STRUCTURE OF THE PEST ENTOMOFAUNA OF RED CLOVER SEED AND CONTROL OF THE CLOVER WEEVILS

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Abstract

The study presents new data regarding the pest entomological fauna in red clover crops, specifically the clover flower weevil Apion spp. The report also presents aspects regarding the numerical density of pest insect species in 100 red clover captula, the former ranging between 20 and 885 insects or the fighting of pests through seed and vegetation treatments during the budding stage of the clover and at the beginning of the blooming stage. The employed products belong to the group of synthesis pyrethroids, which have reduced remanence and a particular selectivity towards bees, their efficiency being of over 90%. The production of clover is highly influenced by the weevil's attack and, without adequate crop protection, clover seed production is out of the question.

Key words: weevil, clover, entomofauna, seed, treatment.

INTRODUCTION

Red clover is one of the most important fodder plants, due to its highly nutritious qualities, whereas from an agrophytotechnical point of view, it holds a considerable significance in crop rotation, because it leaves the soil rich in nitrogen and has no common pests with other groups of plants, such as cereals, hoeing plants, tubers, root crops and others.

This plant's seed production is affected by pests that attack the seed and flowers, the losses ranging between 10 – 60% (Perju and col., 1975), these pests being, in fact, common to all perennial leguminous plants. Among the pests of red clover, the species *Apion aestivum*, *Apion apricans*, *Apion asimilis* and *Apion varipes* present annual densities that exceed the economic threshold of damage. (Brudea and colab., 1983)

The species which have a particular economic importance for clover crops in our area are: *Apion apricans*, *Apion aestivum, Haplothrips spp*, as well as others, such as *Sitona spp, Adelphochoris spp*, which in favorable years can reach densities that exceed the economic damage threshold.

The study presents some aspects regarding the numerical density of phytophagous insects that cause damages to red clover crops, as well as ways of fighting such pests by using chemical methods, especially in seed clover crops.

MATERIAL AND METHODS

The crop in which the experiments were performed was in its second year of vegetation, the seed being harvested in the second mowing. In order to establish the structure of fauna that is specific to clover, sweepings using the insect net were performed during the following phenological stages: start in vegetation, sprouting, budding, blooming, and full maturity. Sixteen simple sweepings or eight double sweepings were performed in each 10 m² lot, the collected insects being afterwards sorted, classified and kept in 70 º C alcohol.

Several methods were employed for the prevention and fighting of the pest: chemical treatment of the seed and treatments on vegetation applied during budding and at the beginning of the blooming period.

The experiment involving the treatment of the seed in the prevention of the attack was placed according to the method of the Latin square, having five variants of treatment in five repetitions; the experiment in which treatment was applied on the vegetation was placed according to the method of the Latin rectangle, having eight and respectively twelve variants in five repetitions, the surface of the plot being of 10 m². A norm of 300 l water/ha was used.

The mortality of *Apion spp*. adults and larvae was established 48 hours after having applied the treatment, by means of sweeping with the insect net or collecting clover capitula (in order to ascertain the products' efficiency on larvae). Furthermore, the production obtained in kg/ha was also determined. The results of the efficiency tests ant the results regarding production were statistically processed by using the variance analysis method.

RESULTS AND DISCUSSION

The damaging entomofauna of red clover crops is well represented in this area, the main pest being the *Apion* species, followed by *Haplothrips spp*, *Bruchophagus* and *Sitona*. The numerical density differs according to the clover's phonological phase of development. Table 1 shows that the highest density of weevils was collected during the sprouting of the plant from the first sweep (32.4 samples /m²), the pest's density decreasing significantly in the second sweep, this fact proving once more that it is absolutely necessary that red clover be mown for green mass and that only the second sweeping be left for seeding.

Table 1

Numeric density of pest phytophagous insects in red clover crops

Sweep	Phenological phase	Density of samples/m²		
		Apion spp.	*Sitona spp.*	*Adelphocoris spp.*
First sweep	Start of vegetation	4.6	0.24	0.10
	Sprouting	32.4	1.24	0.30
	Budding	15.0	0.34	2.87
Second sweep	Sprouting	1.3	0.9	1.30
	Budding	3.8	1.9	1.50
	Blooming	5.6	1.1	1.80
	Maturity	4.3	0.9	1.40

As to the density of pests in the clover's flower head, table 2 reveals that density rises gradually in July and August, the *Apion* species remaining the predominant one, with 885 insects collected from 100 clover capitula, followed by the *Haplothrips spp*, with 260 insects and *Bruchophagus spp* with 20 insects.

Table 2

Numerical density of pest insect species found in red clover capitula

Date of collection	Number of insects/100 clover capitula		
	Apion spp	*Haplothrips spp*	*Bruchophagus spp*
26.07	125	40	2
03.08	350	90	6
21.08	410	130	12
Total	885	260	20

The high number of weevils collected in red clover crops illustrates the dominance of the former over the other collected species, while within the *Apion* genus, the *Apion apricans* and *Apion aestivum* species are the dominant ones, though the percentage balance indicates the *Apion aestivum* as leading.

Obtaining a good production of red clover seed depends on several technological factors, but the importance of the entomological factor cannot be ignored, because clover flower weevils significantly reduces the crop, regardless of the employed technology.

The chemical treatment of the seed was applied in the fighting of the pest, the obtained results being presented in table 3.

