CHEMICAL CONTROL OF WEEDS IN SUNFLOWER CROPS

Manea Dan Nicolae*, Ştef Ramona*, Şmuleac Laura Josefina*, Cărăbeţ Alin*, Ienciu Anişoara Aurelia*

*Banat's University of Agriculture and Veterinary Medicine „King Michael the I[st] of Romania" from Timişoara, Faculty of Agriculture, 119 Calea Aradului St., Timişoara, Romania, e-mail: ienciuani@yahoo.com

Abstract

The present paper aims to determine the effectiveness of controlling segetal species in sunflower crops, using a diverse range of preemergent and/or post emergent herbicides. The effect of controlling weeds in sunflower was monitored. Research was carried out in 2017 and 2018, in the experimental field of the didactic farm in Timişoara, Romania. Initial weeding was 211 plants/m^2 in 2017 and 183 plants/m^2 in 2018. The annual grasses Setaria viridis and Echinochloa crus-galli shared, together, over 30%, but overall, seven annual dicotyledonous species were dominant. The best efficacy in controlling segetal species in the two years (92.15% and 89.23%, respectively) was registered in the V_9 variant, in which post emergent Pulsar Plus (imazamox 25 g/l) -1.5 l/ha, was applied early during vegetation and Gramin 5 EC (quizalofop-P-etil 50 g/l) -1.5 l/ha, was applied during vegetation. Very close results (89.47% and 88.21%, respectively) were recorded in V_{10} variant – Wing P (250 g/l pendimetalin + 212.5 g/l dimetenamid-P) – 4.0 l/ha + Gramin 5 EC. The level of sunflower productions in the trial has been clearly influenced by the effectiveness of weed control, but also by the climatic conditions of the two years.

Key words: sunflower, weed control, herbicides, crops

INTRODUCTION

Segetal species (weeds) are unwanted plants in agricultural crops. The causes and size of the damage caused by weeds in agricultural crops are diverse, wide-ranging and irrecuperable (Berca, 2004; Chirilă, 2001).

The essential aspect of weed control is part of controlling plant populations. Its target is not simply the harvest or the weeds, but maximizing the production of the plant cultivated in the presence of plants of other species (Mortensen et al., 2000; Post, Wijnants, 1996).

Controlling weeds means reducing the weeding degree down to the level at which they no longer produce significant damage (Pötsch, 1991).

Sunflower occupies has a significant share in the structure of agricultural crops in our country; however, it is very affected by the presence of weeds, especially if they are installed at the beginning of the vegetation period (Anhel et al, 1972, Manea, 2006).

MATERIAL AND METHOD

The research was carried out in two years, 2017 and 2018, in the experimental field of the didactic farm in Timişoara, Romania. The trials

were monofactorial, located in the field after the method of randomized blocks, with 10 variants in 4 repetitions. The initial weeding was assessed by the numerical quantitative method. Approximately 30 days after the last treatment, we determined the effectiveness of controlling segetal species in sunflower crops (expressed in %), but also the selectivity of the herbicide tested on the hybrid of cultivated sunflower (through notes granted according to the EWRS scale). The production of sunflower (expressed in q/ha) was determined, both in the control variant and in the variants treated with various herbicides. Both the efficacy of herbicides and production results were processed and interpreted through variance analysis. The cultivated sunflower hybrid was SY Neostar CLP, a hybrid adapted to Clearfield Plus technology.

Experimental variants were: V_1 – control; V_2 – Gramin 5 EC (quizalofop-P-etil 50 g/l) -1.5 l/ha; V_3 – Pledge 50 WP (flumioxazin 50%) – 0.12 kg/ha; V_4 – Pulsar Plus (imazamox 25 g/l) -1.5 l/ha; V_5 – Successor Tx (petoxamid 300 g/l + terbutilazina 187.5 g/l) – 4.0 l/ha; V_6 – Tender (960 g/l S-metolaclor) – 1.5 l/ha; V_7 - Wing P (250 g/l pendimetalin + 212.5 g/l dimetenamid-P) – 4.0 l/ha; V_8 – Pledge 50 WP (flumioxazin 50%) – 0.12 kg/ha + Gramin 5 EC (quizalofop-P-etil 50 g/l) - 1,5 l/ha; V_9 – Pulsar Plus (imazamox 25 g/l) – 1.5 l/ha + Gramin 5 EC (quizalofop-P-etil 50 g/l) – 1.5 l/ha; V_{10} - Wing P (250 g/l pendimetalin + 212.5 g/l dimetenamid-P) – 4.0 l/ha+Gramin 5 EC (quizalofop-P-etil 50 g/l) - 1.5 l/ha.

