# The Morphometrical study of some honeybee (*Apis mellifera* L.) (Hymenoptera: Apidae) races in Sulaimani - Iraqi Kurdistan Region

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#### Abstract

Study the Morphological characterize of some honeybee races in Sulaimani- Kurdistan region. The races including *Apis mellifera carnica*, *Apis mellifera ligustica*, *Apis mellefera meda*, *Apis mellifera* lamarckii, *Apis mellifera florea*, *Apis mellifera carnica* hybrid(1), *Apis mellifera carnica* hybride (2) and *Apis mellifera carnica* hybride (3). The highest rate of body weight of mature larva was 117.500 mg in *Apis mellifera carnica* hybride (3) in summer season, the highest rate of body weight of newly emerged workers was 117.400 mg in Spring season in *Apis mellifera carnica*, the highest average of body weights of Workers thirty days old was 95.700 mg in Autumn season in *Apis mellifera carnica*. The highest average of number of hook was 24.700 in *Apis mellifera carnica* hybride (3), the rate of proboscis length was 6.850 mm in *Apis mellifera carnica* hybride (2), the highest average of forewing length was 10.700 in *Apis mellifera* florea, the highest average of head length and width were 5.575. 4.550 mm respectively in *Apis mellifera* lamarckii.

Key words: Apis mellifera L., Number of hamuli, Proboses, forewing, Fat body.

دراسة بعض الصفات المورفولوجية لبعض السلالات نحل العسل في المنطقة السليمانية- اقليم كوردستان العراق روخوش جوهر رشيد ، قسم البستنة- كلية علوم الهندسة الزراعية- جامعة السليمانية الخلاصة

Apis منات المورفولوجية لبعض السلالات النحل العسل في منطقة السليمانية كوردستان العراق. السلالات تشمل Apis carnica, Apis mellifera ligustica, Apis mellefera meda, Apis mellifera lamarckii, Apis mellifera carnica, Apis mellifera ligustica, Apis mellefera meda, Apis mellifera lamarckii, Apis mellifera florea, Apis mellifera carnica hybrid(1), Apis mellifera carnica hybride (2) and Apis mellifera florea, Apis mellifera carnica hybrid(1), Apis mellifera carnica hybride (2) and Apis (3) mellifera carnica hybride في المد الاخير 117.500 ملغم / يرقة في معدل وزن لجسم يرقة العمر الاخير 117.500 ملغم / يرقة في معدل وزن لجسم يرقة العمر الاخير 117.400 ملغم / يرقة في معدل وزن لجسم الشغالة الخارجة الحديثه بلغ معدل وزن لجسم الشغالة الخارجة الحديثه بلغ 117.400 مند معدل وزن لجسم الشغالة الخارجة الحديثه بلغ معر 30 المريع ، واعلى معدل وزن لجسم الشغالة بعمر 30 ايام معدل معدل المن معدل وزن لجسم الشغالة الخارجة الحديثه بلغ معدل وزن لجسم الشغالة بعمر 30 ايام معدل معدل وزن لجسم الشغالة الخارجة الحديثه بلغ 117.400 ملغم / لشغالة سلالات 95.700 ملغ معدل لطول خرطوم 6.850 ملم في السلالة Apis mellifera carnica hybride (2) ، بلغ اعلى معدل طول للجناح 10.700 ملم في السلالة Apis mellifera carnica hybride (3) ، بلغ اعلى معدل طول للجناح 40.700 ملم في السلالة Apis mellifera carnica hybride (3) ، بلغ اعلى معدل طول للجناح 40.700 ملم في السلالة Apis mellifera carnica hybride (3) معدل طول خرطوم 40.500 ملم في السلالة Apis mellifera carnica hybride معد لطول وحرض الرأس (5.57، 55.50) ملم في السلالة Apis mellifera a معدل لطول وحرض الرأس (5.57، 55.50) ملم في السلالة Apis mellifera lamarckii معلى معدل لطول .

