CHEMICAL CONTROL OF THE SEGETAL FLORA PRESENT IN MAIZE CROP

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Abstract. *The research took place during 2021 in Ciclova Română in Caraş - Severin County. The experimental field presented 4 treatments that had various combination of herbicides. Two herbicides were applied in each variant, because in the experimental group were present both monocotyledonous and dicotyledonous weeds (Nicogan, Dicopur, Nicogan, Ceredin, Nicogan, Cliophar). The degree of weeding was high, the quantitative numerical counting showed a number of 92.95 plants/m^2. In the experimental variants were present problem weed species (Sorghum halepense, Cirsium arvense, Rubus caesius, etc.). 14 days after the application the highest efficacy of the phytosanitary products was registered. Their efficacy decreased four months after application, as some species either regenerated or re-weeded due to the staggered germination of target weeds. The weeds, present in the corn crop, were very well controlled by the associated application of the herbicide Nicogan and Cliophar, ensuring protection of the crop until harvest.*

Keywords*: chemical control, segetal flora, maize,*

INTRODUCTION

In recent years (2016-2019), Romania has occupied the first positions of the European Union ranking on production (27.8% of total production is provided by Romania) and the area cultivated with corn (2.49 million hectares) according to the National Institute of Statistics. Maize (Zea mays) is the third cereal crop of international importance (MANEA ET AL., 2010, AMIT J. JHALA ET AL., 2014). Diseases, pests and weeds are the main biotic factors that reduce corn production (GROZEA ET AL., 2008, CHIRIȚĂ ET AL., 2008) but the biggest losses are caused by weeds, especially in the early stages of vegetation because they emerge before the crop plants having enough space for development. A particularly important role in the growth and development of maize plants is the protection against weeds.

According to BUDOI (1994), the most harmful weed species present in the corn crop are: grouse (*Setaria* sp.), bearded grass (*Echinochloa crus galli*), millet (*Digitaria sanguinalis*), *Chenopodium album*, newt (*Amaranthus* sp .), *Hibiscus trionum*, *Cirsium arvense*, *Sorghum halepense*, horsetail (*Equisetum arvense*), *Agropyron repens*, *Convolvulus arvensis*, *Sonchus* sp. Maize has a slow growth rate in the early stages and a low surface density, can not withstand competition with the 800-1500 weeds that grow to one m^2 (MUNTEAN ET AL. 2001). Weeds control plays a crucial role in achieving a profitable culture. Weed control using herbicides is a fast, cost-effective and highly effective method (SILVA ET AL., 2012 TAVELLA ET. AL., 2015, PINHEIRO ET AL. 2008).

The study aimed to control the segetal flora in the corn agroecosystem.

MATERIAL AND METHODS

The researches took place during 2021 in the locality of Ciclova Română in Caraş - Severin County.

To establish the efficiency of herbicides against weeds in maize crop, a single-factor experiment was set up in the field, based on the randomized block method, each harvestable

variant having 30 m^2. The 4 experimental variants were differentiated by the combination of herbicides.

Two herbicides were applied to each variant, because in the experimental group were present both monocotyledonous and dicotyledonous weeds (Nicogan + Dicopur, Nicogan + Ceredin, Nicogan + Cliophar).

Treatments description

		Comercial product	Acvtive ingridient	Dose
Treatment	1.	Unhoed control	-	-
	2.	Nicogan + Dicopur	nicosulfuron 40 g/l + acid 2,4 D DMA 600g/l	1,5 l/ha + 1,0 l/ha
	3.	Nicogan +Ceredin	nicosulfuron 40 g/l + 344 g/l 2,4 D DMA and 120G/L dicamba	1,0 + 1,0 l/ha
	4.	Nicogan +Cliophar	nicosulfuron 40 g/l + clopiralid 300 g/l	0.5 l/ha

Prior to the application of herbicides, weeds were mapped to find the initial degree of weeding in the control variant and subsequently, at 14 and 35 days and 4 months after application, the efficacy of the herbicides was determined.

