

Control of *Cirsium* and *Xanthium* in sunflower hybrids resistant to the herbicide Express 50 SX

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ABSTRACT

Field research was carried out in four locations and during two years to study the selectivity and efficiency of the herbicide Express 50 SX applied in post-emergence to sunflower hybrids resistant to sulfonylurea herbicides.

Key words: dicots – herbicide – post-emergence – sulfonylurea – sunflower –weeds.

INTRODUCTION

Sunflower is one of the most important crops, strongly competed for by weeds from the first vegetation stages, especially in spring with low temperatures, which lead to slight growth of plants (Jonson, 1971). The sowing time is also of a special importance for early weed species, which could influence, at a high infestation, the yield level (Vannozzi et al., 1990).

On sunflower, several herbicides were first developed to be applied before and after sowing (trifluraline, linuron, metobromuron) for the control of annual weeds (Monotti, 1980). Afterward, attention was given to the association of herbicides such as trifluralin, alachloro, metolachloride, pendimethaline, linuron, prometrin, fluoroachloridone, oxifluorfen (Lauretti, 1985; Tei et al., 1991; Millet et al., 1992). The research results have shown that a high efficiency in sunflower weed control is achieved by the association of chemical and mechanical treatments (Pintilie, 1986; Sarpe, 1987). In Romania (1970-1992), sunflower weed control was only partially solved because most dominant weeds (*Xanthium*, *Cirsium*, *Abutilon*, *Datura*) were not controlled by any herbicide. This problem was solved by the development by the Pioneer company, in collaboration with Cyanamid researchers (after 1990), of the first “genetically unmodified” sunflower hybrids “IR”, resistant to imidazolinone systemic herbicides, with effect in resistant dicots control: *Xanthium*, *Abutilon* and, partially *Cirsium*. This research performed world-wide after 2000 contributed to the development of the first “genetically unmodified” hybrids, resistant to tribenuron (Express 50 SX) of great importance under Romania conditions, due to the efficiency of Express 50 SX herbicide in post-emergence application, to control “problem” weeds: *Xanthium*, *Cirsium*, *Abutilon*.

The main aim of the research performed in Romania was to establish the optimum strategy to control mono- and dicots (including *Xanthium*, *Cirsium*) in sunflower crop with hybrids resistant to sulfonylurea (Express 50 SX).

MATERIALS AND METHODS

The experiments were performed during 2004-2005, at NARDI Fundulea, ARDS Lovrin, Oradea and Teleorman, with various weed infestations depending on the pedoclimatic conditions. The experiments were organized as randomized blocks, with plot area of 25 m², in four repetitions. Each plot was sown with 4 rows, with distance between rows of 70 cm. The cultivated hybrid was XF 4419, belonging to the Du Pont company. In the experiment plots, the herbicides mentioned in Table 1 were applied in post-emergence (sunflower: 4-6 leaves and 6-8 leaves stages), Also, the “split application” was employed (sunflower, 2-3 leaves and 6-8 leaves at re-infestation). For herbicide treatment, 250-400 l water/ha were used.

RESULTS AND DISCUSSION

The paper presents the results obtained during 2004-2005 at the research stations Lovrin, Teleorman, Oradea and NARDI Fundulea, placed under various climatic conditions, especially with a highly diversified infestation degree, weed spectrum and dominance. On average, the experiments presented strong infestations (80-95%) with annual and perennial mono- and dicots, with dicots prevalence (65%).

Table 1. Experimental details

Year	No.	Treatment	Rate a.i g/ha	Time of application	Content a.i g/l	Company
2004	1.	Untreated	-	-	-	-
	2.	DPX ₇₅ WG+Trend**	15 + 0.1%	Postem (4-6 lves)	75% tribenuron+Adj.	Du Pont
	3.	DPX ₇₅ WG+Trend**	15+ 0.1%	Postem (6-8 lves)	75% tribenuron+Adj.	
	4.	DPX ₇₅ WG+Trend** + DPX ₇₅ WG+Trend	7.5+0.1%+ 7.5+0.1%	EPO (2-3 lves) +Reinf.(6-8 lves)	75% tribenuron+Adj.	
	5.	DPX ₇₅ WG+Trend + Reset	15 + 0,1% + 37,5	Postem (4-6 lves)	75% tribenuron+Adj. + 50 g/l quizalofop P-etil	
	6.	Raft 400* (standard)	600	Postem (4-6 lves)	400 g/l oxidiargil	Bayer
2005	1.	Untreated	-	-	-	-
	2.	Raft 400 (standard)*	600	Postem (4-6 lves)	400g/l oxidiargil	Bayer
	3.	Express 50 SX**	15	Postem (4-6 lves)	50% tribenuron	Du Pont
	4.	Express 50 SX+ Trend**	15 + 0,1%	Postem (4-6 lves)	50% tribenuron + Adj.	Du Pont
	5.	Express 50 SX+Trend+ Fusilade s.	15 + 0,1% + 187	Postem (4-6 lves)	50% tribenuron + Adj.+ 125g/l fluazifop	Du Pont, Syngenta
	6.	Express 50 SX**	15	Postem (6-8 lves)	50 % tribenuron	Du Pont
	7.	Express 50 SX + Trend**	15 + 0,1%	Postem (6-8 lves)	50 % tribenuron + Adj.	Du Pont
	8.	Express 50 SX+ Trend+ Fusilade s.	15 + 0,1% + 187	Postem (6-8 lves)	50 % tribenuron + Adj.+ 125g/l fluazifop	Du Pont , Syngenta