#### Introduction

Honey bee is one of the most important social insects known in the world. The importance of this insect is play A major role in pollination and produces an essential substances such as; honey, royal jelly, wax, propolis and Venom, the honeybee is widespread in Europe, Africa and western Asia. The different in their morphology, behavior and physiology according

to the environmental condition they have adapted to among these subspecies at least eight of them (*anatoliaca, meda, caucasica, syriaca, carnica, lamarckii and ligustica*). The effect of nutritional stress on body size of honeybees worker and their morphometric of stressed bees were compared with the morphometric of large point of reference population of European and African honey bees (Daley et al., 1995). In Apis mellifera ligustica workers, the average proboses length and femur length were 6.07 mm and 2.35 mm respectively while forewing length and width were 8.85mm and 3.15 mm respectively (EL- Aw et.al., 2012). Adenovic et al.,(2011) found that the average of Ais mellifera carnica of fore wing length and width, proboses length was 8.41-9.37, 4.746.46, 3.05-3.31mm respectively. The comparative between the body length of larvae 13.5 mm with their head capsule width 6.6 mm and the body length of adult bees workers 17 mm and the head capsule width 5.9 mm of Apis mellifera adansonii in mangrove area of logas (Fasasi et al.,2011). Many studies have been undertaken honey bees using morphological on characteristics (e.g. Abou-Shaara et al. 2012 and Garnery et al. 2004). hese characteristics can be divided into three major groups; which are length measurements, color measurements, and wing venation characteristics. Wing venation reviewed characteristics previously were intensively by Abou-Shaara (2013).morphological characteristics were measured to investigate the impacts of imported queens on honey bee populations (Guler 2010) or to check populations purity (Miladenovic et al. 2011). Multiple body characteristics, including wing length, wing width and tongue length were used to differentiate between honey bee subspecies (Szymula et al. 2010). Mostajeran et al. (2002) found that honey production was related to tongue length, fore wing length and width, hind wing length, leg length, femur length, tibia length and metatarsus width.

The objective of the current study is Morphometrical characteristics of some honeybee races in Iraqi Kurdistan region.

#### Materials and Methods:

Eight honey bee (*A. melifera* L.) colony hives were chosen at three locations within Sulaimani governorate (Sulaimani center, Qaradagh and Sharbazher) the following processes were condected:

Method of labeling

Newly emerged workers were labelled with nail stains of different colors (Snodgrass, 2003 and Shamdin, 2003, Targany, 2008). One drop of the stains were stamped on the notum which characterize with little hair to avoid manipulation the workers during cleaning. Preliminary experiment was carried out in the laboratory in order to avoid any side effects of the stains on the viability of the young workers.

Labeling is conducted as follows

1- Fixation of the worker excluders on both sides of sealed brood comb at the stage of emerging from pupa into adult. Then the workers were throw down with bee brush and captured frames returned to their original places in the experimental hives (Mahmud, 2011). In the following morning, the excluded frames was removed from their colonies and the labeled frames was transported inside a wooden box with special design (Mahmud, 2003). In a closed combs, newly emerging workers were labelled through  $3 \times 3$  mm sive space excluders. The average wide of head capsule was 3.7249 mm and that of the third and fourth abdominal tergum e 4.4145 mm.(Amin,1991).

## Preparation of specimens for study Sampling

Samples were taken from experimental colonies containing a considerable number of labeled workers with known ages. Fifteen young workers of known ages were picked up from each hives by using forceps. Live specimens were placed in the plastic containers containing a piece of cotton soaked in glacial acetic acid, (Pantin, 1964). Then they were transported to the laboratory for studying the characteristics wanted, some of the workers should be kept

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in the refrigerator for the purpose of anatomical and histological studies.

The samples taken include the following

- A- Mature larva(6 days old)
- B- Different stages of adult workers Dissection

The workers were fixed on the dissecting tray after removed the legs and wings, then filled

with physiological solution, after that transferred this unit to dissecting microscope and

then, cut off the head and place on the filter paper for the measurement.

Workers were dissected by sharp scalpel to made two lateral longitudinal cleavages of the abdomen after mount the specimens on the dissecting tray by a fine stainless pins (Cook and Meola, 1983, Mahmoud, 1991, Mahmoud 1992 and Shamdin,2003). The workers were keep in Physiological saline 0.9% (Nacl) 0.9 gm per 100ml distilled water),(pantin,1964).the fixed worker were dissected under 2x and 4x objective lenses of binocular. After cutting the cuticle and removed the muscles, the fat bodies then picked up and placed on clean slide and stained with methylene blue in normal limitation or after pick up from the haemocoel and prepared wet smear. The binocular dissecting and compound microscope for photographs and measurements used by eye piece graticule.

The results were analyzed statistically using factorial RCBD design with triple replicates and performed using XLSTA program (2017) m, Duncan's multiple range Test was used to determine the differences between means at P=0.05 and determine the correlation coefficient(r).