The effectiveness of the herbicides was determined by the Abbott formula

$$\text{Abbott \%} = \left(1 - \frac{n \text{ in } T}{n \text{ in } C}\right) x\ 100$$

n – weeds number; T- treated; C- untreated (control)

RESULTS AND DISCUSSIONS

The results regarding the degree of weeding and the species present in the maize agroecosystem are presented in figure 1. The degree of weeding was high, the mapping performed showed a number of 92.95 plants/m^2.

In the corn agroecosystem, Ciclova Română, the following species were present: (Code EPPO: ECHG - *Echinochloa crus-galli;* XANSI - *Xanthium italicum,* SORHA - *Sorghum halepense;* CONAR - *Convolvulus arvensis;* CHEAL - *Chenopodium album*; SINAR - *Sinapis arvensis;* PAPRH - *Papaver rhoeas;* CIRAR - *Cirsium arvense;* MATIN - *Matricaria inodora;* RUMG - *Rumex sp.;* DIGSA - *Digitaria sanguinalis*; RUBCA - *Rubus caesius;*). After weeds identification, it was observed that the experimental plots were dominated by *problem weeds*, such as: SORHA, ECHG, CONAR, XANSI, CIRAR, DIGSA, RUBCA, CHEAL, these species having the same statute in America (KREMER, 2004).

Of the total weed species/m^2, determined in the experimental variants, the annual and perennial monocotyledonous species presented an average of 47.99 plants/m^2. Weeds in the class of annual and perennial dicotyledons represented 44.96 plants /m^2. The dominant species was the SORHA with a frequency of 32.33 plants/m^2 and a degree of participation of 34.78%. XANSI was present in a percentage of 13.26% (figure 1). The species RUBCA, RUMG, PAPRH were present in the corn agroecosystem, with a low frequency of 0.66 plants/m^2. The composition of the segetal flora, from the control-untreated variant, was represented by 12 species, the researches carried out by BOGDAN ET AL. (2011), in Transylvania, highlights a spectrum of weeds, in the corn agroecosystem, of 18-20 species.

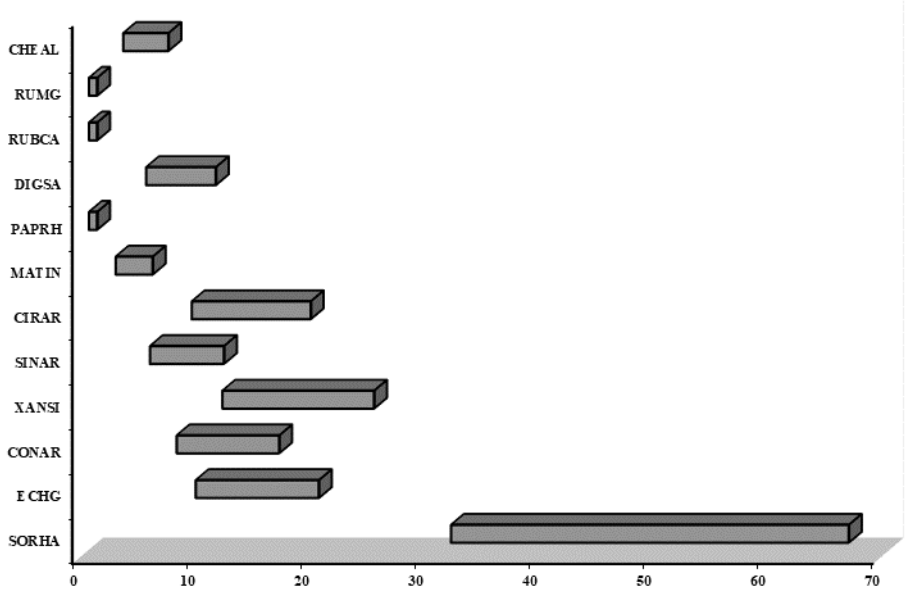

Fig. 1 - Weed specrum in untreated control

At 14 days after application, the substance nicosulfuron affected 98.33 - 100% of Jonson grass, millet and bearded grass (figure 2). The dicotyledonous weed species were very well controlled, in the variants in which clopiralid was applied. 2.4 D acid controlled dicotyledonous species in a proportion of 40.67 - 100%, the lowest efficacy was recorded in the species *Rubus caesius*.

