CIRSIUM ARVENSE (L.) SCOP.: AN UNWANTED PRESENCE IN WINTER WHEAT CROPS

CIRSIUM ARVENSE (L.) SCOP. – O PREZENȚĂ NEDORITĂ ÎN CULTURILE DE GRÂU DE TOAMNĂ

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Abstract: *Research was carried out over two years (2004-2005 and 2005-2006) on the trial field of the Department of Agricultural technology and Weed Science of the Agricultural and Veterinary University of the Banat in Timişoara, Romania, on a slightly salified vertosoil. The trial was mono-factorial. We monitored the efficiency of weed control, in particular of Cirsium arvense (L.) Scop. using ten different post-emergent herbicides. The best results in diminishing weeding degree (over 92.00%) compared to the control treated with the classical product SDMA Super 1 l/ha, concerning both total weeding and horse thistle were the result of applying the herbicide Dialen Super 0.90 l/ha and Premiant 1 l/ha, respectively. On all the trial plots, 30 days after application, and particularly 60 days after application, there was a regeneration trend in horse thistle shoots. All the herbicides we tested were very selective for the winter wheat cultivar we cultivated (Lovrin 49), with no symptoms of phyto-toxicity.*

Rezumat*: Cercetările s-au desfăşurat pe parcursul a doi ani (2004-2005 şi 2005-2006) în câmpul experimental al Disciplinei de Agrotehnică şi Herbologie a Universității de Ştiințe Agricole şi Medicină Veterinară a Banatului din Timişoara, pe un sol de tip vertosol slab sărăturat. Experiența a fost monofactorială, urmărind eficacitatea combaterii buruienilor şi, în special, a speciei Cirsium arvense (L.) Scop., folosind zece erbicide postemergente diferite. Cele mai bune rezultate în reducerea gradului de îmburuienare (peste 92.00%) comparativ cu varianta martor erbicidată cu produsul clasic SDMA Super 1 l/ha, atât în ceea ce priveşte îmburuienarea totală, cât şi îmburuienarea cu pălămidă, au fost înregistrate ca urmare a aplicării erbicidului Dialen Super 0.90 l/ha, respectiv Premiant 1 l/ha. În toate parcelele experimentale, după 30 de zile şi, mai ales, după 60 de zile, s-a observat o tendință de regenerare a lăstarilor de pălămidă. Toate erbicidele testate au fost foarte selective pentru soiul de grâu de toamnă cultivat (Lovrin 49), neobservându-se simptome de fitotoxicitate.*

Key words: *winter wheat, weeds, Cirsium arvense (LL.) Scop., control, and post-emergent herbicides*
Cuvinte-cheie*: grâu de toamnă, buruieni, Cirsium arvense (L.) Scop., combatere şi erbicide postemergente*

INTRODUCTION

Horse thistle is a weed with broad ecological amplitude, so that it can grow on all the types of soil, from the sea level up to altitudes of 1,400 m. On the globe, there are species of *Cirsium* in Europe, in northern and southern Africa, in central and western Asia, in northern India, in China, Japan, North America, New Zealand, Tasmania, and south-eastern Australia (Labrada 1995). In Romania, it can be met in almost all the crops, being considered one of the most damaging weeds existent in our country. It is considered a "problem-weed" that can be met again, year after year, in all the country's regions, covering almost 65.00% of the cereal crops (Berca 2004).

The causes of weeding by *Cirsium* are linked, firstly, to its multiplying and spreading manner. Thus, it multiplies both generatively, through seeds, and vegetatively, through rhizomes and root buds, that generate offsets. Though horse thistle does not produce large numbers of akenes, they conserve their germinating ability for 4-5 years, accumulating in the

soil year after year ((Heimann & Cussans 1996). Horse thistle is a clonal weed that often produces compact patches of tens or even thousands of shoots per square meter; this is why the subterranean vegetative system of horse thistle is considered to be the main cause for massive weeding by this species (Chiriță 2000).

