THE INFLUENCE OF SOME HERBICIDES ON WEED DEGREE DECREASING AND THE INFLUENCE ON MAIZE YIELD IN THE NORTH - WESTERN PART OF ROMANIA

INFLUENȚA UNOR ERBICIDE ASUPRA REDUCERII GRADULUI DE ÎMBURUIENARE ŞI INFLUENȚA ACESTORA ASUPRA PRODUCȚIEI DE PORUMB ÎN PARTEA DE NORD-VEST A ROMÂNIEI

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***Abstract**: In the control technology, the appropriation of combined herbicides having fundamentally Atrazin will be replaced with herbicides having fundamentally Terbutilazin which have a similar efficiency in annual weeds (91 – 93%), but without any remanence for environmental and for next cultures. For annual and perennial weeds control the alternative control methods are based on utilization of some associate treatments (preemergents or ppi) (Metaclor, Acetoclor, Dimetenamid) with those post-emergent (Mesotrine,Prosulfuron, Primsulfuron/prosulfuron) as well as application of herbicides only post-emergent (Rimsulfuron/Dicamba, Mesotrine + Nicosulfuron). The exclusive post-emergent application follows after choosing the strategy depending on the weeds infestation.*

***Rezumat:** În tehnologia de combatere a buruienilor, utilizarea erbicidelor combinate pe bază de Atrazin vor fi înlocuite cu erbicide pe bază de terbutilazin a căror eficacitate în combaterea buruienilor anuale este similară (91 – 93%), fără remanență pentru mediul ambiant şi culturile postmergătoare. Pentru combaterea buruienilor anuale şi perene, alternativele de combatere sunt bazate pe utilizarea tratamentelor asociate (preemergente sau ppi) (Metaclor, Acetoclor, Dimetenamid) cu cele postemergente (Mesotrine, Prosulfuron, Primsulfuron/prosulfuron), precum şi aplicarea erbicidelor numai în postemergență (Rimsulfuron/Dicamba, Mesotrine + Nicosulfuron). Aplicarea erbicidelor numai în postemergență oferă posibilitatea de a alege strategia în funcție de infestarea cu buruieni.*

***Key words**: maize, dominant weeds, chemical control, preemergent herbicides, postemergent herbicides, efficacy, environmental protection.*
***Cuvinte cheie**: porumb, buruieni dominante, combatere chimică, erbicide preemergente, erbicide postemergente, eficacitate, protecția mediului.*

INTRODUCTION

In Romania more than 60 percent from cultivated area with maize (specially in south – east, south and western country) present a dominant infestation with monocotyledonous and perennial weeds species (*Echinochloa, Setaria, Digitaria, Elymus, Sorghum*) as well extremely dangerous dicotyledonous (*Amaranthus, Chenopodium, Cirsium*, etc).

The research effectuated in Romania (SARPE N. 1995, POPESCU et al 1999) and in same time in very numerous maize cultivating countries (LIDIJA STEFANOVIC et al 1999, BECKIE H.G. 2001) demonstrate that biological potential yield of actual existing hybrids is possible to be achieved only in conditions of cultivating plants using protection against weeds from rise to physiological maturation.

The impossibility of atrazin utilization because of the new European lows, after 31 of December 2007, oblige to find new alternatives instead of this herbicide, well known as having the best selectivity and in the same time the larger control spectrum of annual weeds. The alternative is terbutilazine utilization which does not have remnant effect for follower crop and

efficacy is higher.

The scope of the present paper is evaluation of chemical alternatives of weeds control and elaboration of new sustainable control strategies utilizing new and unpolluted herbicides.

MATERIAL AND METHOD

The experiences was organized at Agricultural Research and Development Station Oradea in 2005 – 2007 period, on the preluvosoil with a humus content 2.32%, pH (H_2O) 5.5 and clay content at 32.55%.

The set up method of variants was randomized blocks with 25 m^2 size plots in 4 replications, including a control plot with classical tillage (3 cultivations) and a second control plot without cultivation. After chemical treatment was made observations and was noted by EWRS scale regarding selectivity (mark 1 – without fitotoxicity, mark 9 > 85% destroyed plants) and efficacy (mark 1 – efficacy > 90%, mark 9 – without efficacy) of herbicides.