Table 3

Fighting the *Apion spp* weevils in red clover crops
by chemically treating the seed

Variant	Dose l/t	Degree of attack %			Efficiency %
		2005	2006	2007	
Furadan 35 ST	14.2	1.3	0.4	0.4	87.5
Terrafuran 350 FS	14.2	0.9	0.3	0.3	87.4
Promet 400 CS	12.5	1.0	0.2	1.2	90.1
Talstar 20 ST	30.0	2.0	0.5	0.7	92.3
Reference lot	-	11.5	5.6	7.6	-
DL 5%	-	1.9	0.8	1.4	-

Following the chemical treatment of the seed, the degree of attack of the *Apion* species was reduced from 11.5 % to 0.9% in 2005, from 5.8% to 0.2% in 2006 and from 7.6% to 0.3% in 2007; whereas the employed products ensured a mortality of adult pests of over 87.4%.

During the clover's vegetation period, the scheme of fighting comprised two treatments; the first one was applied during budding, while the second – at the beginning of blooming. Products with different active ingredients were used, most of them belonging to the group of natural pyrethrins.

The efficiency in adults and larvae, as well as the production obtained after having applied these fighting methods was determined. The results are presented in table 4.

Observations were made regarding both clover flower weevils and vegetable leaf weevil (*Sitona spp*). The table reveals that the density of adults belonging to the *Apion* species was reduced after treatment from 82 insects/m² in the reference lot to 0 – 7 in the treated variants, and the density of the *Sitona* species was reduced from 34 insects /m² to 0 – 4 insects in the treated variants.

The number of *Apion* larvae found in clover flower heads ranged between 43 in the reference lot and 4 – 13 in the treated variants. The efficiency of the employed products ranged between 91.4% and 100% on adults and between 69.8% and 90.7% on larvae. The mortality of larvae was lesser because inside the flowers, where the larvae actually live, pesticides have a slighter effect, not being systemic.

Table 4

Efficiency of some pesticides used in the fighting of clover pests as treatment applied on the vegetation

Variant	Dose ml/ha	No. of insects / mp		No. of larvae in capitula	Efficiency %	
		Apion spp	*Sitona spp*		Adults	Larvae
Fastac 10 EC	150	4	1	8	95.1	81.4*
Decis 2.5 EC	300	7	4	12	91.4	72.0
Polytrin 200 CE	150	5	2	10	93.9	76.7
Supersect 10 EC	200	2	2	7	97.6*	83.7**
Karate 5 EC	150	6	3	11	92.7	74.4
Cypermetrin 200 CE	200	3	1	9	96.3	79.0
Fury 10 EC	100	1	1	6	98.8**	86.0**
Sumialpha 5 CE	200	2	2	13	97.6	69.8
Bulldock 0.25 EC	300	1	0	5	98.8**	84.4***
Regent 200 CE	100	0	0	4	100.0**	90.7***
Alphaguard 10 CE	150	2	2	8	97.6*	81.4*
Reference lot	-	82	34	43	-	-

Dl 5% - 6.1; DL 1% - 7.3; DL 0.1% - 8.6 for adults
Dl 5% - 7.3%; DL 1% - 10.1; DL 0.1% - 15.5 for larvae

As we can observe, the applied doses were reduced and, even if until now schemes of fighting with 4 treatments were used, this year the scheme was reduced to 2 treatments applied at optimal moments, so that their influence on the environment be as slight as possible, and that the period of blooming be avoided in order to protect the pollinators, which are of great importance in the production of seed.

Also, the statistic processing of the data regarding efficiency was performed in comparison with the Decis 2.5 CE product, considered the standard.

The production of seed recorded in the treated variants confirms the fact that the protection of the clover crop against the attack of pests is a necessity; the obtained results are presented in table 5.

Table 5

The production of seed in red clover crops

Variant	Dose ml/ha	Production		Difference compared to reference lot	Significance
		kg/ha	%		
Fastac 10 EC	150	120	133	30	**
Decis 2.5 EC	300	110	122	20	*
Polytrin 200 CE	150	135	150	45	***
Supersect 10 EC	200	130	144	40	***
Karate 5 EC	150	125	139	35	**
Cypermetrin 200 CE	200	131	146	41	***
Fury 10 EC	100	135	150	45	***
Sumialpha 5 CE	200	130	144	40	***
Bulldock 0.25 EC	300	137	152	47	***
Regent 200 CE	100	150	167	60	***
Alphaguard 10 CE	150	136	151	46	***
Reference lot	-	190	100	-	-

DL 5% - 18 kg/ha; DL 1% - 28 kg/ha; DL 0.1% - 37 kg/ha.

The obtained production increased from 90 kg/ha to 150 kg/ha as a result of using the Regent product. The recorded differences of production were statistically ensured as very significantly positive by comparison to the reference lot in most of the variants, except the Decis variant, in which the difference was significant.

CONCLUSIONS

Within the complex of clover's specific pests, the *Apion apricans* species is dominant in the crop agro-ecosystems in this part of the country, followed by the *Apion aestivum* species.

The fighting of the clover flower weevil is performed by means of chemically treating the seed and treatments applied on vegetation: the first one during budding, while the second one at the beginning of blooming.

It is important to choose selective products for bees, given that clover is a melliferous plant.

The best results were obtained when using the Regent, Fury, Bulldock and Supersect products.

The fighting of clover flower weevils has positively influenced the production of seed, which was statistically ensured as very significant by comparison with the reference lot.

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