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Effect of the Honeybee Hybrid and Geographic Region on the Honey Bee Venom Production

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ABSTRACT

The present study was carried out at the apiary of Plant Protection Department, Faculty of Agriculture, Al-Azhar University at Nasr city, Cairo Governorate, and Motobes region Kafr El-Sheikh Governorate. The study was designed to investigate the effect of the Carniolan and Italian hybrids and geographic regions on the honey bee venom production during different seasons, at the beginning from September 2017 to the end of August 2018.Data showed that the average amounts of dry bee venom collected from Carniolan and Italian colonies were 51.3 and 44.8 mg/colony, respectively, and there were no significant differences observed between dry bee venom amounts collected from the two honey bee hybrids.Results indicated that the highest amount of dry bee venom (99.9 mg/colony) was recorded in May, and the least amount (11.1 mg/colony) was recorded at October, under Nasr city conditions. While under Motobes region conditions, the highest amount of dry bee venom (102.5 mg/colony) was recorded in June, and the least amount of dry bee venom (60.2mg/colony) was obtained at the end of November.

INTRODUCTION

The honey bee *Apis mellifera* L. is considered one of the most important beneficial insects for the people. Honey bee colonies give us nutritional, medical and industrial products: honey, royal jelly, pollen, bees wax, propolis, bee venom as well as bee brood. When honeybees gather nectar and pollen, they pollinate many of different crop plants. Estimation of benefits and increasing of quality and quantity of pollinated crops is about 20 times values of all hive products together (Elfeel 2017).

Honeybee venom is produced by a part of glands near the sting structure in worker bees. Workers guarding the hive entrance the have the most venom stored in the venom sac, which can be released when the barbed stinger penetrates an animal (Nasrallah 2015).

Bee venom apparatus has a prime role of defense to the bee colony. Bee venom from the venom gland located in the abdominal cavity contains several biologically active peptides, including melittin (the major component of bee venom), apamin, adolapin, mast cell degranulating peptide, and enzymes (phospholipase A2, and hyaluronidase) as well as non-peptide components, such as histamine, dopamine, and norepinephrine (Raghuraman and Chattopadhyay 2007).

Bee venom is one of the important products of honey bee's colony that is used for the cure of many diseases such as arthritis, rheumatism, herpes, etc. Hegazi *et al.* (2015), and El- Menabbawy *et al.* (2014). Honeybee venom is a transparent liquid dries up easily even at room temperature, odorless, ornamental pungent smell, a bitter taste, hydrolytic blend of proteins with basic pH (4.5 to 5.5) that is used by bees for defense (Schmidt and Buchmann,1999). When it comes in contact with air it forms grayish-white crystals. Dried venom takes on a light yellow color and some commercial preparations are brown, may be due to oxidation of some of the venom proteins. Bee venom contains a number of the high volatile compounds which are easily lost during collection, it is considered a rich source of enzymes, peptides and biogenic amines, its specific weight is 1.133, The amount of venom from *Apis mellifera* worker is about 94 micrograms.(Schmidt *et al.* 1986).

The venom is produced in the abdomen of worker bees from a mixture of acidic and basic secretions. It is synthesized by the venom glands associated with the sting apparatus of worker and queens, stored in the venom reservoir and injected through the sting apparatus during the stinging process. Its production increases during the first two weeks of the adult worker's life and reaches a maximum when the worker bee becomes involved in hive defense and foraging (Roat *et al*., 2006). Also, at Egypt Khodairy and Omar (2003) determined the relationship between bee venom produced by electrical impulses and certain characters of honey bee colonies (i.e. bee population, brood, stored pollen, stored honey areas and yield and foraging activity) and the variability of venom quantity collected from colonies at different periods of active season and found significant variations in the amounts of collected venom at different periods of active season, in addition they reported that the amount of venom was high in June compared with that collected in May and July, finally they found positive correlations between venom production and each of the bee population, bee brood, stored pollen, uncapped and capped honey areas and foraging activity. Moreover, Malaiu *et al.* (1981), Schumacher *et al.* (1994) conducted good experiments on the effect of bee venom collection on bee activity.

