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EFFECT OF DIFFERENT BEE VENOM COLLECTION PERIODS USING ELECTRICAL SHOCH DEVICE ON SOME VENOM CHARACTERISTICS AND HONEYBEE COLONIES ACTIVITIES

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ABSTRACT

Bee venom was collected from different races and hybrids bees using high quality of the electric shock device. The bee venom was collected every 4&7 days interval during different seasons of the year. Egyptian race and Craniolian hybrid recorded highest venom values among other tested bee races during spring, summer and winter seasons particularly at 4 days interval collection periods. Increases in some biological activities of honeybee colonies resulted collected bee venom were recorded with same collection period. Collected bee venom in the winter season was preferred every 7 days intervals. There weren't clearly effects resulted both two venom collection periods or race of bees on some bee venom analysis, while total bee venom proteins were related with the season activity.

INTRODUCTION

Honeybees (*Apis mellifera* L.) had many useful products, play an important role in honeybee industrial (Dade, 1962). Bee venom considered one of the most important bee products for its different uses in different medical purposes. Bee venom is produced from acid and alkaline glands of bee workers and its secretion are increased during the first two weeks of bee age reached the maximum when bee worker becomes involved in hive defense and foraging activities on the beginning of 21 days old (Snodgrass, 1956). There were many factors affecting on the bee venom production from honeybee colonies like bee race, age, season of the year and nutrition factor (Muszynska *et al*., 1989). There were different applications for collected bee venom naturally or artificially methods. The most commercial and productive application methods for getting the higher venom values was the electric shock devices (Simics, 1995).

The aim of this investigation is to study the effect of bee venom collection periods using the electric shock device on some venom characteristics and honey bee colonies activities.

MATERIALS AND METHODS

This work was carried out at the Development of Apiculture Secondary Products Project's Apiary. Plant Protection Research Institute, Agriculture Research Center, El-Kanater El-Kairia, El-Kalubia Governorate, Egypt during 2005-2006.

The following honeybee races and hybrids were conducted for this study; Egyptian race (*Apis mellifera lamarkii*), Carniolian race (*A. m. carnica*), and Carniolian, and Italian hybrids (Nine colonies / for each race). The nine bee colonies were divided into three groups (Three colonies for each tested venom collection period (Two collection periods), while the third group was used as control). The bee venom was collected every 4 & 7 days intervals for one month during spring, summer and winter seasons.

I: Bee venom collection method

High quality of the electric shock device "VC-Starter kit" was used to collect bee venom from tested honey bee colonies. Two collection periods, 4 & 7 days intervals were determined for collecting bee venom per one month every tested season.

II: The biological activities

The following biological activities of honey bee colonies were recorded every 12 days intervals to determine the effect of honeybee race, season of year and different venom collection periods on some biological activities of honeybee colonies;

1- No of covered combs with bees / colony.
2- Sealed worker brood area (Inch^2/colony).
3- Honey stored area (Inch^2/colony).
4- Pollen stored area (Inch^2/colony).

III: Bee venom analysis

Collected bee venom from tested honeybee colonies every 4 & 7 days was submissive for chemical analysis to study the effect of bee race, collected bee venom periods and season of year on some venom characteristics which were electrical separated by polyacrylamide gel electrophoresis (PAGE) technique according to method of Lammeli, (1970) and Bradford, (1976).

RESULTS AND DISCUSSIONS

I: Bee venom collection periods

Data illustrated in Table (1) revealed presence higher venom values collected from Carniolian hybrid followed with those the obtained by Egyptian and Carniolian races and Italian hybrid during spring, summer and winter seasons at the 7th days collection period intervals. The best venom collection periods for obtaining large amount of the venom was 4 days interval particularly with Egyptian race followed by Carniolian hybrid during spring and summer seasons while Carniolian hybrid recorded the best results with winter season.

Collected bee venom every 4 days intervals recorded higher venom values than those collected at every 7 days at interval at spring and summer seasons. In the other hand bee venom collected at winter season every 7 days intervals give higher venom values than those obtained every 4 days. That may be due to the fall season and less protein stored in bee hives reflects that on the venom reservoir and the bee workers needed longer period to compensate lost venom proteins. It could be summarized that spring season consider the better for collecting bee venom followed with summer and winter seasons with all tested bee races and hybrids. While winter season was preferable for collecting the venom every 7th days intervals.

