CURRENT MEASURES TO COMBAT SEGETAL SPECIES IN THE AUTUMN WHEAT CROP

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Abstract. *Due to the agricultural and economic importance of wheat, there is an ongoing concern to study the impact of weeds on wheat production (https://ro.wikipedia.org/wiki/Gr%C3%A2u, https://www.scribd.com/doc/77393966/graul*,http://www.fao.org/statistics/en/,https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Agriculture*). In this context, the researches that are the subject of this work aimed to establish the most effective current means of chemical control of weeds in autumn wheat crops, with direct effects on production results. The research was made within the company SC Prodagro Vest SRL from Arad, during two years: 2021 and 2022, being tested a number of 11 post-emergent herbicides to combat weeds in the wheat crop, in order to reduce the degree of weeding, the cost per the product unit and, by default, the increase in productivity. The placement of the experimental field for combating weeds in the wheat crop was done according to the randomized block method, being a monofactorial experiment, with 12 variants, in four repetitions. In the first year of research, 2021, in the non-herbicized control variant, 67.5 weeds/m^2 were recorded, and in the second year, 2022, were present 54.7 weeds/m^2. The most effective weed control, over 90%, was recorded in the variants: V_6 - aminopyralid 30% + florasulam 15% - 33 g/ha, V_2 - 2,4-D acid 300 g/l + florasulam 6.25 g/l – 0.6 l/ha and V_9 – tribenuron – methyl 600 g/kg + florasulam 200 g/kg – 25 g/ha., in 2021, respectively V_9 in 2022. There were no obvious symptoms of toxicity in cultivated plants, as a result of the application of the herbicide products in the experiments. The level of wheat production was determined by the climatic conditions, but also by the effectiveness of herbicides in combating the present segetal species.*

Keywords*: herbicides, weeds, wheat, production, variants*

INTRODUCTION

The defense of plants against weed competition has been a concern since ancient times, the methods of combat evolving along with the technical-scientific progress of society. In the fight against weeds, it is considered to reduce them below the economic threshold of damage, by combining cultural and chemical measures, considering that no measure applied individually will solve the weeding problem. This combination of methods translates into the modern concept of integrated weed control (BERCA 2004, MANEA et al., 2019, SLONOVSCHI et al., 2001, http://www.incda-fundulea.ro/anale/79/79.8.pdf,https://www.agrimedia.ro/articole/influenta-negativa-a-buruienilor-asupra-plantelor-cultivate).

Weeds from all biological groups are encountered in the wheat crop, especially among those that can germinate in autumn or early spring, due to the specificity of the crop (in a wheat field the temperature is lower, the light is lower, the humidity is higher, the soil is cooler), a phytoclimate suitable for the development of a varied flora is created (CHIRILĂ 2001, POPESCU V., 1997, SĂNDOIU D. D., 1994, SIN 2007).

The most critical period for wheat is spring. During this period, we intervene with herbicides, the application of which must take into account the growth stage of the weeds, the optimal period being the rosette phase. The growth stage of the wheat is no longer so important, thanks to the fact that we have herbicides available that can be applied up to the time of ripening (https://www.usamv.ro/images/Programe_de_studii/Doctorat/Teze_de_doctorat/Arhiva_2013/Pascu_RO.pdf, https://insse.ro/cms/ro/tags/productia-vegetala-la-principalele-culturi-0).

MATERIAL AND METHODS

The main aim of the work was to establish the most effective current means of chemical control of weeds in autumn wheat crops, with direct effects on production results.

The research was made during two years, 2011 and 2022, in the experimental field of the company Prodagro Vest SRL Arad, being tested the effect of a number of 11 post-emergence herbicides on the fight against weeds in the autumn wheat crop.

The placement of the experimental field for combating weeds in the wheat crop was done according to the randomized block method, being a monofactorial experiment, with 12 variants, in four repetitions. The post-emergence herbicides were administered in the vegetation, when the weeds were in the rosette phase, and the wheat in the tillering phase, at an air temperature above 15˚C (figure 1.).

The following aspects were followed:

- degree of weed control (readings were taken 21 days after herbicide application and scores were given according to the EWRS weed control scale);
- wheat production in q/ha on the non-herbicidized and the herbicided variants;
  the selectivity of the herbicides tested on the cultivated wheat variety.

