EFFECT OF VENOM COLLECTION USING THE METHOD OF COUPLED ELECTRICAL AND SOUND STIMULATION ON HONEY YIELD IN BEE COLONIES

Michał Rybak

Research Institute of Pomology and Floriculture, Apiculture Division,
Kazimierska 2, 24-100 Puławy, Poland,
e-mail: michlr@man.pulawy.pl

Received 18 October 2008; accepted 01 December 2008

Summary

This study was undertaken in 1998-2001 in the apiaries of the Apiculture Division, of the Research Institute of Pomology and Floriculture, in Puławy, Poland. The study was undertaken to identify whether honeybee venom collection by means of coupled electrical and sound stimulation, affected honey production in honeybee colonies. The production of honey was compared between colonies subjected to venom collection and control colonies. Each group was made up of 10 honeybee colonies settled in storey hives. Venom was collected three times over the apiarian season: around the 15th of June, the 30th of June and the 15th of July.

The results obtained demonstrated that the mean yield of honey, obtained only from colonies in which venom was collected using the method of coupled electrical and sound stimulation, was not significantly different than the yield of honey recorded in control colonies.

Keywords: honeybee venom, electrical stimulation, sound stimulation, honey yield.

INTRODUCTION

Honeybee venom is a valuable raw material to the pharmaceutical industry. Its collection may also constitute an additional source of income for beekeepers. The technology for honeybee venom collection involving the stimulation of honeybees with electrical impulses was elaborated at the Research Institute of Pomology and Floriculture, Apiculture Division in Puławy in the years 1989-1994 (Rybak et al. 1995). Studies have also been conducted into the effect of venom collection using this method, on the development, strength and productivity of honeybee colonies. The studies demonstrated that the application of this technology in practice did not diminish any of the above-mentioned parameters (Skubida et al. 1995). In addition, analyses have shown that the mass of collected venom, was affected to a significant extent by special predispositions some honeybee colonies possess (Muszyńska et al. 1998).

World-wide studies provide only sparse data on this subject. For example, Mitev (1971) demonstrated that intensive collection of venom definitely had a negative effect on honey production. A similar opinion was expressed by Balzekas (1978), who reported that venom collection affected honey production by causing a 14% decrease. In contrast, Bahreini et al. (2000) demonstrated that the practice of collecting venom three times over the apiarian season had no impact on honey production.

All the above-cited findings, both international and domestic, refer to venom collection solely by means of electrical stimulation.

From 1999-2001, at the Research

Institute of Pomology and Floriculture, Apiculture Division in Puławy, Poland the technology of venom collection was improved. This improvement involved the application of additional sound stimuli. This stimuli was applied during the procedure of venom collection with standard electrical stimulation. The improved type of stimulation was named "coupled electrical and sound stimulation". It enabled a significant increase in venom production (Rybak and Skubida 2007).

The reported study was aimed at identifying whether venom collection by means of coupled electrical and sound stimulation affected honey production in honeybee colonies.

MATERIAL AND METHODS

The study was conducted in 2002, 2003 and 2005 in apiaries of the Research Institute of Pomology and Floriculture, Apiculture Division in Puławy, Poland. Honeybee colonies with queens of the Carniolan and Caucasian breeds were settled in Wielkopolski hives. Analyses were aimed at evaluating the effect of venom collection with the method of coupled electrical and sound stimulation (Rybak and Skubida 2007) on the productivity of honeybee colonies. A comparative analysis was conducted of honey production in colonies subjected to venom collection, and in control colonies. In each year of the study, twenty colonies of similar strength were selected. In ten of them venom was collected by means of venom storeys (Rybak et al. 1995). The method of coupled electrical and sound stimulation was used. The other ten colonies served as a control group.

Venom was collected three times in the season around the 15th of June, the 30th of June and the 15th of July. Venom collected from each colony was weighed to determine the efficiency of the procedure.

The venom collection procedure lasted for 1 hour. Before the procedures began, the venom storeys were fixed on the top super of the hive. In order to make them available to bees, all bars were taken off the roof. The supers were closed from the top side with window panes. Loudspeakers that emitted sound signals were mounted on the window frames. The venom storeys were coupled by conductors with a generator of electrical impulses. The loudspeakers were supplied with a generator of sound signals.

Window panes used to cover the venom storeys enabled observations of honeybees during venom recovery. Light was transmitted throughout them to encouraged the bees to enter the storey in the first phase of the session. The set for venom collection, included both the venom storeys as well as generators of electrical and sound impulses. All were constructed at the Division of Apiculture by the author (Rybak et al. 1995, Muszyńska and Rybak 2002, Rybak and Skubida 2007).

The honey harvest was conducted two to three times in the season. The mass of honey was evaluated based on masses of frames before and after centrifugation of honey.