The precipitations sum from research period was between 375.5 – 424.8 mm, and the precipitations in 20 days after treatments were ranged between 40.4 mm and 48.8 mm determining a good efficacy of applied herbicides (Table 1).

Utilized herbicides on presented in table 2.

Table 1

The sum of precipitation (mm) in vegetation period, Oradea 2005 – 2007

Year/ Mounts	April	May	June	July	August	September	Total	Sum of precipitation in 20 days after treatments
2005	62.8	57.8	54.6	75.6	131.2	42.8	424.8	48.0
2006	90.1	79.8	77.2	28.8	139.1	5.0	420.0	48.8
2007	3.2	80.6	50.5	67.6	82.4	91.2	375.5	40.4

Table 2

Utilized herbicides in 2005 – 2007 period

Active ingredient	Commercial name	Rate / ha
1. Acetoclor 360g/l + Atrazin 180 g/l	Guardian extra	4.0
2. S – metolaclor 400g/l + Atrazin 320g/l	Primextra Gold	2.5
3. Isoxaflutol 50g/l + Atrazin 500g/l	Merlin Mix	2.0
4. Pendimetalin 300g/l + Atrazin 200 g/l	Tazastomp	4.0
5. S – metolaclor 312,5 g/l + Terbutilazin 187,5 g/l	Gardoprim plus Gold	4.0
6. Isoxaflutol 37,5 g/l + Terbutilazin 375 g/l	Merlin Duo	2.5
7. S - metalaclor	Dual Gold	1.25
8. Terbutilazin 50%	Terbutilazină	3.0
9. Mesotrim 480 SC	Callisto	0.250
10. Acetoclor 768 g/l + Diclorid 128 g/l	Trophy	
11. Acetoclor 900 g/l	Challenger	
12. Prosulfuron	Peak 75%	
13. Dimetenamid 900 g/l	Frontier	1.7
14. Bentazon 300 g/l + Dicamba 90 g/l	Cambio	2.5
15. Rimsulfuron 3,26 % + Dicamba 60,87 %	Titus plus	0.307
16. Nicosulfuron 40 g/l	Mistral 4 SC	1.0

RESULTS AND DISCUSSION

The floristically composition of control (untreated variant) show the presents of 26 major weed species in maize, from all of these 8 weed species was registered in more than 17 years. The bigger percentage value (60.4%) was registered in the case of annual monocotyledonous. (Table 3)

Table 3

The quantity of weeds from maize crop in untreated variant, Oradea 1990 – 2007

Specification	Quantity dry weight	
	kg/ha	%
Total weeds	6960	100
Annual monocotyledonous	4210	60.4
Annual dicotyledonous	2360	33.9
Perennial dicotyledonous	360	5.6

The treatments with new combined herbicides by synthesis based terbutilazin respectively S – metolaclor/terbutilazin, Isoxaflutol/terbutilazin have efficacy higher then 90% in control of annual species mono and dicotyledonous (Echinochloa, Setaria, Amaranthus, Chenopodium, Polygonum, Galinsoga), similar efficacy with combined herbicides based on atrazin (S-metolaclor/atrazin, Isoxaflutol/atrazin, Pendimetalin/atrazin) which can be controlled be vegetation treatments with the specific herbicides. (Table 4).

Table 4

Selectivity, efficacy and maize grain fields treated with various herbicides provided the rates and application timing, Oradea 2005 – 2007

	Rates kg a.i./ ha	Time of application	Weed control %	Yield	
				kg/ha	%
1. Control I 3 hoeing	-	-	98	7930	100
2. Control II not hoed	-	-	0	2530	32
3. Acetoclor/atrazin	2.7	preem.	88	6980	88
4. S – metolaclor/atrazin	1.8	preem.	87	6900	87
5. Isoxaflutol/atrazin	0.96	preem.	90	6990	88
6. Pendimetalin/atrazin	2.0	preem.	90	7060	89
7. S metolaclor/terbutilazin	2.0	preem.	90	7100	90
8. S metolaclor + terbutilazin	1.2 + 1.5	preem.	89	7080	89
9. Isoxaflutol/trebutilazin	1.03	preem.	91	7100	90

LSD 5% = 358 kg/ha; LSD 1% = 474 kg/ha; LSD 0.1% = 613 kg/ha

The kernel yields obtained are in correlation with herbicides efficacy being superior significant in comparison with untreated variant and represent 87 – 90% from yield level of classically tilled plot with 3 cultivations.