Bahreini *et al*. (2000) described a venom-collecting apparatus. The device was a 42 x 50 x 58 cm cage like box, with inner walls that were equipped with electric wires, which would be sequentially charged and discharged. Bees that would come in contact with two adjacent wires would receive an electric shock of 21 volts for 3 seconds. After a lapse of 7 seconds, the wire is recharged and ready for the next electric shock. This 10 second cycle continues for duration of 5 minutes, during which bees are made to sting on the plastic covering of a glass plate. Venom deposited on the glass plates is scraped off by a sharp lancet in the laboratory. No diverse effect was observed in the production of honey.

Many factors effecting on honey bee venom production and its quality such as; honey bee race, age of bees, colony strength, season of collection, feeding supply, race, its defense behavior and method of collection (Haggag *et al*., 2015).

The highest production of bee venom from the two honey bee hybrid (Carniolan and Italian) was 0.45 and 0.44 mg/colony for August. And the lowest average of bee venom amount was 0.3 mg/colony during February in each hybrid respectively (Omar, 2017).

The general mean of bee venom collected during the year by *Apis mellifera caucasica* was 2.77 mg / colony,

while that value of *Apis mellifera carnica* was 2.86 mg / colony, and the statistical analysis showed that there was no significant difference between the quantities of bee venom produced by the races (Mohanny, 2005)

Honeybee like any other organisms, have specific nutritional requirements. Necessary proteins, carbohydrates, fats, vitamins and minerals are available in natural sources which are pollen and nectar (Saffari e*t al.,* 2010).

Protein plays a major role in honeybee longevity, brood rearing, production of honey and other bee products which will be reduced when protein availability is inadequate. (Amdam and Omholt, 2002).

The main honey flow seasons in Egypt are citrus during March and April, Egyptian clover during April to June, and cotton during July and August (Taha, 2005). In addition, two secondary honey flow seasons: loofah during June to October (Taha *et al*., 2006), and banana during August and September (Taha, 2007) were recorded in Kafrelsheikh province. Long gaps in the availability of bee floral resources between the flow seasons affect the growth and productivity of bee colonies (Taha, 2000, 2005). During such floral dearth periods, particularly when pollen is not available, colonies gradually use up stored resources within the combs in their nests, while the queens stop laying eggs and the colonies become weak (Taha and Al-Kahtani, 2013). Such colonies use up a major part of nectar and pollen collected directly after the dearth for buildup of colony population.

Taha *et al*. (2017) found that Kafr El-Sheikh province is very rich in floral resources nectar and pollen, ninety seven plant species belonging to 33 families were recorded as nectar sources, and 82 plant species belonging to 36 families were recorded as pollen sources during the whole year. The largest amount of monthly trapped pollen was obtained during May followed by August. It can be concluded that, beekeepers in Kafr El-Sheikh province can harvest good honey yield at the end of blooming seasons of citrus (*Citrus spp*.) during March and April, Egyptian clover (*Trifolium alexandrinum* L.) during May and June, loofah (*Luffa aegyptiaca* Mill.) during June to October, cotton (*Gossypium spp*.) during July and August, and banana (*Musa spp*.) during August and September. They also, could be trapping pollen loads collected from faba bean (*Vicia faba* L.) and flax (*Linum usitatissimum* L.) during January to March, date palm (*Phoenix dactylifera* L.) during March and April, Egyptian clover during May and June, summer seed watermelon (*Citrullus lanatus* var. colothynthoides L.) during June and July, loofah and maize (*Zea mays* L.) during June to November.

The aim of this study is an attempt investigate the effect of honeybee hybrid and geographic region on the honey bee venom production.

MATERIALS AND METHODS

This study was carried out at the apiary of Plant Protection Department, Faculty of Agriculture, Al-Azhar University at Nasr city, Cairo, Egypt, and Motobes region Kafr El-Sheikh Governorate during different seasons beginning from September 2017 to the end of August 2018.

