THE WEED CONTROL IN SUNFLOWER CROPS UNDER PEDOCLIMATIC CONDITIONS FROM FUNDULEA

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Abstract

The sunflower is part of the order Compositales (Asterales), the family Compositae (Asteraceae), is native to Central and North America and spread throughout the globe, especially for its oil. It is a plant that is cultivated on large areas in our country, especially in Dobrogea, the Romanian Plain and the West.

The development and implementation of a complex of measures and methods for combating weeds in agricultural crops requires a thorough study of their lifestyle and behavior in different climatic conditions, due to the fact that weeds have different biological properties compared to the crop plant.

In the pedoclimatic conditions specific to the area at NARDI - Fundulea, the sunflower crop presents a high weeds infestation (75%), a weeds spectrum and a dominance specific to the area. In the experimental field, the sunflower crop had characteristic weed species, the most representative being: monocotyledonous- Setaria viridis, Echinochloa crus-galli, Sorghum halepense and annual dicotyledons – Amaranthus retroflexus,Chenopodium album and Polygonum convolvulus.The study and control of weeds is an important research direction, because they cause damage that can affect production by up to 35% - 70%. Effective weed management is one of the many critical components of sunflower production.

The purpose of the research was to identify weeds, crop selectivity and combat the weed species present by applying herbicide treatments, with the objective of broadening the spectrum of control, synergism, persistence and without negative impact on the environment.

The herbicide treatments must be correlated with the infestation degree of weeds, the spectrum and dominance of weeds, the time of application, the technical potential for efficacy, the local climatic conditions from Fundulea.of weeds, the time of application, the technical potential for efficacy, the local climatic conditions.

Key words: weeds, herbicides, time of application, selectivity and efficacy.

INTRODUCTION

The presence of weeds in field crops is a reality in all their cultivation areas.The damage caused by weeds can be diverse and often lead to a reduction in production, an increase in production costs, a deterioration in the quality of products, ideal hosts for pathogens and pests, etc. (*Mortensen et al., 2000; Roman and Lăzureanu, 2012*).

Weeds have the highest negative impact at around 37% compared to insects (18%), fungi and bacteria (16%) and viruses (2%) (Oerke, 2006). Weeds have the greatest negative impact, around 37%, compared to insects (18%), fungi and bacteria (16%) and viruses (2%) (*Oerke, 2006*).

Effective weed management is one of many critical components of successful wheat production.Severe weed infestations can essentially eliminate wheat production and/or crop efficiency while also creating weedy plant fragments, often reducing food and forage value.

In the field of weed control in field crops, the main objective is, permanently, to eliminate the competition of weeds below the level of the damage threshold throughout the vegetation period, in order to reduce the consumption of water and nutrients by them, so that in the future the plants culture to have a normal development, which will lead, in the end, to obtaining high productions/ha, qualitative and at the level of the biological potential of the cultivated varieties. (*Popescu 2007*)

Herbicide is one of the most valuable works in the entire complex of works performed in plant protection actions and constitutes the most expensive and demanding technological link (*Berca, 2004*).

In a modern agriculture, in the integrated management of weeds, the use of the chemical control method remains a very important link contributing to the increase of productions by reducing the competition of weeds (*Sharpe et al., 1975; Vlăduțu et al., 1988*). Although the nature of crop production varies greatly around the world, herbicides have become a primary tool for weed control in most areas. (*Peterson et al., 2017*). A global consumption of pesticides in Europe amounts to 318 active substances where the respective quantities are: herbicides – 48%, insecticides – 25%, fungicides – 20%, others – 3% and growth regulators – 2%. Moreover, among new pesticides, the use of herbicides increases to 59%, while that of fungicides and insecticides reaches 22% and 19%, respectively (Markovic et al., 2000).

Herbicides will remain in future agriculture an efficient tool for control of weeds as part of an integrated weed control. The application of herbicides requires only a quarter of the fuel used than one passage over the same surface with a row crop cultivator (*Hanna M., 2001 cited by Gianessi, L., 2013*)

The application of herbicide treatments in sunflower crops must be closely related to the degree of infestation, the spectrum and dominance of weeds, the application period, the technical potential for effectiveness and the zonal pedoclimatic conditions, before and after the treatments.

The purpose of the research was to identify weeds, crop selectivity and combat the weed species present by applying herbicide treatments, with the objective of broadening the spectrum of control, synergism, persistence and without negative impact on the environment.