# Result and Discussion

Table (1) shows that the average of body weights of mature larvae differences races in spring season, early summer season, Summer season and autumn season, The highest average was 117.500 mg in *Apis mellifera carnica* 

hybrid(3)in summer season while the lowest average was 64.900 mg in Apis mellifera ligustica in autumn season Statistically had significant difference at level P 0.05 between differences races and body weight of mature larvae in differences seasons, the height average of body weight of mature larvae in spring, early summer, summer and autumn seasons were (113.400, 115.500, 117.500 and 111.400) mg respectively in Apis mellifera carnica hybrid(3 while the lowest average of body weight of mature larvae in spring, early summer, summer and autumn seasons were (69.400, 71.600, 73.600 and 67.400)mg respectively in Apis mellifera ligustica. Statistical had significant differences at level 0.05 between differences races and body weight of mature larvae. These results dis agree with Babendreier et al.,(2004) who found that the average weights of larvae varied from 132-155 mg. In conclusion the morphological characterizes of difference races of honey bee in Iraqi Kurdistan region that the highest rate of body weight of mature larva in Apis mellifera carnica hybrid.

In Table (2) illustrated the comparison among the body weight of newly emerged workers showed significant differences at level 0.05 between differences races in all seasons height average of body weights of newly emerged workers was 117.400 mg in Spring season in Apis mellifera carnica while the lowest average of body weights of newly emerged workers was 62.600 mg in Early summer season in Apis mellifera florea. the height average of body weight of newly emerged in spring, early summer, summer and autumn seasons were ( 117.400, 108.500, 113.400 and 113.800) mg in Apis mellifera carnica, while the lowest average of body weight of newly emerged in spring, early summer, summer and autumn seasons were (71.000, 62.600, 67.200 and 68.300) mg in Apis mellifera florea. Statistical had significant differences at level 0.05 between differences races and body weight of newly emerged workers.

Mature	Apis	Apis	Apis	Apis	Apis	Apis	Apis	Apis
larvae	mellifer	mellifer	mellefer	mellifera	mellifer	mellifer	mellifer	mellifer
	a	a	a <i>meda</i>	lamarckii	a florea	a	a	a
	carnica	ligustic				carnica	carnica	carnica
		a				hybrid(	hybrid(	hybrid(
						1)	2)	3)
Spring	108.500	66.900	104.300	105.500	69.400	85.400	105.300	113.400
season	fg	v	jk	ij	st	0	ij	с
Early	110.700	68.800	106.300	107.300	71.600	87.400	107.400	115.500
summe	de	tu	hi	gh	r	n	gh	b
r								
season								
Summe	113.600	70.800	108.300	109.400	73.600	89.300	109.400	117.500
r	с	rs	fg	ef	q	m	ef	а
Autum	106.500	64.900	101.800	103.500	67.400	83.400	103.200	111.400
n	hi	W	1	kl	uv	р	kl	d

 Table (1) show body weight of mature larvae differences races in spring season, early summer season, summer season and autumn season

Means with the same letter are not significantly different at level 0.05.

Table (2): Average body weight of newly emerged workers in spring, early summer, summer and autumn seasons.

Worker	Apis							
1 day	mellifer							
old	а	а	meda	а	a florea	a	а	а
	carnica	ligustic		lamarck		carnica	carnica	carnica
		а		ii		hybrid	hybrid	hybrid
						(1)	(2)	(2)
Spring	117.40	78.900	105.700	111.30	71.000	88.700	106.40	115.30
season	0 a	1	def	0 c	n	j	0 de	0 ab
Early	108.50	70.100	97.100	101.10	62.600	79.900	98.500	106.90
summe	0 d	no	i	0 h	q	1	i	0 de
r								
season								
Summe	113.40	75.000	102.100	105.90	67.200	84.700	103.20	111.50
r	0 bc	m	Gh	0 de	р	k	0 fgh	0 c
Autum	113.80	76.200	103.100	106.90	68.300	85.700	104.20	112.50
n	0 bc	m	fgh	0 de	ор	k	0 efg	0 c

Means with the same letter are not significantly different at level 0.05.

Table (3) the comparison among the body weight of Workers ten days old showed significant differences at level 0.05 between differences races in all seasons height average of body weights of Workers ten days old was 128.600 mg in Spring season in *Apis mellifera carnica* while the lowest average of body weights of Workers ten days old was 68.900

while the lowest average of body weight of Workers ten days old in spring, early summer, summer and autumn seasons were (81.100, 68.900, 71.100, 76.000) mg in *Apis mellifera* florea. Statistical had significant differences at level 0.05 between differences races and body weight of Workers ten days old.