The herbicides terbutilazin is utilized in associated treatments as well with graminicide herbicides (S-Metolaclor) with similar efficacy like in the case of synthesis combined herbicides.

The promotion of herbicides having like base terbutilazin solves the problem of soil and ground water pollution with atrazin.

The future strategies is graminicide herbicides utilization at seeding followed be the postemergent second treatment (maize have 4 – 6 leaves and the dicotyledonous weeds 2 – 4 leaves) or only in postemergent with associated or combined herbicides (by synthesis).

The herbicides Metolaclor, Acetoclor, Dimetenamid, Acetoclor/dichloride, pre-emergent applied, followed by the postemergent second treatment with dicotyledonous herbicides assure an annual and perennial weeds control higher than 90% (92 – 93%). (Table 5)

The herbicides application (combined and associated) only in post-emergent, may be for future a good alternative with a lot of advantages: the selection of herbicides in function of floristically composition existing; the establishing of herbicides rate in function of infestation degree; using of some herbicides in lower rates (Titus plus 307 g/ha). The control degree even in too case, of annual and perennial weeds mono and dicotyledonous is above 92 – 93%.

Table 5

Efficacy of different strategies in controlling annual and perennial weeds in maize average, Oradea 2005 – 2007

Strategy and herbicides	Rate kg/ a.i./ha	Time of application	Weed control %	Yield	
				Kg/ha	%
1. Control I – 3 haeings	-	-	98	7670	100
2. Control II not haet	-	-	0	2140	28
3. Metolaclor + Primsulfuron/prosulfuron + Adj	1.4 + 0.02 0.2	pree. postem	92	6750	88
4. Metolaclor + Mesotrim	1.25 + 0.12	preem./ postem	93	6900	90
5. Acetoclor/diclorid + Acid 2.4 –D/ dicamba	1.79 + 0.38	preem./ postem.	93	6980	91
6. Acetoclor + Prosulfuron	1.08 + 0.015	preem./ postem.	92	6900	90
6. Acetoclor + Prosulfuron	1.08 + 0.015	preem./ postem.	93	6830	89
8. Dimetenamid + Bentazon/dicamba	1.08 + 0.82	preem./postem.	93	7060	92
9. Rimsulfuron /dicamba + Trend	0.197 + 0.1%	postem.	92	6910	90
10. Mesotrine + Nicosulfuron + Atplus	0.12 + 0.3+ 0.5%	postem.	93	6900	90

LSD 1% = 406 kg/ha; LSD 5% = 538 kg/ha; LSD 0.1% = 696 kg/ha

Pre-emergent application of herbicides against monocotyledonous followed by a second post emergent treatment (maize at 4 – 6 leaves and dicotyledonous weeds at 2-4 leaves) achieved a efficacy ranging between 88 – 92% correlated with herbicide type and applied rate.

CONCLUSIONS

The floristic composition in maize crops is very various, predominating annual monocotyledonous weeds (Echinocloa and Setaria), in participation with 60.4%;

In weeds control technology pre-emerging utilization of herbicides based on atrazin (Guardin extra, Primextra Gold, Merlin Mix, Tazastomp), will be replaced with combined herbicides based on terbutilazin (Gardoprim Plus Gold, Merlin Duo, etc) witch have a similar efficacy (90 – 91%) with herbicides based on atrazin;

A good alternative weed control in perspective will be associated graminicides pre-emergent herbicides (Dual Gold, Trophy, Challanger, etc) and as well dicotyledonous post-emergence herbicides (Callisto, Peak, Cambio, Ring 80, Oltisan M, etc) witch assure an efficient control of annual and perennial weeds;

The newest weeds control directions with a lot of advantages are treatments utilization only in vegetation period with combined herbicides or associated herbicides (Titus plus, Mistral + Callisto, etc) with higher efficacy and with rates and herbicides types in function of floristically composition and weed existing degree.

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