*Graminicide herbicide pre-emergently applied

**Graminicide herbicide post-emergently applied

As dominance, the most representative ones were: *Cirsium*, *Xanthium*, *Sinapis*, *Raphanus*, *Chenopodium*, *Amaranthus*, *Hibiscus*, *Polygonum persicaria*, *Anthemis*, *Convolvulus* and only 35% annual mono-: *Echinochloa*, *Setaria*. In 2005, at Fundulea, with an infestation level of 90%, mono-species were predominant (65%): *Sorghum* (seed and rhizomes), *Echinochloa*, *Setaria*, while the dicots (35%) had a lower level of infestation: *Amaranthus*, *Chenopodium*, *Xanthium*, *Sinapis*, *Cirsium*, *Convolvulus*.

During two years of research, with enough rainfall after treatment, (30,2-128,8 mm in 20 DAT) at the application of herbicides DPX 75 (20 g/ha) and Express 50 XS (30 g/ha) associated with adjuvant Trend (0.1%) at two stages (4-6 and 6-8 leaves stages), phytotoxic symptoms were not recorded, as compared to standard treatment which showed leaves necrosis (averaged EWRS quotation 2.1 in 2004 and 2.3 in 2005), as we noticed in Table 2.

In 2005, at Fundulea (Fig. 3) in the variants treated by Express 50 SX alone or in association -Trend, Fusilade -in optimum stage (sunflower 4-6 leaves), the dicots control (including *Cirsium*, *Xanthium*) was higher (90-98% in 14-28 DAT) than 2004 due to lower dicots infestation (35%). In late application (sunflower 6-8 leaves) of the Express 50 SX herbicide, it obtained a lower effect in dicots control (85-93%, in 14-28 DAT) compared to the treatments applied in optimum stage.

In 2004, at four stations (Fig. 1 and 2), at the application of the above mentioned herbicides to control dicots (especially the resistant ones: *Xanthium*, *Cirsium*), a superior efficiency (92-96%) was recorded as compared to standard variant (Raft 400) with control effect of 85-68% due to non control of resistant dicots (*Xanthium*, *Cirsium*). During the two experimentation years, the highest results in 14-28 DAT (92-96% -2004 and 96-97%, 2005), in dicots controlling (including the resistant ones: *Xanthium*, *Cirsium*) were recorded in the variants treated by DPX 75 WG (20 g/ha) or Express 50 SX (30 g/ha) + Adjuvant, applied in optimum stage for weeds and sunflower plants.

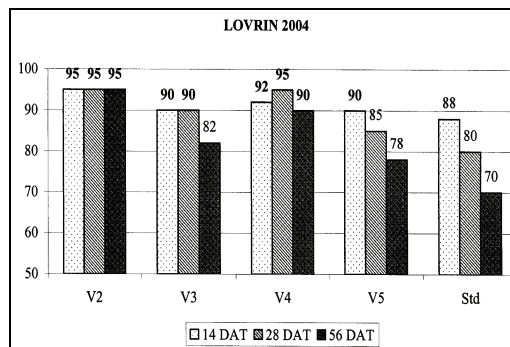
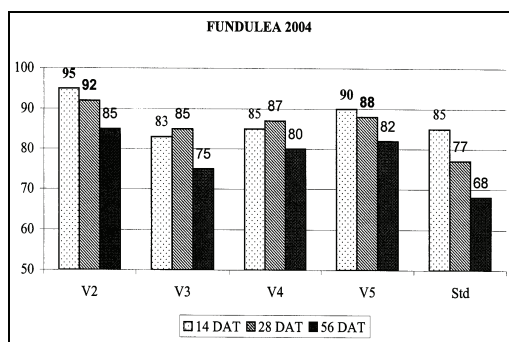
Table 2. The selectivity (EWRS quotation) of herbicides, postemergently applied, to control dicots in sunflower with hybrids resistant to Express 50 SX

