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SELECTIVITY AND EFFICIENCY OF SOME HERBICIDES IN CONTROLLING WEEDS FROM MONOECIOUS HEMP CROPS

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ABSTRACT – The herbicides tested in the monoecious hemp crops from the Agricultural Research and Development Station of Secuieni, Neamț County, on a typical Cambic Chernozem with 2.7% humus, 34% clay and a pH of 5.8, have shown a high degree of hemp susceptibility to herbicides. Herbicides Guardian (2.2 l/ha), Dual Gold (1.5 l/ha) and Fusilade forte (1.0 l/ha) were better tolerated by hemp crops, while herbicides Sencor, Lontrel 300, Logran and Granstarm were not tolerated. As concerns the efficiency of herbicides in controlling weeds, we found out changes in the dynamics of weed encroachment, differentiated according to used herbicides and climatic conditions. Guardian (2.2 l/ha) and Dual Gold (1.5 l/ha) have controlled annual mono- and dicotyledonous weeds by 65 and, respectively, 55%. The obtained seed yields were influenced by herbicide selectivity and efficiency, but also by climatic conditions.

Key words: selectivity, efficiency, herbicides

REZUMAT - Selectivitatea şi eficacitatea unor erbicide în combaterea buruienilor la cânepa monoică. Erbicidele experimentate la cultura de cânepă monoică în cadrul S.C.D.A. Secuieni - Neamț, pe un tip de sol cernoziom cambic tipic cu 2,7% humus, 34% argilă şi un pH de 5,8, arată un grad ridicat de sensibilitate al plantelor de cânepă față de erbicide. Erbicidele Guardian (2,2 l/ha) Dual Gold (1,5 l/ha) şi Fusilade forte (1,0 l/ha) au fost tolerate mai bine de plantele de cânepă. Erbicidele Sencor, Lontrel 300, Logran şi Granstarm nu au fost tolerate de plantele de cânepă. În ceea ce priveşte eficacitatea erbicidelor în combaterea buruienilor se constată schimbări în dinamica îmburuienării, care au fost diferențiate în funcție de erbicidul folosit, dar şi de condițiile climatice. Erbicidele Guardian (2,2 l/ha) şi Dual Gold (1,5 l/ha) au combătut buruienile mono- şi dicotiledonate anuale în procent de 65, respectiv, 55%.

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Producţiile de semințe realizate au fost influențate de selectivitatea şi eficacitatea erbicidelor, dar şi de condiţiile climatice.

Cuvinte cheie: selectivitate, eficacitate, erbicide

INTRODUCTION

The consumers' demand for natural and mixed tissues pointed out the need of cultivating hemp on greater areas and increasing the output per ha. Therefore, seed production is very important.

The reduction of mechanical works and the elimination of hand hoeing in seed hemp crop, by using herbicides were less studied worldwide and in Romania, because of the crop susceptibility to herbicides (Chiriță and Găucă, 1983; Segărceanu et al., 1978; Şarpe and Strejan, 1981).

This paper presents data concerning the selectivity and efficiency of the new herbicides applied in monoecious hemp crops.

MATERIALS AND METHODS

The investigations were conducted at the Agricultural Research and Development Station of Secuieni, Neamț County, in 2006 and 2007, on a typical Cambic Chernozem, with the humus content of 2.7%, clay of 34% and pH of 5.8. Plots were designed according to the method of randomized blocks in four replicates.

The herbicides used under their commercial denomination, the content in active ingredient, the rate used per ha and the time of herbicide application are shown in *Table 1*. Applying herbicides was done with hand pumps, using a solution amount of 300 l/ha.

Table 1- Herbicides applied in monoecious hemp crop

Herbicide	Active ingredient	Rate l,kg/ha	Time of application
Untreated	-	-	-
Guardian	Acetachlor 900 g/l	2.2	Pre-emergent
Sencor	Metribuzine 75%	0.5	Pre-emergent
Dual Gold	Metolachlor 960 g/l	1.5	Pre-emergent
Lontrel 300	Chlopyralid 300 g/l	0.3	Post-emergent
Fusilade Forte	Fluosiphor – p –butyl 150 g/l	1.0	Post-emergent
Logran	Triasulfuron 75%	0.025	Post-emergent
Logran	Triasulfuron 75%	0.040	Post-emergent
Granstar	Tribenuron methyl 75%	0.015	Post-emergent

The effect of herbicides on weeds and the selectivity towards hemp crops were assessed by marks, according to the EWRS notation scale, where *1* was given to the variants where no toxicity symptoms were signalled, while *9* was given to the variants where hemp plants were damaged at a rate of 85-100%. *Table 2* presents the main

phytotechnical elements and climatic data, which show that years 2006 and 2007 were very different years as climate.

