APERA SPICA VENTI: A PROBLEM WEED IN STRAW CEREALS IN THE BANAT HILL AREA

APERA SPICA VENTI: BURUIANĂ PROBLEMĂ ÎN CULTURILE DE CEREALE PĂIOASE DIN ZONA COLINARĂ A BANATULUI

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Abstract: *Experiments were carried out over two years (2007 and 2008) in Pirdea, in the Banat hill area, on a typical luvosoil with 34.5% argyle content, 2.19% humus, and a pH of 5.5. In 2007, winter wheat weeding reached 136 weeds/m^2, of which 38.5% Apera spica venti and 61.5% dicot species such as Viola arvensis, Raphanus raphanistrum, Matricaria inodora, Cirsium arvense, and Convolvulus arvensis. In 2008, we identified 162 weeds/m^2, of which 45.7% monocots (particularly Apera spica venti) and 54.3% annual and perennial dicots. Anti-graminaceae herbicides applied during vegetation were selective in winter wheat and had good results in controlling Apera spica venti: Puma super (95-92%), Assert 250 C (93-89%) and Grasp 25 SP (90-85%). Taking into account the relatively large number of dicot weeds, it is necessary to complete the treatment during vegetation with an anti-dicot herbicide (e.g. Icedin Super). In these variants we also obtained the highest yield increases (356-613 kg/ha in 2007 and 534-815 kg/ha in 2008). Among herbicides applied pre-emergently, the best results in controlling weeding degree in winter wheat (91-88%) was with Dicuran Forte, while Cougar and particularly Treflan 48 were less efficient, their effect being impacted by the precipitations during the period following treatment application. Yield increase ensured by Dicuran Forte was 384 kg/ha in 2007 and 508 kg/ha in 2008.*

Rezumat: *Experienţele s-au desfăşurat pe parcursul a doi ani 2007şi 2008 în localitatea Fîrdea, situată în zona colinară a Banatului, pe un luvosolic tipic cu un conţinut în argilă de 34,5%, 2.19% humus şi pH de 5,5. În anul 2007 îmburuienarea grâului de toamnă a fost de 136 buruieni/m^2, reprezentate în proporţie de 38,5% de Apera spica venii şi 61,5% de specii dicotiledonate ca Viola arvensis, Raphanus raphanistrum, Matricaria inodora, Cirsium arvense, Convolvulus arvensis. În anul următor, s-au identificat 162 burmeni/m^2 dintre care 45,7% monocotiledonate (în special Apera spica venti) şi 54,3 % dicotiledonate anuale şi perene. Erbicidele antigramineice aplicate în vegetaţie au fost selective pentru cultura grâului şi au avut o bună eficacitate în combaterea speciei Apera spica venti :Puma super (95-92%), Asert 250 SC (93-89%) şi Grasp 25 SP (90-85%). Având în vedere prezenţa în număr relativ mare şi a buruienilor dicotiledonate este necesară completarea tratamentului în vegetaţie cu un erbicid antidicotiledoneic (ex. Icedni Super). De altfel, în aceste variante s-au obţinut şi cele mai mari sporuri de recoltă (356-613 kg/ha în anul 2007 şi 534-815 kg/ha în anul 2008). Dintre erbicidele aplicate preemergent, cele mai bune rezultate în reducerea gradului de îmburuienare la grâul de toamnă (91,38%) au fost asigurate de erbicidul Dicuran Forte, în timp ce erbicidele Cougar şi, în special Treflan 48, au fost mai puţin eficace, efectul acestora fiind influenţat puternic de precipitaţiile căzute în perioada imediat următoare aplicării. Sporul de producţie asigurat de erbicidul Dicuran Forte a fost de 384 kg/ha primul an şi de 508 kg/ha în anul următor.*

Keywords: *winter wheat, weed control, Apera spica venti, herbicides, selectivity, eficiency;*
Cuvinte cheie: *grâu de iarnă, controlul buruienilor, Apera spica venti, ierbicide, selectivitate, eficienţă*;

INTRODUCTION

Increasing the share of straw cereals within crop rotations by expanding cereal agricultural system, as well as guiding weed control particularly dicot ones have changed the ratio between weed species, with monocots becoming predominant. Among them, in the Banat hill area cultivated with straw cereals, the most common is loose silky bent (*Apera spica venti*) (BERCA M., CHIRLLĂ C., 2002).