Experiments design:

Honeybee colonies:

The venom collected from the (Carniolan hybrid) honeybee workers *Apis mellifera carnica* and the (Italian hybrid) honeybee workers *Apis mellifera ligustica*.

Bee venom collections were done before sunset every 21 days intervals during spring, summer and autumn seasons, for 30 minutes.

16 honey bee colonies (eight Carniolan and eight Italian) of the same strength were prepared. Each colony consisted of three brood combs, two honey and pollen combs and headed by new mated queen sisters. The prepared colonies of the two hybrids were divided into two group eight colonies (four Carniolan and four Italian) at Nasr city Cairo and another group at Motobes region Kafr El-Sheikh Governorate. These colonies of the two hybrids were used for bee venom collection.

Bee venom collection:

Honey bee venom was subjected to bee venom collecting electric shock device (Chung-Jin Biotech Ltd., Ansan, Korea), the device consists of a five bee venom collection frames with wire electrodes installed in parallel to each other. Each frame was placed on the top of the combs in every hive and then were connected to an electro-stimulator. Electrical impulses to stimulate the bee workers to sting through latex sheet placed on a glass plate of the device frame. Bees that come into contact with the wires received a mild electrical shock and stung onto the glass sheet. The alarm odor, which evaporated from the venom, mobilized and irritated the other bees and they also started to sting. The frames with the fresh bee venom are carefully packed into a special container for transportation to the laboratory through 24-48 hours. The processing of dry bee venom scraping was implemented by sharp scraper under laboratory conditions, after that dry bee venom was weight and packed up in the dark glass jars and stored in a cool and dry place.

Statistical Analysis: Means and standard deviations of the data collected for each experiment were calculated using Microsoft Excel and statistical significance determined by t-test and two-way ANOVA

RESULTS AND DISCUSSION

Data tabulated in table (1) Show that of the highest amounts of bee venom collected from two honey bee hybrids (Carniolan, Italian) were 89.1 and 80.7 mg/colony during spring season followed by summer season were 48.9 and 39.8 mg/colony, respectively. In contrast, the averages of the lowest amounts of bee venom collected were 15.9 and 14 mg/colony during autumn season for each hybrid respectively. Statistically, there were no significant differences observed between bee venom amounts averages collected from two honey bee hybrids, while there were significant differences observed between bee venom amounts collected in different seasons.

Table 1. Effect of the honeybee hybrid Carniolan and Italian on bee venom quantities (mg.) per colony in Nasr city Cairo Governorate during season (2017-2018).

Season	Date	Carniolan honeybee hybrid					Italian honeybee hybrid				
		R1	R2	R3	R4	Mean	R1	R2	R3	R4	Mean
Autumn	4/9/2017	21.5	18.2	27.3	32.5	24.9	15.1	14.3	28.3	26.1	21.0
	25/9/2017	15.7	14.5	18.4	22.3	17.7	12.6	13.5	21.7	20.9	17.2
	16/10/2017	8.3	9.7	11.4	14.8	11.1	8.6	6.7	10.5	11.8	9.4
	6/11/2017	7.1	10.3	13.6	15.6	11.7	9.4	7.2	11.3	12.2	10.0
	27/11/2017	9.3	12.2	14.7	19.5	13.9	10.3	8.6	14.4	15.7	12.3
	Mean	12.4	13.0	17.1	20.9	15.9	11.2	10.1	17.2	17.3	14.0
Spring	12/3/2018	70.5	76.4	81.2	86.6	78.7	58.4	63.4	72.4	82.4	69.2
	2/4/2018	79.4	83.5	95.7	98.1	89.2	67.8	76.3	81.7	89.8	78.9
	23/4/2018	80.4	84.5	92.4	97.3	88.7	74.3	79.8	86.2	91.7	83.0
	14/5/2018	95.2	96.2	100.8	107.4	99.9	85.1	89.7	96.3	95.7	91.7
	Mean	81.4	85.2	92.5	97.4	89.1	71.4	77.3	84.2	89.9	80.7
Summer	4/6/2018	73.2	78.6	87.2	92.8	83.0	71.3	69.4	74.4	79.5	73.7
	25/6/2018	63.2	57.3	74.8	81.9	69.3	44.8	64.1	71.7	74.8	63.9
	16/7/2018	31.5	39.4	48.9	57.6	44.4	19.7	21.6	26.4	29.2	24.2
	6/8/2018	29.9	25.7	32.8	36.4	31.2	19.7	21.6	26.4	29.2	24.2
	27/8/2018	13.6	16.2	17.4	19.5	16.7	11.4	13.6	12.9	14.7	13.2
	Mean	42.3	43.4	52.2	57.6	48.9	33.4	38.1	42.4	45.5	39.8
General mean		56.1	58.3	66.1	71.1	51.3	47.4	52.1	57.7	61.6	44.8
L.S.D at 5% between		hybrids = 20.2				season =28.6		hybrids* season =40.4			

