

## Study Some Factors Which Affecting of Increase Secretion of Honey Bee Worker Venom Gland

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### ABSTRACT

Experiments were conducted in the apiary of Honey Bee Research Center. A field experiment was carried out in 2014-2015 at the Experimental Research Station of The Agriculture Research Center, El-Arish, North Sinai, in order to study some factors affecting increase secretion of honey bee worker venom gland such as: The time factor for the extraction of dry bee venom by electrical impulses technique in practical experiments or on a commercial scale is important, where the extractive bee venom is higher after the sun set period in comparison to other day periods due to as Sarah bees return to their colonies. The position of venom collector device (VCD) also affects venom quantity, to put the bee venom collector between three hive positions (under frames, over frames & at the entrance). The best position for the bee venom collection was over the hive frames because guard bees sting the glass, and the allover board surrounding that exposed to the sting. This means increasing the exposed surface area of stings by bees also their effects on some biological activities of honeybee colonies were studied.

**Keywords:** Honey Bee, venom, biological activities, venom collector device (VCD)

### INTRODUCTION

According to Shipolini (1984), the properties of bee venom is a clear liquid with bitter taste, aromatic odour and acidic reaction. It dissolves completely in water. Bee venom contains a number of pharmacologically active polypeptides, apamine, melittin and mast cell degranulating peptide are the components, the sting apparatus in worker and queen of honey bee is an ovipositor which is modified to play an important role of defense to the colony and stinging behavior is most commonly observed in the proximity of the hive or nest. Pheromones secretion is considered as one of the main stimuli for inducing an aggressive attitude amongst defending worker bees. Zhou et al., (1992) studied the effects of venom collection periods on the defensive behaviour of Italian honey bees (*Apis mellifera ligustica*) by counting the numbers of stings left in a black cotton ball moved in front of the hive. When venom was collected in the hive once every three days or once a day, the numbers of stings delivered immediately after venom collection were 68.2% and 63.6% less than the number of stings delivered by control. Khodairy and Omar (2003) showed that positive correlations between the amount of venom production and each of bee population, sealed brood, stored pollen, uncapped & capped honey areas and foraging activity. Barker et al. (1963) reported that the honey bee workers appear to become ravenous after venom extraction and will devour large quantities of honey, after which they appear to suffer no adverse effect. Marked bees have been noted working normally on the combs 12 days after venom extraction. Nasser, (2013) found that using the frames of collectors device over the hive the experimental bee colonies produced the highest amount of dry bee venom by 50.194 by compared with near of entrance hive.

The aim of this study is to determine the effects of some factors that could increase the productivity of honeybee venom. This investigation discusses improving the production of the venom from honeybee's colonies by using the technique electrical impulses.

### MATERIALS AND METHODS

Experiments were conducted in the apiary of Honey Bee Research Center. A field experiment was carried out in 2014-2015 at The Experimental Research Station of The Agriculture Research Center, El-Arish, North Sinai, in order to study some factors affecting increase secretion of honey bee worker venom gland such as; the time of day of bee venom collection through different season of years, collection board position, also their effects on some biological activities of honeybee colonies were studied.

#### 1-Study of the relationship between quantity of bee venom extracted and position of venom collection boards

All twelve honey bee colonies from local hybrid carniolan bees equal in strength were subjected to one board position of three board positions (under frames, over frames, at the entrance) venom collector device (VCD) every venom collection (15 day) during 2014-2015 years:

- **First position (under frames):** colonies were excited and the collection board of electrical impulses put down all colony frames.
- **Second position (over frames):** colonies were excited and collection board of electrical impulses put above all colony frames of the highest hive horizontally, under the outer cover of the hive.
- **Third position (at the entrance):** colonies were excited and the collection board of device electrical impulses put at the entrance of the hive before leaving the board. After 20 minute from putting the collection board of electrical impulses into his position, the dry bee venom was collected from a glass plate before weighing in the laboratory. This test repeated respectively for three groups as one position of venom collection boards for all groups every 15 days during 2014-2015 years.

#### 2-Study of the relationship between amount of collected bee venom and collection time of day.

Twelve honey bee colonies from local hybrid carniolan bees equal in strength were selected and divided in three groups (four colonies for each

group).The experiment conducted over 3 different times in each venom collection (early morning, at noon, after sunset) to reach the best time in which a highest amount of dry venom bee can be obtained. This designed as follows:

- First group:** beevenom was extracted for four of colonies during the early morning for 20 mints at 6-7 am.
- Second group:**bee venom was extracted for four of coloniesat noonfor 20 mints at 12-1pm.
- Third group:**bee venom was extracted for four of colonies after sunset for 20 mints at 5-6pm.After 15 minute from putting the collection board of electrical impulses, The dry bee venom was collected from a glass plate before weighing in the laboratory. This test repeated every 15 days during season of years (2014-2015).

