THE INFLUENCE OF TREATMENTS WITH INSECTICIDES APPLIED TO MELLIFEROUS RAPE CULTURE ON THE HONEYBEES GATHERING ACTIVITY

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***Abstract**: These researches have been conducted to demonstrate the toxicity of chemicals in the field for bees. They are not novelty but on the other hand they are of paramount importance, since they complete the previous observations in the field. Substances that have been used are not new and in all years of observations there have been problems in the aspect of their impact on honey bees.The aim was to observe the insecticide toxicity to bees, because both substances used had devastating impact on families of bees that collected nectar and pollen from the field in the day the insecticide was sprayed on the rape culture. By statistically processing the data it can be observed that in the first monitoring week of the three variants analysed there are no significant differences in the average of the collecting bees. From a biological point of view this is a normal phenomenon, thus bee families under study had a uniform degree of development, until the moment the rape culture treatment was applied, i.e. insecticide for combating pests. In the second and the third week of monitoring, there are big statistical differences between the witness and the two variants. The witness had a constant value of around 300 bees followed by a growth of 450 bees. In the case of the latter variants, where insecticide treatments had been applied, the average of bee numbers, in the same period, at hives in the two localities, was a lot smaller (180 bees) as compared to witness locality (320 bees). Between variants L1 and L2 i.e. localities Comlosul Mic and Teremia Mare, data shows that there is a slight significance, insecticides used for conducting activities have disturbed the bees collected from both locations. In the second locality in the third week of observations, there was a shortage of bees, with an average of 110 bees. This number is very small compared to the witness where there were identified 370 bees in the third week.*

Key words: *honeybee, identified, gathering, toxicity*

INTRODUCTION

Rape (*Brassica napus* L.) is largely cultivated in Europe for the seed, used for oil production. It is very attractive to honeybees both for nectar and pollen and in Central and Eastern European countries represents one of the most important spring sources, giving rise to large amounts of very pure unifloral honey (Persano Oddo L.et Piro R., 2004).

The surfaces cultivated with rape in Romania have grown by each year, rape has become one of the most important meliferous plants in our country (Iordache P. et al., 2008).

As with honeybees working any agricultural or horticultural crop, the risk of pesticide sprays is a serious threat to the health and well-being of the honeybees.

Honeybees find rape very attractive and will fly several kilometers to forage on the blossom of rape crops. For growers it is often necessary to apply an insecticide to control pests during flowering when the bees are the most active but insecticides kill honeybees and serious losses have been experienced while hives have been working rape crops (Somerville D., 2002).

The phenomenon of disappearance of honeybee colonies in recent years has led to growing interest in studying unknown aspects of this important pollinator. This phenomenon is determined by several factors (Patruica Silvia et Mot Daniela, 2012), one of which is use of insecticides in intensive agriculture (Vandame R. et Palacio M., 2010).

The sublethal effects of insecticides reported in the scientific literature include a range of behavioural disturbances in honeybees: disorientation and difficulties in returning to the hive; reduced foraging and travel; and failure to communicate properly with colony members. (Thompson H., 2003; Desneux N. et al., 2007; Thompson H. et Maus C., 2007).

MATERIAL AND METHODS

In order to determine the number of colleting bees under observation, individual studies have been made for each bee family aside. Bees caring pollen have been observed while entering the hive for four weeks and then the weekly average of the bees for every single hive has been taken into account. We took under observation the evolution of the bee family before having a stress factor, i.e. the pesticide, and the moments that followed after applying it. Researches were carried out in 2012 in localities Pustini□, Comlosul Mic and Teremia Mare.

In locality Teremia Mare the rape treatment was made in April 26, 2012 and the insecticide used was Mavrik (2F tau-fluvalinate 240g/l) in a dose of 0.2 l / ha and on May 5, 2012 insecticide Biscay 240 OD was applied (thiacloprid 240 g / l) at a dose of 0.3 l / ha. The interpretation of Teremia Mare locality was considered number 1.