RESULTS AND DISCUSSION

In 2017, the initial weeding was 211.0 plants/m^2. The annual monocots *Setaria viridis* and *Echinochloa crus-galli* shared 17.27% and 15.77%, respectively, of the weeds, followed by the annual dicots *Ambrosia elatior* (13.47%), *Hibiscus trionum* (12.56%), *Amaranthus retroflexus* (10.83%), *Chenopodium album* (9.99%), etc. Perennial dicots shared less, being represented only by two species: *Convolvulus arvensis* (1.10%) and *Cirsium arvense* (0.55%). *Sorghum halepense*, a perennial monocot, was represented by 7.15 plants/m^2, representing a real danger to the sunflower crop (Fig. 1).

The best efficacy, in 2017, of the control of segetal species (92.15%) was registered in the V_9 variant, in which the post emergent Pulsar Plus was applied early during vegetation and Gramin 5 EC was applied during vegetation. Very close results (89.47%) were recorded in the V_{10} variant – Wing P + Gramin 5 EC. The Pulsar Plus product, even in the V_4 variant in which it applied itself, due to the wide spectrum of species controlled, had good efficacy (86.70%). Among the self-applied preemergent herbicides, Tender, Wing P and Successor Tx ensured good weed control (75.93-82.12%). In V_3 variant – Pledge 50 WP, because the weed grasses were not

affected, the control had unsatisfactory values (64.57%), but considerably improved (85.66%), due to the addition, during vegetation, of the product Gramin 5 EC (Tab. 1).

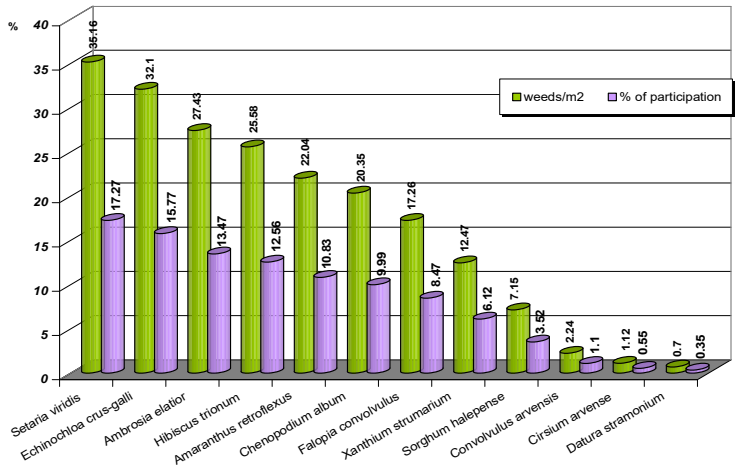

Fig. 1. Initial weeding of sunflower crop in 2017

Table 1

Controlling segetal species in sunflower crop, in 2017

Variants	Weeds/m^2	Weed control (%)	Diference	Meaning
V_9 – Pulsar Plus +Gramin 5 EC	16.56	92.15	-194.44	000
V_{10} - Wing P + Gramin 5 EC	22.22	89.47	-188.78	000
V_4 – Pulsar Plus	28.06	86.70	-182.94	000
V_8 – Pledge50WP+Gramin5EC	30.26	85.66	-180.74	000
V_5 – Successor Tx	37.73	82.12	-173.27	000
V_7 - Wing P	39.12	81.46	-171.88	000
V_6 – Tender	50.79	75.93	-160.21	000
V_3 – Pledge 50 WP	74.76	64.57	-136.27	000
V_2 – Gramin 5 EC	118.54	43.82	- 92.46	000
V_1 – neerbicidat	211.00	0.00	Control	-

$DL_{5\%}$ = 4.87 weed./m^2 $DL_{1\%}$ = 7.45 weed./m^2 $DL_{0.1\%}$ = 9.36 weed./m^2

As a principle, the best production results were achieved in the variants in which the weeds were most efficiently controlled. Thus, the largest sunflower production in ha, in 2017, was obtained on the V_9 version – Pulsar Plus + Gramin 5 EC (29.16 q/ha), the difference of 4.29 q/ha compared to the field average being very significantly positive. Good crops, over 28 q/ha, were recorded in V_{10} variant – Wing P + Gramin 5 EC and V_8 variant – Pledge 50 WP + Gramin 5 EC, with distinctly positive differences from the field average (Fig. 2).