Taking into account that this species multiplies exclusively through seeds, the objective of weed control is to diminish the number of seeds reaching the soil, by destroying loose silky bent plants before they fructify thus limiting competition from weeds in the crops. Diminishing seed reserve in the soil prevents strong infestation of straw cereal fields in the years to follow (CIOBANU CORNELIA, POPESCU ALEXANDRINA, 2002; HENEGAN C. et al., 2002).

In this paper we aim at identifying chemical alternatives to controlling loose silky bent and identifying an efficient control strategy in winter wheat crops by using post-emergent herbicides and, more recently, pre-emergent ones (ARDVIDSSON T., 1992).

MATERIALS AND METHODS

Research was carried out over the years 2006-2007 and 2007-2008 on a typical luvosoil representative for the Banat hill area. Experiments were set in the field after the randomized block method, with 12 variants of 4 replications each (CIULCA S., 2002). We cultivated the Alex winter wheat cultivar.

Pre-emergent herbicides were applied in the fall, right after sowing. Post-emergent herbicides were applied in spring, when winter wheat plants were still before the first inter-knot. During this period, the loose silky bent plants were still in the 2-4 leaf stage, while dicot weeds were in the rosette stage (2-4 leaves). After treatment with herbicides, we made successive measurements concerning herbicide selectivity to winter wheat. We also mapped the efficacy of the different herbicides in diminishing the number of total weeds and of *Apera spica venti* (CHIRILĂ C, 1988).

After harvesting, yield from each variant was calculated according to the standards, and results were processed through variance analysis (CIULCA S., 2002).

Knowing that most of the seeds of loose silky bent germinate in the fall, depending on the precipitations, we monitored the limitation of this species with the help of pre-emergent herbicides: Cougar SC (isoproturon 500 g/l + diflifenican 100 g/l), Dicuran Forte WP (chlortoluron 79.25% + triasulfuron 0.75%), and Treflan 48 (trifluralin 480 g/l). To control weed seedlings we used some post-emergent herbicides: Arelon Super (isoproturon 60% + amidosulfuron 1.5%), Assert 250 SC (imazabetabenz 250 g/l), Grasp 25 SC (tralkoxydim 250 g/l) and Puma Super 100 EC (fenoxaprop-ethyl 100 g/l).

Taking into account that in winter wheat we also identified numerous species of dicot weeds, it was necessary to use during vegetation a herbicide that controls this species. Therefore we used Icedin Super (acid 2,4 D 280 g/l + dicamba 100 g/l).

RESULTS AND DISCUSSIONS

În 2006-2007, winter wheat weeding reached 136 weeds/m^2. Among them, *Apera spica venti* shared 38.5%, and dicot species reached 61.5%, most common being the following ones: *Raphanus raphanistrum* (14.9%), *Matricaria inodora* (13.3%), *Convolvulus arvensis* (10.8%) and *Polygonum convolvulus* (9.1%) (table 1).

As for the effect of the tested herbicides on winter wheat plants, we noticed that they were all selective for the crop (grade 1 EWRS). Pre-emergent herbicides Dicuran Forte WP and Cougar SC controlled very well loose silky bent (91%), while Treflan 48 yielded poorer results (69%), which could be explained by the fact that the latter is more volatile and was

affected by the strong hydro deficit in the fall of 2006. The Dicuran Forte 80 WP product also controlled satisfactorily dicot species, ensuring a total diminution of the weeding of 82%. The other two pre-emergent herbicides controlled dicot species unsatisfactorily, particular perennial ones, a reason why we also need to apply a treatment during vegetation with Icedin Super.

Table 1.

