

RESEARCH ON THE TOLERANCE OF SUNFLOWER HYBRIDS TO THE HERBICIDES CHALLENGE 600 SC AND VIBALLA

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Abstract

In order to deal with the weeding specific to the area, we have located at the Livada Research and Development Station a technological experience in sunflower culture. The major objective of this research was the tolerance of Clearfield, Express SUN and Conventional sunflower hybrids to Challenge 600 SC and Viballa herbicides in the pedoclimatic conditions of Livada, Satu Mare county, and implicitly the effectiveness of treatments with the aforementioned herbicides. The reserve of weeds on the soil types from the "luvosol albic" orchard being much higher as a result of the preservation of the seeds in the soil for a longer period of time determines a high level of weeding compared to which the herbicide Challenge 600 SC (aclonifen 600g/l) 4l/ha pre-emergence applied to the sunflower crop, regardless of the type of hybrid, proved to be effective and selective throughout the vegetation period. The effectiveness of the new herbicides was determined by the climatic conditions and the floristic composition of the weeds.

Key words: sunflower, herbicide, tolerance, efficacy

INTRODUCTION

Originally from the western part of North America, the sunflower is one of the most valuable oil plants cultivated on the globe and the most important oil plant in our country (Muntean 2011).

The sunflower is very sensitive to weeding in the first part of the vegetation (a period of 30-40 days), until the stage of five pairs of leaves, when it still does not cover the ground well (after this phase, the sunflower plants, due to the fast pace of growth, shade the soil and manage to suppress weeds) (Muntean 2011).

Chemical control is the only effective method of preventing weed competition in the early stages of sunflower plant growth (Berca 2004).

Numerous have been carried out in our country and abroad, testing most of the herbicides synthesized worldwide, in order to develop chemical combat strategies (Barnaveta 2003).

MATERIALS AND METHODS

The research was carried out in the pedoclimatic conditions at SCDA Livada, Satu Mare county during the year 2023, on an albic luvisol with a pH of 5.1, a clay content of 20.9% and a humus content of 1.8 (Alexandrescu 2019).

The experience was located according to the method of subdivided plots, including factor A – sunflower hybrids with three gradations (a1 – conventional, a2 - clearfield and a3 - express) and factor B –

chemical treatment with three gradations (Mondici 2019).

The main factor in this experience was the use of the herbicides Challenge 600 SC and Viballa, and their tolerance on the three sunflower hybrids.

To achieve this objective, the herbicide Challenge 600 SC was applied to each type of flower (conventional, clearfield

and express) in a dose of 4l/ha associated with the herbicide Dual Gold 1.5l/ha, applied pre-emergence, while the herbicide Viballa was applied to the same hybrids in a dose of 1l/ha associated with Leopard 1.5l/ha applied post-emergence (Mondici et. all, 2016).

The herbicide application schedule is presented in table 1.

Table1. Herbicides applied to the sunflower crop 2023

Nr. Var	HERBICIDES	Dose l,kg/ha	Active substance
1	Untreated	-	-
2	Challenge 600 SC+ Dual Gold	4+1,5	aclonifen 600g/l + S-metolacior 960g/l
3	Viballa+ Leopard 5EC	1+1,5	halauxifen-metil + quizalofop-P-etil 50 g/l

Average annual temperatures vary between 8°C – 11.6°C. The sum of useful temperatures (>10°C) in the lowland area oscillates between 1200 and 1450°C.

The average multiannual temperature recorded at the Livada station in the last 60 years is 9.9°C. At Livada, the multiannual precipitation average over 60 years reaches

751.4 mm with an uneven and capricious distribution during the growing season.

The climatic conditions during the vegetation period of the sunflower crop in 2023 recorded at the Livada Agricultural Development Research Station are presented in table 2.

Table 2. Annual and multiannual temperatures (°C) and precipitation (mm) recorded at SCDA Livada

Factor	Ian.	Febr.	Mart.	Apr.	Mai.	Iuni.	Iuli.	Aug.	Sept.
rainfall mm	2023								
Dec I	24,1	18,5	4,0	20,4	6,3	33,8	4,0	16,5	3,1
Dec II	28,1	33,2	14,7	9,8	10,9	25,3	25,5	0,0	12,1
Dec III	16,9	14,3	27,1	43,1	2,5	11,1	32,7	27,4	25,0
Monthly amounts	69,1	66,0	45,8	73,3	19,7	70,2	62,2	43,9	40,2
Multi-year averages	49,0	43,9	45,7	50,5	76,4	91,1	81,1	74,8	66,4
Deviations ±	20,1	22,1	0,1	22,8	-56,7	-20,9	-18,9	-30,9	-26,2
Temperature °C	2023								
Dec I	6,7	-2,0	5,4	6,4	14,4	19,2	22,2	21,6	19,6
Dec II	5,8	2,1	5,9	11,6	15,2	18,5	23,0	23,3	20,7
Dec III	1,9	4,5	7,9	10,9	19,4	21,3	21,5	24,0	19,8
Monthly averages	4,8	1,5	6,4	9,6	16,3	19,7	22,2	23,0	20,0
Multi-year averages	-2,1	0,1	4,7	10,5	15,8	19,0	20,5	19,9	15,4
Deviations ±	2,7	1,4	1,7	-0,9	0,5	0,7	1,7	3,1	4,6

RESULTS AND DISCUSSIONS

The spectrum of weeds existing in the untreated control are shown in figure 1. As

can be seen, the dominant ones were: Chenopodium album, Eriochloa villosa, Setaria viridis.

