

STUDY REGARDING THE EFFICACY OF HERBICIDES AGAINST THE WEEDS OF THE SUNFLOWER CROPS OF SIMNIC LUVISOL

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keywords: sunflower, herbicides, production, antigramineic herbicide, antiodicofil herbicide.

ABSTRACT

During the period of 2010-2012 inside the experimental field of SCDA Simnic an experiment has been organized, inside which multiple methods of weed control for the benefit of the sunflower crop have been tested : without hoeing, 2 manual hoeing, 2 mechanical hoeing, 2 mechanical hoeing + 2 manual hoeing, acetochlor 900 g/l , dimethenamid 720 g/l, pentoxamid 600 g/l, s-metolaclo 960 g/l , acetochlor 900 g/l +oxiflufen 480 g/l, fluazifop-p-butyl 150 g/l, fluorocloridan 230 g/l. The sunflower seed production displayed more promising results when the antigramineic herbicide (acetochlor) and the antiodicofil herbicide (oxiflufen) have been combined. It showed an average of 3050kg/ha for 3 years, 95% compared to the hoed variant.

A loss of productivity has been found only for the variants which had herbicides applied postem only for monocot weeds (fluazifop-p-butyl) or only for dicot weeds (fluorocloridan). The productivity differences were of 983kg/ha and 1140kg/ha compared to the hoed variant.

INTRODUCTION

Weed control is mandatory even from the early stages of crop development. In the case of a delayed weed control, the growth of the plants is drastically diminished, gaining a green to yellow colour, eventually resulting in a loss of productivity because of the slow and only partial recovery of the plants.

The time and the amount of hoeing is directly determined by the stage in which weeds begin to appear. The hoeing must be commenced as soon as weeds develop, both mechanically between the lines with the according equipment and manually, in an individual manner. The mechanical hoeing must be executed before the plants reach a high enough height in order to avoid damaging.

Pintilie and Co's research, dating from 1978 regarding the positive effects of hoeing for weed control and the increase of productivity, show that only the mechanical hoeing, without any herbicides increase the productivity of sunflower by 470-800 kg/ha. Should a manual hoeing be added, this would bring an additional increase of 200-370kg/ha; the first manual hoeing reduced the weed population by 30%. A second mechanical hoeing would reduce the weed population by an additional 15%. The first manual hoeing would allow an increase of 67% and a second one would bring an increase of an additional 23% (Berca, 2011).

The experiments made in the domain of sunflower weed control showed that the most dangerous damaging plants are the ones which develop in the first 30 days of vegetation after the sight of sunflower plants. This is the reason why the sanitary standards are very high during the first 30 days of the sunflower seeding (Slonovschi and Co., 2001).

In case herbicides have not been applied, hoeing is the most important step, 2-3 manual hoeing being required between the lines.

Applying herbicides in agro allow complex procedures to maintain pretty good sunflower sown in clean condition during herboactivă it.

MATERIALS AND METHODS

The purpose of this experiment is to prove the efficacy of simple herbicides and the early appliance of acetochlor dimethenamid, pentoxamid, s-metholachlor, the use of combining these elements with products which are applied during the early stages of growth in order to control the dicotil weed spreading- oxifluorfen but also to prove the possibility of extending the effects of herbicides by applying two manual hoeing and two mechanical hoeing in order to better control the spreading of both dicot and yearly weeds. The degree of weed spreading and the dry mass of mono and dicot plants has also been determined.

The **main goal** of this study is to determine the optimal methods of applying simple and combined variants of herbicides applied shortly after seeding or during the vegetation stage in order to best control the spreading of mono and dicot yearly weeds which are a threat to the sunflower crop.

The studies have been conducted inside the Station of Agricultural Research and Development of Simnic, during the period of 2010-2012 on a luvisol.

The variants have been arranged according to the randomized blocks method, having 4 cycles, using a plot of 21 m². The herbicides have been applied in two cycles: shortly after the seeding and during vegetation, when the plants have about 4-6 leafs and the yearly monocot weeds have 10-15cm.