During the conducted research, the autumn wheat variety Miranda created by I.N. C.D.A. Fundulea. It is a medium-early variety and has a very high production potential. It belongs to the group of varieties of good to very good quality for baking.

Fig. 1 - Phase of application of postemergent herbicides

The experimental variants were the following:

V_1 – non-herbicides
V_2 – VECTOR (2,4D Acid + Florasulam) – 0.6 l/ha
V_3 – BUCTRIL UNIVERSAL (Bromoxynil + 2,4D Acid) – 1 l/ha
V_4 – DICOPUR D (2,4D Acid) – 1 l/ha
V_5 – CHENKAR (Thifensulfuron-Methyl + Metsulfuron-Methyl) – 0.075 kg/ha
V_6 – LANCELOT SUPER (Aminopyralid + Florasulam) – 33 g/ha
V_7 – CEREDIN FORTE (Dicamba +2,4D Acid) – 1 l/ha
V_8 – ARKEM (Metsulfuron-methyl) – 30 g/ha
V_9 – SARACEN MAX (Tribenuron – methyl + Florasulam) – 25 g/ha
V_{10} – GENTIS 450 EC (2,4D Acid + Fluroxypyr) – 1.25 l/ha
V_{11} – STARANE (Fluroxypyr) – 0.8 l/ha
V_{12} – CLOE 300 SL (Clopyralid) – 0.4 l/h

RESULTS AND DISCUSSIONS

Segetal species identified in 2021

From the data presented in the figure 2., it appears that in 2021, in the non-herbicided control variant, a number of 67.5 weeds/m^2 were recorded.

The most numerous were the annual dicotyledonous species: *Polygonum aviculare* (common knotgrass), *Veronica hederifolia* (speedwell, bird's eye, and gypsyweed), *Stellaria media* (chickweed), *Polygonum convolvulus* or *Fallopia convolvulus* (the black-bindweed or wild buckwheat), *Lamium amplexicaule* (henbit), together holding a weight of 72.1% of the total weeding (48.7 plants/m^2).