Another source of weeding enhanced by the division of the land ownership is uncultivated agricultural areas that can turn into real *Cirsium arvense* (L.) Scop. "crops". The large share of wheat and maize crops in Romania prevented their introduction in long run rotation crops, favouring the repeated use of the same herbicides in the control of horse thistle; in these conditions, there appeared numerous bio-types of *Cirsium arvense* (L.) Scop. that are resistant to these herbicides (Slonovski et al. 2001).

MATERIAL AND METHOD

Research was carried out over two years (2004-2005 and 2005-2006) on the trial fields of the department of agricultural technology and Weed Science of the Agricultural and Veterinary University of the Banat in Timişoara, România, on a slightly salified vertosoil.

The trials were set in the field after the randomized block method with four replications, aiming at identifying the most efficient post-emergent herbicides in controlling winter wheat crop weeds, in particular horse thistle. We tested nine herbicides compared to the control variant, in which we only applied a classical herbicide based on 2,4 D acid (SDMA Super):

V_1 – SDMA Super (2,4 D acid – 600 g/l) – 1 l/ha

V_2 – Buctril Universal (bromoxynil – 280 g/l + 2,4 D acid – 280 g/l) – 1 l/ha

V_3 – Dialen Super (2,4 D acid – 344 g/l + dicamba – 120 g/l) – 0.9 l/ha

V_4 – Extaz (tribenuron-methyl – 75%) – 20 g/ha

V_5 – Lancet (fluroxipir – 80 g/l + 2,4 D acid – 450 g/l) – 1.2 l/ha

V_6 – Lintur (triasulphuron – 4.1% + dicamba – 65.9%) – 150 g/ha

V_7 – Premiant (2,4 D acid – 300 g/l + dicamba – 100 g/l) – 1 l/ha

V_8 – Rival Super Star (tribenuron-methyl – 37.5% + chlorsulphuron – 37.5%) – 20 g/ha

V_9 – Sansac (2,4 D acid – 360 g/l + metosulam – 5 g/l) – 1 l/ha

V_{10} – Sekator (amidosulphuron – 5% + iodosulphuron-methyl – 1.25%) – 0.3 kg/ha

The treatments were applied in spring, during the union – beginning of straw stages, dicotyledonate plants being in the rose stage.

Assessing initial stage of weeding and the effect of herbicides was done through mapping weeds using the quantitative-numerical method. During vegetation, we made repeated observations on the herbicide selectivity on wheat plants. The wheat cultivar we used was Lovrin 49.

RESULTS AND DISCUSSION

In the first trial year, in the initial state of winter wheat crop there were 96.00 weeds/m^2, i.e. 14 different weed species (2 dicotyledonate perennial species and 12 dicotyledonate annual species). We identified 13.2 plants/m^2 of *Cirsium arvense* (L.) Scop. with a share of 13.8% of the total weeding (Table 1).

In 2006, as a result of initial mapping, we recorded 84.60 weeds/m^2, i.e. 12 species (3 dicotyledonate perennial species and 9 dicotyledonate annual species). Climate conditions in the spring of 2006 favoured a stronger weeding by horse thistle, i.e. 16.50 weeds/m^2, with a share of 19.50% of the total weeding (Table 2).

Table 1

Initial weeding of the winter wheat crops in the year 2004-2005

No.	Weed species	No. of weeds/m^2	Share (%)	Botanical class
1	*Polygonum convolvulus*	22.60	23.60	D. A.
2	*Stellaria media*	15.40	16.10	D. A.
3	*Cirsium arvense*	13.20	13.80	D. P.
4	*Convolvulus arvensis*	12.20	12.70	D. P.
5	*Veronica hederifolia*	7.00	7.30	D. A.
6	*Stachys annua*	5.80	6.10	D. A.
7	*Anthemis arvensis*	5.30	5.50	D. A.
8	*Galium aparine*	4.20	4.30	D. A.
9	*Viola arvensis*	3.70	3.80	D. A.
10	*Consolida regalis*	3.20	3.30	D. A.
11	*Fumaria officinalis*	1.20	1.20	D. A.
12	*Papaver rhoeas*	0.90	0.90	D. A.
13	*Bifora radians*	0.80	0.80	D. A.
14	*Adonis aestivalis*	0.50	0.50	D. A.
	TOTAL	96.00	100.00	-