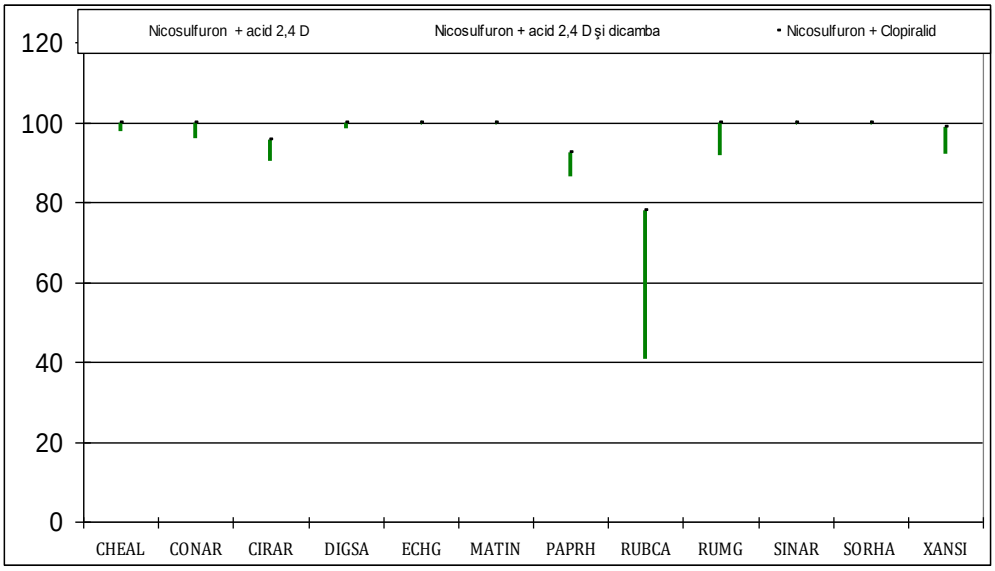

Fig. 2 - The control percentage of the segetal flora present in the corn crop - at 14 days from the application

The data on the efficacy of auxins from auxin group, 2,4 D and dicamba, are satisfying, considering that they have been used for many years, only a few weed species have developed resistance (GREEN JM ET AL., 2008). The reduction of crop flora in agroecosystems through the combined application of herbicides is increasingly being studied and used due to optimizing efficiency, minimizing costs and avoiding problems related to herbicide resistance. (KUDSK, 2002, PANNACCI ET AL., 2007, FRIESEN ET AL. 2000, NORSWORTHY ET AL. 2012, PANNACCI AND ONOFRI, 2016). The researchers found that the application of two or more compatible herbicides, used as a mixture, has a broader spectrum in weed control (narrow-leaved and broad-leaved weeds) (AKBAR HOSSAIN ET AL., 2019).