Data tabulated in table (2) Show that the average of the highest amounts of bee venom collected from two honey bee hybrids (Carniolan, Italian) were 86.0 and 77.6 mg/colony during summer season followed by Spring season 84.8 and 72.3 mg/colony respectively.

On contrast, the average of the lowest amounts of bee venom collected were 78.3 and 62.4 mg/colony during autumn season in each hybrid respectively. Statistically, there were no significant differences observed between bee venom amounts averages collected from two honey bee hybrids, also there were no significant differences observed between bee venom amounts averages collected in different seasons.

Table 2. Effect of the honeybee hybrid Carniolan and Italian on bee venom quantities (mg.) per colony in Motobes region-Kafr El-Sheikh Governorate during season of (2017-2018).

Season	Date	Carniolan honeybee hybrid					Italian honeybee hybrid				
		R1	R2	R3	R4	Mean	R1	R2	R3	R4	Mean
Autumn	1/9/2017	77.2	73.2	64.8	71.5	71.7	56.8	62.7	43.3	51.4	53.6
	22/9/2017	92.7	98.7	82.4	86.4	90.1	76.2	73.4	56.2	63.5	67.3
	13/10/2017	97.2	101.2	87.3	90.3	94.0	93.9	89.2	79.4	78.6	85.3
	3/11/2017	78.6	81.4	65.8	75.6	75.4	64.2	66.4	43.6	45.9	55.0
	24/11/2017	69.7	65.7	56.7	48.6	60.2	55.9	58.6	43.7	45.2	50.9
	Mean	83.1	84.0	71.4	74.5	78.3	69.4	70.1	53.2	56.9	62.4
Spring	6/3/2018	93.2	90.7	87.5	81.7	88.3	84.2	81.4	76.7	78.3	80.2
	30/3/2018	98.7	107.3	91.4	90.8	97.1	88.7	90.0	86.4	82.4	86.9
	20/4/2018	72.8	86.4	76.7	68.6	76.1	56.4	61.4	41.2	46.3	51.3
	11/5/2018	80.9	82.0	75.2	73.2	77.8	75.2	74.6	62.4	70.8	70.8
	Mean	86.4	91.6	82.7	78.6	84.8	76.1	76.9	66.7	69.5	72.3
Summer	1/6/2018	110.7	112.3	90.9	96.2	102.5	93.4	98.4	87.5	84.8	91.0
	22/6/2018	97.7	88.6	64.5	83.4	83.6	93.4	79.0	74.2	78.3	81.2
	13/7/2018	93.7	96.4	92.7	72.5	88.8	80.7	76.2	73.6	67.0	74.4
	3/8/2018	79.8	74.6	67.4	74.8	74.2	76.9	67.8	63.9	64.2	68.2
	24/8/2018	81.5	83.4	78.4	80.4	80.9	80.4	86.7	79.5	46.9	73.4
	Mean	92.7	91.1	78.8	81.5	86.0	85.0	81.6	75.7	68.2	77.6
General mean		87.4	90.7	79.8	79.7	83.03	80.0	78.7	70.1	67.8	70.76
L.S.D at 5% between		hybrids = 7.2				season =10.2		hybrids* season =14.4			

Data presented in table (3) indicate that the general mean of bee venom amounts collected from Carniolan honey bee colonies was 51.3 mg/colony under Nasr city conditions, while the general mean of bee venom amounts collected from Carniolan honey bee colonies was 83.03 mg/colony under Motobes region conditions.