Table (3): Average body weight of ten days old workers in spring	g, early summer, summer and autumn
seasons	

Worker s ten days old	Apis mellifer a carnica	Apis mellifer a ligustic a	Apis mellifer a Meda	<i>Apis</i> <i>mellifera</i> lamarcki i	Apis mellifer a florea	Apis mellifer a carnica hybrid( 1)	Apis mellifer a carnica hybrid( 2)	Apis mellifer a carnica hybrid( 3)
Spring	128.600	90.600	114.500	122.900	81.100	100.700	115.500	124.600
season	a	n	efg	b	р	1	def	b
Early	116.600	78.400	102.400	111.000	68.900	89.000	103.800	112.400
summe	cde	pq	kl	hi	r	n	jk	fghi
r								
season								
Summe	118.500	80.400	104.400	113.000	71.100	91.000	105.800	114.400
r	cd	р	jk	fgh	r	n	j	efg
Autum	123.500	85.500	109.500	117.900	76.000	111.900	95.900	119.600
n	b	0	i	cd	q	ghi	m	cd

Means with the same letter are not significantly different at level 0.05.

In table (4) showed the highest rate of body weights of Workers twenty days old was 102.100 mg in Autumn season in Apis mellifera carnica while the lowest average of body weights of Workers twenty days old was 54.100 mg Early summer season in Apis mellifera florea. The height average of body weight of Workers twenty days old in spring, early summer, summer and autumn seasons were (98.500, 97.500, 98.500, 102.100)mg in Apis mellifera carnica, while the lowest average of body weight of Workers twenty days old in spring, early summer, summer and autumn seasons were (55.200, 54.100, 55.600, 59.100) mg in Apis mellifera florea. Statistical had significant differences at level 0.05 between differences races and body weight of Workers twenty days old. These results agreed with Ayoub (2011) who recorded that the weight in 10 day old workers higher that the body weight of newly emerged and forager workers.

Table (5) shows the highest average of body weights of Workers thirty days old was 95.700 mg in Autumn season in *Apis mellifera carnica* that had not significant difference with workers in spring season while the lowest average of body weights of Workers thirty days old was 46.300 mg summer season in *Apis mellifera* florea. The height average of body weight of Workers thirty days old in spring, early summer, summer and autumn seasons were (89.700, 94.400, 88.700, 95.700)mg in *Apis mellifera carnica,* while the lowest average of body weight of Workers thirty days old in spring, early summer, summer and autumn seasons were (47.300, 52,300, 46.300 and 56.200) mg in *Apis mellifera* florea. Statistical had significant differences at level 0.05 between differences races and body weight of Workers thirty days old. These results agreed with Shamdin (2003) who found that the body weight of one day old workers higher that thirty day old workers. In conclusion the highest average of body weights of Workers thirty days old in Autumn season in *Apis mellifera carnica*.

. Table (4): Average body weight of twenty days old workers in spring, early summer, summer and autumn seasons

Worker s twenty days old	Apis mellifer a carnica	Apis mellifer a ligustica	Apis mellifer a Meda	Apis mellifera lamarckii	Apis mellifer a florea	Apis mellifera carnica hybrid(1	Apis mellifera carnica hybrid(2	Apis mellifera carnica hybrid(3
						)	)	)
Spring	98.500	61.200 n	87.100 j	91.100	55.200 o	69.9001	88.500	96.900
season	bcd			fgh			hij	cde
Early	97.500	60.200 n	86.300 j	90.100	54.100 o	68.8001	87.500 ij	95.800
summer	bcd			fghi				de
season				C				
Summe	98.700	61.700 n	87.300 j	91.300 fg	55.600 o	70.1001	88.700	96.900
r	bc		-				ghij	cde
Autumn	102.100	65.300	90.400	94.600 e	59.100 n	73.800 k	92.100 f	99.900
	a	m	fgh					ab

Means with the same letter are not significantly different at level 0.05.

