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EFFECT OF SOME TYPES OF PROTEIN NUTRITION ON THE PRODUCTIVITY OF HONEY BEE VENOM

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ABSTRACT

Experiments were conducted in the apiary of Honey Bee Research Center. A field experiment was carried out during 2014 and 2015 seasons, at the Experimental Research Station of the Agriculture Research Center, El-Arish, North Sinai, to study the impact of different sources of nutritive protein on honey bee worker venom gland secretion. 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 electrical impulses technique. This study includes several essential factors, such as using different types of nutrition proteins 1:1 W: W of honey bee to beer yeast or soya beans or natural pollen grain, respectively. Results indicated that the natural pollen grain is the best because it is mainly provide structural elements of muscles, glands and other tissues.

Key words: Honeybee, VCD, Bee Venom, Nutritive proteins, Collection, Sting apparatus, Acid gland, Venom sac.

INTRODUCTION

Bee venom therapy is a part of apitherapy which utilizes bee venom in the treatment of health conditions. It has been used from an old era to modern end as an alternative therapy to treat several diseases like: Multiple sclerosis, Lyme disease, and Chronic fatigue syndrome. Bee venom has a rich source of enzymes, peptides and biogenic amines and contains at least 18 active components.

The aim of this study is to determine the effects of some factors that could increase the productivity of honeybee venom. **(El-Bassiony, 2007; El-Shaarawy, 2007)** found that using the pollen grain diet treatment gave the best results for bee venom production comparing with the other treatments (free fate milk, dead yeast and sugar solution. **Omar (2011)** found that when newly emerged honey bee workers were fed on sufficient level of stored bee bread in bee colonies, the total length of acid gland increased with the age and reached to the maximum length at 18th day-old (13.03mm). The length of acid gland started to decrease again at 24th day–old.

MATERIALS AND METHODS

Experiments were conducted in the apiary of Honey Bee Research Center. A field experiment was carried out during 2014 and 2015 at the Experimental Research Station of the Agriculture Research Center,

El-Arish, North Sinai, in order to study some factors which affecting secretion of honey bee worker venom gland such as: the

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different types of nutritive protein through two different seasons. 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 electrical impulses technique. This study includes several essential factors, such as sources of different nutrition proteins as1:1 W: W of honey bee to beer yeast or soya beans or natural pollen grain, respectively.

Relation between amount collected bee venom from worker venom gland and different types of nutritive protein in honeybee colonies after 10 days from feeding during 2014 and 2015 seasons (spring, summer, fall, winter) respectively.

Twelve honeybee colonies from local hybrid Carniola bees, relatively equal in their strengths were chosen and divided into three groups as follows:

First Group

Each colony contains 50 grams of bear yeast cake (pollen traps were situated on the entrance of each hive to avoid the presence of pollen grains in it). The bear yeast cake prepared from 1:1 *W:W* of bear yeast: honey bee.

Second Group

Each colony contains 50 grams of soybean cake (pollen traps were situated on the entrance of each hive to avoid the presence of pollen grains in it). The soybean cake prepared from 1:1 *W:W* of soybean: honey bee

Third Group

Each colony contains 50 grams of pollen grain cake. The pollen grain cake prepared from 1:1 *W:W* of pollen grain: honey bee. Feeding in each group was every 10 days and each group was subdivided into four subgroups, one of them control and the rest of three subgroups fed on the specific type of nutritive protein.

RESULTS AND DISCUSSION

Relationship Between Some Types Effect of Protein Nutrition and the Amount of Honey Bees Producing After 10 Days from Feeding Operation During 2014 and 2015 Seasons

Results in Table 1 show the impact of different types of protein nutrition on the amount of bee venom produced after 10 days of feeding operation during spring season. Application of pollen feed had the highest significant ($P \leq 0.05$) values 1.661 mg/colony of dry bee venom which produced from Carniolan hybrid honeybees colonies by using electrical impulses device during 2014 and 2015 seasons.

The result clearly show that the pollen grain feeding the amount of dry bee venom was increased by 73.382% in first season 2014 and 64.461% in second season 2015 as compared with that of venom produced from control. These results are in agreement with many authors **(Omar, 1994a; Omar 1997; Zakaria and Ammany, 2004).** They said that the nutrition has an important effect in venom production and the honeybee workers that fed artificially in cages without giving proteins (pollen) produce less much venom than that fed got protein in the diet.