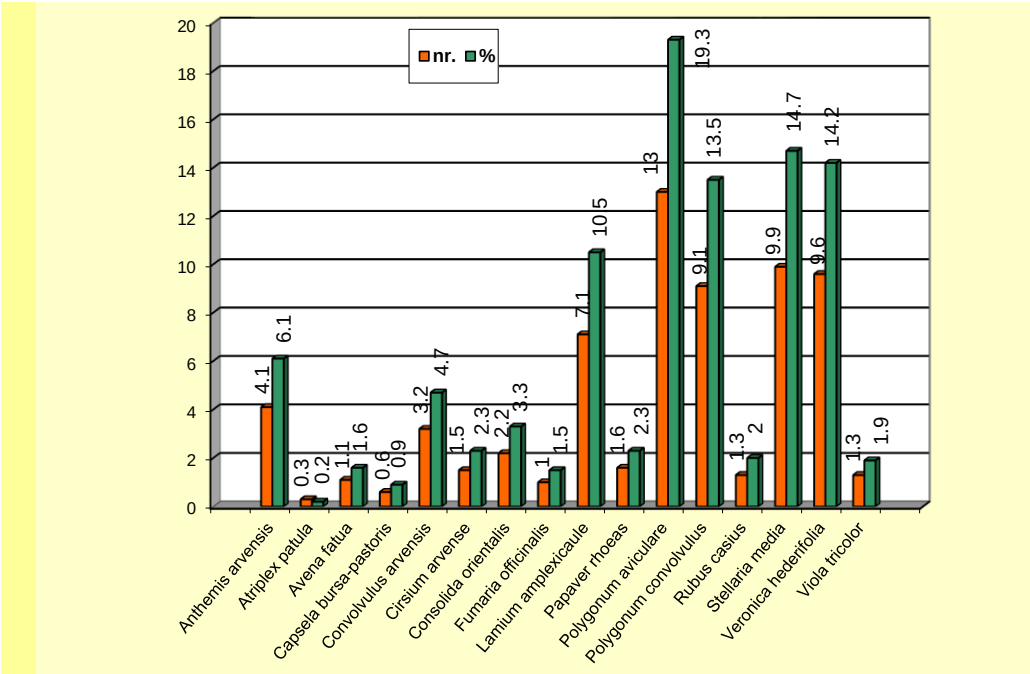

Fig. 2 - Number of weeds, by species, in the control variant, in 2021

Three perennial dicotyledonous species were also identified: *Cirsium arvense* (Canadian thistle), *Convolvulus arvensis* (field bindweed), *Rubus arvensis* (field blackberry). These, although they represented only 9% of the total number of weeds, represent a real danger, because they have a great competitive capacity and are difficult to combat [].

An annual monocotyledonous segetal species was also identified: *Avena fatua* (common wild oat).

The efficacy of herbicides against weeds in 2021

In 2021, the herbicide products tested in the experiment had very different efficacies in terms of reducing the weeding degree.

Approximately three weeks after the application of herbicides, the degree of weeding was reduced in a proportion ranging from a minimum of 54.5% in the V_{12} variant - Cloe 300 SL - 0.4 l/ha, to a maximum of 93.6% in the V_2 variant - Vector 33 g/ha (figure 3.).

A very good control of weeds, over 90%, was recorded in the variants: V_2 - Vector (2,4D Acid + Florasulam - 0.6 l/ha), V_6 - Lancelot Super (Aminopyralid + Florasulam - 33 g/ha) and V_9 – Saracen Max (Tribenuronmethyl + Florasulam – 25 g/ha).

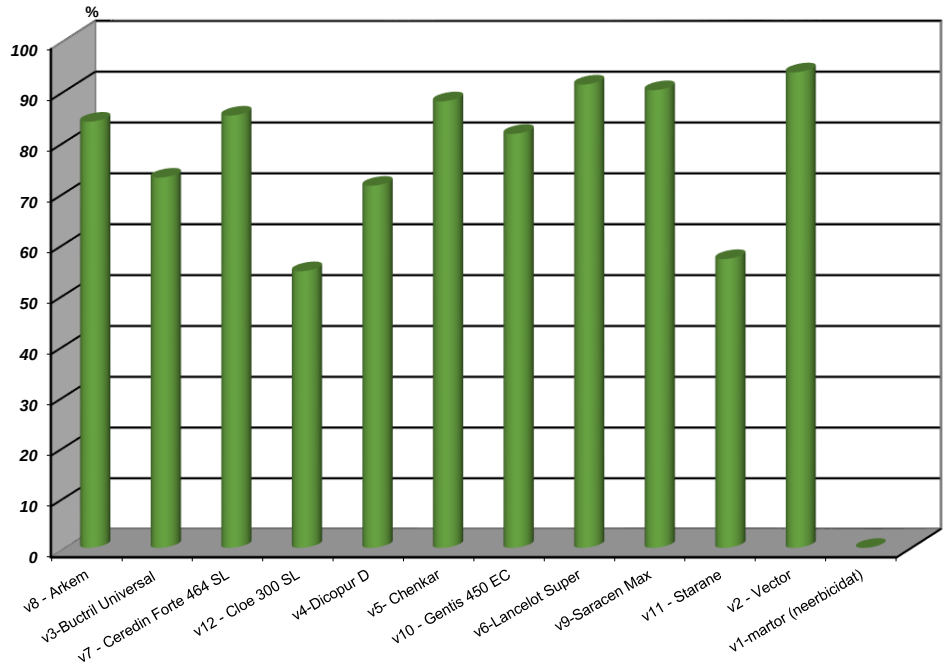

Fig. 3 - Reducing the number of weeds in 2021

No symptoms of phytotoxicity were observed in the wheat plants, which could have appeared as a result of the application of the herbicides tested in the experiment.

Production results achieved in 2021

The climatic conditions of 2021 influenced the level of wheat production obtained in the experimental plots, the field average being 5231 kg/ha. The wheat was affected by the

drought of the previous autumn (at the establishment of the crop) and by the heavy rains in the spring.

