THE CONTROL OF WEEDS PRESENT IN THE WHEAT CROP

Mihaela CERGAN[1], Gheorghe MĂTURARU[1], Elena PARTAL[1], Cătălin LAZĂR[1]

e-mail: mily_mily2007@yahoo.com;erbicide.incda@yahoo.com
[(1)] National Agricultural Research and Development Institute Fundulea, 915200 Fundulea,
E-mail: erbicide.incda@yahoo.com;mily_mily2007@yahoo.com

Abstract

Wheat (Triticum aestivum) is the most important plant cultivated in our country and in more than 100 countries around the world. Providing plenty of food to feed Earth's population is a concern for humanity. This paper present the results obtained at National Agricultural Research and Development Institute Fundulea, during 2022-2023, according to the herbicide treatments: Floramix (70.8 g/kg piroxsulam + 14.2 g/kg florasulam + 70.8 g/kg cloquintocet - mexil (safener)+ Dasoil 26-N (adjuvant); Omnera (fluroxipir 135 g/l + tifensulfuron metil 30 g/l + metsulfuron metil 5g/l)+Foxtrot(fenoxaprop-P-etil 69 g/l + cloquintocet mexil 34.5 g/l (safener); Pallas (7.5% piroxsulam + 7.5% cloquintocet-mexil safener) + adjuvant, postemergently applied -BBCH 32-, for the weeds controlling from the wheat crop.

The main objective of this work focused on the study of the selectivity and effectiveness of the application of herbicide treatments to combat the weeds present in the crop. The weather from the experimentation years is representative for the local trend.In the wheat crop, the application of herbicide treatments must be correlated with the infestation degree, the spectrum and dominance of the weeds, the time of application and the pedoclimatic conditions.

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

INTRODUCTION

Wheat (Triticum aestivum) is the most important plant cultivated in our country and in more than 100 countries around the world. Providing plenty of food to feed Earth's population is a concern for humanity.

All branches of biological science work intensively and purposefully to solve a large number of problems and tasks. (Georgiev et al., 2019; Nenova, 2019; Nenova et al., 2019; Petrova et al., 2019; Nenova, 2017; Shopova & Cholakov, 2015; Shopova & Cholakov,2014).

Genetic transformation has the potential to improve plant resistance to various stressors, including pathogens, pests and weeds (Bonciu, 2023a,b), in a sustainable way, in full harmony with the environment (Bonciu, 2023c). Moreover, the entire process of obtaining food raw material is based on the challenge of ensuring food security and environmental protection, in the conditions of unprecedented climate changes (Paunescu et al., 2023, 2024).

Weeds are wheat's main competitors for water, nutrients and light. Weeds also cause indirect damage, as many of the species are disease and pest hosts (Kalinova et al., 2012).
In appearance, things are like this, but if we analyze the state of wheat weeding through its structure, some important aspects are noted, which it is good for every farmer to take into account.

The species - both the annual ones and the perennial ones that make up the floristic spectrum - are characteristic of the wheat culture, given the relatively long wheat vegetation period (autumn wheat covers practically all four seasons of the year) in which weed species (unwanted) very diverse: some weeds are specific for autumn, others for spring, others for autumn - spring, and others for early summer (Anghel et al., 1972).
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).
The number and spectrum of weeds depends on different factors such as soil type, crop rotation, tillage, crop density, fertilization level,

etc. (Hanzlik and Gerowitt, 2011; Partal et al., 2023; Sălceanu et al., 2024).

There is a large number of literature sources that prove the harmful consequences caused by weeds and also the importance of mechanical and chemical weed control (Fetvadzieva et al., 1991; Spasov, 1995; Petcu et al., 2022).

Considering these diverse and very important aspects, it is considered that for the winter wheat crop the best results in reducing the degree of weeding are obtained by accepting and promoting integrated weed management (IMB) (Sharpe et al., 1983; Barberi, 2002).

Herbicides must be correlated with the degree of infestation of the crop, with the spectrum and dominance of the weeds, the time of application, the technical potential of effectiveness and the zonal pedoclimatic conditions, before and after the treatment (Maturaru, 2022).

Choosing an appropriate herbicide, the optimal time and application rate is one of the most important and responsible moments in wheat management (Petrova, 2017; Penchev & Petrova, 2015; Petrova & Sabev, 2014; Abbas et al., 2009a; Khalil Khalil). et al., 2008; Sherawat & Ahmad, 2005).

The main objective is the study regarding the degree of selectivity and effectiveness of the herbicide treatments applied in combating the existing weed species in the wheat crop.

Table 1

The herbicide treatments applied in the wheat crop. Experimental variants

No var	Herbicide treatments	Active ingredient	Dose l /ha	Time of application
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	Postemergence BBCH 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	Postemergence BBCH 32
4	Pallas 75WG + ADJ	7.5% piroxsulam + 7.5% cloquintocet-mexil safener	250 g/ha+ 0.5 l/ha	Postemergence BBCH 32

Table 2

Monthly sum of precipitation (mm)

Monthly	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
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

Table 3

Monthly average temperature (°C)

Monthly	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
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

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 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 Abund wheat variety created by the institute from 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, the amount of water used was 300 l/hectare. In this experiment, we observed the degree of selectivity of wheat plants and the degree of control of weeds by applying herbicide treatments (table 1): Floramix + Dasoil 26-N(Adj); Omnera +Foxtrot 69W and Pallas 75WG + Adj. 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 (table.2, table.3) recorded during the research period were extremely different, especially the amount of precipitation recorded.The average sum of precipitation (mm) for the 2022 year was 258.4 mm and for the 2023 year was 423.4mm.The difference of precipitation (2022,2023) was - 165.0 mm. The average temperature (°C) in 2022 was 12.1°C and in the year 2023 was 13.3°C.