Year	No	Variants	Rate a.i g/ha	Time of application	Selectivity (EWRS quotation) 2004				
					7 DAT	14 DAT	28 DAT	56 DAT	Mean
2004	V1	Untreated	-	-	1	1	1	1	1
	V2	DPX ₇₅ WG+Trend**	15 + 0.1%	Postem. (Sunfl., 4-6 lves)	1	1	1	1	1
	V3	DPX ₇₅ WG+Trend**	15 + 0.1%	Postem. (Sunfl., 6-8 lves)	1	1	1	1	1
	V4	DPX ₇₅ WG+Trend** + DPX ₇₅ WG+Trend	7.5 + 0.1%+ 7.5 + 0.1%	EPO (2-3 lves) Reinf. (6-8 lves)	1	1	1	1	1
	V5	DPX ₇₅ WG+Trend + Reset	15 + 0.1%+ 37.5	Postem. (Sunfl., 4-6 lves)	1	1	1	1	1
	V6	Raft 400* (standard)	600	Postem. (Sunfl., 4-6 lves)	3	2 ⁵	1 ⁵	1	2 ¹
2005	V1	Untreated	-	-	1	1	1	1	1
	V2	Raft 400* (standard)	600	Postem. (Sunfl., 4-6 lves)	3 ⁵	2 ⁷	1 ⁸	1	2 ³
	V3	Express 50 SX**	15	Postem. (Sunfl., 4-6 lves)	1	1	1	1	1
	V4	Express 50 SX + Trend**	15 + 0.1%	Postem. (Sunfl., 4-6 lves)	1	1	1	1	1
	V5	Express 50 SXTrend + Fusilade	15+ 0.1%+187	Postem. (Sunfl., 4-6 lves)	1	1	1	1	1
	V6	Express 50 SX**	15	Postem. (Sunfl., 6-8 lves)	1	1	1	1	1
	V7	Express 50 SX + Trend**	15+ 0.1%	Postem. (Sunfl., 6-8 lves)	1	1	1	1	1
	V8	Express 50 SX + Trend + Fusilade	15+ 0.1+187	Postem. (Sunfl., 6-8 lves)	1	1	1	1	1

* Graminicide herbicide pre-emergently applied

** Graminicide herbicide post-emergently applied

Also, the best effect, 85-95% (2004) and 90-98% (2005) to control annual and perennial mono- and dicots was achieved in “tank mix” variant, using DPX 75, Express + Trend + graminicide (Reset or Fusilade), applied post-emergence, in optimum time (sunflower 4-6 leaves), being superior to standard treatment efficiency. The results show that the high efficiency to control mono- and dicots (especially the resistant ones) is directly correlated with rainfall before treatment, infestation degree, weed spectrum and prevalence as well as weed stage at treatment application.



Infest. degree 85%
M/D 40/60
(Dp 35)
Weeds:

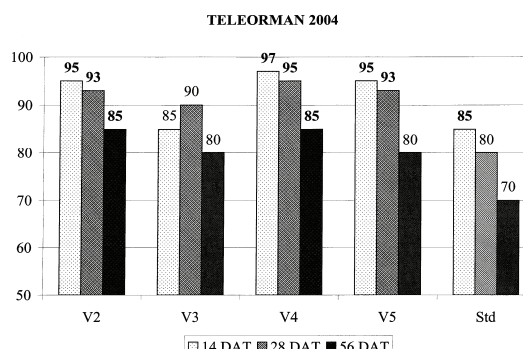
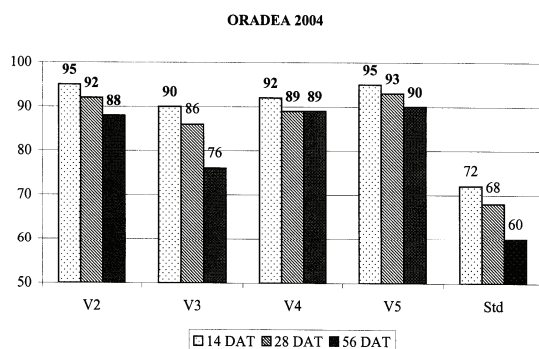
CIRAR	ANTAR
GALAP	PAPRH
XANST	ECHCG
AMARE	SETSP

Infest. degree 90%
(D/P 35/65)

Weeds:

SINAR	POLPE
CIRAR	CHEAL
CONAR	ECHCG
HIBTR	SETGL

Fig. 1. Efficiency (%) of herbicides, postemergently applied, to control dicots in sunflower with hybrids resistant to Express 50 SX in Fundulea and Lovrin in 2004.