In locality Comlo□ul Mic the rape treatment was made in April 28, 2012 and the insecticide used was Calypso 480 SC (480 g/l tiaclopride) in a dose of 0.15 l/ha and on May 4, Fastac insecticide was applied (100 g/l alfa- cipermetrine) in a dose of 0.15 l ha. This locality was considered number 2 in the interpretation of the data.

The witness locality was Pustini□, where insecticides were not used for treating the rape culture. The researches were carried out for 4 weeks.

The insecticide treatment for the rape cultures in the two studied localities was made with the field spraying machine.

The bee families were weighed during the four weeks, during the research, data were taken weekly from 4 bee families from each location.

RESULTS AND DISCUSSIONS

In the research conducted, the results were pooled and analysed statistically. The aim was to observe the insecticide toxicity to bees, because both substances used had a devastating impact on families of bees that collected nectar and pollen from the field in the day the insecticide was sprayed on the rape culture.

From data collected, in the witness locality Pustinis, it can be observed that there is a continuous growth in the bee family development throughout the entire flowering period of the rape culture. This growth was continuous as the bees were not disturbed by insecticides. In localities Teremia Mare and Comlo□ul Mic where treatments were applied in order to destroy pests in the rape culture there can be observed a slowdown in the development of bee families, as they are facing a disturbing factor- the insecticide.

Table 1

Average and statistical index of the number of worker bees identified in the hive entrance

Locality	***N***	***Mean***		***Std. Deviation***	***Variance***
	Statistic	***Statistic***	***Std. Error***	***Statistic***	***Statistic***
Monitoring 1					
L0	24	172.3333	16.50600	80.86256	6538.754
L1	24	183.8333	18.64773	91.35486	8345.710
L2	24	220.8750	22.68525	111.13459	12350.897
Monitoring 2					
L0	24	313.8750	33.12637	162.28539	26336.549
L1	24	138.1250	15.22564	74.59008	5563.679

L2	24	168.9167	20.17531	98.83843	9769.036
Monitoring 3					
L0	24	368.5833	35.52494	174.03596	30288.514
L1	24	179.8750	17.92004	87.78992	7707.071
L2	24	110.5417	16.53729	81.01582	6563.563

By statistically processing the data (table 1) it can be observed that in the first monitoring week of the three variants analysed there are no significant differences in the average of the collecting bees. From a biological point of view this is a normal phenomenon, thus bee families under study had a uniform degree of development, until the moment the rape culture treatment was applied, i.e. insecticide for combating pests.

In the second and the third week of monitoring, there are big statistical differences between the witness and the two variants. The witness had a constant value of around 300 bees followed by a growth of 450 bees. In the case of the latter variants, where insecticide treatments had been applied, the average of bee numbers, in the same period, at hives in the two localities, was a lot smaller (180 bees) as compared to witness locality (320 bees). The variation indexes under study are presented in table 2.

Table 2

The anova test for variation indexes under study

ANOVA						
		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Monitoring1	Between Groups	30885.028	2	15442.514	1.701	0.190
	Within Groups	626413.292	69	9078.454		
	Total	657298.319	71			
Monitoring 2	Between Groups	422792.861	2	211396.431	15.220	***
	Within Groups	958393.083	69	13889.755		
	Total	1381185.944	71			
Monitoring 3	Between Groups	856027.583	2	428013.792	28.817	***
	Within Groups	1024860.417	69	14853.050		
	Total	1880888.000	71			