**3-Study of the biological activities of honeybee colony**

The following biological activities of honeybee colonies were recorded every 13days intervals for all colonies of honeybee during the different seasons of the year.

1. Average of the colony strength (average of covered combs with bees/ colony).
2. Average of worker brood area (inch<sup>2</sup> / colony).
3. Average of stored honey area (inch<sup>2</sup> / colony).
4. Average of stored pollen area (inch<sup>2</sup> / colony).
5. Measurement the change of seasonal bee venom production

**RESULTS AND DISCUSSION**

**1.Study of the relationship between quantity of bee venom extractedand position of venom collection boards after 15 day during 2014-2015 years.**

**Study of the relationship between quantity of bee venom extracted and position of venom collection boards after 15 days during spring 2014-2015 years.**

Data presented in table (1) showd that the relationship between bee venom amount extracted and

**Table (1): Relationship between quantity of bee venom extracted and position of venom collection boards after 15 days during spring 2014-2015 years.**

Types of position	Dry bee venom(mg/colony/20 minutes )							
	First season 2014		% Rate of increment(+) Or Decrement(-) from (control)	second season 2015		% Rate of increment(+) Or Decrement(-) from (control)		
Min.	Max.	Mean S.E.		Min.	Max.		Mean S.E.	Min.
Bottom	0.429	1.720	1.014 c ± 0.057	+ 14.140	0.195	1.572	1.026 c ± 0.123	+ 3.207
Front	0.143	1.874	1.181 b ± 0.033	Control	0.140	1.850	1.060 b ± 0.124	Control
Top	0.446	1.612	1.091 a ± 0.066	+ 7.620	0.200	1.894	1.091 a ± 0.125	- 2.924
L.S.D 5%			0.0019				0.405	

**Study of the relationship between quantity of bee venom extracted and position of venom collection boards after 15 days during summer2014-2015 years.**

Data presented in Table (2) shows relationship between bee venom amount extracted and different position of venom collection boards in honey bee colony after 15 day during summer 2014/2015 seasons. Results indicated that no significant different between treatment in both seasons which producing from

different position of venom collection boards in honey bee colony after 15 day during spring 2014/2015 seasons. Results indicated that the highest (P≤0.05) amount of dry bee venom extracted 1.328 mg/colony was obtained in top position followed by Front 1.181 mg/colony in both seasons which producing from Carniolan hybrid colonies by using electrical impulses device during 20 min. To know the best type of positionof collection board to reach the highest amount of dry bee venom can be obtained.

The data clearly showed that after using bottom position the amount of dry bee venom decreased by 14.140%in first season 2014 and 3.207% in second season 2015 as compared with that of venom produced from control .This means that the use bottom position given the least significant (P≤0.05) values 1.091 mg/colony between treatment of dry bee venom in both seasons.

Maschwitz.(1964) reported that when guards of honey bee workers are standing at the entrance of the hive and disturbing, they released alarm pheromone to recruit other bees from the interior of the hive that are ready to sting. Moore et al.(1987) described that a small proportion of a colony worker population serves as guards ;only about 10% of the workers perform guarding activities. Hunt et al.(2003) recorded that there are usually middle-aged workers (13 to 16 days old) .Workers guard briefly for one to three days in the majority of cases and some workers may guard for as log as six days. The normal position of collection boards at the hive entrance firstly was used when the device was designed by Omar et al. (1993).

Excitation of honey bee workers was happened directly when the collection boards were used over the top frames of oney bee colonies .The majority of colony population was ready in a defense case to sting .All the area of collection board was exposed to bees stinging. (Omar., 2006). This means increasing the exposed surface area of stings by bees.

Carniolan hybrid honeybees colonies by using electrical impulses device during 20 min.

The data clearly show that after using top position the amount of dry bee venom increased by 23.293%in first season 2014 and 9.617% in second season 2015 as compared with that of venom produced from control .This means that the use top position given the highest significant (P≤0.05) values 1.231mg/colony between treatment of dry bee venom in both seasons.The honey bee worker were exited and crowded in defense case to sting the glass of the collection and

then returned to the hive after 15 -30 minute and gave up the defense behaviour. Excitation of honey bee workers was happened directly when the collection board were used over the top frames of honey bee colonies .The majority of colony population was ready in a defense case to sting .All the areas of collection board was exposed to bee sting Omar, (2011).

Rybak et al , (1995) reported that the collection frames in the upper body . mid- July was the best period for venom collection and the final apparatus developed consists of an electro des mounted every 5 sec in venom –collecting frames fitted in one of the hive bodies . The frames include a glass screen on which the venom is deposited .