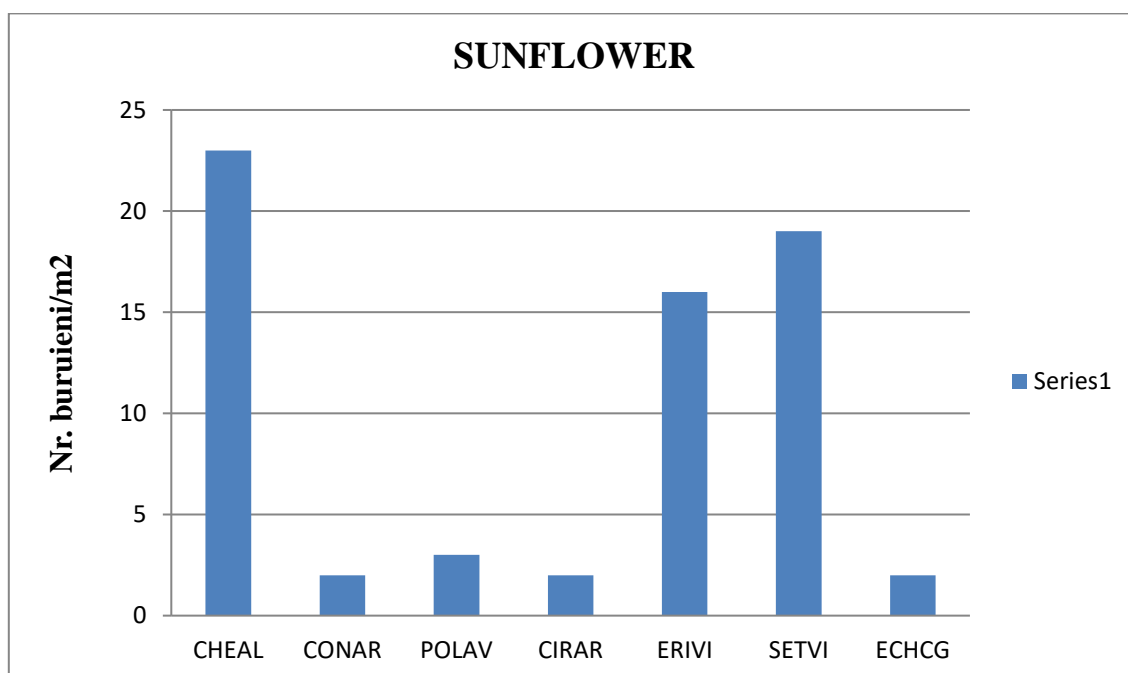


Figure 1. Dominant weed species existing in the non-herbicated variant in the 2023 sunflower crop

Table 3. Observations on the behavior of sunflower plants when herbicided with Challenge 600 SC and Viballa

No.	Herbicides	Dose l,kg/ha	Application period	Status of the culture after treatment		
				3 days	7 days	14 days
1	Untreated	-	-	-	-	-
2	Challenge 600 SC+ Dual Gold	4+1,5	preem	-	-	Normal
3	Viballa+ Leopard 5EC	1+1,5	post	Umbrella effect	Normal	Normal

After the application of herbicides, observations were made at 3, 7, 14 days regarding the tolerance of sunflower hybrids. It should be noted that after the application of Viballa herbicide, the sunflower plants, regardless of their type, received the appearance of an umbrella, returning to normal after 7 days of application.

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During the vegetation period, ratings were made according to the EWRS scale regarding the selectivity and effectiveness of the herbicides (Table 4).

Analysing the selectivity of the tested herbicides, it is highlighted that some phytotoxic phenomena (umbrella effect) for sunflower plants were recorded in the treatments with Viballa 1l/ha, a reversible phenomenon that did not affect production. The results regarding the effectiveness of the herbicides highlight the fact that monocotyledonous and dicotyledonous weeds were combated in a proportion of 88-94% in the variants treated with Challenge 600 SC 4l/ha + Dual Gold 1.5l/ha, applied pre-emergence, both to conventional hybrids and to Clearfield and Express respectively. Vegetation treatments ensure

a 71-81% lower control, due to the species *Chenopodium album*, not controlled by Viballa herbicide (Table 4).

