ZOLONE FORMULATIONS AS "SAFE ON BEES INSECTICIDES" ON FLOWERING WINTER RAPE FIELDS

by

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Introduction

A large-scale program was initiated in Hungary to re-examine and re-evaluate toxicity of pesticides to honeybees /Benedek, 1975, 1976, 1981/. This program has been extended to winter rape and Zolone formulation.

Methods

Studies were made with methods described by Benedek /1975, 1981/. First direct contact toxicity was studied as direct sprays with a specific spraying tower /see: Benedek 1972/ the working performance of wich greatly resambles to largely used field spraying machines.

Secondly tests were made to estimate and compare residual toxicity of field-weathered samples on flowering plots with a semi-lab method. Plots were sprayed at the recommended field dosages at the twilight period. Samples were taken in the top of the sprayed plants different times after the treatment. Bees fed with sugar syrup were placed on the samples in sompletely dark laboratory at room temperature. Mortality was counted 24 hours later. This type of experiment, however, usually gives higher mortality than under normal field conditions. Therefore,

pesticides producing less than 30 per cent mortality could be promising from the point of view of twilight sprays being safe on bees under farm conditions.

Final tests were made at large flowering fields. All the field was sprayed with the recommended field dosage of the pesticide by an airplane or a helicopter. Three hives with strong colonies were moved to the field 4-5 days before the treatment and another three colonies were moved to untreated field 5 km apart. All the hives were equipped with simple dead-bee-traps. Dead bees were counted for 24 hour periods. Also the strength of colonies - area or number of covered frames - was inspected.

Results and discussion

Field dosages of Zolone 30 WP and dosage series of Zolone 30 WP, Zolone 35 EC and Zolone Flow were tested on honeybees /Table 1/. Results show that Zolone is less toxic to bees than most other insecticides. Thus, field sprays at recommended dosages would not cause as serious bee losses even in daytime hours like insecticides with a knock down effect on honeybees. Nevertheless, it is not recommended to spray flowering crops with Zolone in the period when bees are on wing. This statement is corroborated by the ED_{50} values which are as follows:

- Zolone 30 WP: 0,71 kg/ha /prob y = 5,23 + 1,58 log x/
- Zolone 35 EC: 0,28 l/ha /prob y = 5,81 + 1,21 log x/
- Zolone Flow: 0,27 l/ha /prob y = 6,75 + 2,55 log x/

On the other hand, tests with field-weathered residues show that toxicity of samples was well below the critical 30 per cent mortality in each case and were fairly low in most cases /Table 2/. Low temperatures

/5 to 8 °C/ do not have a definite effect on the residual toxicity of the products to honeybees.

Large-scale field experiments show that Zolone formulation are safe on bees if applied at flowering crops when the bees are not present in great numbers. This conclusion is supported both by the low daily mortality at colonies moved to flowering crops sprayed late afternoon or early evening and by the number of frames full of bees indicating the possible changes in the strength or rather in the population level of the bee colonies. Experiments snow that daily mortality of colonies being at fields sprayed in the twilight period is not higher than the normal physiological mortality of honeybee colonies during the spring period /Table 3/.

Based on the results presented Zolone formulations have been recommended in recent years in Hungary to use at flowering rape fields if necessary. This practice has largely been utilized for some years and farm experiences completely coincide with experimental results. No bee losses have been observed so far due to twilight sprays with Zolone on flowering crops.

References

1. Benedek, P. /1972/: Növényvédelem, 8: 544-550. - 2. Benedek, P. /1975/: Növényvédelem, 11: 145-153. - 3. Benedek, P. /1976/: Növényvédelem, 12: 497-511. - 4. Benedek, P. /1981/: Internationale Zeitschrift der Landwirtschaft, Nr. 1: 42-47. - 5. Benedek, P. /1982/: In: Növényvédelmi Tudományos Napok '82, Növényvédelmi Állattani Szekció Elõadásainak Összefoglalói, MTA Növ. véd. Biz. - MAE Növ.véd. Társaság, Budapest: 19.