The following variants have been tested:

1	without hoeing
2	manually hoed twice
3	mechanically hoed twice
4	manually hoed twice + mechanically hoed twice
5	Acetoclor 900 g/l
6	Dimetenamid 720 g/l
7	Pentoxamid 600 g/l
8	s-metolaclor 960 g/l
9	Acetoclor 900 g/l +oxiflurfen 480 g/l
10	Fluazifop-p-butyl 150 g/l
11	Fluorocloridan 230 g/l

The following herbicides have been applied:

Active substance	Commercial product	Dose 1/ha	Time of appliance
Acetoclor 900 g/l	Regal	2	preem
Dimetenamid 720g/l	Frontier forte - monocot per year and dicot perenials	1	preem
Fluazifop-P-butyl 150 g/l	Fusilade forte -monocot	1	postem
Fluorocloridon 230 g/l	Racer 25EC -dicot per year	1	postem
Oxifluorfen 480 g/l	Goal 4F -dicot weeds per year	0,5	preem
Pentoxamid 600g/l	Sucesor 600 -monocot and some dicot weeds	3	preem
s-metolaclor 960 g/l	Dual Gold 960 EC -monocot + dicot	1,5	preem

The Performer sunflower hybrid was used.

RESULTS AND DISCUSSION

The antigramineic herbicides have shown a very good selectivity during the 3 years of testing, the sunflower crops displaying an appearance similar to the crops which did not receive any herbicides. The fluorochloridon has shown a slight toxicity 20 days after its appliance, defined by the staining and discoloration of the leafs, followed by a slight stagnation of growth. However, 40 days after the appliance of the treatment, the subjects stabilized, not having any permanent negative effect. Since it requires hoeing, the sunflower is a plant which is bound to have a high weed population during each agricultural year. Twelve weed species have been spotted during the 3 years of testing.

The total mass of weeds during the 3 years of testing ranged between 9,9 t/ha in 2012 and 13,7 t/ha in 2010. 12.2t/ha of these were dry. The majority of the found weeds were the yearly monocots (9.6t/ha on average, with an annual variation between 5.2t/ha and 11.1t/ha(2011)). Annual monocots accounted for 71% of the total weeds. Annual dicots were the second highest amount (2,6 t/ha). Based on these values it can be observed that the sunflower crops are facing a constant substantial weed threat and that measures of weed control are required. High amounts of weeds are generated because of the applied fertilizers, as well as many other factors.

Table1
Weed species occurring in vegetation and competed sunflower SCDA Șimnic
-2010-2012

SPECIA	Participation in years (%)		
	2010	2011	2012
ECHCG	100	100	100
SETGL	95	95	95
DIGSA	92	90	80
AMARE	80	82	70
CHEAL	80	75	70
MATIN	70	65	60
POLPE	55	50	44
HIBTR	40	36	33
POLAV	32	30	22
AMBAR	25	20	20
CIRAR	88	85	80
CONAR	85	80	76

Table 2
The total amount of the weeds above the classes (t / ha of dry matter)

YEAR	The total quantity of weeds t / ha	Of which:		
		MA t/ha	DA t/ha	DP t/ha
2010	13,7	9,6	4,2	0,8
2011	13,0	11,1	3,3	1,7
2012	9,9	5,2	0,2	0,5
Medie	12,2	8,6	2,6	1,0
Participare%	100	71	21	8

The control of weed spreading by manual and mechanical methods. The gathered amounts during the 3 years of study were of 1540 kg/ha on the variant which encountered

weeds naturally (ranging between 1010 kg/ha in 2012 and 1880 kg/ha in 2011). The hoed variant resulted in 3203 kg/ha (varying yearly between 2680 kg/ha in 2012 and 3580 kg/ha in 2011). A loss of 1663 kg/ha on average. The production percentage for the variant which presented weeds was of 48%, having a loss of 52%. (tabel 3).