Table 1.The herbicide treatments applied in the sunflower crop. Experimental variants

No var	**Herbicides treatments**	**Active ingredient**	**Dose l /ha**	**Time of application**
1	***Untreated***	**-**	**-**	**-**
2	Stomp Aqua	455 g/l pendimetalin	3.5	**Preemergence BBCH 00**
3	Frontier Forte	720 g/l dimetenamid-P	1,4	Preemergence BBCH 00

Table 2.

Monthly sum of precipitation (mm)													
YEAR	IAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	AVERAGE
2022	4.8	5.4	12.3	47.6	30.1	59.6	29.2	14.4	35.4	5.2	19.6	21.8	258.4
2023	64.2	5.8	10.0	77.2	32.4	40.2	43.8	6.6	4.2	29.0	85.6	24.4	423.4

Table 3.Monthly average temperature (°C)

YEAR	IAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	AV
2022	2.1	4.7	4.4	12.1	17.9	22.6	25.0	25.6	18.6	13.5	9.0	3.5	13.3
2023	4.9	3.3	8.2	10.8	16.9	22.3	26.1	26.1	21.7	16.1	8.5	4.3	14.1

MATERIAL AND METHOD

The research was carried out in the period 2022-2023, at the National Institute for Agricultural Research and Development - Fundulea, being studied the application of herbicide treatments to sunflower crop. The research was carried out in the experimental field, the experiment being located on a soil of cambic chernozem type (3.2% organic matter, 37% clay, 6.5

pH), using the FD 15-27 hybrid created by the institute -Fundulea.The organization of the experiment was done according to the

method of randomized blocks, with a plot area of 25 m^2, in 3 replications, the amount of water used was 300 l/hectare.

In this experiment, we observed the degree of selectivity of plants and the degree of control of weeds by applying herbicide treatments (table 1): Stomp Aqua (455 g/l pendimetalin) and Frontier Forte (720 g/l dimetenamid-P).

The herbicide treatments were applied in the preemergence (growth and development stage of sunflower: BBCH 00). After the application of herbicide treatments, the observations of selectivity (%) were made at different intervals (7 - 14 - 28 days after the application of treatments) and the degree of control (%) of weeds at different intervals 14 - 28 days from the application of treatments.

In the two years of research, the climatic conditions(table.2),especially the amount of precipitation, were extremely different, the year 2022 (258.4mm) and the year 2023 (423.4mm).The average temperature in the years 2022 and 2023 was 13.3 -14.1(°C).

RESULTS AND DISCUSSIONS

In the experimental field,the crop showed a high infestation degree of - 75%, with weeds, extremely diversified, depending on the local pedoclimatic conditions of the years.

In the experimental field, the sunflower crop had characteristic weed species, the most representative(fig.1)being:*Setaria viridis, Echinochloa crus -galli, Sorghum halepense* and annual dicotyledons– *Amaranthus retroflexus, Chenopodium album and Polygonum convolvulus.*

In the experimental field, all the selectivity observations made for the sunflower hybrid cultivated FD15-27, not recorded phytotoxic phenomena (EWRS scale = 0).

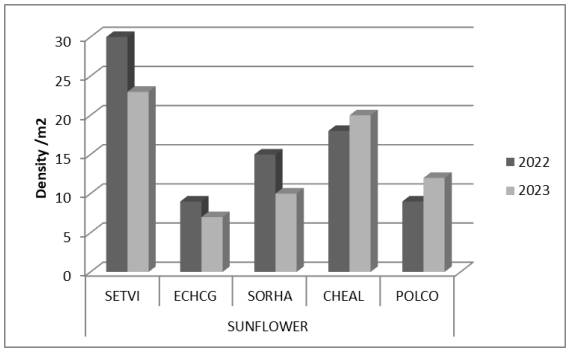

Figure 1. The infestation degree (%) with weed species present in the untreated plot.

In the sunflower crop, following the treatments with herbicides applied preemergence (BBCH 00), the results obtained showed a good weed control effect, highlighting the effectiveness of the treatments through a single application. After the application of the treatments with herbicides, good results were obtained regarding the fight against weeds, depending on: the climatic conditions, the degree of infestation, the spectrum and the dominance of the species present in this crop.

Stomp Aqua is a pendimethalin-based herbicide, from the dinitroaniline class. It is a soil-applied herbicide for the control of annual monocotyledonous weeds and some annual dicotyledonous species. It inhibits both cell division and cell elongation in the root meristem.

Weed growth is directly inhibited by uptake through the coleoptile/hypocotyl growth tips. Weeds die immediately after germination or emergence, being eliminated early from the competition.