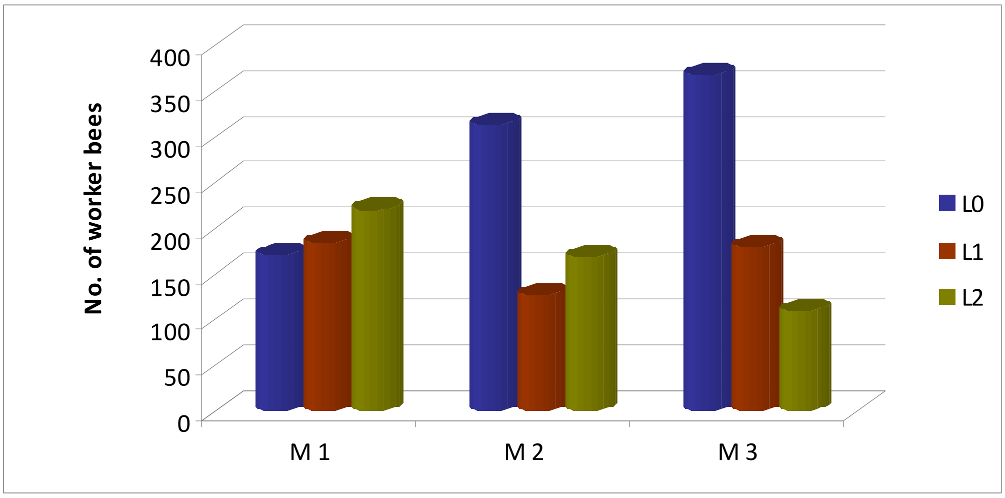

Fig. 1. The average number of collecting bees for the three localities studied (L0, L1, L2), in the monitoring weeks (M1, M2, M3).

In the 3 monitored weeks there are significant differences between the witness and the two localities (fig. 1). The average registered number of bees in Pustinis locality was of 313 bees. The number of colleting bees has increased during the three weeks of observations and the maximum recorded was of 370 bees.

Table 3

Multiple comparisons between variants analyzed

Multiple Comparisons Tukey HSD							
Dependent Variable			Mean Difference	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Monitoring 1	L0	L1	-11.50000	27.50523	0.908	-77.3836	54.3836
		L2	-48.54167	27.50523	0.189	-114.4253	17.3419
	L1	L2	-37.04167	27.50523	0.375	-102.9253	28.8419
Monitoring 2	L0	L1	175.75000*	34.02175	***	94.2573	257.2427
		L2	144.95833*	34.02175	***	63.4656	226.4510
	L1	L2	-30.79167	34.02175	0.639	-112.2844	50.7010
Monitoting 3	L0	L1	188.70833*	35.18173	***	104.4371	272.9796
		L2	258.04167*	35.18173	***	173.7704	342.3129
	L1	L2	69.33333	35.18173	0.127	-14.9379	153.6046
*. The mean difference is significant at the 0.05 level.							

Between variants L1 and L2 i.e. localities Comlosul Mic and Teremia Mare, data shows that there is a slight significance (table 3), insecticides used for conducting activities have disturbed the bees collected from both locations.

In the second locality in the third week of observations, there was a shortage of bees, with an average of 110 bees. This number is very small compared to the witness where there were identified 370 bees in the third week. This bee crisis can be caused by insecticide Fastac, stating that it was more aggressive to bees than insecticide Biscaya.

CONCLUSIONS

By analysing these data statistically and considering the fact that bees are social insects, it is observed that the insecticide damages bees collecting nectar and pollen, as well as bees that don't leave the hive, also having a negative impact on the development of the bee family and the production of honey.

At the first monitoring there are no significant differences between the three localities studied regarding the number of collecting bees (numbered at the entrance). This can be explained by the fact that bees didn't encounter any damaging factor in this period, as the rape cultures were not treated chemically.

At the third monitoring, there were bigger differences between bees identified in the three localities studied. In the witness locality the average of the bee number identified at the entrance of the hive was 386 bees, in locality Teremia Mare 179 bees and in Comlosu Mic there were 110 bees.

Between localities that had insecticide treatments, at rape cultures, there were no significant differences between the number of bees and the quantity of harvested honey, having a slight difference of approximately 70 bees.

The decrease in the number of bees was dramatic in Comlosu Mic locality where Fastac insecticide was used, also leading to a decrease in the honey production.

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