During the period of study under Nasr city conditions, The highest amount of dry bee venom (99.9 mg/colony) was recorded in May, and the least amount (11.1 mg/colony) was recorded in October, while results revealed that during the period of study under Motobes region conditions, the highest amount of dry bee venom (102.5 mg/colony) was recorded in the first week at the beginning of June, and the least amount of dry bee venom (60.2mg/colony) were obtained at the end of November.

There were significant differences observed between bee venom amounts collected from two regions (Table 3).

Table 3. Effect of the regions Nasr city (Cairo) and Motobes (Kafr El-Sheikh) on bee venom quantities (mg.) for Carniolan honeybee hybrid during season (2017-2018).

Season	Date	Nasr city (Cairo)					Date	Motobes (Kafr El-Sheikh)				
		R1	R2	R3	R4	Mean		R1	R2	R3	R4	Mean
Autumn	4/9/2017	21.5	18.2	27.3	32.5	24.9	1/9/2017	77.2	73.2	64.8	71.5	71.7
	25/9/2017	15.7	14.5	18.4	22.3	17.7	22/9/2017	92.7	98.7	82.4	86.4	90.1
	16/10/2017	8.3	9.7	11.4	14.8	11.1	13/10/2017	97.2	101.2	87.3	90.3	94.0
	6/11/2017	7.1	10.3	13.6	15.6	11.7	3/11/2017	78.6	81.4	65.8	75.6	75.4
	27/11/2017	9.3	12.2	14.7	19.5	13.9	24/11/2017	69.7	65.7	56.7	48.6	60.2
	Mean	12.4	13.0	17.1	20.9	15.8	Mean	83.1	84.0	71.4	74.5	78.3
Spring	12/3/2018	70.5	76.4	81.2	86.6	78.7	6/3/2018	93.2	90.7	87.5	81.7	88.3
	2/4/2018	79.4	83.5	95.7	98.1	89.2	30/3/2018	98.7	107.3	91.4	90.8	97.1
	23/4/2018	80.4	84.5	92.4	97.3	88.7	20/4/2018	72.8	86.4	76.7	68.6	76.1
	14/5/2018	95.2	96.2	100.8	107.4	99.9	11/5/2018	80.9	82.0	75.2	73.2	77.8
	Mean	81.4	85.2	92.5	97.4	89.1	Mean	86.4	91.6	82.7	78.6	84.8
Summer	4/6/2018	73.2	78.6	87.2	92.8	83.0	1/6/2018	110.7	112.3	90.9	96.2	102.5
	25/6/2018	63.2	57.3	74.8	81.9	69.3	22/6/2018	97.7	88.6	64.5	83.4	83.6
	16/7/2018	31.5	39.4	48.9	57.6	44.4	13/7/2018	93.7	96.4	92.7	72.5	88.8
	6/8/2018	29.9	25.7	32.8	36.4	31.2	3/8/2018	79.8	74.6	67.4	74.8	74.2
	27/8/2018	13.6	16.2	17.4	19.5	16.7	24/8/2018	81.5	83.4	78.4	80.4	80.9
	Mean	42.3	43.4	52.2	57.6	48.9	Mean	92.7	91.1	78.8	81.5	86.0
General mean		45.3	47.2	53.9	58.6	51.3	General mean	87.4	90.7	79.8	79.7	83.03
L.S.D at 5% between		regions = 15.2				season =21.6		regions * season =30.5				

Data presented in table (4) indicated that the general mean of bee venom amounts collected from Italian honey bee colonies was 44.83 mg/colony under Nasr city - Cairo Governorate conditions, while the general mean of bee venom amounts collected from Italian honey bee colonies was 71.43 mg/colony under Motobes region Kafr El-Sheikh Governorate conditions.

