

THE IMPACT OF HERBICIDE TREATMENTS IN THE CONTROL OF WEED SPECIES PRESENT IN THE WHEAT CROP

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Abstract

Wheat (Triticum aestivum) is one of the most important cereals worldwide, essential for human and animal nutrition, being a dominant agricultural crop in Romania, with a major economic role. Weed control remains a key component in optimizing wheat crop productivity and the application of herbicide treatments is a fundamental agronomic practice. Weeds are a major factor in reducing wheat production, and the application of herbicides is an effective measure for their control. The present study evaluates the impact of treatments on the control of weed species in wheat crops, under the pedoclimatic conditions of the Fundulea area. The purpose of the research was to identify new technological sequences regarding the control of weeds in wheat crops by using herbicide treatments, having as main objective the broadening of the spectrum of control, synergism, persistence and without negative impact on the environment. The main objective of this work is the study of the degree of selectivity and effectiveness of the application of herbicide treatments in combating weed species existing in wheat crops. The use and application of herbicide treatments must be correlated with the degree of infestation, the spectrum and dominance of weed species and the pedoclimatic conditions of the research area.

Key words: wheat, weeds, herbicide, efficacy, selectivity.

INTRODUCTION

Wheat (*Triticum aestivum*) is the most important plant cultivated in our country and in over 100 countries around the world. Providing abundant food to feed the Earth's population is an essential concern for humanity.

All branches of biological science are working intensively and purposefully in this direction (Shopova and Cholakov, 2014, 2015; Nenova, 2017; Georgiev et al., 2019; Nenova, 2019; Nenova et al., 2019; Petrova et al., 2019)

Weeds also cause indirect damage, as many of the species are hosts to diseases and pests (Kalinova et al., 2012). Weeds are usually characterized by rapid development and abundant seed production, they spread easily.

Weeds have the greatest negative impact, around 37%, compared to insects (18%), fungi and bacteria (16%) and viruses (2%) (Oerke, 2006). Weeds have a negative effect on the level of production and its quality, the presence of a large number of weeds makes harvesting difficult, they also increase drying costs, they can have toxic effects on people and animals, and they can also favor the transmission of

diseases and pests to plants (Chirilă, 2001). Weeds also cause indirect damage, as many of the species are hosts to diseases and pests (Kalinova et al., 2012). Weeds are usually characterized by rapid development and abundant seed production, they spread easily.

Herbicide application must be correlated with the degree of infestation of the crop, the spectrum and dominance of weeds, the application period, the technical potential for effectiveness and the zonal pedoclimatic conditions before and after treatment (Măturaru et al., 2022).

Choosing an appropriate herbicide, the optimal time and application rate is one of the most important and responsible moments in wheat management (Sherawat and Ahmad, 2005; Khalil et al., 2008; Abbas et al., 2009; Petrova and Sabev, 2014; Penchev and Petrova, 2015; Petrova, 2017). To be economically efficient, herbicide treatment must be carried out in accordance with the existing weeds (Klaus, 1992).

The main objective is to reduce the negative impact of weeds on agricultural production, while respecting the principles of sustainability

and environmental protection. Regarding the existing state of research, significant progress has been made in identifying and developing effective methods of weed control. The main objective of this work is the study of the degree of selectivity and effectiveness of the application of herbicide treatments in combating weed species existing in wheat crops. The use and application of herbicide treatments must be correlated with the degree of infestation, the spectrum and dominance of weed species and the pedoclimatic conditions of the research area.

MATERIALS AND METHODS

The research was carried out in the period 2022-2024, at the National Institute for Agricultural Research and Development - Fundulea, being studied the application of the herbicide treatments at the wheat 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 Glosa created by the institute from NARDI Fundulea. The organization of the experiment was done according to the method of randomized blocks, with a plot area of 25 m², in 3 replications and 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): Floramix+ Dasoil 26-N (Adj); Omnera+Foxtrot 69W and Pixxaro Super.

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

No var	Herbicides treatments	Active ingredient	Dose g, l/ ha	Time of appli cation
1	Untreated	-	-	
2	Floramix+ Dasoil 26-N(adj)	70.8 g/kg Piroxsulam + 14.2 g/kg Florasulam + 70.8 g/kg Cloquintocet – mexil (safener)	260 g/ha +0.6 l/ha	Poste m BBC H 32
3	Omnera+ Foxtrot 69W	-(fluroxipir 135 g/l + tifensulfuron metil 30 g/l + metsulfuron metil 5 g/l) + -fenoxaprop-P-etil 69 g/l + cloquintocet mexil 34.5 g/l (safener)	1.0 l/ha+ 1.0 l/ha	
4	Pixxaro™	12 g/l halauxifen-metil + 280 g/l fluroxipir meptil + 12 g/l cloquintocet-mexil	0.5 l/ha	