Selectivity and efficacy of herbicides used to control *Apera spica venti* and dicot weeds in winter wheat (2006-2007)

No.	Share of weed species	% of participation	Weeds/m^2
1.	*Apera spica venti*	38,5	52,4
2.	*Raphanus raphanistum*	14,9	20,3
3.	*Matricaria inodora*	13,3	18,1
4.	*Convolvulus Arvensis*	10,8	14,7
5.	*Polygonum convolvulus*	9,1	12,4
6.	*Rubus Caesius*	6,6	9,0
7.	*Cirsium arvense*	4,0	5,4
8.	*Galium Aparine*	2,8	3,7
Total		100,0	136,0

Herbicides	*Times of applic*	*Selectivity Scale EWRS*	*Weed control*					
			Total	*Apera Spica venti*	Yield Kg/ha	Yield %	Yied Incr. Kg/ha	Meaning
V_1- Control	-	1	0	0	2976	100	-	-
V_2 – Dicuran forte 80WP (2l/ha)	preem	1	82	91	3360	113	384	xx
V_3- Dicuran forte 80WP (2l/ha)+ Icedin Super CE (1l/ha)	preem post	1 1	93	90	3515	118	539	xxx
V_4-Cougar SC (1l/ha)	preem	1	53	91	3186	107	210	-
V_5-Cougar SC91l/ha) + Icedin super CE (1l/ha)	preem post	1 1	92	89	3409	115	438	xxx
V_6 – Treflan 48 (1,25l/ha)	preem	1	47	69	3227	108	251	x
V_7- Icedin super CE (1l/ha)	post	1	56	0	3168	106	192	-
V_8-Arelon super (1l/ha)	post	1	61	92	3305	111	329	xx
V_9- Assert 250 SC (2l/ha) + Icedin Super CE (1l/ha)	post post	1 1	94	93	3441	116	465	xxx
V_{10}-Grasp 25 SC (1l/ha) + Icedin super CE (1l/ha)	post post	1 1	88	90	3332	112	356	xx
V_{11}- Puma super 100 CE (1l/ha)	post	1	37	95	3270	110	294	x
V_{12} – Puma super 100 CE (1l/ha) + Icedin super CE (1l/ha)	post post	1 1	96	94	3589	121	613	xxx

$DL_{5\%}$=236kg/ha, $DL_{1\%}$=316 kg/ha, $DL_{5\%}$=417 kg/ha

As a result of this treatment, total weed control increased from 92-93% and yield increases were very significant, i.e. 433 kg/ha in the variant treated with Cougar SC 1.5 l/ha +

Icedin Super 1 l/ha, and 539 kg/ha in the variant treated with Dicuran Forte 80 WP 2 l/ha + Icedin Super 1 l/ha.

Table 2

Selectivity and efficacy of herbicides used to control *Apera spica venti* and dicot weeds in winter wheat (2007-2008)

No.	Share of weed species	% of participation	Weeds/m^2
1.	*Apera spica venti*	45,7	74,9
2.	*Raphanus raphanistum*	12,3	20,2
3.	*Matricaria inodora*	10,1	16,6
4.	*Polygonum convolvulus*	6,2	10,2
5.	*Lamium purpureum*	5,3	8,7
6.	*Viola arvensis*	4,0	6,5
7.	*Consolida regalis*	3,7	6,1
8.	*Convolvulus arvensis*	3,1	5,1
9.	*Fumaria officinalis*	3,0	4,9
10.	*Galium aparine*	2,7	4,4
11.	*Cirsium arvense*	2,5	4,1
12.	*Rubus caesius*	1,4	2,3
Total		100,0	164,0

Herbicides	*Times of applic*	*Selectivity Scale EWRS*	*Weed control*					
			Total	*Apera Spica venti*	Yield Kg/ha	Yield %	Yield Incr. Kg/ha	Meaning
V_1- Control	-	1	0	0	3215	100	-	-
V_2 – Dicuran forte 80WP (2l/ha)	preem	1	75	88	3723	116	508	xxx
V_3- Dicuran forte 80WP (2l/ha)+ Icedin Super CE (1l/ha)	preem post	1 1	91	91	3927	122	712	xxx
V_4-Cougar SC (1l/ha)	preem	1	60	86	3402	106	187	-
V_5-Cougar SC91l/ha) + Icedin super CE (1l/ha)	preem post	1 1	87	89	3675	114	460	xx
V_6 – Treflan 48 (1,25l/ha)	preem	1	51	75	3520	109	305	x
V_7- Icedin super CE (1l/ha)	post	1	53	0	3584	111	369	x
V_8-Arelon super (1l/ha)	post	1	57	90	3637	113	422	xx
V_9- Assert 250 SC (2l/ha) + Icedin Super CE (1l/ha)	post post	1 1	92	89	3906	121	691	xxx
V_{10}-Grasp 25 SC (1l/ha) + Icedin super CE (1l/ha)	post post	1 1	83	85	3749	117	534	xxx
V_{11}- Puma super 100 CE (1l/ha)	post	1	44	92	3612	112	397	xx
V_{12} – Puma super 100 CE (1l/ha) + Icedin super CE (1l/ha)	post post	1 1	95	93	4030	125	815	xxx