The unilateral application of the Pulsar Plus product (1.5 l/ha) or Wing P (4.0 l/ha) resulted in significant production increases exceeding 2 q/ha. Both the average of the field of 24.87 q/ha and the production from the control variant (8.12 q/ha) were largely influenced by the climate conditions of 2017 (Fig. 2).

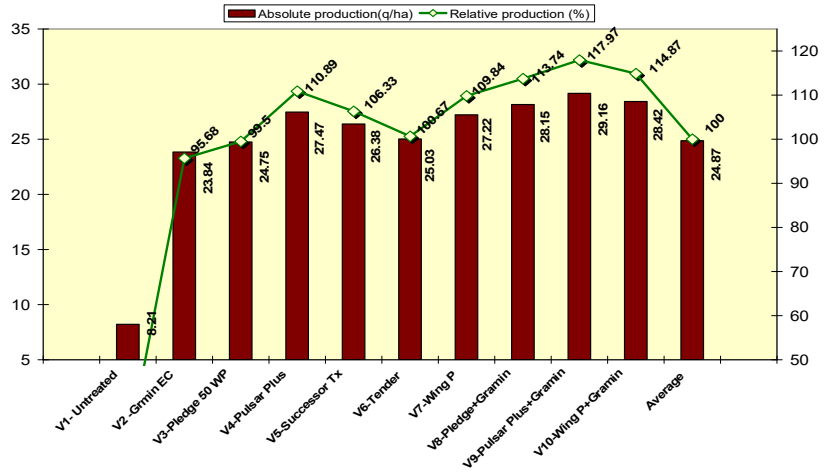

Fig. 2. Sunflower productions obtained in the year 2017

In 2018, the number of weeds in the control variant was 183 plants/m^2. Among them, 34.29 plants/m^2 and 24.56 plants/m^2, respectively, were annual monocots *Echinochloa crus-galli* and *Setaria viridis*. The most significant share was that of annual dicots *Amaranthus retroflexus*, *Chenopodium album*, *Ambrosia elatior*, *Hibiscus trionum*, *Datura stramonium*, *Falopia convolvulus*, *Xanthium strumarium* etc. Perennial dicots were represented by two species, *Cirsium arvense* and *Convolvulus arvensis*; these weed species, although they had a relatively low share of the general weeding (7.73%), together with perennial monocot *Sorghum halepense*, were a notable competition for the sunflower crop, difficult to control (Fig. 3).

The degree of weed control had values ranging from 45.16% to 89.23%. the best efficacy in controlling segetal species (89.23%) was registered in the V_9 variant, in which the post emergent Pulsar Plus was applied early during vegetation and Gramin 5 EC was applied during vegetation. Very close results (88.21%) were recorded in the V_{10} variant – Wing P + Gramin 5 EC (Tab. 2).

The largest sunflower productions, in 2018, were obtained in the 3 variants in which combinations of two herbicides were applied (V_9, V_8 and V_{10}). In 2018, both the average field of 22.77 q/ha and the production of the control variant (8.95 q/ha) were largely influenced by the climate conditions of the year (Fig. 4).

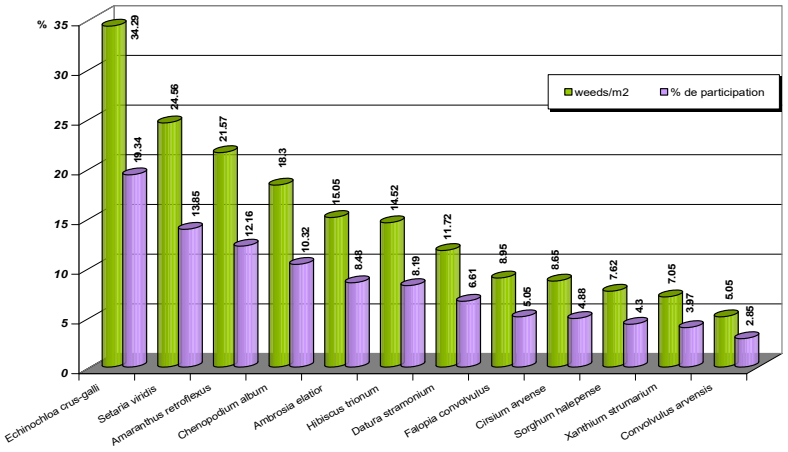

Fig. 3. Initial weeding of sunflower crop, in 2018

Table 2

Controlling segetal species in sunflower crop, in 2018

Variants	Weeds/m^2	Weed control (%)	Diference	Meaning
V_9 – Pulsar Plus +Gramin 5 EC	19.86	89.15	-163.14	000
V_{10} - Wing P + Gramin 5 EC	21.58	88.21	-164.42	000
V_4 – Pulsar Plus	26.12	85.73	-156.89	000
V_8 – Pledge50WP+Gramin5EC	27.41	85.02	-155.58	000
V_5 – Successor Tx	31.95	82.54	-151.05	000
V_7 - Wing P	41.63	77.25	-141.37	000
V_6 – Tender	52.50	71.31	-130.50	000
V_3 – Pledge 50 WP	57.10	68.80	-125.90	000
V_2 – Gramin 5 EC	100.36	45.16	- 82.64	000
V_1 – neerbicidat	211.00	0.00	Control	-