Table (5): Average body weight of thirty days old workers in spring, early summer, summer and autumn seasons

Workers thirty	Apis mellifera							
days	carnica	ligustica	Meda	lamarckii	florea	carnica	carnica	carnica
old						hybrid	hybrid	hybrid
						(1)	(2)	(3)
Spring	89.700 b	52.500	80.200 g	82.200	47.300 n	61.100 j	79.700 g	88.300
season		m		efg				bc
Early	94.400 a	57.400	85.000	86.900 cd	52.300	66.000 i	84.500	93.200 a
summer		kl	cde		m		def	
season								
Summer	88.700 b	51.600	79.300 g	81.200 fg	46.300 n	60.100	78.700 g	87.300
		m	_	_		jk	_	bcd
Autumn	95.700 a	61.500 j	89.300 b	89.400 b	56.2001	70.700 h	88.400	96.700 a
							bc	

Means with the same letter are not significantly different at level 0.05.

In table (6) shows the average number of hooks on ten races that the highest average number of hooks was 24.700 on A.m. Carnica hybrid (3) statistically there were significant difference at level 0.05 between numbers of hooks in another races. Shows the average proboscis length on nine difference races that the highest average was 6.850 mm in Apis mellifera hybrid (2) statistically there were significant difference at level 0.05 between lengths of proboscis of other races while the lowest average was 4.100 mm in A. mellifera meda. The average length of honeybee forewing in difference races, the highest average was 10.700 mm in A.m. florea while the lowest average was 8.275 mm in A.m. lamarckii. Statistically, there were significant differences at level 0.05 between each races.

However shows the average head length on different races in adult gave the highest average was 5.575 mm in A.m. lamarckii, while the lowest average was 3.750 mm in A. mellifera ligustica, Statistically, there were significant differences at level 0.05 between each races. The average head width on difference races, in adult honey bee gave the highest average was 4.550 mm on A. mellifera lamarckii, while the lowest average was 3.250 mm in A. mellifera ligustica, Statistically, there were significant differences at level 0.05 between each races. In conclusion the highest average of number of hook in Apis mellifera carnica hybrid, the rate of proboscis length in Apis mellifera carnica hybrid ,the highest average of forewing length in Apis mellifera florea.

Table (6): Average N.hook, Proboscis, Length forewing, Length head and Width head pf differencesraces of Honeybee.

Race	N.hook	proboscis	Length. forewing	Length. head	Width head
A.m.Carnica hybrid (3)	24.700 a	6.100 c	8.700 d	5.100 b	4.100 b
A.m.Carnica hybrid (2)	24.500 ab	6.850 a	9.775 b	5.225 b	4.225 b
A.m.lamarckii	24.100 bc	6.575 b	8.275 e	5.575 a	4.550 a
A.m.Carnica hybrid (1)	23.800 c	6.175 c	9.850 b	5.200 b	4.200 b
A.m.florea	22.300 d	6.300 c	10.700 a	4.725 c	4.225 b
A.m.ligustica	21.600 e	5.075 d	9.200 c	3.750 e	3.250 d
A. mellifera meda	21.500 e	4.100 e	9.100 c	4.600 c	3.600 c
A.m.Carnica	20.500 f	4.200 e	9.250 c	5.200 b	4.200 b

Means with the same letter are not significantly different at level 0.05.

\_In Plate 1 and 2 show fat bodies in one day old workers the cell grew and cell wall consist of large dark inclusion and tick wall, a few alteration appear on cytoplasm to be course and the cell slightly bigger some nucleus appear while other invisible dark purple in color polymorphous in shape, also there were irregular shapes of fat bodies with central dense inclusion in all races compared with fat bodies in thirty days old workers that gave different shape in compared with young old workers by very small cell and light in color large vacuolated and smooth cytoplasm, very obvious in shape dark purple in color. In conclusion we also studied the fat body difference through the stages of life for honeybee races.



Plate (1) fat bodies in one day workers (a- *Apis mellifera carnica*, b- *Apis mellifera ligustica*, c- *Apis mellifera* meda d- *Apis mellifera* lamarckii, e- *Apis mellifera* florea, f- *Apis mellifera carnica* hybrid(1), g- *Apis mellifera carnica* hybrid(2), h- *Apis mellifera carnica* hybrid(3))



Plate (2) fat bodies in thirty days old workers (a- *Apis mellifera carnica*, b- *Apis mellifera ligustica*, c- *Apis mellifera* meda d-*Apis mellifera* lamarckii, e- *Apis mellifera* florea, f- *Apis mellifera carnica* hybrid(1), g- *Apis mellifera carnica* hybrid(2), h-*Apis mellifera carnica* hybrid(3)

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