- Pre-emergent – herbicides were applied after sowing, before hemp plant sprouting;
- Post-emergent – herbicides were applied when weeds were found at the rosette stage and hemp plants had 2-3 pairs of real leaves.

Table 2 – Phytotechnical and climatic characteristics of the experiment

Specification	Year	
	2006	2007
Grown variety	Zenit	Zenit
Denseness at sowing (germinating grains/m^2)	15	15
Distance between rows (cm)	70	70
Sowing date	April 29	April 17
Sprouting date	May 11	May 1
Treatment date - Pre-emergent	May 3	April 18
- Post-emergent	May 26	May 15
Rainfall amounts after treatment (mm)		
- Pre-emergent	64.8	27.5
- Post-emergent	77.3	3.0
Rainfall amounts during the vegetation period (mm)	385.5	281.4

RESULTS AND DISCUSSION

In spring, before applying treatments on vegetation, an inventory was drawn up on the weeds found in the experimental field. Determinations were shown in *Table 3*. Species *Echinochloa crus-galli, Setaria viridis, Chenopodium album, Amaranthus retroflexus, Raphanus raphanistrum* and *Cirsium arvense* have shown the maximum percentage, being the most important weeds from hemp crops in the region of Secuieni.

Within these weed species, the highest frequency was found in the annual monocotyledonous weeds, represented by *Echinochloa crus-galli* (23 plants/m^2), *Setaria viridis* (18 plants/m^2) and the annual dicotyledonous species *Chenopodium album* (9 plants/m^2), *Amaranthus retroflexus* (7 plants/m^2) and *Raphanus raphanistrum* (6 plants/m^2).

A quite high weed encroachment was found with perennial species *Cirsium arvense* (5 plants/m^2), *Convolvulus arvensis* (35 plants/m^2) and *Sonchus arvensis* (3 plants/m^2).

Table 3 –Presence (P%) and constancy (K%) in weed species

Weed species	Plants/m^2	P%	K%
Echinochloa crus –galli	23	25.5	83
Setaria viridis	18	20.0	88
Chenopodium album	9	10.0	60
Amaranthus retroflexus	7	7.8	63
Raphanus rephanistrum	6	6.7	100
Sinapis arvensis	6	6.7	88
Cirsium arvense	5	5.6	53
Convolvulus arvensis	3	3.3	60
Sonchus arvensis	3	3.3	12
Galinsoga parviflora	5	5.6	40
Polygonum persicaria	3	3.3	41
Polygonum convolvulus	2	2.2	32

Selectivity. The mean observations on the way in which herbicides were tolerated by hemp plants demonstrated once again that hemp plants had a high susceptibility to herbicides (*Table 4*). In most of herbicide variants, phytotoxicity was found at different levels; the symptoms were leaf distortions, cessation of hemp plant growing and even plant fading.

After five days since herbicide application, we found in the growth-ceased plants, a stronger tillering capacity and, finally, tiller fructification, which resulted in getting seed yields under conditions of those phytotoxic effects. Tillering was the result of rainfalls registered in that period, in both years of experiencing.

Table 4 – Results on the selectivity and efficiency of some herbicides in monoecious hemp crop (2006-2007)

Applied herbicides	Rate l,kg/ha	Marks EWRS	Weed control, %
Untreated	-	1.0	0
Guardian	2.2	1.5	65
Sencor	0.5	5.0	60
Dual Gold	1.5	2.5	55
Lontrel 300	0.3	4.0	35
Fusilade Forte	1.0	2.0	39
Logran	0.025	5.0	40
Logran	0.040	5.2	50
Granstar	0.015	5.1	52

The most reduced effects of phytotoxicity, marked by EWRS with 1.5:2.5 and, respectively, 2.0, were found in the herbicide variants with Guardian (2.2 l/ha), Dual Gold (1.5 l/ha) and Fusilade forte (1.0 l/ha).

