most recent study of honey bees in Iran. The comparison of Saghez results with results of TAHMASBI studies (1996) on Mazandaran bees that indicate the size of forewing length, forewing width, hind leg length and proboscis length is larger in the bees of Mazandaran province but cubital index, the length of third and fourth tergum and thinness coefficient in the bees of Mazandaran bees is shorter and smaller than the bees of Saghez ,while the colors of scutellum and the third tergum color in Mazandaran bees are darker than the bees of Saghez.

The comparison of our results with the YOSEFI studies (personal communication) conducted on the bees of Neka, Juibar, Babol and Babolsar (north of the country) indicates that the size of forewing length, wide of front wing, the length of hind leg, proboscis length, the length of third and fourth tergum and thinness coefficient in the bees of these regions is smaller than Saghez. But cubital index in the bees of mentioned places is greater than the bees of Saghez, scutellum color and the third tergum color in the bees of mentioned provinces are darker than the bees of Saghez. In comparison of these results with TAHMASBI, 1996 studies on the bees of the southern regions of Iran, it can be concluded that the length of forewing, proboscis length, the length of third and fourth tergum and thinness coefficient in the bees of the southern regions of Iran is smaller than the bees of Saghez. The wide of forewing, cubital index and the length of hind leg in the bees of

Iran southern regions are larger than the bees of Saghez, the color of scutellum in the bees of the southern regions of Iran is lighter and the color of third tergum is darker than in the bees of Saghez.

Comparison of the results with the results of TAHMASBI (1996) and DEGHAN studies (personal communication) conducted respectively on the bees of Zanjan (1996) and Salmas in the north-west, indicates that the length of forewing, the width of forewing, cubital index, the length of hind leg and the tenth of proboscis in the bees of Zanjan and Salmas are larger than in the bees of Saghez. In addition, the length of third and fourth tergum in the bees of Zanjan and Salmas is smaller than in the bees of Saghez. The thinness coefficient in the bees of Zanjan was smaller than in Saghez bees while the thinness coefficient of bees in Salmas was equal with the thinness coefficient of the bees of Saghez. The color of scutellum in the bees of Zanjan and Salmas is lighter, and the color of third tergum is darker in the bees of Zanjan province and it is lighter in the bees of Salmas than in the bees of Saghez.

The results indicated that in Mazandaran, the southern regions of Iran and Salmas, the bees are darker than the honeybees of Saghez, but the bees of Babolsar and Zanjan are lighter than the Saghez bees. Also the wing length, wing width, cubital index and the length of hind leg in the bees of Saghez are smaller than in the bees of eastern Mazandaran, Zanjan and Salmas. The proboscis length is equal in the bees of eastern Mazandaran and the bees of Salmas.

The third and fourth tergum is smaller in the bees of Mazandaran, the southern regions of Iran, Zanjan and Salmas than in the bees of Saghez. The thinness coefficient of the bees in Mazandaran (except for the east Mazandaran), the southern regions of Iran, Zanjan and Salmas is smaller than in Saghez. The scutellum color in Mazandaran bees is darker than the bees of Saghez. The scutellum color in the bees of the southern regions of Iran, Zanjan and Salmas is lighter than in the bees of Saghez.

CONCLUSION

The statistical results obtained from the measurement of external characteristics in the honeybees of Saghez with the results of previous studies, show similarities as well as differences of honeybees in Saghez that are explained as follows.

According to TAHMASBI (1996) Iranian honey bee mass can be divided into three groups: northern group, central group and western group. The northern group collected from northern provinces (Mazandaran, Gilan, so on) have bigger and darker body. The western group was collected from the west of Iran and it is a small group. This group has some similarities in some characteristics such as cubital index with the populations in Iraq and Syria. The central group was collected from central

and southern provinces of the country and it shows intermediate characteristics. Despite the fact that many of the western provinces have not been studied, our results show that Saghez honey bee population shares majority of the similarities with the western group and it is close to Kordestan province population in west of Iran. There are some similarities and differences between northern population and Saghez population (table 3). These similarities can be explained by the transmigration of some Saghez hives to the north of Iran, i.e. there is some interference between Saghez and northern populations. The differences between mentioned populations can be completely justified by great differences between the climate conditions and plant vegetation of the northern and other parts of the country. There are some similarities between Saghez population and population in the central part of Iran. These similarities can be acceptable, because in some apiaries, the queens are introduced to Saghez from the central part of the country. There are no special similarities between southern population and Saghez population. These differences can be explained by two reasons: first: Saghez colonies rarely transmigrated to south of the country; second: the weather and latitude in southern provinces and Saghez are completely different.

It is obvious that the honey bee mass in Iran is completely diverse (at least morphologically) and should be studied more exactly. This strain has many sub-populations which secondarily adapted to diverse climate conditions in the country and can be considered as a valuable genetic source for strain improvement. Regarding all the studies and in order to improve apiculture industry and supply managerial factors we recommend that all population is investigated in a perfect national project at the same time. After the study of morphological variables, it would be useful to study genetic variations of Iranian endemic mass, too. There are a few published reports concerning the genetic diversity of Iranian honey bee (ROYAN et al., 2007, DADKHAH et al., 2008). These studies should be done all around the country, so that the detection of Iranian honeybees' endemic mass and genetic treasure of this insect in Iran would result in genetic improvement.

ACKNOWLEDGMENT

We are thankful to Horticultural Research Institute for financial support of this project.

REFERENCES:

- ALPATOV, W. W. 1929: Biometrical studies on variation and races of the honey bee (*Apis mellifera* L.). - *Quarterly Review of Biology*, 4: 1-58.
- DADKHAH, M., ZAHRI, S., & ASGHARI, A. 2008: Genetic variation analysis between *Apis mellifera* meda populations in Ardebil province using Microsatellite marker. - *The 2nd*

- National Congress of Cellular & Molecular Biology Proceeding*, Kerman, Iran: 576-578pp.
- GOETZE, G. 1940: The best bee: methods for selecting bees for (great) length of tongue. - *Insects Sociaux*, 3:335–346.
- ROYAN, M., RAHIMI, G., ESMAILKHANIAN, S., MIRHOSEINI, S. Z. & ANSARI, Z. 2007: A study on the genetic diversity of the *Apis mellifera meda* population in the south coast of the Caspian Sea using microsatellite markers. - *Journal of Apicultural research*, 46(4): 236–241.
- RUTTNER, F. 1988: Biogeography and Taxonomy of Honey Bees. - *Springer Verlag*, Berlin, Heidelberg, 284 pp
- RUTTNER, F., POURASGHAR, D. & KAUHAUSEN, D. 1985: Die Honigbienen Des Iran. *Apis mellifera meda* skorikow, Die Persische Biene. - *Apidologie*, 16(3): 241–264.
- TAHMASBI, G.H. 1996: morphological and biochemical survey of honey bee (*Apis mellifera* L.) populations in Iran. Ph.D. Thesis, - Tarbiat Modares University, Iran.

Received: 24 October 2010.