The results obtained are going in line with the finding of El-Ashhab, (2001). He found that Carniolian bees from Manzala location (F2) had been given better venom quantity than other tested bee races. Zhou *et al*., (1992) indicated that collecting bee venom every 3 days was better than daily in defense behavior. In addition when the period goes longer it was better until every 15 days interval. Bachmayer *et al*., (1972) and Mohanny ,(2005) recorded that in general venom quantity of bee workers was higher during spring and summer seasons when there is a peak in colony activity and there is flowering activity.

Table (1): Effect of collecting bee venom periods on bee venom weight collected from different honeybee races and hybrids during spring, summer and winter

Honeybee races and hybrids		Bee venom weight collected during different season and collection periods (days)							
		spring		summer		winter		LSD 0.05	
		4	7	4	7	4	7	4 days	7 days
Egyptian race	mean	a 0.1592 x	0.2078 x	a 0.1442 x	0.1827 x	a b 0.0173 y	0.0149 y	0.0188	0.0386
Carniolian hybrid	mean	a 0.1639 x	0.1942	a 0.1457 x	0.1556	a 0.0203 y	0.0154	0.0294	F=3.2927
Carniolian race	mean	a b 0.1406 x	0.1761 x	a b 0.1175 x	0.1537 x	a b 0.0171 y	0.0121 y	0.0221	0.0087
Italian hybrid	mean	b 0.0838 x	0.1696	b 0.0677 y	0.1462	b 0.0163	0.0066 z	0.0044	F=1.9624
LSD 0.05		0.0226	F=0.4381	0.0240	F=0.1428	0.0081	F=0.1415		

- **Significant between races and hybrids a b c**
- **Significant between seasons x y z**

II: The biological activities

Data detected in Table (2) showed that stored bee pollen in honeybee colonies recorded higher amounts when bee venom was collected at every 4 days intervals than with 7 periods during spring season. While during summer season the 7th day was the better period. There were positive effects to collecting bee venom in both periods on honey stored area in most tested races and hybrids at spring and summer seasons. On the other hand no significant differences on the biological activities in winter season between venom collection periods and control ones. This may be due to less activity of honey bee colonies in late winter.

Table (2): Effect of bee venom collection periods on some biological activities of honeybee colonies from different bee races during different seasons:

Season	Race / Hybrid	Venom collection/day	biological activities			
			covered combs with bees	brood area	honey area	pollen area
Spring		4	7,50	301,33	1196,56	243,00
	Egyptian race	7	6,33	266,44	901,22	179,78
		without	6,83	176,22	1111,00	209,22
	$LSD_{0.05}$		1,94	29,59	75,65	5,29
		4	7,00	297,22	1011,89	222,67
	Carniolian race	7	6,78	230,78	674,55	189,00
		without	6,00	217,89	1036,78	198,67
	$LSD_{0.05}$		0,11	10,27	46,53	5,77
		4	7,00	307,89	1029,00	227,00
	Carniolian hybrid	7	6,50	246,33	978,11	183,00
		without	6,67	226,89	1085,66	198,00
	$LSD_{0.05}$		1,94	40,66	127,17	
		4	6,17	244,11	883,78	187,78
	Italian hybrid	7	6,44	371,00	947,89	181,78
		without	6,45	378,67	1029,56	185,11
	$LSD_{0.05}$		0,74	43,98	15,78	27,62
Summer		4	4,22	281,89	389a	132,33
	Egyptian race	7	4,11	241,56	370,44	145,11
		without	4,06	266,78	291,67	138,11
	$LSD_{0.05}$		F=0.361	1,91	F=61.451	F=1.362
		4	4,83	387,44	364,44	146,00
	Carniolian race	7	3,33	331,78	303,89	178,33
		without	5,44	311,11	520,44	103,33
	$LSD_{0.05}$		0,55	20,76	18,22	2,90
		4	6,00	326,33	619,44	174,44
	Carniolian hybrid	7	4,89	257,78	396,67	185,11
		without	4,11	287,00	256,33	136,89
	$LSD_{0.05}$		0,96	51,13	68,02	34,82
		4	5,61	246,67	448,44	171,33
	Italian hybrid	7	4,89	329,00	424,44	180,67
		without	6,33	401,56	530,89	168,44
	$LSD_{0.05}$		0,91	109,12	77,84	F=1.051
winter		4	3,94	196,78	238,00	46,22
	Egyptian race	7	3,55	188,78	215,00	33,89
		without	3,33	198,55	167,33	37,66
	$LSD_{0.05}$		F=2.198	F=190.098	F=162.072	F=27.405
		4	3,56	174,78	289,44	57,55
	Carniolian race	7	4,00	163,33	276,00	68,44
		without	3,56	173,33	294,34	64,11
	$LSD_{0.05}$		F=2.776	F=109.494	F=293.253	F=34.95
		4	4,17	243,22	355,67	83,78
	Carniolian hybrid	7	3,61	248,00	353,00	82,33
		without	4,22	231,55	358,89	83,56
	$LSD_{0.05}$		F=2.523	F=271.492	F=437.641	F=108.701
		4	4,00	168,22	321,89	82,67
	Italian hybrid	7	4,06	169,33	266,78	74,45
		without	4,38	188,44	317,55	80,89
	$LSD_{0.05}$		F=3.799	F=112.562	F=506	F=108.864