The herbicide treatments were applied in the post-emergence (BBCH 32). After the application of herbicide treatments, observations of selectivity (%) of wheat plants 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. The climatic conditions (Figure 1) recorded in Fundulea area, during the research period in the 2022-2024 years, were extremely different, especially the amount of precipitation recorded. The average sum of precipitation (mm) for the 2022 year was 258.4 mm, in 2023 year was 423.4 mm and in 2024 was 437.0 mm. The average temperature (°C) in 2022 was 13.3°C, in the year 2023 was 14.3°C and in the year 2023 was 14.2°C

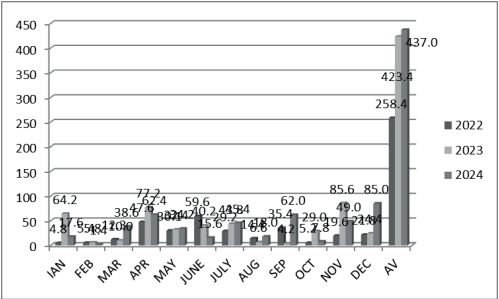


Figure 1. The climatic conditions of 2022-2024 years from NARDI FUNDULEA

RESULTS AND DISCUSSIONS

In the wheat experience carried out in the experimental field, the crop presented an average infestation degree - 89%, with weeds, extremely diversified, depending on the predecessor plant and the local climatic conditions. The most representative (Figure 2) weed species were: *Veronica hederifolia*, *Anthemis arvense*, *Polygonum convolvulus*, *Galium aparine*, *Matricaria inodora*, *Papaver rhoses*, *Apera spica venti* and *Avena fatua*. Weed species are uncultivated plants, harmful, devoid of economic value, adapted to grow and develop alongside agricultural plants. The weed species demonstrate a better adaptation to climate and soil conditions.

Their main cause leads to the compromising of crops, the reduction of production and in some cases to destruction.

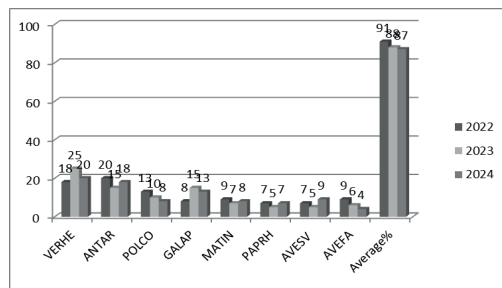


Figure 2. The infestation degree (%) with weeds from the untreated plots

Compared to the pedoclimatic conditions recorded during the research period, the wheat crop presented an average infestation of 80% (2022 - 72% and 2023 - 88%, Figure 3).

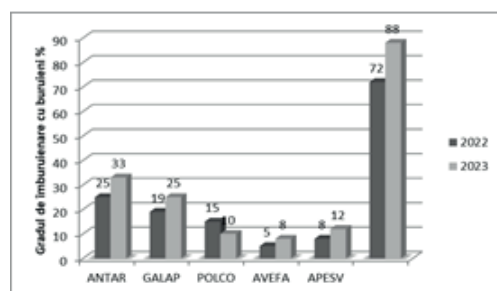


Figure 3. Infestation degree with weeds 2022-2023

In the experiment, the weed species present were diversified: annual dicotyledons *Anthemis arvensis* (ANTAR), *Galium aparine* (GALAP), *Polygonum convolvulus* (POLCO) and monocotyledons *Avena fatua* (AVEFA) and *Apera spica venti* (APSV) (Cergan, 2024)

In the experimental field, all the selectivity observations made for the crop, not recorded phytotoxic phenomena (EWRS scale = 0).

In the wheat crop, the herbicide treatments applied post-emergence (BBCH 32) had a good control effect, highlighting their effectiveness through a single application. By applying the treatment with herbicides, good results were obtained regarding the effect of combating weeds, depending on: the climatic conditions, the degree of infestation, the spectrum and the dominance of the species present in the field from Fundulea area.

The treatment with the herbicide Floramix + Dasoil 26-N (adj) was applied in the dose of 260 g/ha +0.6 l/ha (postemergence - BBCH 32), following the application of this treatment, a very good effectiveness was recorded for the weeds present in the wheat crop, especially for annual dicotyledons *Anthemis arvensis* - 96% and *Matricaria inodora* - 94% (the average of 2022-2024).

The weeds *Papaver rhoses*, *Polygonum convolvulus*, *Galium aparine*, and *Veronica hederifolia* registered a good efficacy 85-75 - 74% (the average of 2022-2024).

The species (Figure 4) *Apera spica venti* and *Avena fatua* have recorded a good control effect following the treatment applied (85% and 89%).

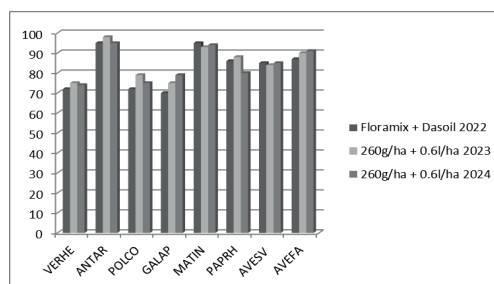


Figure 4. The efficacy (%) of the Floramix+ Dasoil 26-N (adj) applied for the weeds control from the wheat crop (Fundulea, 2022-2024)

Figure 5 shows the average effectiveness results (%) of the Omnera + Foxtrot 69W treatment applied at the dose of 1.0 l/ha + 1.0 l/ha, post-emergence-BBCH 32.