Table 3

The evolution of sunflower production of the variants which had weed problems and did not receive any herbicides during hoeing

YEARS	Hybrid	Sunflower production kg / ha		
		Prășit	Neprășit	Diferența+semnificație
2010	Performer	3350	1730	-1620 ^{ooo}
2011	Performer	3580	1880	-1700 ^{ooo}
2012	Performer	2680	1010	-1670 ^{ooo}
media	Kg	3203	1540	-1663 ^{ooo}
	%	100	48	52

DL 5% = 560 kg/ha

DL 1% = 790 kg/ha

DL 0,1% = 954kg/ha

The conclusion is that we must not allow the development of weeds before interfering and utilizing the most optimal methods of weed control. No matter if applied manually, mechanically or manually +mechanically, the hoeing variants always display better productivity results compared to the variants which suffer from weed infestation. (fig. 1).

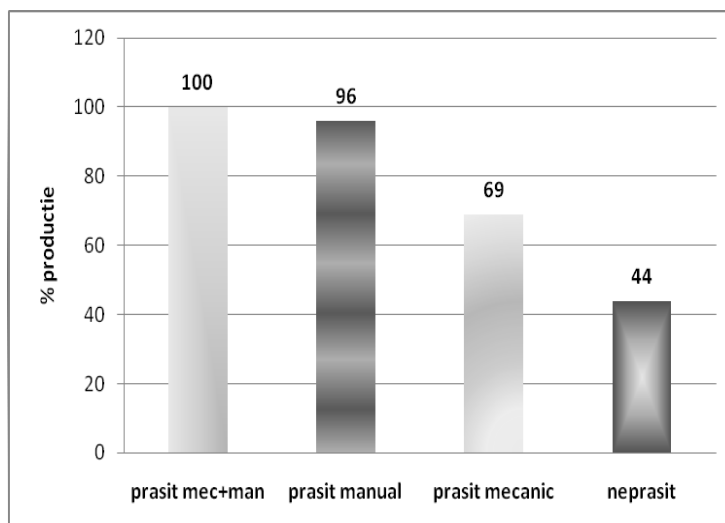


Fig.1 HOED influence of mechanical and manual weed control and training in the production of sunflower

A mechanical hoeing alone has shown a productivity increase of 24%. Through mechanical hoeing, the weeds found between the lines are cut off yet the weeds found below the sunflower plants themselves are instead denied the light they require, depending on the species (annual dicots and perenes being generally faster). Through exclusive manual hoeing the weeds are completely removed, thus resulting in higher productivity (96% additional seed production, which is 27% more than the mechanical hoeing and 52% more than the unhoed variant). During the 3 years of study, the acetochlor, dimethonamid, pentoxamid, s-metolachlor herbicides were proven to be 100% effective against the Echinochloa, Setaria and Digitaria monocot weeds, 4-8% successful against the dicot weeds and 0% useful against the perene ones. The acetochlor + oxifluorfen variant, when applied preem, had a success rate of 90%. A very good result

was shown against the monocot and dicot annual weeds (100%). A poor result was obtained however against the perene dicots: 10%. This variant has shown better results on the plants which received manual (80%) or mechanical hoeing (57%). When the flurozifop p-butyl herbicide displays a very good result when applied on the vegetation against the annual monocot weeds (99%), yet a very poor one against all other types of weeds (0%).

The fluorochloridon herbicide displayed poor results when applied preem against annual dicot and perene weeds (62%, 0%), while also damaging the plants with a certain amount of toxicity.

When manual and mechanical hoeing are combined, a productivity boost of 56% is shown, compared to the variants which did not receive any hoeing. The weed control success rate varied between 13% and 90% during the period of 2010-2012. The 100% success rate was reached when 2 mechanical hoeing and 2 manual ones were applied. The herbicides based on acetochlor, dimethenamid, pentoxamid, s-metolachlor that were applied during the preem phase had a very lengthy effect of 5-7 weeks in controlling the monocot species of Echinochloa, Setaria and Digitaria. Should it rain during summer, the crops may get reinfested with monocot weeds, yet only on a small scale which is not enough to reduce the seed count. (tabel 5).