In the available literature, honey bee workers used protein of pollen mainly to provide structural elements of muscles, glands and other tissues. Under normal conditions, pollen consumption diminishes when the bees are of 8 to10 days old **(Dietz, 1975).** The stored pollen areas in excited honey bee colonies by electrical impulses for venom production decreased.

Table (1): The relationship between some types of protein nutrition on the amount of honey bees producing after 10 days from feeding during spring of 2014 and 2015 seasons.

Dry bee venom(mg/colony/20 minutes)								
	2014				2015			
Type of protein food	Min.	Max.	Mean ± S.E.	(%) Rate of increment (+) or Decrement (-) from (control)	Min.	Max.	Mean ± S.E.	%Rate of increment (+) or Decrement (-) from (control)
Control	0.533	1.530	0.958 b ± 0.056	Control	0.569	0.831	0. 650 b ± 0.083	control
Pollen	1.101	2.688	1.661 a ± 0.353	- 73.382%	0.677	1.428	1.069 a ± 0.085	-64.461%
Soyabean	0.618	1.218	0.960 b ± 0.070	- ٠.208%	0.462	1.026	0.686 b ± 0.083	- 5.538%
Yeast	1.047	1.252	1.121 ab ± 0.078	- 17.014%	0.437	1.004	0.702 b ± 0.134	- 8%
LSD 5%			0.609				0.2806	

These results can be explained that stressed bees by electrical impulses consumed more protein for developing venom glands **(Omar, 1994b).** In their study on the efficacy of feeding protein substitutes to honey bee found slightly poorer development of honey bee glands against that fed bee bread. Also, **Hanna and Schmidt (2004)** reported that the biotic effect of different pollen substitutes was poor in comparison with bee bead stored in honey bee colonies **(Szymas and PrzybyI , 1996).** The results showed that scarcity bee venom in honey bee colonies during the period extraction reduced venom production by 50.3% **(Omar, 2011).**

Results in Table 2 show the effect of some types of protein nutrition on the amount of honey bees producing after 10 days from feeding operation during summer season. The results reflected the same trend of spring where the highest (P≤0.05) dry bee venom was recorded with application of pollen feed which producing from Carniolan hybrid honeybees colonies by using electrical impulses device during 2014 and 2015 in both seasons without significant differences with application of soyabean, yeast and control in both seasons.

Also, the results clearly show that after using pollen grain feeding the amount of dry bee venom increased by 79.322% in first season of 2014 and 32.735% in second season of 2015 as compared with that of venom produced from control .This means that the use of pollen in nutrition gave the highest significant (P≤0.05) values 1.184 mg/colony between treatments of dry bee venom in both seasons.

Table (2): The relationship between some types of protein nutrition and the amount of honey bees producing after 10 days from feeding during Summer2014 and 2015 seasons.

Dry bee venom(mg/colony/20 minutes)								
	2014				2015			
Type of protein food	Min.	Max.	Mean± S.E.	(%) Rate of increment (+) or Decrement(-) from (control)	Min.	Max.	Mean± S.E.	(%) Rate of increment (+) or Decrement (-) from (control)
Control	0.470	0.967	0.590 b ± 0.134	Control	0.956	1.041	0.892 b ± 0.117	Control
Pollen	0.580	1.618	1.058 a ±0.066	- 79.322%	1.127	1.377	1.184 a ± 0.056	- 32.735%
Soyabean	0.424	1.015	0.703 ab ± 0.160	- 19.152%	0.857	1.113	0.853 b ± 0.116	+ 4.572%
Yeast	0.128	0.916	0.532 b ± 0.124	+ 9.830%	0.942	1.479	1.098 b ± 0.149	- 23.094%
LSD 5%			0.3722				0.3398	

According to **(El-Shaarawy*et al.*, 2007)** located that the best result was with the pollen grains where in it gives the highest bee venom quantity followed with the powder milk then the medical yeast and the sugar solution was at last.

Results in Table 3 show the effect of the relationship between some types of protein nutrition and the amount of honey bees producing after 10 days from feeding operation during fall season. The results reflected the same trend of summer where the highest (P≤0.05) of dry bee venom was recorded with application of pollen feed which producing from Carniolan hybrid honeybees colonies by using electrical impulses device during 2014 and 2015 seasons without o significant differences with application of soyabean, yeast and control in both seasons.

Also, the results clearly show that after using pollen grain feeding, the amount of dry bee venom increased by 40.220% in first season (2014) and 76.058% in second season (2015) as compared with that of venom produced from control. This means that the use of pollen in nutrition given the highest significant (P≤0.05) values 0.956 mg/colony between treatments of dry bee venom in both seasons.