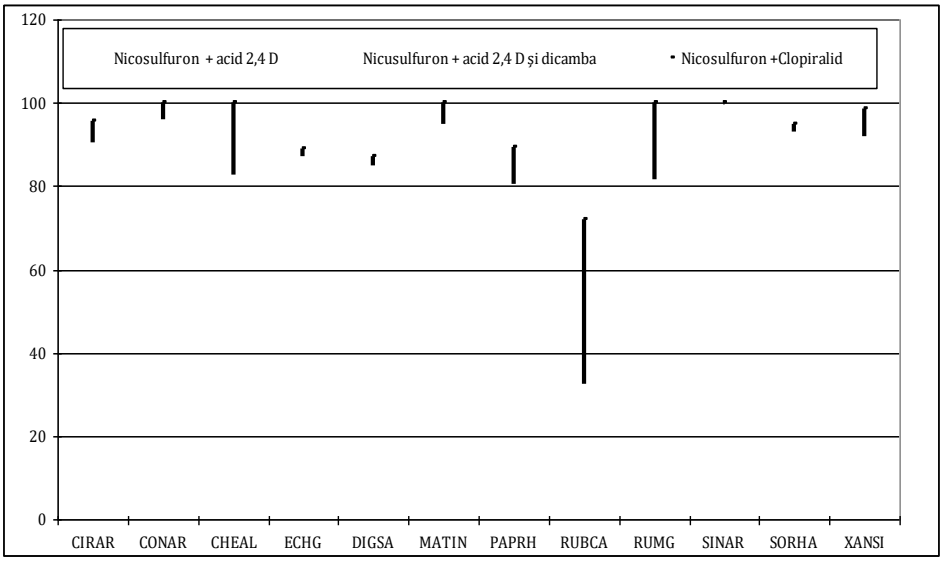

Fig. 3 - The control percentage of the segetal flora present in the corn crop - at 35 days from the application

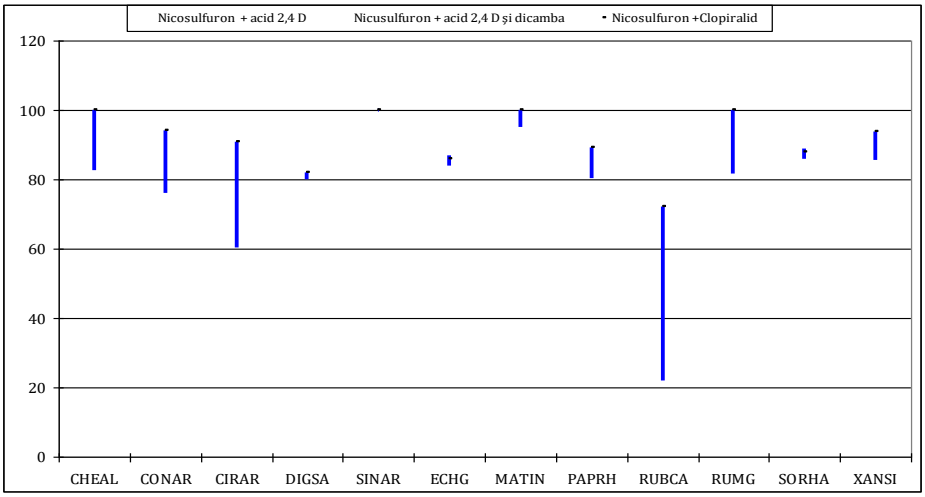

Fig. 4 - Results regarding the control of weed species present in the maize crop - 4 months after application

At 35 days after the application of the treatments, the herbicide hierarchy remained the same (figure 3), but a closer analysis of the results shows that the herbicide efficacy is significantly lower than that recorded at 14 days. This decrease in the effectiveness of herbicides can be explained by the regeneration of some species.

Four months after treatment, herbicide efficacy decreased compared to previous assessments (at 14 and 35 days).

The decrease in herbicide efficacy is explained by the presence of regenerated perennial species and by the staggered emergence of the species (figure 4). Mixing Nicogan and Cliophar herbicides, the best control of the crop population was obtained. Cliophar also showed good efficacy in controlling the stubble *Rubus* species (72%).