Infest degree -90%
M/D 20/80
Weeds:

XANST	POLSP
CIRAR	ANTAR
RAPRA	AMARE
CHEAL	ECHCG

Infest degree -90%
(M/D 35/65)
Weeds:

SOLNI	HIBTR
SINAR	AMARE
CIRAR	XANST
VIOAR	CONARCONAR
CHEAL	ECHCG

Fig. 2. Efficiency (%) of herbicides, postemergently applied, to control dicots in sunflower with hybrids resistant to Express 50 SX in Oradea and Teleorman in 2004.

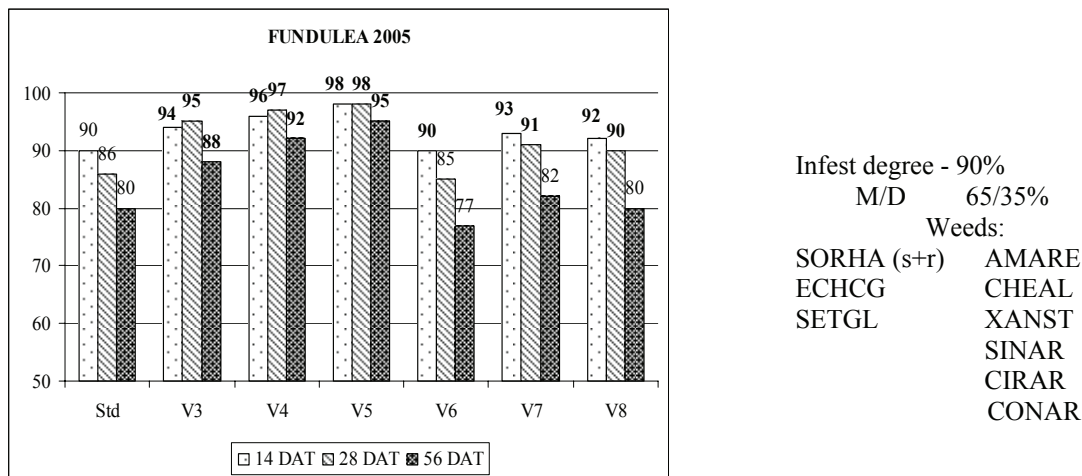


Fig. 3. Efficiency (%) of herbicides, postemergently applied, to control dicots in sunflower with hybrids resistant to Express 50 SX

CONCLUSIONS

1. Herbicides DPX 75 and Express 50 SX, applied post-emergence (in both stages – 4-6 and 6-8 leaves) presented a very good selectivity (EWSR quotation =1) for sunflower “resistant” hybrids (XF 4419).
2. The selectivity degree recorded in variants treated with the above mentioned herbicides was superior (EWSR quotation=1) to classical treatment with herbicide based on oxydiargil (EWSR quotation=2¹-2³).
3. Superior effect (over 90% in 14-28 DAT) was achieved in dicots control (including *Xanthium*, *Cirsium*) by post-emergence application of herbicides DPX 75, Express 50 SX + adj., at rate of 15 g. a.i./ha, sunflower 4-6 leaves stage.
4. The tested herbicide (in wet conditions) could be applied in association with herbicide based on fluzifop p-butyl (in wet conditions), to control mono- and dicots, in “resistant” sunflower.
5. The application of herbicide based on tribenuron (single or with adjuvant), in late stage (sunflower 6-8 leaves) registers a diminution in its control of dicots (below 90%), especially on resistant species (*Xanthium*, *Chenopodium*, *Cirsium*), a re-growth taking place after treatment as compared to herbicides applied in optimum stage (sunflower 4-6 leaves; dicots 2-4 leaves).
6. The results obtained regarding the selectivity and efficiency to control dicots, at application of sulfonylurea systemic herbicides were superior to standard treatment – with contact herbicides (based on oxydiargil), which had no effect on “hard to control” species (*Xanthium*, *Cirsium*).
7. The establishment of an optimum strategy to control weeds in “resistant” sunflower was performed depending on climate conditions (before and after treatment), infestation level, weed prevalence and their development stage at the moment of application.

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