Hayes (1984) recommended that the soybean flour and yeast added to candy as a food to be given to honey bee colonies in the spring. Also, **Cook and Wilkinson (1986)** indicated that the pollen substitute diets produce inconsistent results. **Szymas and Przybyl (1996)** investigated how feeding with some pollen substitutes affected different tissues of honey bee and they found that the development of some organs were similar to that of bees that were fed bee bread. Results in Table 4 show that the effect of the relationship between some types of protein nutrition and the amount of honey bees producing after 10 days from feeding operation during summer season.

Table (3): The relationship between some types of protein nutrition and the amount of honey bees producing after 10 day from feeding during fall 2014 and 2015 seasons

Dry bee venom(mg/colony/20 minutes)								
	2014				2015			
Type of portentous food	Min.	Max.	Mean± S.E.	(%) Rate of increment (+) or Decrement (-) from (control)	Min.	Max.	Mean± S.E.	(%) Rate of increment (+) or Decrement (-) from (control)
Control	0.136	0.655	0.363 b ± 0.012	Control	0.424	0.700	0.543 b ± 0.055	Control
Pollen	0.183	0.947	0.709 a ± 0.067	- 40.220%	0.188	1.615	0.956 a ± 0.026	- 76.058%
Soyabean	0.139	0.701	0.378 ab ± 0.039	- 4.132%	0.185	1.109	0. 598 b ± 0.033	- 10.128%
Yeast	0.092	0.593	0.318 b ± 0.037	+ 12.396%	0.040	0.495	0. 253 c ± 0.107	+ 53.406%
LSD 5%			0.1352				0.1982	

Table (4): The relationship between some types of protein nutrition and the amount of honey bees producing after 10 days from feeding during winter 2014/2015 seasons.

Dry bee venom (mg/colony/20 minutes)								
	2014				2015			
Type of portentous food	Min.	Max.	Mean ± S.E.	(%) Rate of increment (+) or Decrement (-) from (control)	Min.	Max.	Mean ± S.E.	(%) Rate of increment (+) or Decrement (-) from (control)
Control	0.128	0.383	0.222 a ± 0.098	Control	0.074	0.332	0.186 ab ± 0.062	Control
Pollen	0.198	0.383	0.341 a ± 0.163	- 53.603%	0.076	0.971	0.384 a ± 0.227	- 213.978%
Soyabean	0.001	0.593	0.253 a ± 0.113	- 13.963%	0.062	0.425	0. 204 ab ± 0.139	- 9.677%
Yeast	0.017	0.418	0.187 a ± 0.072	+ 15.765%	0.022	0.164	0.081 b ± 0.026	+ 56.451%
LSD 5%			0.3807				0.4483	

Results indicated that no significant different between treatment was found in first season 2014 but in second season 2015, the results reflected the same trend of fall where the highest (P≤0.05) of dry bee venom was recorded with application of pollen feed which producing from Carniolan hybrid honeybees colonies by using electrical impulses device during 20 min without no significant differences with application of soyabean, yeast and control.

Also, the results clearly show that after using pollen grain feeding the amount of dry bee venom increased by 53.603%in first season (2014) and 213.978% in second season (2015) as compared with that of venom produced from control. This means that the use of pollen in nutrition gaven the highest significant (P≤0.05) values 0.584 mg/colony between treatments of dry bee venom in both seasons.

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الملخص العربي

دراسة تأثير بعض أنواع التغذية البروتينية على إنتاجية سم النحل

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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 وتم دراسة تأثير الانواع المختلفة من التغذية البروتينية (حبوب لقاح، فول صويا، خميرة بيرة) على كمية السم المستخرجة من غدة السم فى شغالات نحل العسل فى المواسم المختلفة حيث أوضحت النتائج أن التغذية بحبوب اللقاح أعطت أعلى كمية من سم النحل الجاف التي نتجت من نحل هجين أول كرنيولى باستخدام جهاز النبضات الكهربائية لمدة ٢٠ دقيقة خلال فصل الربيع بنسبة ١,١٠١.

الكلمات الاسترشادية: نحل العسل، جهاز تجميع السم، سم النحل، التغذية البروتينية، حبوب اللقاح، الغدة الحمضية، الأنشطة البيولوجية، كيس السم، الصدمة الكهربائية، آلة اللسع، عمليـة اللسع.