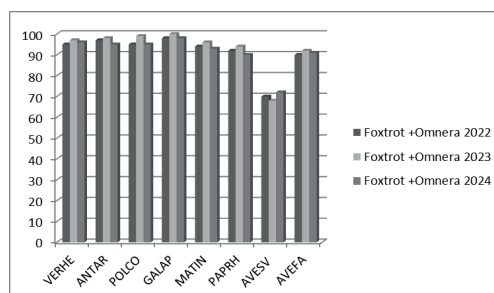


Figure 5. The efficacy (%) of the herbicides Omnera + Foxtrot 69W applied for the weeds control from the wheat crop (Fundulea, 2022-2024)

After applying the Omnera + Foxtrot 69W treatment, the excellent control for annual dicotyledonous weeds was more than 99-96%

Galium aparine, *Anthemis arvensis*, *Polygonum convolvulus* and *Veronica hederifolia*.

The weed species *Matricaria inodora*, *Papaver rh.*, and *Avena fatua* registered a good efficacy 94%, 92% and 91%.

The monocotyledonous species recorded an average control following the treatment applied - *Apera spica venti* - 70%.

The next variant treated was with Pixxaro S. (Figure 6) which ensures very good efficacy on a very large number of problem dicotyledonous weeds in wheat crops. Visible symptoms appear within hours of application and continue until the weed dries out completely within a few weeks.

Following the application of this treatment at a dose of 0.5 l/ha, the control was very well controlled on the species present in the fields: *Polygonum convolvulus* - 98%, *Anthemis arvense*, *Matricaria inodora*, *Galium aparine* - 96%; *Papaver rh.* - 87% and *Veronica h.* - 83%.

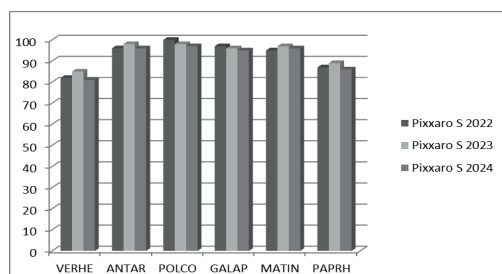


Figure 6. The efficacy (%) of the herbicides Pixxaro S., applied for the weeds control from the wheat crop (Fundulea, 2022-2024).

Following the application of post-emergence herbicide treatments in wheat crops, the average production (Figure 7) obtained during the years 2022-2024 was: Floramix + Adj -6.99 t/ha; Omnera + Foxtrot 69W - 6.65 t/ha and Pixxaro S. -5.07 t/ha.

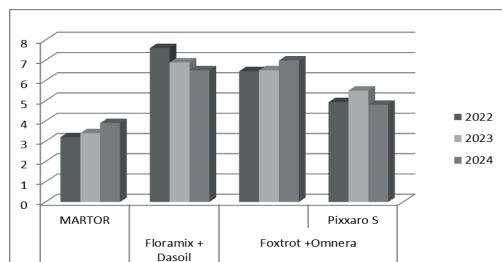


Figure 7. The wheat yields (t/ha) under the 3 experimental treatments

In the uncontrol variants, the yields were much lower (average 3.5 t/ha), due to competition between the crop and existing weeds compared to the variants treated with different products.

Integrated weed management is a system of combined measures that aims to maintain the level of weed infestation of crops below the damage threshold, while minimizing the negative impact on the environment (Cergan, 2025).

In our country, special attention is paid to the control of weed species by using and applying herbicide treatments due to the degree of weeding, dominant and diversified spectrum weeds present in the crop.

Modern agriculture faces multiple challenges generated by climate change that directly influences the dynamics of agricultural ecosystems. Among the biotic factors affecting crop productivity, weeding is one of the most important problems for farmers.

CONCLUSIONS

The herbicide treatments applied post-emergence - BBCH 32, did not record phytotoxic symptoms for the cultivated wheat variety.

The efficacy of herbicide treatments (postemergent- BBCH 32) used for wheat crop depends on certain essential factors: the degree of infestation of the crop with weeds; the spectrum and dominance and the pedoclimatic conditions from Fundulea.

The production obtained was in close correlation with: the biological potential of the cultivated variety, the effectiveness of herbicide treatments and the pedoclimatic conditions in the Fundulea area.

Weed control remains a key component in optimizing wheat crop productivity and the application of herbicide treatments is a fundamental agronomic practice.

Weeds are a major factor in reducing wheat production, and the application of herbicides is an effective measure for their control.

The present study evaluates the impact of treatments on the control of weed species in wheat crops, under the pedoclimatic conditions of the Fundulea area.

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