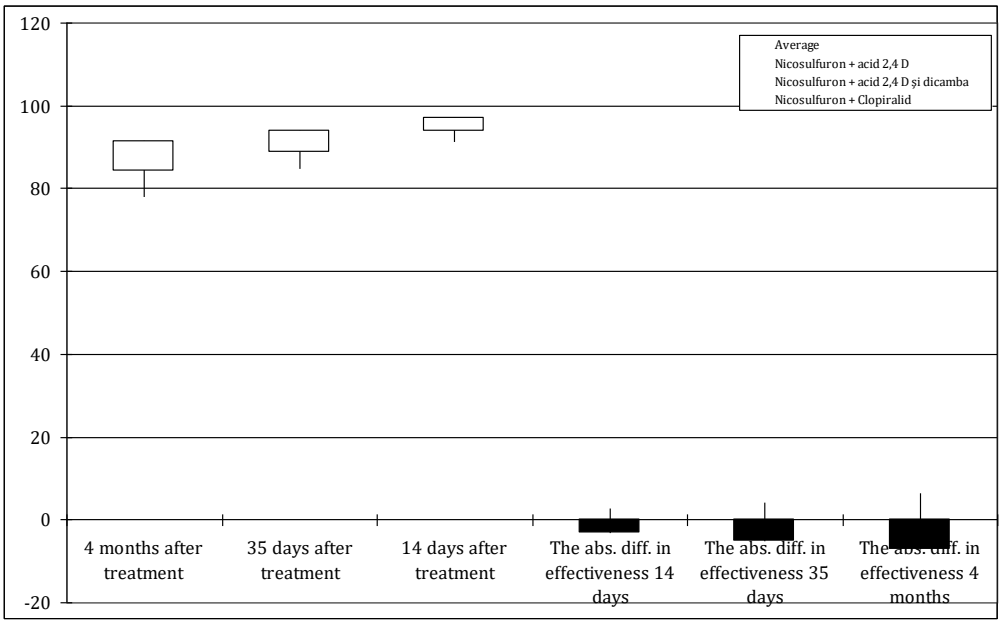

Fig. 5 - Efficacy of weed control weeds in maize crop compared to average experience (at 14 days/35 days/4 months)

At 14 days after the application of the treatments, the lowest efficacy was recorded in the plots treated with nicosulfuron and 2.4 D acid, with significantly negative differences compared to the average experience. In the plots treated with nicosulfuron + 2.4 D acid and dicamba (92.86%) there were no differences compared to the average (93.73%) (figure 5). The results of this study are confirmed by other research in the field, GORSIC ET AL., 2008 obtained weed control (*Setaria glauca, Echinochloa crus-galli, Chenopodium polyspermum, Amaranthus retroflexus, Ambrosia artemisiifolia, Chenopodium album*) in the percentage of 95%.

The segetal population of the variants treated with nicosulfuron + clopiralide was controlled in a proportion of 97.03%, showing an absolute difference of 3.30 compared to the average. The hierarchy of herbicides, in the control of weeds, from the experimental plots is maintained even 35 days after application.

The herbicides that managed to provide good protection to the corn crop, in the long term (four months) after application, were nicosulfuron + clopiralide (91.31%), the explanation

comes from the systemic action and translocation to the reproductive organs. Weeds in the plots treated with nicosulfuron and 2,4 D acid showed a very significant negative difference (6.26%) compared to the control (average experience). At the last assessment (four months after application), there was no significant difference (0.99) in respect of segetal flora by applying mixed herbicide Ceredin and Nicogan.

CONCLUSIONS

14 days after the application of the treatments, the highest efficacy of the phytosanitary products was registered. Their effectiveness decreased four months after application, as some species either regenerated or re-weeded due to the staggered germination of weed species.

The weed species, present in the corn crop, were very well controlled by the associated application of the herbicide Nicogan and Cliophar, ensuring protection of the crop until harvest.

The mixture of Nicogan and Dicopur herbicides did not achieve very good protection of the maize crop, as some dicotyledonous species were not controlled.

BIBLIOGRAPHY

AKBAR HOSSAIN, MST. TANJINA ISLAM, MD. SHOHIDUL ISLAM, NURISLAM, SHARIF AHMED, KHOKAN KUMER SARKER MAHESH KUMAR GATHALA, 2019 - Chemical Weed Management in Maize (*Zea mays* L.) under Conservation Agricultural Systems: An Outlook of the Eastern Gangetic Plains in South - Asia

BERCA, M. , 2011 - Agrotehnică- transformarea modernă a agriculturii, Editura Ceres, București

BOGDAN ILEANA, TEODOR RUSU, ŞTEFANIA GÂDEA, ILARIE IVAN, PAULA MORARU, ADRIAN POP, 2011 - Effective Weed Control in Maize, Bulletin UASVM Agriculture, 68(1)