Efficiency. Analysing the obtained data on the efficiency of herbicides in controlling weeds, we found out changes in the dynamics of weed encroachment, which differed according to applied herbicides and to the evolution of climatic conditions. Weeds were controlled at a rate of 35-65%, which showed a lower control (*Table 4*). These control results were due to the phytotoxic effect of herbicides on hemp plants, thus being formed other nutrition places, occupied subsequently by weeds.

The best weed control (55-65%) was done in the herbicide variants with Guardian (2.2 l/ha), Sencor (0.5 kg/ha) and Dual Gold (1.5 l/ha).

These herbicides had a very good efficiency in controlling annual weeds: *Echinochloa crus –galli, Setaria viridis* and *Chenopodium album.*

The perennial weed species *Cirsium arvense, Sonchus arvense* and *Convolvulus arvensis* could not be controlled.

The seed hemp yields obtained per ha have shown that they had very low values, of 225 kg/ha, at the untreated control, and between 116 and 525 kg/ha at the herbicide variants (*Figure 1*).

Yields were influenced by the herbicide type, as concerns the selectivity and efficiency in weed control and by the climate conditions during the vegetation period of hemp crop.

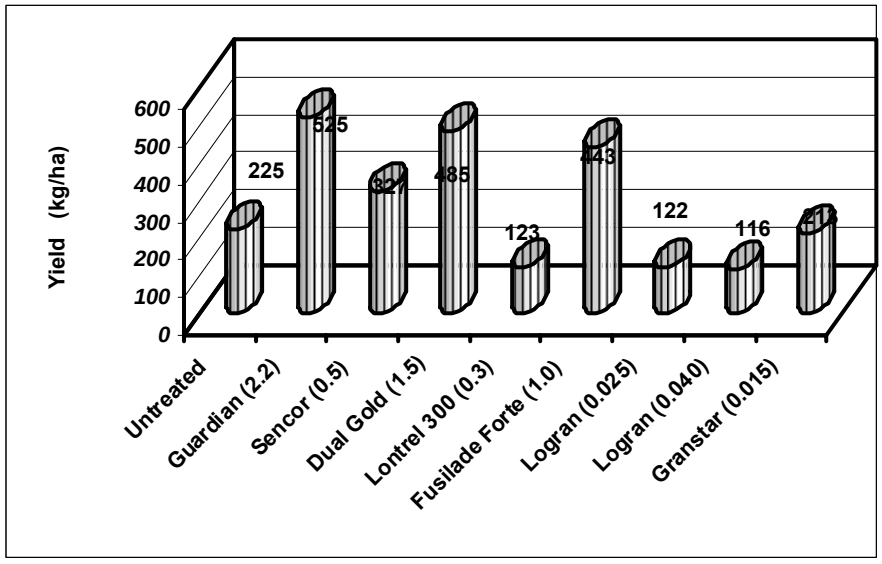

Fig. 1- Influence of some herbicides on yield in monoecious seed hemp

CONCLUSIONS

The most frequent weeds were *Echinochloa crus – galli, Setaria viridis, Chenopodium album, Amaranthus retroflexus, Raphanus raphanistrum, Cirsium arvense, Sonchus arvensis* and *Convolvulus arvensis.*

The hemp plants have shown a very high susceptibility to the tested herbicides. The best tolerated herbicides were Guardian (2.2 l/ha), Dual Gold (1.5 l/ha) and Fusilade forte (1.0 l/ha).

Applying herbicides has diminished weed encroachment at a rate of 35-65%, according to the herbicide type. The best weed control (55%-65%) was obtained in the herbicide variants with Guardian (2.2 l/ha), Sencor (0.5kg/ha) and Dual Gold (1.5 l/ha).

As the perennial weed species *Cirsium arvense, Convolvulus arvensis* and *Sonchus arvensis* were herbicide resistant, we recommend hand hoeing.

The seed yields obtained per ha were influenced by herbicide selectivity and efficiency, and by the climatic conditions.

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