The results obtained were elaborated statistically with the use of one-way and two-way analysis of variance for venom and honey, respectively. The significance of differences was evaluated by means of the Duncan test. Calculations were performed at a significance level of $p=0.05$.

RESULTS AND DISCUSSION

Results collected in Table 1 indicate that the mean mass of venom collected from one honeybee colony did not differ significantly in the subsequent years of the study. High variability was observed in the amount of collected venom between the examined colonies.

Table 1.

Mean mass of collected venom in the subsequent years of analyses (mg).

Number of colonies	Years			Mean value
	2002	2003	2005	
10	**112.4 a**	**98.9 a**	**124.1 a**	**111.8**
Range	68.9-167.9	56.8-136.9	63.8-172.9	62.5-159.2
Standard deviation	31.5	22.7	34.5	29.5

Mean values denoted with different letters differ significantly ($p \geq 0.05$) acc. to Duncan's test.

Table 2.

Mean production of honey in colonies subjected to venom collection and in control colonies in 2002, 2003 and 2005 (kg).

Variants	Number of colonies	Years			Mean value
		2002	2003	2005	
Colonies subjected to venom collection	10	10.9	8.3	13.2	10.8a
Control colonies	10	15.6	13.5	5.8	11.6a
Mean		13.3b	10.9	9.5a	

Mean values denoted with different letter differ significantly ($p \geq 0.05$) acc. to Duncan's test.

In the first two years of analyses, honey production was lower in the colonies subjected to venom collection compared to the control ones (Table 2). That tendency was not confirmed in the year 2005 when honey production turned out to be higher in the colonies subjected to venom collection than in the control ones. The differences observed were, however, not confirmed to be statistically significant. The mean production of honey per honeybee colony subjected to venom collection with the method of coupled electrical and sound stimulation did not differ significantly from that recorded in the control colonies. The mean production of honey in the three experimental years was at a similar level in both groups of colonies.

CONCLUSIONS

— Venom which had been collected three times during the season with the method of coupled electrical and sound stimulation did not result in any significant reduction of honey yield.

— Honeybee venom collection by means of coupled electrical and sound stimulation may constitute an additional source of income to beekeepers.

REFERENCES

Bahreini R., Fakhimzadeh K., Nowzary J., Nehzati G.A. (2000)- Design and construction of a venom collecting electric cage and its effects on honey production in honeybee colonies. *Iranian J. Agric. Sci.* 31(2):333-339.

Balzekas J. A. (1978) - Effect of bee venom collection on the productivity of honeybee colonies. *Lietuos Zemdirbystes Makslino Tyrimo Instituto Darbac* 22:78-87.

Mitev B. (1971) - Collection of bee venom using a weak electric current - its effect on the condition and performance of the colony. *Zhivotnov'dni Nauki* 8(1):103-108.

Muszyńska J., Rybak M. (2002)- Attempt to use sounds in commercial beekeeping. *J. apic. Sci.* 46(1):67-74.

Rybak M., Muszyńska J., Skubida P., Marcinkowski J. (1995) - A technology for bee venom collection. *Pszczeln. Zesz. nauk.* 39(2):223-231.

Rybak M., Skubida P. (2007)- Application of coupled electrical and sound stimulation for honeybee venom collection *J. apic. Sci.* 51(2):63-67.

Skubida P., Muszyńska J., Rybak M., Marcinkowski J. (1995)- Bee venom collection and its effect on the general output of the apiary and wintering. *Pszczeln. Zesz. nauk.* 39(2):209-221.

WPŁYW POZYSKIWANIA JADU METODĄ ZESPOLONEJ STYMULACJI ELEKTRYCZNEJ I DŹWIĘKOWEJ NA PRODUKCJĘ MIODU W RODZINACH PSZCZELICH

Rybak M.

Streszczenie

W latach 2002, 2003 i 2005 w pasiekach Oddziału Pszczelnictwa badano wpływ pozyskiwania jadu metodą zespolonej stymulacji elektrycznej i dźwiękowej na produkcyjność rodzin pszczelich. Porównywano produkcję miodu w rodzinach, w których pozyskiwano jad oraz w rodzinach kontrolnych. W każdej z grup było po 10 rodzin pszczelich osadzonych w ulach korpusowych. Pozyskiwanie jadu odbywało się trzykrotnie w ciągu sezonu pszczelarskiego w terminach: około 15 czerwca, 30 czerwca i 15 lipca.

Na podstawie uzyskanych wyników stwierdzono, że średnia produkcja miodu, jaką uzyskano z jednej rodziny pszczelej, w której pozyskiwano jad metodą zespolonej stymulacji elektrycznej i dźwiękowej nie różniła się w sposób istotny od produkcji miodu w rodzinach kontrolnych.

Słowa kluczowe: jad pszczeli, elektrostymulacja, stymulacja dźwiękowa, produkcja miodu.