The highest wheat yields obtained this year were recorded on the variants: V_6 - Lancelot Super (aminopyralid + florasulam) - 6352 kg/ha, V_9 - Saracen Max (tribenuron methyl + florasulam) - 6014 q/ha and V_2 - Vector (Acid 2.4-D + florasulam) – 5991 kg/ha. In these variants, the production differences were assessed as being very significantly positive compared to the field average. The combined application of the active substances thifensulfuronmethyl + metsulfuronmethyl (Chenkar herbicide) resulted in an increase in production of over 600 kg/ha compared to the field average (figure 3.).

The lowest production, of 4431 kg/ha, among the herbicide variants, was recorded in the V_{11} variant, treated with Starane (0.8 l/ha), with approximately 800 hg/ha less compared to the control variant (field average).

The minimum production was recorded in the non-herbicidated variant (control), where the production was 3827 kg/ha.

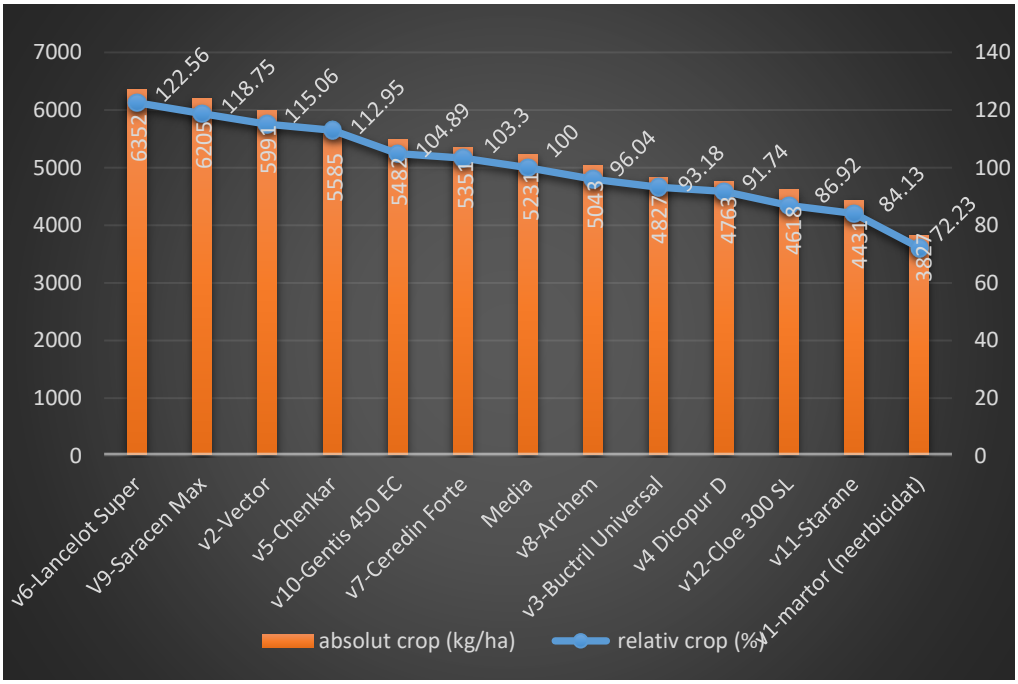

Fig. 4 - The productions obtained during the autumn wheat crop, in 2021

Segetal species identified in 2022

Figure 5 shows the 17 weed species identified by mapping, in the non-herbicidated version, from the autumn wheat crop, in 2022.

From the presented results, it appears that in the control variant, a number of 54.7 weeds/m^2 were identified.

Also, in this year, the best represented were the annual dicotyledonous segetal species: *Polygonum persicaria* (lady's thumb, spotted lady's thumb or and redshank.), *Stellaria media* (chickweed), *Veronica persica* (common field speedwell, winter speedwell), *Lamium*

purpureum (red dead-nettle, purple dead-nettle, or purple archangel), *Galinsoga parviflora* (gallant soldier, littleflower quickweed), *Polygonum convolvulus* or *Fallopia convolvulus* (the black-bindweed or wild buckwheat), *Viola arvensis* (field pansy), *Galium aparine* (cleavers, bedstraw, catchweed bedstraw, grip grass, stickywilly), *Anagallis arvensis* (scarlet pimpernel, red pimpernel), *Consolida regalis* (forking larkspur, rocket-larkspur, and field larkspur), *Fumaria officinalis* (fumitory, drug fumitory or earth smoke) and *Papaver rhoeas* (common poppy, corn poppy, corn rose, field poppy and red poppy). Together, they accounted 84.3% of the total weeding, while the perennial dicotyledonous species such as: *Cirsium arvense* (Canadian thistle), *Convolvulus arvensis* (field bindweed), *Rubus caesius* (field blackberry) and *Lathyrus tuberosus* (earthnut pea, tuberous sweetpea), represented only 13.4 %.