**Table (2): Relationship between quantity of bee venom extracted, and position of venom collection boards after 15 days during summer 2014-2015 years.**

Types of position	First season 2014				second season 2015			
	Range Min.	Range Max.	Mean S.E.	% Rate of increment(+) Or Decrement(-) from (control)	Range Min.	Range Max.	Mean S.E.	% Rate of increment(+) Or Decrement(-) from (control)
Bottom	0.085	1.664	0.727 <sup>a</sup> ± 0.129	- 7.863	0.524	1.904	1.017 <sup>a</sup> ± 0.079	+ 9.439
Front	0.025	1.445	0.674 <sup>a</sup> ± 0.104	control	0.272	1.664	1.123 <sup>a</sup> ± 0.054	Control
Top	0.107	1.772	0.831 <sup>a</sup> ± 0.106	- 23.293	0.618	1.568	1.231 <sup>a</sup> ± 0.062	- 9.617
L.S.D 5%	0.5125				0.297			

**Study of the relationship between quantity of bee venom extracted and position of venom collection boards after 15 days during autumn 2014-2015 years.**

Data presented in Table (3), revealed that the relationship between bee venom amount extracted and different position of venom collection boards in honey bee colony after 15 day during autumn 2014/2015 seasons. Results indicated that the highest (P≤0.05) amount of dry bee venom extracted 0.739mg/colony was obtained in top position in both seasons followed by bottom 0.383 mg/colony in first season and front

0.588 mg/colony in second season respectively, which producing from Carniolan hybrid honeybees colonies by using electrical impulses device during 20 min.

The data clearly showed that after using top position the amount of dry bee venom increased by 19.893% in first season 2014 and 25.680% in second season 2015 as compared with that of venom produced from control .This means that the use of top position given the highest significant (P≤0.05) values 0.739 mg/colony between treatment of dry bee venom in both season

**Table (3): Relationship between quantity of bee venom extracted and position of venom collection boards after 15 days during autumn 2014-2015 years.**

Types of position	First season 2014				second season 2015			
	Range Min.	Range Max.	Mean S.E.	% Rate of increment(+) Or Decrement(-) from (control)	Range Min.	Range Max.	Mean S.E.	% Rate of increment(+) Or Decrement(-) from (control)
Bottom	0.000	1.217	0.383 <sup>b</sup> ± 0.005	- 1.591	0.057	1.762	0.537 <sup>c</sup> ± 0.072	+ 8.673
Front	0.222	0.599	0.377 <sup>c</sup> ± 0.055	Control	0.035	1.565	0.588 <sup>b</sup> ± 0.046	Control
Top	0.041	1.517	0.452 <sup>a</sup> ± 0.056	- 19.893	0.046	1.653	0.739 <sup>a</sup> ± 0.022	- 25.680
L.S.D 5%	0.055				0.167			

**Study of the relationship between quantity of bee venom extracted and position of venom collection boards after 15 days during winter 2014-2015 years.**

Data presented in Table (4) indicated that relationship between bee venom amount extracted and different position of venom collection boards in honey bee colony after 15 day during winter 2014/2015 seasons. Results indicated that the highest (P≤0.05) amount of dry bee venom extracted 0.179 mg/colony was obtained in top position in first season but no significant different between treatment in second season

which producing from Carniolan hybrid honeybees colonies by using electrical impulses device during 20 min.

The data clearly showed that after using top position the amount of dry bee venom increased by 25.510% in second season 2015 as compared with that of venom produced from control .This means that the use of top position given the highest significant (P≤0.05) values 0.369 mg/colony between treatment of dry bee venom in both seasons

**Table (4): Relationship between quantity of bee venom extracted and position of venom collection boards after 15 days during winter 2014-2015 years.**

Types of position	First season 2014				second season 2015			
	Range Min.	Range Max.	Mean S.E.	% Rate of increment(+) Or Decrement(-) from (control)	Range Min.	Range Max.	Mean S.E.	% Rate of increment(+) Or Decrement(-) from (control)
Bottom	0.002	0.032	0.122 <sup>c</sup> ± 0.096	- 3.174	1.004	0.028	0.304 <sup>a</sup> ± 0.232	- 3.401
Front	0.003	0.040	0.126 <sup>b</sup> ± 0.907	Control	0.782	0.017	0.294 <sup>a</sup> ± 0.294	Control
Top	0.000	0.866	0.179 <sup>a</sup> ± 0.011	+ 42.063	0.826	0.023	0.399 <sup>a</sup> ± 0.369	- 25.510
L.S.D 5%	0.012				1.3676			

**Relationship between bee venom amount and the collection time of day in honey bee colonies during spring of 2014/2015 seasons.**

The amount of bee venom was extracted electrically for 20 min. from from local hybrid carniolan bees equal in strength were subjected to three types collection time of day ,i.e., (early, noon, sunset) for

comparison during different season of 2014-2015 in the apiary of Honey Bee Research Center, to reach the best time of day in which a highest amount of dry venom bee can be obtained

Data presented in Table (5) showed that the relationship between bee venom amount extracted and different time of day in honey bee colony during spring

2014/2015 seasons. Results indicated that the highest (P≤0.05) amount of dry bee venom extracted 1.370mg/colony was obtained in sunset period in both seasons which producing from Carniolan hybrid honeybees colonies by using electrical impulses device during 20 min.