During the period of study under Nasr city conditions, the highest amount of dry bee venom (91.7 mg/colony) was recorded in May, and the least amount (9.4 mg/colony) was recorded in October. While, under Motobes region conditions, the highest amount average of dry bee venom (89.5 mg/colony) was recorded in the end of June, and the least amount average of dry bee venom (50.9 mg/colony) was obtained at the end of November.

Regarding to effect of the Nasr city and Motobes region on bee venom quantities for Carniolan honeybee hybrid, there were significant differences observed between bee venom amounts averages collected from two regions (Nasr city and Motobes region).

Table 4. Effect of the regions Nasr city (Cairo) and Motobes (Kafr El-Sheikh) on bee venom quantities (mg.) for Italian honeybee hybrid during season (2017-2018).

Season	Collection date	Nasr city (Cairo)					Collection date	Motobes (Kafr El-Sheikh)				
		R1	R2	R3	R4	Mean		R1	R2	R3	R4	Mean
Autumn	4-Sep.	15.1	14.3	28.3	26.1	21.0	1-Sep.	56.8	62.7	43.3	51.4	53.6
	25-Sep.	12.6	13.5	21.7	20.9	17.2	22-Sep.	86.2	83.4	66.2	73.5	77.3
	16-Oct.	8.6	6.7	10.5	11.8	9.4	13-Oct.	93.9	89.2	79.4	78.6	85.3
	6-Nov.	9.4	7.2	11.3	12.2	10.0	3-Nov.	64.2	66.4	43.6	45.9	55.0
	27-Nov.	10.3	8.6	14.4	15.7	12.3	24-Nov.	55.9	58.6	43.7	45.2	50.9
Mean		11.2	10.1	17.2	17.3	14.0	Mean	71.4	72.1	55.2	58.9	64.4
Spring	12-Mar.	58.4	63.4	72.4	82.4	69.2	6-Mar.	84.2	81.4	76.7	78.3	80.2
	2-Apr.	67.8	76.3	81.7	89.8	78.9	30Mar.	91.7	93.0	82.4	85.4	88.1
	23-Apr.	74.3	79.8	86.2	91.7	83.0	20-Apr.	56.4	61.4	41.2	46.3	51.3
	14-May	85.1	89.7	96.3	95.7	91.7	11-May	75.2	74.6	62.4	70.8	70.8
Mean		71.4	77.3	84.2	89.9	80.7	Mean	76.9	77.6	65.7	70.2	72.6
Summer	4-Jun.	71.3	69.4	74.4	79.5	73.7	1-Jun.	93.4	79.0	74.2	78.3	81.2
	25-Jun.	44.8	64.1	71.7	74.8	63.9	22-Jun.	98.4	87.5	84.8	87.3	89.5
	16-Jul.	19.7	21.6	26.4	29.2	24.2	13-Jul.	80.7	76.2	73.6	67.0	74.4
	6-Aug.	19.7	21.6	26.4	29.2	24.2	3-Aug.	76.9	67.8	63.9	64.2	68.2
	27-Aug.	11.4	13.6	12.9	14.7	13.2	24-Aug.	80.4	86.7	79.5	46.9	73.4
Mean		33.4	38.1	42.4	45.5	39.8	Mean	86.0	79.4	75.2	68.7	77.3
General mean		47.4	52.1	57.7	61.6	44.83	General mean	81.0	78.1	69.6	68.5	71.43
L.S.D at 5% between		regions = 15.1				season =21.3		regions * season =30.2				

Based on the present data, it can be concluded that beekeepers at Motobes region (Kafr El-Sheikh) can obtain high honey bee venom yield, during the blooming seasons of faba bean (January to March), citrus (March and April), Egyptian clover (April to June), cotton (July and August), and *Cynanchum acutum* (August and November) which increase brood rearing and high population of workers. Whereas we can obtain low honey bee venom yield at Nasr city (Cairo) because absence the blooming plants all over the year and presence of honey bee enemies.