An annual monocotyledonous species was also identified: *Avena fatua* (common wild oat), but in a relatively small number (1.6 plants/m^2).

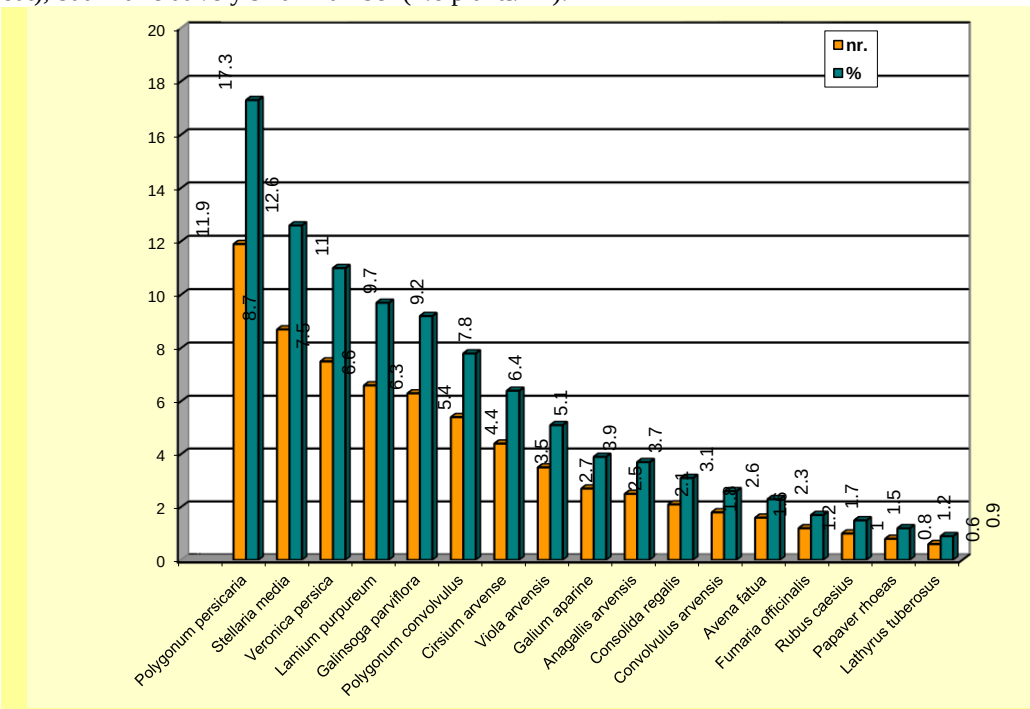

Fig. 5 - The number of weeds, by species, in the control version, in 2022

The efficacy of herbicides against weeds in 2022

In the year 2022, the number of weeds/m² existing in the non-herbicid version was reduced as a result of the application of the treatments, with 26.3 weeds/m² in the version herbicided with Starane EC (Fluroxipir 250 g/l – 0.8 l/ha), up to 52,2 weeds/ m² in the herbicide version with Lancelot Super (Aminopyralid 30% + Florasulam 15% – 33 g/ha) (figure 6.).

The variants that ensured the highest degrees of general control, over 85%, were the following: V_6 – Lancelot Super (Aminopyralid 30% + Florasulam 15% – 33 g/ha), V_9 – Saracen Max (Tribenuron methyl + Florasulam) – 25 g/ha), V_2- Vector (Acid 2.4-D 300 g/l + Florasulam 6.25 g/l – 0.6 l/ha), V_{10} – Gentis 450 EC (Acid 2.4D 360 g/l + Fluroxypir 90 g/l – 1.25 l/ha) and v_7 – Ceredin Forte (Dicamba +2,4d acid) – 1 l/ha.