The data cleared that after using Sunset period the amount of dry bee venom increased by 67.868%in first season 2014 and 53.415% in second season 2015 as compared with that of venom produced from control .This means that the use of sunset period given the highest significant (P≤0.05) values 1.536 mg/colony between treatment of dry bee venom in both seasons

According to Rybaket *al.*, (1995) the techniques used for honey bee venom collection were studied at Poland , during 1989-1994. The results showed that the optimal electrical parameters are: impulse frequency, 1 KHZ ; voltage , 25 V; impulse duration , 1 s ; interval between impulses , 2 s . The best results were obtained

when venom collection for 1 h ( early morning , before bee flight ) or 2 h ( when foraging was occurring ).

According to Simics ,(1995) in Aabberta , Canada, found that colonies were relatively unaffected by the procedure ;, an observation during the collection period showed that on, 68bees died per colony after collection use .

In the available literature, (Malaiu et al., 1981) used a device depends on electric stimulus signal consisting of series of impulses of complex wave, positive amplitude of 45 v for 1.4 micro second, instantaneously followed by negative amplitude of 60 v for micro seconds . The frequency of impulses is 58 HZ. they obtained 9.2, 26.1 and 53.3 mg/colony when the duration of electric stimulus was 15, 30 and 60 minutes, respectively. By using this device about 1.5 gm of dry bee venom could be obtained from 10 colonies during 30 minutes (Omar,2011) .

**Table (5): Relationship between bee venom amount and the collection time of day in honey bee colonies during spring of 2014/2015 seasons.**

Types of timing	Range		First season 2014		% Rate of increment(+) Or Decrement(-) from (control)	Range		second season 2015	
	Min.	Max.	Mean S.E.			Min.	Max.	Mean S.E.	% Rate of increment(+) Or Decrement(-) from (control)
Early	0.533	1.252	0.974 b ± 0.082		- 6.448	0.373	1.572	0.985 b ± 0.071	- 10.302
Noon	0.498	1.420	0.915 b ± 0.152		control	0.363	1.343	0.893 b ± 0.055	Control
Sunset	0.934	2.688	1.536 a ± 0.335		- 67.868	1.026	1.739	1.370 a ± 0.080	- 53.415
L.S.D 5%				0.7546					0.2423

**Relationship between bee venom amount and the collection time of day in honey bee colonies during summer of 2014/2015 seasons.**

Data presented in Table (6)showed that the relationship between bee venom amount extracted and different time of day in honey bee colony during spring 2014/2015 seasons. Results reflected the same trend of spring where the highest (P≤0.05) amount of dry bee venom extracted 1.003 mg/colony was recorded with application of sunset period in first season 2014 followed by noon 0.612 mg/colony and early 0.611

mg/colony respectively, but no significant different between treatment which producing from Carniolan hybrid honeybees colonies by using electrical impulses device during 20 min in second season 2015.

The data clear that after using Sunset period the amount of dry bee venom increased by 63.888%in first season 2014 and 29.687% in second season 2015 as compared with that of venom produced from control .This means that the use of sunset period given the highest significant (P≤0.05) values 1.162 mg/colony between treatment of dry bee venom in both seasons

**Table (6): Relationship between bee venom amount and the collection time of day in honey bee colonies during summer of 2014/2015 seasons.**

Types of timing	Range		First season 2014		% Rate of increment(+) Or Decrement(-) from (control)	Range		second season 2015	
	Min.	Max.	Mean S.E.			Min.	Max.	Mean S.E.	% Rate of increment(+) Or Decrement(-) from (control)
Early	0.174	1.137	0.611 b ± 0.099		+ 0.163	0.928	1.465	0.570 a ± 0.502	- 75.223
Noon	0.186	1.059	0.612 b ± 0.108		control	0.821	1.220	0.896 a ± 0.071	control
Sunset	0.522	1.618	1.003 a ± 0.064		- 63.888	0.941	1.317	1.162 a ± 0.047	- 29.687
L.S.D 5%				0.2788					0.8873

**Relationship between bee venom amount and the collection time of day in honey bee colonies during autumn of 2014/2015 seasons.**

The obtained results in Table (7) indicated that the relationship between bee venom amount extracted and different time of day in honey bee colony during spring 2014/2015 seasons. Results reflected the same trend of spring where the highest (P≤0.05) amount of dry bee venom extracted 0.860 mg/colony was recorded with application of sunset period followed by noon 0.522 mg/colony and early 0.312 mg/colony

respectively, which producing from Carniolan hybrid honeybees colonies by using electrical impulses device during 20 min in both seasons.