$DL_{5\%}$=278kg/ha, $DL_{1\%}$=373 kg/ha, $DL_{5\%}$=482 kg/ha

In post-emergent anti-graminaceae herbicides, weed control degree for *Apera spica venti* was between 92% (Arelon Super 2 l/ha) and 95% (Puma Super 100 EC 1 l/ha), but total

weed control was unsatisfactorily (37-61%). As a result, in the case of these herbicides too we need to complete herbicide treatment with Icedin Super 1 l/ha. After combined application of these two types of herbicides, total weed control percentage increased, reaching 94% in the variant Assert 250 SC 2 l/ha + Icedin Super 100 EC 1 l/ha. In these variants we also obtained the highest yield increases of 465 kg/ha and 613 kg/ha, respectively.

In the year 2007-2008, we identified 164 weeds/m^2 in the control variant. *Apera spica venti* shared 45.7%, the rest being represented by 12 annual and perennial dicot species (table 2).

In this year too, tested herbicides proved to be selective for winter wheat plants. Though, due to more abundant precipitations in the fall of 2007, pre-emergent herbicides had a more visible effect in weed control compared to 2006, the best results were in the variant with two treatments: Cougar SC 1.5 l/ha + Icedin Super 1 l/ha (87%) and Dicuran Forte WP 2 l/ha + Icedin Super 1 l/ha (91%). These decreasing of weeding resulted in yield increases of 460 kg/ha and 712 kg/ha, respectively. Applying unilaterally the herbicide Dicuran Forte 80 WP 2 l/ha after sowing determined a total weed control of 75%, ensuring a very significant yield increase of 508 kg/ha.

Anti-graminaceae herbicides applied post-emergently controlled efficiently *Apera spica venti* from 90% with Arelon Super 2 l/ha to 93% with Puma Super 100 EC 1 l/ha. These herbicides, in exchange, had not a satisfactory control of all dicot weed species; the most efficient weed control was in the variants in which Icedin Super 1 l/ha was also applied: 92% in the variant Assert 250 SC 2 l/ha + Icedin Super 1 l/ha and 95% in the variant Puma Super 100 EC 1 l/ha + Icedin Super 1 l/ha. Yield increases thus obtained were 691 kg/ha and 815 kg/ha, respectively.

Conclusions

1. *Apera spica venti* is a problem weed for the Banat hill area; its expansion was favored by the large share of straw cereals and by the repeated use of dicot control herbicides.

2. In 2006-2007, weeding degree was 136 weeds/m^2, of which 38.5% was represented by *Apera spica venti* and the rest by other annual and perennial dicot weed species such as *Raphanus raphanistrum*, *Matricaria inodora*, *Convulvulus arvensis*, etc. In 2008, weeding degree was 164 weeds/m^2, of which 45.7% *Apera spica venti*.

3. All tested herbicides were selective for the Alex winter wheat cultivar, with no phyto-toxicity symptoms.

4. Efficacy of pre-emergent herbicides was influenced by the amount of precipitations in the fall after sowing. This influence was less with Dicuran Forte 80 WP, but more obvious in Cougar SC and particularly in Treflan 48.

5. Post-emergent herbicides controlled *Apera spica venti* very well (over 90%), but they yielded unsatisfactory results in dicot weed control.

6. To control all weed species efficiently, we need to apply simultaneously and in combination a herbicide for *Apera spica venti* and a herbicide for dicot weed species (Icedin Super). In these variants, we also obtained maximum yield increases: 365 kg/ha – 613 kg/ha in 2007 and 460 kg/ha – 815 kg/ha in 2008.

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