D.A. Annual Dicotyledonate
D.P. Perennial Dicotyledonate

Table 2

Initial weeding of the winter wheat crops in the year 2005-2006

No.	Weed species	No. of weeds/m^2	Share (%)	Botanical class
1	*Polygonum convolvulus*	19.70	23.30	D. A.
2	*Cirsium arvense*	16.50	19.50	D. P.
3	*Stellaria media*	15.20	18.10	D. A.
4	*Convolvulus arvensis*	10.80	12.70	D. P.
5	*Galium aparine*	6.10	7.20	D. A.
6	*Consolida regalis*	4.20	5.00	D. A.
7	*Veronica hederifolia*	4.00	4.70	D. A.
8	*Anthemis arvensis*	2.80	3.20	D. A.
9	*Stachys annua*	2.70	3.20	D. A.
10	*Viola arvensis*	2.10	2.50	D. A.
11	*Rubus caesius*	0.30	0.40	D. P.
12	*Atriplex patula*	0.20	0.30	D. A.
	TOTAL	84.60	100.00	-

D.A. Annual Dicotyledonate
D.P. Perennial Dicotyledonate

Ten days after applying herbicides on trial plots, in the year 2004-2005 we noticed obvious differences from the point of view of the efficiency of these herbicides in controlling weeding degree of the winter wheat crop. Thus, the best results in general weed control were ensured by the herbicide Premiant 1 l/ha (95.30%) and Dialen Super 0.9 l/ha (94.10%), followed by Lancet 1.2 l/ha (85.20%) and Buctril Universal 1 l/ha (84.00%); the poorest results were in the variants treated with Extaz 20 g/ha (55.60%) and Sekator 0.3 kg/ha (52.90%). As

for the exclusive control of the species *Cirsium arvense* (L.) Scop. we can see the very significantly positive differences compared to the control variant treated with SDMA Super 1 l/ha, the variants treated with Dialen Super 0.9 l/ha and Premiant 1 l/ha. There were unsatisfactory results, below 50%, in the treatment with Rival Super Star 20 g/ha, Sekator 0.3 kg/ha, and Extaz 20 g/ha (Table 3).

Table 3

Results concerning the efficiency of herbicides in weed control in winter wheat crops in the year 2004-2005

Variant	Weed control				
	Total (%)	*Cirsium arvense* (L.) Scop.			
		%	Controlled weeds/m^2	Difference compared to the control/m^2	Significance of the difference
V_1 – SDMA Super 1 l/ha	66.30	68.10	8.99	-	-
V_2 – Buctril Universal 1 l/ha	84.00	81.90	10.81	+1.90	x
V_3 – Dialen Super 0.90 l/ha	94.10	95.00	12.54	+3.60	xxx
V_4 – Extaz 20 g/ha	55.60	42.30	5.58	-3.50	000
V_5 – Lancet 1.2 l/ha	85.20	87.30	11.60	+2.70	xx
V_6 – Lintur 150 g/ha	80.60	81.50	10.76	+1.90	x
V_7 – Premiant 1 l/ha	95.30	94.60	12.49	+3.49	xxx
V_8 – Rival Super Star 20 g/ha	74.50	49.70	6.56	-2.50	0
V_9 – Sansac 1 l/ha	78.00	76.80	10.14	+1.20	-
V_{10} – Sekator 0.30 kg/ha	52.90	45.10	5.95	-3.10	000