The data clearly showed that after using Sunset period the amount of dry bee venom increased by 89.803%in first season 2014 and 64.750% in second season 2015 as compared with that of venom produced from control .This means that the use of sunset period given the highest significant (P≤0.05) values 0.860 mg/colony between treatment of dry bee venom in both seasons.

**Table (7): Relationship between bee venom amount and the collection time of day in honey bee colonies during autumn of 2014/2015 seasons.**

Types of timing	Dry bee venom(mg/colony/20 minutes )							
	First season 2014				second season 2015			
	Range		Mean S.E.	% Rate of increment(+) Or Decrement(-) from (control)	Range		Mean S.E.	% Rate of increment(+) Or Decrement(-) from (control)
Min.	Max.	Min.			Max.			
Early	0.076	0.666	0.312 b ± 0.028	- 22.352	0.032	0.567	0.277 c ± 0.082	+ 46.934
Noon	0.111	0.702	0.255 b ± 0.052	control	0.172	1.102	0.522 b ± 0.044	Control
Sunset	0.183	0.923	0.484 a ± 0.025	- 89.803	0.168	1.567	0.860 a ± 0.040	- 64.750
L.S.D 5%	0.1156			0.1814				

**Relationship between bee venom amount and the collection time of day in honey bee colonies during winter of 2014/2015 seasons.**

Data presented in Table (8) showed that the relationship between bee venom amount extracted and different time of day in honey bee colony during spring 2014/2015 seasons. Results reflected the same trend of summer where the highest ( $P \leq 0.05$ ) amount of dry bee venom extracted 0.438 mg/colony was recorded with application of sunset period followed by early 0.205 mg/colony and noon 0.115 mg/colony respectively,

**Table (8): Relationship between bee venom amount and the collection time of day in honey bee colonies during winter of 2014/2015 seasons.**

Types of timing	Dry bee venom(mg/colony/20 minutes )							
	First season 2014				second season 2015			
	Range		Mean S.E.	% Rate of increment(+) Or Decrement(-) from (control)	Range		Mean S.E.	% Rate of increment(+) Or Decrement(-) from (control)
Min.	Max.	Min.			Max.			
Early	0.509	0.042	0.205 b ± 0.164	- 78.260	0.170	0.034	0.083 b ± 0.051	- 25.757
Noon	0.270	0.036	0.115c ± 0.112	control	0.100	0.032	0.066 b ± 0.023	control
Sunset	0.610	0.459	0.438 a ± 0.028	- 80.869	0.771	0.071	0.414 a ± 0.273	- 27.272
L.S.D 5%	0.5231			0.7256				

**3. Study of some biological activities that affectsof honeybee colonies during 2014/2015 seasons by square inch.**

**Study of the worker brood area (inch<sup>2</sup>/colony) activities of honeybee colonies during 2014/2015 seasons by square inch.**

Brood rearing is a method for measuring the colony growth and maintenance of maximum populations. Unsealed and sealed brood areas were measured during the two seasons of study.

The following the worker brood area (inch<sup>2</sup>/colony) activities of honeybee colonies during 2014/2015 seasons. were recorded every 13 days intervals for all colonies of honeybee during the different seasons of the year ,i.e., (Summar, Spring, Autumn, Winter ) for comparison in the apiary of Honey Bee Research Center. to reach the best season in which a highest the worker brood area (inch<sup>2</sup>/colony) activities can be obtained

Data in table (9) indicated that the highest ( $P \leq 0.05$ ) the worker brood area (inch<sup>2</sup>/colony) activities 140.184 (inch<sup>2</sup>/colony) was recorded with application of summer season followed by spring 90.150 (inch<sup>2</sup>/colony) the least of the worker brood area (inch<sup>2</sup>/colony) activities was 4.266 (inch<sup>2</sup>/colony) in winter season can be obtained, because the mass of flowering plants while in late autum there is a few of the source of nectar and the colonies are recovering from the winter season .This means the summer season that the best season which a highest the worker brood area

which producing from Carniolan hybrid honeybees colonies by using electrical impulses device during 20 min in both seasons.

The data clearly showed that after using sunset period the amount of dry bee venom increased by 80.869%in first season 2014 and 27.272% in second season 2015 as compared with that of venom produced from control .This means that the use of sunset period given the highest significant ( $P \leq 0.05$ ) values 0.438 mg/colony between treatment of dry bee venom in both seasons

(inch<sup>2</sup>/colony) activities can be obtained which producing from Carniolan hybrid honeybees colonies by square inch.