Table 4 Selectivity and efficacy of Challenge 600 SC and Viballa herbicide treatments to the 2023 sunflower crop

Hybrids	Treatments	Dose l,kg/ha	Application period	SelectivityNote EWRS	Effectiveness %
Conventional	Untreated	-	-	-	-
	Challenge 600 SC+ Dual Gold	4+1,5	preem	1	88
	Viballa+ Leopard 5EC	1+1,5	post	1	73
Clearfield	Netratat	-	-	-	-
	Challenge 600 SC+ Dual Gold	4+1,5	preem	1	91
	Viballa+ Leopard 5EC	1+1,5	post	1	81
Express	Netratat	-	-	-	-
	Challenge 600 SC+ Dual Gold	4+1,5	preem	1	94
	Viballa+ Leopard 5EC	1+1,5	post	1	71

Analyzing the influence of sunflower hybrids on production, it is noted that regardless of the studied hybrid, no

statistically guaranteed difference in production was obtained (Table 5).

Table 5 Influence of sunflower hybrids on production

Factor A	Production q/ha	The difference +/- q/ha	The meaning
Convențional	24,37	-	-
Clearfield	25,61	1,25	-
Express	27,84	3,47	-

DL 5% = 5,34q/ha; DL 1% = 8,83q/ha; DL 0,1% = 16,53q/ha;

Regarding the influence of herbicide treatments on production, regardless of the type of sunflower hybrid, it can be seen from the data presented in table 6 that by applying any herbicide, very significantly

positive production differences are achieved compared to the level of the untreated control of 9.42q/ha.

Table 6 The influence of herbicide treatments on sunflower production regardless of hybrid type

Factor B	Dose l,kg/ha	Production q/ha	The difference +/- q/ha	The meaning
Untreated	-	9,42	-	-
Challenge 600 SC+ Dual Gold	4+1,5	37,55	28,13	xxx
Viballa+ Leopard 5EC	1+1,5	30,85	21,43	xxx

DL 5% = 4,62q/ha; DL 1% = 6,48q/ha; DL 0,1% = 9,15q/ha;

Table 7 Influența interacțiunii factorilor asupra producției de floarea soarelui

Application period	Treatments	Dose l,kg/ha	Production q/ha	The difference +/- q/ha	The meaning
Convențional	Untreated	-	9,42	-	-
	Challenge 600 SC+ Dual Gold	4+1,5	34,19	24,77	xxx
	Viballa+ Leopard 5EC	1+1,5	29,52	20,10	xx
Clearfield	Untreated	-	9,42	-	-
	Challenge 600 SC+ Dual Gold	4+1,5	35,80	26,39	xxx
	Viballa+ Leopard 5EC	1+1,5	31,61	22,20	xx
Express	Untreated	-	9,42	-	-
	Challenge 600 SC+ Dual Gold	4+1,5	42,66	33,24	xxx
	Viballa+ Leopard 5EC	1+1,5	31,43	22,01	xx

DL 5% = 8,45q/ha; DL 1% = 13,25 q/ha; DL 0,1% = 22,55 q/ha;

Through the interaction of the sunflower hybrids and the chemical treatment, a very significant positive difference in production is achieved in the variant treated with Challenge 600 SC 4l/ha associated with the herbicide Dual Gold 1.5l/ha, applied pre-emergence, variants in which were obtained

productions of 34.19 q/ha, 35.80 q/ha and 42.66q/ha respectively. Regarding the untreated variant, distinctly significant positive differences in production are ensured by the variant treated with Viballa 1l/ha associated with Leopard 1.5l/ha applied post-emergence (Table 7).



Figure 1. Images from the experimental field S.C.D.A. Livada

CONCLUSIONS

Challenge 600 SC and Viballa herbicides, applied pre-emergence and post-emergence, showed very good selectivity for cultivated sunflower hybrids (Conventional, Clearfield and Express).

After the application of the Viballa herbicide, the sunflower plants, regardless of their type, showed the appearance of an umbrella, returning to normal after 7 days of application.

The herbicide Challenge 600 SC 4l/ha + Dual Gold 1.5l/ha applied pre-emergence achieved a very good effectiveness (88-94%) in combating monocots and dicots, but the herbicide Viballa 1l/ha + Leopard 1.5l/ha applied post-emergence achieved a satisfactory effect (71-81%) thanks to the CHEAL species, the species not being controlled by Viballa herbicide.

Regarding the influence of hybrids on production, it is noted that no statistically guaranteed production differences were obtained.

Through the analysis of factor B (herbicides) it is found that very significantly positive production differences were achieved, compared to the control, regardless of the treated variant.

Statistically assured production differences compared to the untreated at a very significant positive level are achieved in the interaction Challenge 4l/ha + Dual Gold 1.5l/ha and the sunflower hybrid both Conventional and Clearfield respectively Express, and through the interaction Viballa 1l/ha + Leopard 1.5l/ha and the hybrid (Conventional, Clearfield and Express) the difference was distinctly significantly positive.

Regardless of the herbicides applied both pre-emergence and post-emergence, each sunflower hybrid sown had a good tolerance to the herbicides applied.

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