Table 5

The efficiency of applying herbicides during the preem and postem cycles of the sunflower crops

Nr. var	Dose L/ha	Age of application	M. A. t/ha	Grad comb	D. A. t/ha	Grad comb.	D. P. t/ha	Grad comb.	Total t/ha	Grad comb
1	-	-	8,6	0	2,6	0	1,0	0	12,2	0
2	-	-	0,9	90	0,9	65	0,7	30	2,5	80
3	-	-	3,8	56	1,2	54	0,2	98	5,2	57
4	-	-	-	100	-	100	0,1	100	0,1	100
5	2	preem	0,1	100	2,5	4	1,0	0	3,6	70
6	1	preem	0,2	100	2,5	4	1,0	0	3,7	70
7	3	preem	0,3	100	2,6	0	0,9	0	3,9	68
8	1,5	preem	0,1	100	2,4	8	0,9	0	3,5	70
9	2+0,5	preem	0,1	100	0,1	100	0,9	10	1,0	90
10	1	postem	0,5	99	2,6	0	1,0	0	4,1	67
11	2	preem	8,6	0	1,0	62	1,0	0	10,6	13

Herbicides are the modern, quick and cost efficient method of weed control. Currently the sunflower benefits from a wide array of efficient herbicides to assure further productivity. Generally a more complex mixed herbicide is used in order to combat more species of weeds at the same time, yet the optimal way of weed control is the combination of multiple pesticides. The positive effect of herbicides for the seed count of the sunflower is directly dependent on 2 elements: selectivity and efficiency. The variants which only used acetolachlor, dimetenamid, pentoxamid, s-metolachlor based herbicides offered results ranging from 2430 kg/ha up to 2887 kg/ha, which is 90% of the variant which was hoed both manually and mechanically. (tabel 6).

The sunflower seedcount productivity boosts when an acetochlor based herbicide has been combined with an oxiflufen based one. The production was of 3050 kg/ha on average for 3 years, which is 95% of the hoed variant.

Production losses have been displayed only for the variants which only used herbicides against the monocot types of weeds (fluazifop-p-butyl) or only against the dicot type of weeds (fluorochloridon). The productivity differences were of 983 kg/ha and 1140 kg/ha compared to the hoed variant.

Table 6

The Effect of Herbicides on the Sunflower Crops Oil Amount – Average of 2010-2012

Nr. crt.	Variant	Dose l/ha	Age of application	Prod kg/ha	Dif+ semn
1	without hoeing	-	-	1540	-1663 ^{ooo}
2	manually hoed twice	-	-	2823	-380 ^o
3	mechanically hoed twice	-	-	1850	-1353 ^{ooo}
4	manually hoed twice + mechanically hoed twice	-	-	3203	Mt
5	Acetoclor 900 g/l	2	preem	2757	-446 ^o
6	Dimetenamid 720 g/l	1	preem	2630	-573 ^o
7	Pentoxamid 600 g/l	3	preem	2430	-773 ^o
8	s-metolaclor 960 g/l	1,5	preem	2887	-316 ^o
9	Acetoclor 900 g/l +oxiflurfen 480g/l	2+0,5	preem	3050	-153
10	Fluazifop-p-butil 150 g/l	1	postem	2220	-983 ^{ooo}
11	Fluorocloridan 230 g/l	2	preem	2063	-1140 ^{ooo}

DL 5% =304; DL 1%=580; DL 0,1%=824

CONCLUSIONS

The variant which used the Regal and Goal herbicides had similar results to the one that was manually hoed twice and mechanically hoed twice. All of the other variants displayed lesser amounts (7.6-11.6g). Herbicides offered values of hectolitric mass similar to the ones of the hoed variant. All of the variants treated with herbicides displayed roughly the same amount of hulls (26-27%). All of the variants that were treated with herbicides displayed superior results of hollow seeds compared to the hoed ones (>2.4-4.9%). The lowest amounts of sunflower oil were obtained from the variants which were treated with herbicides.

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