The obtained results are in agreement with the findings of Bachmayer et al., 1972; Mohanny 2005; and El-Shaarawy et al., 2007.They mentioned that in general spring and summer seasons are the best seasons to collect bee venom when there is a pike in all hive activities. Also there is a relation with the flowering condition of the season that provided the colony need for food (nectar and pollen).

**Table (9):Worker brood area (inch<sup>2</sup>/colony) activities of honeybee colonies during 2014/2015 seasons by square inch.**

Seasons	Biological activities (inch <sup>2</sup> /colony)	
	First season 2014	second season 2015
	Mean S.E.(brood area)	Mean S.E.(brood area)
Autumn	17.575 b ± 1.044	17.878 c ± 1.642
Spring	68.197 a ± 4.374	90.150 b ± 5.189
Summar	77.243 a ± 4.826	140.184 a ± 6.970
Winter	4.266 c ± 0.537	4.583 c ± 0.381
L.S.D 5%	22.11	12.22

**Study of the stored pollen area (inch<sup>2</sup>/colony) activities of honeybee colonies during 2014/2015 seasons by square inch.**

The following the stored pollen area (inch<sup>2</sup>/colony) activities of honeybee colonies during 2014/2015 seasons. were recorded every 13 days intervals for all colonies of honeybee during the different seasons of the year,i.e., (summer, spring,

autumn, winter) for comparison in the apiary of Honey Bee Research Center. to reach the best season in which a highest number of the stored pollen area (inch<sup>2</sup>/colony) activities can be obtained

Bee bread is the natural food used to feed the larval and adult stages. The activity of honey bee workers in gathering and storing pollen is influencing with different factors. Scarcity of bee bread area inside the honey bee colonies has an effective role on the other activities of bees. The present study was oriented to investigate the relationship between venom extraction from honey bee colonies by electrical impulses and fluctuation of stored pollen areas during the active season.

Data in table (10) reflected the same trend of the worker brood area (inch<sup>2</sup>/colony) activities where the highest (P<0.05) amount of the stored pollen area 112.651 (inch<sup>2</sup>/colony) was recorded with application of summer season followed by spring 43.786 (inch<sup>2</sup>/colony) . The least of the stored pollen area was 0.046 (inch<sup>2</sup>/colony) in winter season can be obtained Because the mass of flowering plants while in late autumn there is a few of the source of nectar and the colonies are recovering from the winter season .This means the summer season that the best season which highest amount of the stored pollen area can be obtained which producing from Carniolan hybrid honeybees colonies by square inch.

**Table (10): The stored pollen area (inch<sup>2</sup>/colony) activities of honeybee colonies during 2014/2015 seasons by square inch.**

Seasons	Biological activities (inch <sup>2</sup> /colony)	
	First season 2014 Mean S.E.( Pollen area )	second season 2015 Mean S.E.( Pollen area )
Autumn	13.392 c ± 1.594	12.685 c ± 1.269
Spring	30.678 b ± 1.911	43.786 b ± 5.216
Summer	69.236 a ± 2.137	112.651 a ± 6.371
Winter	0.046 d ± 0.045	2.900 c ± 0.348
L.S.D 5%	11.22	10.23

**Study of the stored honey area (inch<sup>2</sup>/colony) activities of honeybee colonies during 2014/2015 seasons by square inch.**

The following the stored honey area (inch<sup>2</sup>/colony) activities of honeybee colonies during 2014/2015 seasons. were recorded every 13 days intervals for all colonies of honeybee during the different seasons of the year,i.e., (summer, spring, autumn, winter ) for comparison in the apiary of Honey Bee Research Center. to reach the best season in which a highest number of the stored honey area (inch<sup>2</sup>/colony) activities can be obtained by square inch.

Honey area is a criterion used as indication on colony growth, nectar foraging activity, suitability of environmental conditions and exist of honey plants. Unsealed and sealed honey areas were measured during active season from May until the end of December to determine the foraging outcome of honey bee workers.

The obtained results in Table (11) reflected the same trend of the stored pollen area (inch<sup>2</sup>/colony) activities where the highest (P<0.05) amount of the stored honey area 150.229 (inch<sup>2</sup>/colony) was recorded with application of summer season followed by spring

103.739 (inch<sup>2</sup>/colony) . The least of the stored honey area was 8.458 (inch<sup>2</sup>/colony) in winter season can be obtained Because the mass of flowering plants while in late autumn there is a few of the source of nectar and the colonies are recovering from the winter season .This means the summer season that the best season which a highest amount of the stored honey area can be obtained which producing from Carniolan hybrid honeybees colonies by square inch.