Similar results were emphasized by Elhosseny (2016) studied that the effect of month on the collected amounts of bee venom and indicate that the highest amounts of bee venom were collected in July followed by August then September. On contrast, the lowest amounts were collected in October in the two years of study. The average of bee venom amounts collected in July was 0.17 and 0.20

g/colony during 2014 and 2015, respectively. In addition, there were no significant differences observed between bee venom amount collected in September in 2014 and 2015. Generally, the collected venom was higher during 2015 than 2014.

Moreover, Khodairy and Omar (2003) stated that there was variability in the collected amounts of bee venom at different periods through the active season. Also, they reported that the amount of venom was high in July compared with that collected in May. In this respect, Haggag *et al*., (2015) showed that honey bee venom production was affected by many factors one of these factors was season of collection.

Also ,Omar (2017) showed that the average of that the highest production of bee venom from the two honey bee hybrid (Carniolan, Italian) was 0.45 and 0.44 mg/colony for month August. And the lowest average of amount bee venom was 0.3 during February in each hybrid respectively in 2012. While the highest production of bee venom from two honey bee hybrid (Carniolan, Italian) in 2013 were 0.40 and 0.45 mg/colony, And the lowest average of amount bee venom product was 0.29 mg in February respectively.

Sanad and Mohanny (2013) indicated that the highest amounts of bee venom were recorded at August month (0.185 g / day), and the least amount was recorded at March month (0.031 g / day). As for seasons results indicated that there were significant differences among the three seasons, where Summer season occupied the first rank giving the highest amount of bee venom recording 0.161 g / day, followed by Autumn season giving an average of 0.116 g /day, while Spring season gave the lowest amounts of bee venom registering 0.040 g / day.

El feel (2017) show that there was significant difference between amount of venom collected by Carniolan hybrid and Italian hybrid all over the year 2015,Carniolan hybrid was more higher than Italian hybrid, Carniolan colony could collect amount of venom in mean of 70.6 mg., while Italian colony could collect amount of venom in mean of 40.5 mg. In general the highest amount of venom could collect from both hybrid was in April, June and march with mean±se 42.3±29.9, 36.8±14.6 and 34.5±24.4, and the lowest in Nov., Dec. and Jan. with mean±se, 12.1±3.4, 10.6±2.8, 10.0±2.1 mg. /month respectively.

In addition Omar (2011) mentioned that when honey bee colonies contained sufficient areas from bee bread, the excitation by electrical impulses technique produced 84.3 mg. dry venom/colony The quantity decreased to 41.9 mg. when honey bee colonies deprived from bee bread it means that scarcity of bee bread in honey bee colonies during period of venom collection reduce their productivity by 50.3% When supplementary feeding was administrated for depriving colonies, venom production increased slightly to 49.1 mg/colony. Furthermore Hussein (2013) stated that when honey bee colonies contain sufficient areas from bee bread, the extraction by electrical impulses produced during 2011 (40.3 mg. dry venom /colony). The quantity decreased to (29.81 mg. dry venom /colony) when honey bee deprived from bee bread. The quantity increased to (44.25 mg. dry venom) when honey bee colonies contain sufficient areas from bee bread.

Leuter and Verla (1939) stated that the production of a potent bee venom required good nectar, honey and pollen sources consequently, protein food mainly is required for full production of venom.

In this manner Bachmayer *et al.* (1972) mentioned in the general, the venom quantity of worker bees appears to be highest during the summer months when there is peak activity in the hive and relatively young bees are serving as hive guards. Also Kucinschi and Rafiroin (1978) mentioned that the most venom was collected in June and September. Furthermore data obtained by Omar (1994) showed that the honey bee race had a role in amount of bee venom obtained by electrical impulses excitation. Lower venom was obtained from Carniolan colonies during summer season (61.5 mg / colony). The amount of dry bee venom increased gradually with hybridization from 69.2, 81.1 mg /colony to 95.5 mg /colony with first, second and third hybrid Carniolan bees respectively. The third hybrid differed significantly with pure Carniolan bees and it is first hybrid in the amount of dry bee venom produced.