F1

It could be summarized that spring and summer seasons considered the privilege seasons to collect bee venom, particularly at every 4 days intervals. Collecting bee venom was positively affected the biological activities of honeybee colonies markedly if it was collected at every 4 days intervals. Skubida *et al*., (1995), Abreu *et al*., (2000) and El-Ashhab (2001) they recorded that collecting bee venom had negative effect on colony biology, wintering and general products.

III: Bee venom analysis

Data presented in Table (3) and Fig. (1) Showed the analysis of the bee venom samples obtained from tested bee races at two collection periods during spring, summer and winter seasons. There were no differences in the venom chemical analysis using the two tested periods. On the other hand there were variations between the venom collected from different races. This may be attributed to the different physiological characters of the bee races. Collected bee venom in summer season gave little effects on some protein characters particularly with Carniolian and Italian hybrids. While total venom proteins were higher in summer and winter seasons, respectively. The lowest proteins were recorded during winter season that may be assumed to deputation flow in this period through the year and the bee colonies reached to the lowest status of the biological activities particularly collecting pollen grains which consider the main source of the bee proteins.

The results obtained are in agreement with finding of Benton *et al*., (1968), they found that bee venom from different bee races was different from each other. Muszynska *et al*., (1989) found some variations in bee venom activities collected between November and April months. Nelson *et al*., (1990) recorded biochemical differences between Africanized bee and European bee venoms. Nour *et al.*, (2004) found differences in the bee venom protein component collected from Egyptian and Carniolian races.

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نأ ثير جمع سم نحل العسل فى فترات مختلفة بإستخدام جهاز الصدمة العصبية على بعض خصائص السم ونشاط طوائف نحل العسل.

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تم تجميع سم نحل العسل من عديد من الطوائف والسلالات باستخدام جهاز الصدمة الالكترونية عالى الكفاءة. كان يتم تجميع السم كل ٤، ٧ أيام على التوالى خلال الفصول المختلفة خلال العام.سجلت السلالة المصرى والهجين الكرينولى أعلى كميات السم مقارنة بالسلالات المختبرة الأخرى خلال فصول الربيع، الصيف والشتاء خاصة فى اليوم الرابع من التجميع.

تم تسجيل زيادة لبعض النشاطات البيولوجية لطوائف نحل العسل فى نفس فترة تجميع السم. يفضل تجميع السم فى فصل الشتاء كل ٧ أيام.لم يكن هناك تأثير لنوع سلالة النحل ولا لفترات التجميع على بعض خصائص السم، بينما ارتبط بروتين السم بنشاط الفصول.