Table 1. Effect of Zolone formulations on honeybees as direct sprays

Formulation	Dosage: l/ha or kg/ha	Temperature in the laboratory	Mortality of bees 48 hours after treatment	
			bees sprayed with distilled water /control groups/	bees sprayed with the pesticide /corrected mortality/
Zolone 30 WP in field dosages	1,0	20°C	11,2±3,6	64,0±5,5
	2,0	24°C	1,6±1,4	65,0±2,0
Zolone 30 WP in dosage-serie	0,001	22°C	9,6±2,0	1,1±0,7
	0,01	"	"	2,5±1,8
	0,1	"	"	7,4±2,9
	1,0	"	"	25,6±3,8
	10,0	"	"	98,2+1,1
Zolone 35 EC in dosage-serie	0,0001	23-24°C	6,4±2,1	0
	0,001	"	"	15,6±10,5
	0,01	"	"	20,5±7,2
	0,1	"	"	16,2±5,8
	1,0	"	"	24,4±10,3
	10,0	"	"	100
Zolone Flow	0,001	20°C	0,8±0,8	0
	0,01	"	"	0,6±0,6
	0,1	"	"	8,2±3,1
	1,0	"	"	100
	10,0	"	"	100

Table 2. Toxicity of field-weathered residues of Zolone formulations to honeybees in the laboratory

Formulation	Dosage: l/ha or kg/ha	Time of treatment	Field temperature /°C/ between spraying and sampling and bee mortality /%/ in the laboratory in 24 hours period					
			sampling 8 hours after treatment			sampling 12 hours after treatment		
			°C	mortality on untreated samples, %	corrected mortality on treated samples, %	°C	mortality on untreated samples, %	corrected mortality on treated samples, %
Zolone 30 WP	0,9	28 May: 19.45	5,6	20,3	5,3±3,5	6,2	18,5	6,9±4,6
	2,0	10 May: 18.46	8,8	16,6	11,5±5,9	6,7	16,9	25,1±10,4
	2,0	13 May: 20.00	5,8	6,9	7,0±1,3	4,1	8,1	1,1±0,6
	2,0	15 May: 18.55	13,2	10,7	2,9±1,2	13,4	6,7	3,0±1,8
	2,0	24 May: 19.00	11,7	1,6	6,5±0,7	10,2	1,0	5,1±1,1
Zolone 35 EC	3,5	8 May: 19.30	5,0	10,5	7,5±2,8	8,0	14,2	4,4±2,3
Zolone Flow	1,2	26 May: 20.00	9,0	4,3	0,8±0,6	10,0	4,0	0

Table 3. Effect of twilight applications of Zolone formulation sprayed on large blooming winter rape fields to honeybee colonies moved to the crop 4-5 days before the treatment has been done /aerial applications/

Formulation	Time of treatment	Dosage: kg/ha or l/ha	Number of dead bees per colony per day						Number of frames full of bees	
			1 day before treatment	1 day after treatment	2 days after treatment	3 days after treatment	4 days after treatment	9 days after treatment	1 day before treatment	4 days after treatment
Zolone 30 WP	9 May 1978: 18.50-19.20	2,0	39±3	42±2	35±5	28±4	35±3	31±1	8,0	8,7
		*	46±4	44±3	43±3	29±4	41±2	43±2	8,0	9,0
	26 April 1977: 18.56-19,16	1,0	44±3	27±7	47±9	28±2	33±4	28±6	7,0	8,0
		*	44±3	42±2	33±3	32±1	39±3	38±2	7,0	8,7
	16 June 1979: 19.00-19.30	2,0	29±7	2±1	8±2	8±1	2±1	7±1	8,0	8,0
		*	33±3	2±2	14±3	3±3	1±1	7±1	10,5	10,5
	11 May 1979: 18.05-19.05	2,0	39±8	54±23	33±16	58±11	44±23	38±4	4,0	4,3
		*	39±9	62±11	52±10	25±6	60±7	37±10	5,0	5,7
	9 May 1981: 19.07-20.05	3,5	33±10	9±4	1±0	1±0	1±0	2±0	5,5	6,5
		*	34±2	10±2	9±1	4±2	3±1	4±2	6,3	7,7
Zolone 35 EC	18 May 1982: 19.00-20.10	1,75	4±2	96±22	10±1	9±0	16±2	13±2	6,0	7,0
		*	6±2	8±1	7±3	12±2	7±2	14±2	8,0	8,7
	19 May 1982: 19.10-20.20	1,75	161±9	65±7	57±8	54±24	78±2	104±7	13,0	13,5
		*	275±6	42±7	42±24	43±29	104±37	68±30	11,5	13,5
Zolone Flow	18 May 1982: 19.00-20.10	1,2	7±1	10±5	17±5	12±4	10±8	8±6	7,0	7,0
		*	6±2	8±1	7±3	12±2	7±2	14±2	8,0	8,7

* untreated control field at least 5 km apart from the treated one