DL 5% = 1.88 weeds/m^2
DL 1% = 2.54 weeds/m^2
DL 0.1% = 2.81 weeds/m^2

In the trial year 2005-2006, we noticed for their particular performance in the general weed control the herbicides Dialen Super 0.9 l/ha (95.1%) and Premiant 1 l/ha (93.5%). A satisfactory control, over 80%, was also ensured by the herbicides Buctril Universal 1 l/ha, Lancet 1.2 l/ha, and Lintur 150 g/ha, while in the control variant, treated with SDMA Super 1 l/ha, total weed control was only 59.30%. Analysing the performances of the tested herbicides in controlling horse thistle we can see that, on the whole, the results are close to those of the precedent year (Table 4).

Thirty days after applying herbicides we could see a slight regeneration of the horse thistle shoots, in all variants, except for that treated with Sekator 300 g/ha, where there was an obvious increase of the control degree of the attack by *Cirsium arvense* (L.) Scop.

Sixty days after the treatment, we noticed on all the trial plots an obvious regeneration trend of the horse thistle shoots.

Observations made periodically, after applying treatments, showed that all the pre-emergent herbicides we tested proved to be very selective for the Lovrin 49 winter wheat cultivar that we cultivated on the trial field, with no symptom of plant toxicity at all.

Table 4

Results concerning the efficiency of herbicides in weed control in winter wheat crops in the year 2005-2006

Variant	Weed control				
	Total (%)	*Cirsium arvense* (L.) Scop.			
		%	Controlled weeds/m^2	Difference compared to the control/m^2	Significance of the difference
V_1 – SDMA Super 1 l/ha	59.30	66.20	10.92	-	-
V_2 – Buctril Universal 1 l/ha	87.70	85.40	14.09	+3.17	xx
V_3 – Dialen Super 0.90 l/ha	95.10	93.50	15.43	+4.51	xxx
V_4 – Extaz 20 g/ha	58.00	49.00	8.08	-2.84	0
V_5 – Lancet 1.2 l/ha	86.40	82.90	13.68	+2.76	x
V_6 – Lintur 150 g/ha	83.50	72.30	11.93	+1.01	-
V_7 – Premiant 1 l/ha	93.50	92.60	15.28	+4.36	xxx
V_8 – Rival Super Star 20 g/ha	73.80	53.10	8.76	-2.20	0
V_9 – Sansac 1 l/ha	79.60	70.80	11.68	+0.76	-
V_{10} – Sekator 0.30 kg/ha	54.20	41.00	6.76	-4.16	000

DL 5% = 2.17 weeds/m^2
DL 1% = 2.93 weeds/m^2
DL 0.1% = 3.91 weeds/m^2

CONCLUSIONS

1. Initial weeding of the winter wheat crop was in 2004-2005 of 94.00 weeds/m^2, with 14 different species. Among them, *Cirsium arvense* (L.) Scop. had a share of 19.50%.
2. In 2005-2006, we identified 84.60 weeds/m^2, with 12 species; horse thistle had a share of 19.50%.
3. The best results in the general control of the weeding degree were those of the herbicide Premiant 1 l/ha (95.30%) in the first year, and by the herbicide Dialen super 0.90 l/ha (95.10%) in the second year.
4. Weed control in the control variant treated with SDMA super 1 l/ha was about 66.00%.
5. As for the efficiency of the tested herbicides, exclusively in the control of the species *Cirsium arvense* (L.) Scop. we can see that the best results (92.60-95.00%) were also in the variant in which we applied the herbicide Dialen Super 0.9 l/ha or Premiant 1 l/ha.
6. Thirty days and 60 days respectively after applying the treatment with herbicides, there was a slight trend to recovery by the horse thistle shoots.
7. All the tested herbicides were selective for the cultivated winter wheat cultivar Lovrin 49, with no symptoms of plant toxicity.

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