Even this year, no symptoms of phytotoxicity were identified in the wheat plants, as a result of the application of the herbicides applied in the experimental variants.

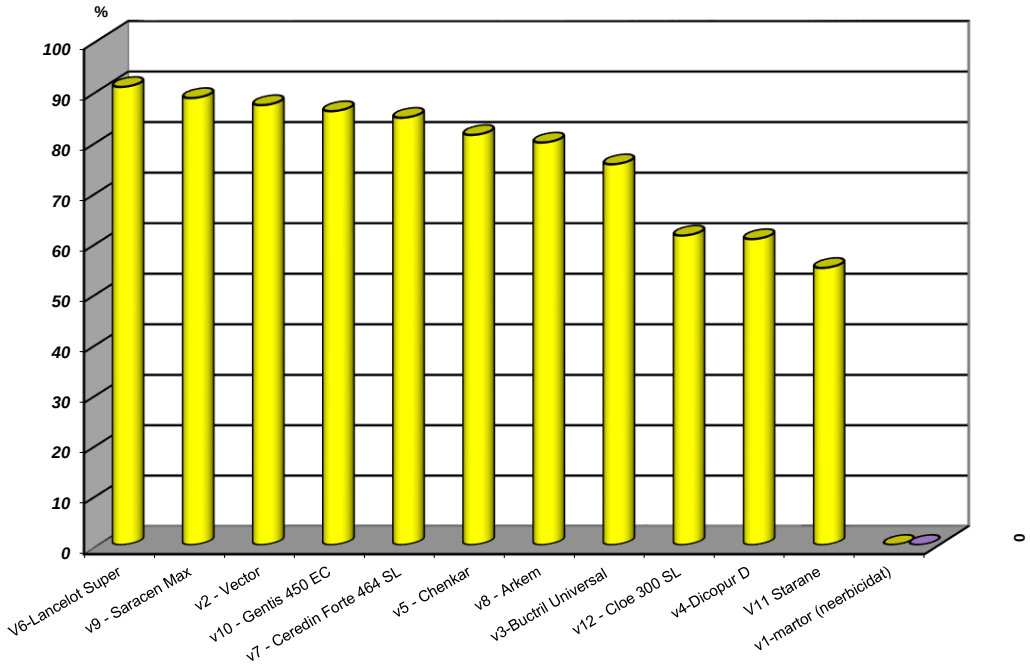

Fig. 6 - Reducing the number of weeds, in 2022

Production results achieved in 2022

The field average this year was 4391 kg/ha. In general, a close correlation could be observed between the effectiveness of the herbicides tested and the level of production obtained (figure 7).

Variants V_6 - Lancelot Super (Aminopyralid 30% + Florasulam 15% – 33 g/ha) and V_9 – tribenuron – methyl 600 g/kg + florasulam 200 g/kg – 25 g/ha determined the achievement of the highest productions, of 5632 kg/ha and respectively 5485 kg/ha, the differences compared to the field average being very significantly positive.

The use of Gentis 450 EC or Vector products led to yield differences of +529 kg/ha, respectively +458 kg/ha, distinctly significantly positive compared to the field average.

In the variants: V_7 – Ceredin Forte (Dicamba +2,4D Acid) – 1 l/ha and V_8 – Arkem (Metsulfuron-methyl) – 30 g/ha, the productions were very close to the field average.

The lowest production, of 3688 kg/ha, among the herbicide variants, was recorded in the V_{11} variant, treated with Cerlit (0.8 l/ha); difference of -1174 kg/ha, statistically assured as very significantly negative compared to the control variant (field average).

This year, the minimum production, recorded in the non-herbicided variant (control), was this year, 3175 kg/ha.