BUDOI G., OANCEA I., PENESCU A., 1996 - Herbologie aplicată- buruienile și combaterea lor intregrată, editura Ceres, București

CHIRIȚA RAMONA, IOANA GROZEA, NICOLAE SARPE, KARL FRITZ LAUER, 2008 - Control of *Sorghum halepense* (L.) species in western part of Romania, Communications in agricultural and applied biological sciences, 73 (4): 959-964

FRIESEN S.L.J., FERGUSON G.M., HALL J.C., 2000 - Management strategies for attenuating herbicide resistance: untoward consequences of their promotion. Crop Protection 19, 891−895.

GORSIC MATIJA, KLARA BARIC, NATALIJA GALZINA, MAJA SCEPANOVIC, ZVONIMIR OSTOJIC, 2008 - Weed control in maize with new herbicide topramezone, Cereal Research Communications Volume: 36, Conference: 7th ALPS-ADRIA Scientific Workshop

GREEN JM, HAZEL CB, FORNEY DR, PUGH LM, 2008 - New multiple-herbicide crop resistance and formulation technology to augment the utility of glyphosate. Pest Manag Sci 64:332–339

GROZEA IOANA, ALIN CARABET, RAMONA CHIRITA, ANA MARIA BADEA, 2008 - Natural enemies in control of invasive species *Diabrotica virgifera virgifera* from maize crops, Communications in agricultural and applied biological sciences

JHALA AMIT J., STEVAN Z. KNEZEVIC, ZAHOOR A. GANIE AND MEGH SINGH, 2014 - Integrated Weed Management in Maize/Chapter 8, B. S. Chauhan, G. Mahajan (eds.), Recent Advances in Weed Management, Springer Science+Business Media New York

KREMER RJ, 2004 - Weed control. In: Smith CW, Betran J, Runge ECA (eds) Corn: origin, history, technology and production. Wiley, Hoboken, pp 717–752

KUDSK P., 2002 - Optimising Herbicide Performance. In: Robert E.L., Naylor (Eds.), Weed Management Handbook, Blackwell Science, 323−344.

MANEA DAN NICOLAE, SIMION ALDA, GHEORGHE CÂRCIU, RAMONA ŞTEF, 2010 - New strategies of chemical control of annual weeds in maize, Research Journal of Agricultural Science, 42 (2):76-80

MUNTEAN L.S., C. SOLOVĂSTRU, G. MORAR, M.M. DUDA, D.I. VÂRBAN, S. MUNTEAN, 2008 - Fitotehnie. EdituraAcademic Pres, Cluj-Napoca;

NORSWORTHY J.K., WARD S.M., SHAW D.R., LLEWELLYN R.S., NICHOLS R.L., WEBSTER T.M., BRADLEY K.W., FRISVOLD G., POWLES S.B., BURGOS N.R., WITT W.W., BARRETT M., 2012 - Reducing the Risks of Herbicide Resistance: Best Management Practices and Recommendations. Weed Science 60(SI1), 31−62.

PANNACCI E., GRAZIANI F., COVARELLI G., 2007 - Use of herbicide mixtures for pre and postemergence weed control in sunflower (*Helianthus annuus*). Crop Protection 26, 1150−1157.

PANNACCI E., ONOFRI A., 2016 - Alternatives to terbuthylazine for chemical weed control in maize. Communications in Biometry and Crop Science 11, 51–63.

PINHEIRO, A.; ROSA, F. C., 2008 - Classificação dos pesticidas usados na Bacia Hidrográfica do Itajaí (SC) quanto ao risco de degradação dos recursos hídricos. Pesticidas: R. Ecotox. Meio Amb., v. 18, n. 1, p. 45-58

TAVELLA L.B., SILVA P.S.L., MONTEIRO A.L., OLIVEIRA V.R., SIQUEIRA, P. L. O. F., 2015 - Weed control in maize with Gliricidia intercropping, Planta Daninha, Viçosa-MG, v. 33, n. 2, p. 249-258