Following the application of pre-emergence treatment at a dose of 3.5 l/ha (fig.2), monocotyledonous weeds showed good efficacy 77-84 % for *Sorghum halepense*, *Echinochloa crus-galli* and *Setaria viridis.*

Regarding the annual dicotyledonous species showed good control for *Amaranthus retroflexus* - 82%, Chenopodium album - 90% and Polygonum convolvulus - 77%.

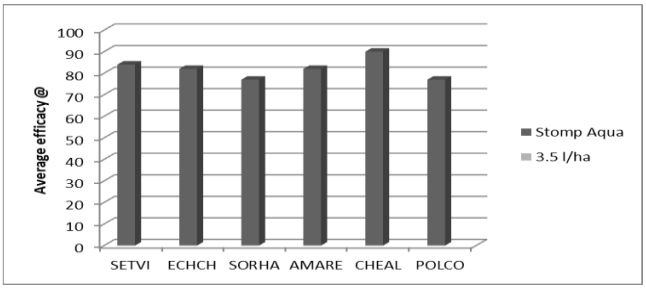

Figure 2. The efficacy (%) of the herbicide Stomp Aqua for the weeds controlling from the sunflower crop

Figure 3 shows the average effectiveness results (%) recorded at the preemergence (BBCH 00) application of the Frontier Forte,. is a herbicide based on dimethenamid-P, from the amide group. It has a systemic action, germinating weeds absorb the active substance – dimethenamid-P – through the coleoptile.

The obtained results show a very good control effect (95-88%) for the annual monocotyledonos *Setaria viridis, Echinochloa crus-galli, Sorghum halepense.*

Following the application of this treatment, the annual dicotyledonous –*Amaranthus retroflexus, and Polygonum convolvulus* presented a good combat effectiveness (94-92%).

The annual dicotyledonous weed species - *Chenopodium album* recorded an average control effect of 62%.

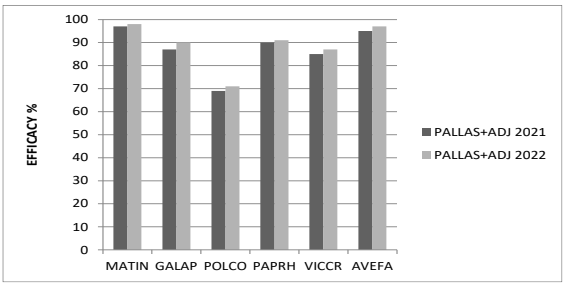

Figure 3. The efficacy (%) of the herbicide Frontier forte for the weeds controlling from the sunflower crop

The average yield (fig.4) obtained in the two years of research was very different between the 2 pre-emergence application treatments: Stomp Aqua- 1285 kg/ha-2022;1340kg/ha-2023 and Frontier forte 1322 kg/ha-2022;1460kg/ha-2023.

In the untreated control, the production obtained (2022-390kg/ha and 2023-410 kg/ha) was much lower due to the competition between the crop plant and weeds and, last but not least, the pedoclimatic conditions at Fundulea.

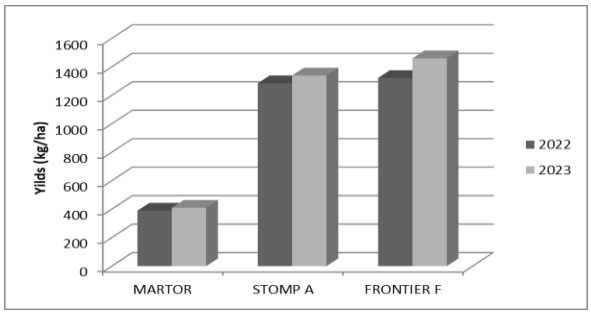

Figure 4. The average yields 2022-2023

The chemical control of the weed species existing in the crop, on the type of cambic chernozem soil from Fundulea, represents an especially important and necessary technological measure.

In the field of weed control, the main objective is to reduce the degree of infestation and, finally, to identify the most effective combinations of substances, to reduce both the impact on the environment and the costs per hectare.

CONCLUSIONS

In the research years, the use and application of the treatments with preemergence applied herbicides had a good control effect, highlighting their effectiveness through a single application.

The degree of control of herbicide treatments depends on the level of infestation, dominance, weed spectrum, applied dose and climatic conditions.

The production obtained was in close correlation with the biological potential of the sunflower hybrid, the efficiency of each treatment and the recorded climatic conditions.

The chemical control of the weed species existing in the crop, on the type of cambic chernozem soil from Fundulea, represents an especially important and necessary technological measure.

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