DL $_{5\%}$ = 6.23 weed./m^2 DL $_{1\%}$ = 9.85 weed./m^2 DL$_{0.1\%}$ = 12.87 weed./m^2

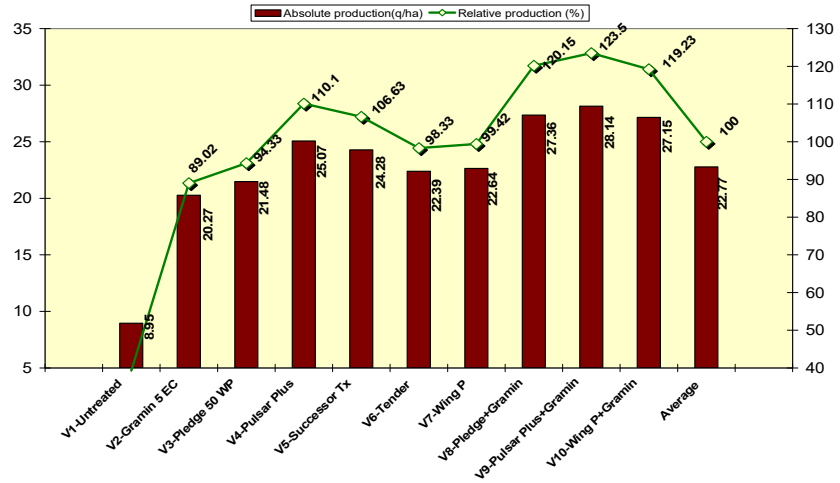

Fig. 4. Sunflower productions obtained in the year 2018

CONCLUSIONS

- Initial weeding was 211.0 plants/m^2 in 2017 and 183.0 plants/m^2 in the following year. The annual grasses *Setaria viridis* and *Echinochloa crus-galli* shared a cumulated percentage of over 30%, but overall, the dominant ones were seven annual dicot species;
- The three species of perennial weeds were identified: *Convolvulus arvensis*, *Cirsium arvense* and *Sorghum halepense*; although they had a relatively low share, they were present in a number large enough to cause considerable damage;
- The best efficacy in controlling segetal species in the two years (92.15% and 89.23%, respectively) was registered in the V_9 variant, in which the post emergent Pulsar Plus was applied early in vegetation and Gramin 5 EC was applied during vegetation. Very close results (89.47% and 88.21%, respectively) were recorded in the V_{10} variant – Wing P Variant + Gramin 5 EC
- In 2017, in the trial, sunflower production had values ranging from 23.84 q/ha to 29.16 q/ha. The largest sunflower production was obtained in the V_9 variant – Pulsar Plus + Gramin 5 EC (29.16 q/ha), the difference of 4.29 q/ha compared to the field average being very significantly positive;
- The following year, the best production results, exceeding 27 q/ha, were obtained in the variants in which the weeds were most effectively controlled in the sunflower crop, specifically in the variants V_9, V_8 and V_{10}, variants in which a combination of two herbicides was applied;
- Both the average field and the production of the control variant were largely influenced by the climate conditions of the years.

REFERENCES

1. Anhel Gh., Chirilă C., Ciocârlan V., Ulinici A., 1972, Buruienile din culturile agricole şi combaterea lor. Ed. Ceres Bucureşti.
2. Berca M., 2004, Managementul integrat al buruienilor. Ed. Ceres Bucureşti.
3. Chirilă C., 2001, Biologia buruienilor. Ed. Ceres Bucureşti.
4. Manea D.N., 2006, Agrotehnică şi Herbologie. Ed. Eurobit, Timişoara.
5. Mortensen D.A., Bastiaans L., Sattin M., 2000, Weed research, Vol. 40.
6. Post B.J., Wijnants F. G., 1996, Al X-lea simpozion naţional de herbologie „Combaterea integrată a buruienilor", Sinaia.
7. Pötsch J., 1991, Unkraut oder Wildpflanze? Verlag Eugen Ulmer, Stuttgart.