**Table (11): the stored honey area (inch<sup>2</sup>/colony) activities of honeybee colonies during 2014/2015 seasons by square inch.**

Seasons	Biological activities (inch <sup>2</sup> /colony)	
	First season 2014 Mean S.E.( Honey area )	second season 2015 Mean S.E.( Honey area )
Autumn	72.108b ±3.891	24.542c±1.909
Spring	80.467b ±4.959	103.739b ±6.371
Summer	143.790a ±4.257	150.229a ±6.876
Winter	26.513c ±2.644	8.458c ±0.758
L.S.D 5%	8.12	6.24

**Study of the colony strength activities(inch<sup>2</sup>/colony) of honeybee colonies during 2014/2015 in different seasons square inch.**

The following the strength activities (inch<sup>2</sup>/colony) of honeybee colonies during 2014/2015 seasons. were recorded every 13 days intervals for all colonies of honeybee during the different seasons of the year ,i.e., (summer, spring, autumn, winter ) for comparison in the apiary of Honey Bee Research Center. to reach the best season in which a highest number of the strength (inch<sup>2</sup>/colony) activities can be obtained by square inch. The biological activities of honeybee colonies were tested for showing how long the bee venom collection throw Season of year affected some tested bee colony activities .The biological activities which were measured during the experiment Seasons 2014/2015 were:

1. Brood area (inch<sup>2</sup>/colony)
2. Honey area (inch<sup>2</sup>/colony)
3. Pollen area (inch<sup>2</sup>/colony)
4. Covered combs with bee (colony strength)

Data in Table (12) indicated that the highest (P<0.05) number of the seasonal fluctuation of venom production in relation to some activities of honey bee colonies during in both seasons( 2014/2015) seasons ,i.e., (the worker brood area, the stored honey area, the stored pollen area) by (inch<sup>2</sup>/colony) was recorded with application of summer season followed by spring . The least number of the seasonal fluctuation of venom production in relation to some activities of honey bee colonies was in winter season can be obtained, because the mass of flowering plants while in late autumn there is a few of the source of nectar and the colonies are recovering from the winter season. Where it gave the highest (P<0.05) number of the colony strength activities the following values respectively 9.069 the worker brood area , 10.000 the stored honey area, 9.111 the stored pollen area by (inch<sup>2</sup>/colony) This means the summer season that the best season which a highest number of the seasonal fluctuation of venom production in relation to some activities of honey bee colonies can be obtained which producing from Carniolan hybrid honeybees colonies by square inch.

Table (12): the colony strength activities (inch<sup>2</sup>/colony) of honeybee colonies during 2014/2015 in different seasons square inch.

Seasons	Biological activities - (colony strength)									
	First season 2014					second season 2015				
	Brood area	Honey area	Pollen area	Empty combs from bee	Covered combs with bee	Brood area	Honey area	Pollen area	Empty combs from bee	Covered combs with bee
Autum	4.150 C	8.333B	3.100B	2.733B	7.266C	5.400B	7.133C	4.366C	2.733B	7.266C
	0.150±	0.281±	0.246±	0.309±	0.309±	0.261±	0.296±	±0.287	0.309±	0.309±
Spring	5.833 B	8.111B	8.444A	1.333C	8.666B	6.138B	8.055B	6.666B	1.333C	8.666B
	0.336±	0.358±	0.259±	0.235±	0.235±	0.390±	0.313±	0.468±	0.235±	±0.235
Summer	7.416 A	10.000A	9.111A	0.000D	9.861A	9.069A	9.972A	8.972A	0.000D	10.000A
	0.303±	0.000±	0.166±	0.000±	0.138±	0.141±	0.027±	0.177±	0.000±	0.000±
Winter	3.458 C	3.791C	0.083C	5.916A	4.083D	3.125C	3.791D	2.250D	5.916A	4.083D
	0.248±	0.180±	0.083±	0.254±	0.254±	0.193±	0.225±	0.242±	0.254±	0.254±
L.S.D 5%	0.399	0.318	0.333	0.343	0.232	0.660	0.534	0.676	0.734	0.675

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دراسة بعض العوامل التي تؤثر على زيادة إفراز غدة السم في شغالات نحلا العسل