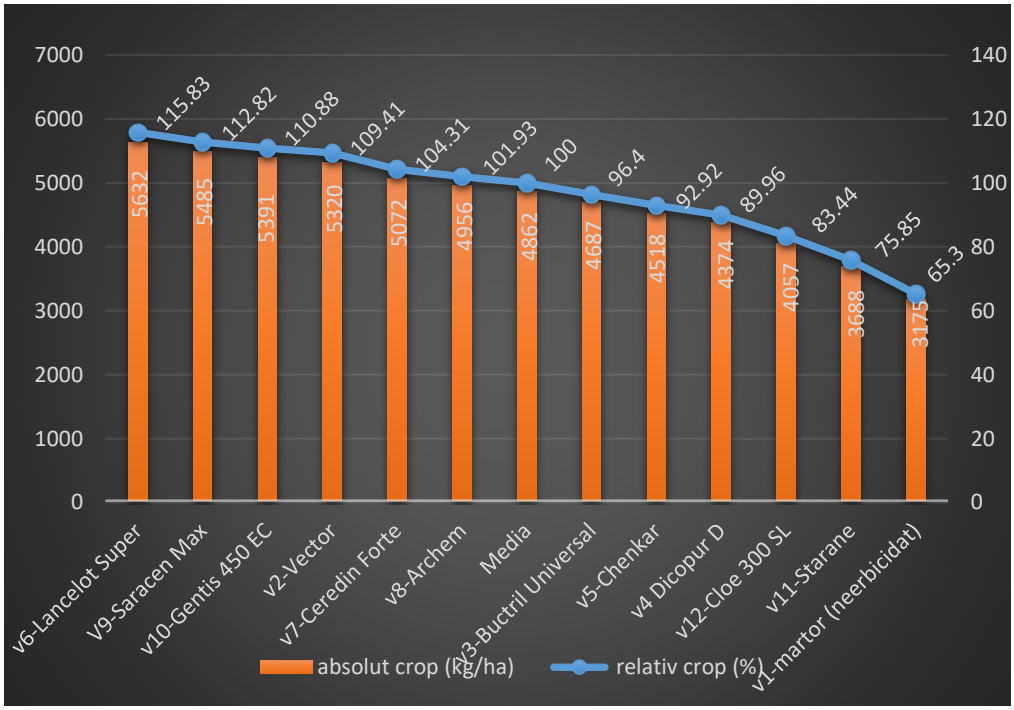

Fig. 7 - The productions obtained during the autumn wheat crop, in 2022

CONCLUSIONS

In the first year of research, 2021, in the non-herbicidated control variant, 67.5 weeds/m^2 were recorded. The most numerous were the annual dicotyledonous species. In the second year, 2022, 54.7 weeds/m^2 were present in the autumn wheat crop.

The most effective weed control, in the 2021 year of research, over 90%, was recorded in the variants: V6 - Lancelot Super (Aminopyralid 30% + Florasulam 15% - 33 g/ha), V2 - Vector - (Acid 2,4-D 300 g/l + Florasulam 6.25 g/l – 0.6 l/ha) and V9 – Saracen Max (Tribenuron – methyl 600 g/kg + Florasulam 200 g/kg – 25 g/ ha).

In 2022, the most effective weed control, over 85%, was recorded in the variants: V_6 – Lancelot Super (Aminopyralid 30% + Florasulam 15% – 33 g/ha), V_9 – Saracen Max (Tribenuron methyl + Florasulam) – 25 g/ha), V_2- Vector (Acid 2.4-D 300 g/l + Florasulam 6.25 g/l – 0.6 l/ha) and V_{10} – Gentis 450 EC (Acid 2.4D 360 g/l + Fluroxypir 90 g/l – 1.25 l/ha.

There were no obvious symptoms of toxicity in cultivated plants, as a result of the application of the herbicide products within the experiments.

The level of wheat production obtained in the experimental field was determined by the climatic conditions, but also by the effectiveness of the herbicides in combating the present segetal species.

In 2021, the highest wheat yields obtained this year were recorded on the variants: V_6 - Lancelot Super (aminopyralid + florasulam) - 6352 kg/ha, V_9 - Saracen Max (tribenuron methyl + florasulam) - 6014 q/ha and V_2 - Vector (Acid 2.4-D + florasulam) – 5991 kg/ha.

In 2022, variants V_6 - Lancelot Super (Aminopyralid 30% + Florasulam 15% – 33 g/ha) and V_9 – tribenuron – methyl 600 g/kg + florasulam 200 g/kg – 25 g/ha determined the

achievement of the highest productions, of 5632 kg/ha and respectively 5485 kg/ha, the differences compared to the field average being very significantly positive.

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