Also Nenchev (2001) found that the annual yield of bee venom from a bee colony for 15 sessions at 14 day intervals between March and October was 3.804 gm. The most bee venom was obtained in June and July, and the least in March and October. In related to this work Mohanny (2005) stated that the general yearly amount of bee venom collected by the two hybrids was 2.8237 gm./colony. According to different months of the year, the collected quantities fluctuated from 0.8387 gm. /colony in August (the greatest) to 0.0386 gm. /colony in December (the lowest). According to the different seasons, the collected quantities could be arranged descending as follows; summer, spring, autumn and winter. Also Omar (2011) stated that Fluctuations of venom production from honey bee colonies by excitation with electrical impulses at different periods of active season were recorded. The results showed that there were three peaks of venom production during the period of study. The smallest one was recorded in May and the second in June. The highest amounts of bee venom (144.33 and 121.42 mg. /colony) were obtained at the third peak at the end of July, during 2008 and 2009 seasons. However, the recent observation by Khalafallah (2012) Mentioned that the heaviest poison sac was obtained during summer, autumn, and then winter. This because the spring season is the start of bee activities season, the clover and citrus crops full of pollens spread in, thus considered as natural feeding full of protein content, so the venom quantity increased during spring season when compared to other seasons. In summer season, cotton and com were more available, thus providing pollen, on the other hand, the high temperature during summer, reduced the production of venom. At autumn season, where the crops reduced, increasing the needs for external nutrition. At winter, no working bees found due to the reduction of temperature and the queen stop laying eggs and no nurse bees, all these reason reduced the quantity and the quality of venom.

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تأثير هجين النحل والمنطقة الجغرافية على انتاج سم النحل

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اجريت هذه الدراسة ابتداء من سبتمبر ٢٠١٧ وحتى أغسطس ٢٠١٨ بمنطقتين، المنطقة الأولى المنحل التابع لقسم وقاية النبات – كلية الزراعة – جامعة الأزهر القاهرة (مدينة نصر) والمنطقة الثانية منحل خاص بمركز مطوبس محافظة كفر الشيخ بهدف دراسة تأثير نوع الهجين و المنطقة الجغرافية علي انتاج سم النحل.تم استخلاص سم النحل بواسطة جهاز جمع السم والذى يعمل بتقنية النبضات الكهربائية تم وضع الجهاز لمدة نصف الساعة أعلى الاطارات لطوائف نحل العسل المستهدفة للدراسة لكلا من الهجين الكرنيولى والهجين الإيطالى بالمنطقتين كل ٢١ يوم.كانت أهم النتائج:تفوقت طوائف هجين النحل الكرنيولى وكذلك طوائف هجين النحل الإيطالى بمنطقة مطوبس محافظة كفر الشيخ على نظيرتها بمنحل الكلية بالقاهرة حيث كان المتوسط العام لكميات السم المنتجة من طوائف هجين النحل الكرنيولى والإيطالى بمنحل الكلية بمدينة نصر ٥١.٣ و ٤٤.٨ ملجم سم / الطائفة بينما كان المتوسط العام لكميات السم المنتجة من طوائف هجين النحل الكرنيولى والإيطالى بمطوبس ٨٣.٠٣ و ٧٠.٧٦ ملجم سم / الطائفة.سجلت طوائف هجين النحل الكرنيولى وكذلك طوائف هجين النحل الإيطالى بمنحل الكلية بمدينة نصر أعلى كمية سم خلال شهر مايو حيث كانت ٩٩.٩ و ٩١.٧ملجم سم / الطائفة وكانت أقل كمية سم ١١.١ و ٩.٤ ملجم سم / الطائفة خلال شهر اكتوبر؛ بينما سجلت طوائف هجين النحل الكرنيولى وكذلك طوائف هجين النحل الإيطالى بمنطقة مطوبس كفر الشيخ أعلى كمية سم خلال النصف الأول من شهر يونيه حيث كانت ١٠٢.٥و ٩١.٠ ملجم سم / الطائفة وكانت أقل كمية سم ٦٠.٢ و ٥٠.٩ ملجم سم / الطائفة خلال النصف الأخير من شهر نوفمبر.