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أجريت التجربة الحقلية خلال موسمي الدراسة ٢٠١٥/٢٠١٤ بالمحطة البحثية لمركز البحوث الزراعية بالعريش في شمال سيناء وذلك لدراسة بعض العوامل التي تؤثر على زيادة إفراز غدة السم في شغالات نحل العسل مثل: دراسة الأوقات المختلفة من اليوم لجمع سم النحل خلال المواسم المختلفة من السنة، دراسة المواضع المختلفة للوحة جمع السم بالإضافة إلى دراسة تأثير بعض الأنشطة البيولوجية على طوائف نحل العسل. ١- دراسة العلاقة بين كمية السم المستخلصة والمواضع المختلفة للوحة جمع السم (الموضع السفلي، الموضع أمام مدخل الخلية، الموضع العلوي) من طوائف نحل العسل بعد مرور ١٥ يوم خلال موسمي الدراسة ٢٠١٥/٢٠١٤ توضح النتائج أن استخدام الموضع العلوي أعطى أعلى كمية من سم النحل الجاف المستخلصة ويليها موضع أمام مدخل الخلية بمقدار التي تنتج من نحل هجين أول كرنولي باستخدام جهاز النبضات الكهربائية لمدة ٢٠ دقيقة في كلا الموسمين. ٢- العلاقة بين كمية سم النحل المستخرجة والأوقات المختلفة من اليوم (في الصباح الباكر، الظهر، الغروب) أوضحت النتائج أن أعلى كمية من سم النحل الجاف المستخرجة كانت في فترة غروب الشمس بمقدار يليها فترة الظهيرة ثم فترة الصباح الباكر على التوالي، وهذا يعني أن فترة غروب الشمس هي أفضل الوقت من اليوم للحصول على أكبر قدر من سم النحل الجاف التي تنتج من نحل هجين أول كرنولي باستخدام جهاز النبضات الكهربائية لمدة ٢٠ دقيقة في كلا الموسمين ٣- دراسة بعض الأنشطة البيولوجية التي تؤثر على طوائف نحل العسل خلال الموسمين ٢٠١٥/٢٠١٤ بالبوصة المربعة ٣.١. دراسة نشاط الحضنة في مستعمرات نحل العسل بالبوصة المربعة خلال الموسمين ٢٠١٥/٢٠١٤ حيث أنه تم دراسة نشاط الحضنة في مستعمرات نحل العسل وذلك كل ١٢ يوم من فترات جمع السم في المواسم المختلفة من السنة (الربيع، الصيف، الخريف، الشتاء) وذلك لمعرفة أفضل موسم من السنة يزداد فيه نشاط الحضنة وأوضحت النتائج أن أفضل موسم لزيادة نشاط الحضنة هو موسم الصيف وكانت بمقدار ٤٠.١٨٤ بالبوصة المربعة ويليها موسم الربيع بمقدار ٩٠.١٥٠ بالبوصة المربعة بينما أقل نشاط في موسم الشتاء بمقدار ٤.٢٦٦. ٣.٢. دراسة نشاط طوائف نحل العسل بالنسبة لمساحة حبوب اللقاح المخزنة بالبوصة المربعة خلال الموسمين ٢٠١٥/٢٠١٤ حيث أنه تم دراسة مساحة حبوب اللقاح المخزنة في مستعمرات نحل العسل وذلك كل ١٣ يوم من فترات جمع السم في المواسم المختلفة من السنة (الربيع، الصيف، الخريف، الشتاء) وذلك لمعرفة أفضل موسم من السنة يزداد فيه المساحة المخزنة من حبوب اللقاح فكانت النتائج نفس الاتجاه السابق حيث تم تسجيل أعلى مساحة من حبوب اللقاح المخزنة في موسم الصيف بمقدار ١١٢.٦٥١ بالبوصة المربعة ويليها موسم الربيع بمقدار ٤٣.٧٨٦ بالبوصة المربعة بينما أقل مساحة كانت في موسم الشتاء بمقدار ١٠.٠٤٦ بالبوصة المربعة ٣.٣. دراسة نشاط طوائف نحل العسل بالنسبة لمساحة العسل المخزنة بالبوصة المربعة خلال الموسمين ٢٠١٥/٢٠١٤ حيث أنه تم دراسة مساحة العسل المخزنة في مستعمرات نحل العسل وذلك كل ١٣ يوم من فترات جمع السم في المواسم المختلفة من السنة (الربيع، الصيف، الخريف، الشتاء) وذلك لمعرفة أفضل موسم من السنة يزداد فيه نشاط طوائف نحل العسل عن طريق قياس الأنشطة البيولوجية بالبوصة المربعة في طوائف نحل العسل والأنشطة البيولوجية التي تم قياسها خلال موسمي الدراسة ٢٠١٥/٢٠١٤. منطقة الحضنة بالبوصة المربعة. ٢. منطقة العسل بالبوصة المربعة. ٣. منطقة حبوب اللقاح بالبوصة المربعة. ٤. البراويظ المغطاة بالنحل (قوة الخلية). أوضحت النتائج أن أفضل موسم لزيادة قوة نشاط طوائف نحل العسل (منطقة الحضنة، منطقة العسل المخزنة، منطقة حبوب اللقاح المخزنة) هو موسم الصيف ويليها موسم الربيع بينما أقل موسم هو موسم الشتاء.