RESULTS AND DISCUSSIONS

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.

Depending on the recorded pedoclimatic conditions of the research years, the wheat crop showed an average weed infestation - 92% (2022 - 86% and 2023 - 98%).

In the experience, the weed species present were diversified: - Annual dicots:

Veronica hederifolia (VERHE), *Anthemis arvensis* (ANTAR), *Polygonum convolvulus* (POLCO), Galium aparine (GALAP)

- Monocotyledonos: Avena fatua (AVEFA); Apera spica -venti (APSV)..

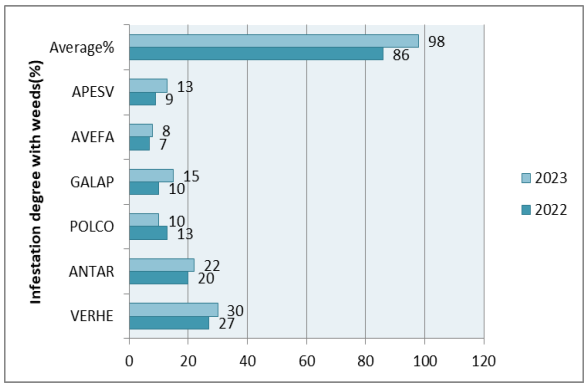

Figure 1 The infestation degree (%) with weeds from the untreated wheat plots.

Following the application of herbicide treatments (postemergence, BBCH - 32), no phytotoxic phenomena (Table 4) were recorded for the cultivated wheat variety – Abund.

Table 4

The average selectivity (%) of herbicide treatments applied at the wheat crop

No var	Herbicides treatments	Dose g,l /ha	Time of application	Selectivity (%)
1	Untreated	-	-	-
2	Floramix+ Dasoil 26-N(adj)	260 g/ha +0.6 l/ha	Postem	1
3	Omnera+ Foxtrot 69W	1.0 l/ha+ 1.0 l/ha	Postem	1
4	Pallas 75WG + adj	250g/ha+ 0.5 l/ha	Postem	1

In the mentioned infestation conditions, through the application of herbicide treatments, good results were obtained regarding the control effect of the species depending on: the degree of weeding, the spectrum and dominance of the weeds and the climatic conditions.

During the research period, the application of herbicide treatments for this crop shows a significant weed control, consistent with the products used, compared to the untreated control.

The treatments with herbicides applied postemergence - BBCH 32, in different doses registered a good control effect, highlighting their effectiveness through a single application.

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 species of weeds present in the wheat crop, especially for annual dicotyledons - *Anthemis arvensis* - 97%, *Polygonum convolvulus* - 76%, *Veronica hederifolia* -74% and *Galium aparine* - 73% (Figure 2).

Regarding the control of weeds, *Avena fatua* (AVEFA) - 94%; *Apera spica venti* (APSV) -92%.

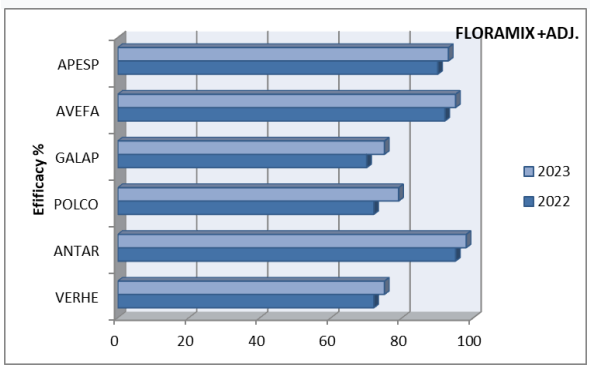

Figure 2 **The efficacy (%) of the Floramix+Dasoil 26- applied for the weeds control from the wheat crop (Fundulea, 2022-2023)**

Figure 3 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.

After applying the Omnera + Foxtrot 69W treatment, the excellent control for annual dicotyledonous weeds was more than 95% - *Veronica hederifolia, Anthemis arvensis, Polygonum convolvulus, Galium aparine.*

Weed species Avena fatua- 96*%; Apera spica venti* -77%.

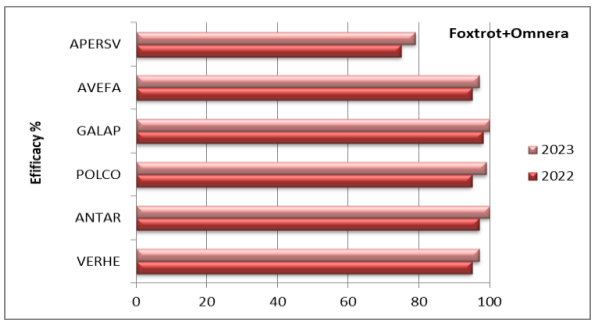

Figure 3 **The efficacy (%) of the herbicides Omnera + Foxtrot 69W applied for the weeds control from the wheat crop (Fundulea, 2022-2023).**

The results obtained following the treatment Pallas 75WG + Adj (Figure 4) applied at the dose of 250g/ha + 0.5 l/ha, post-emergence- BBCH 32 showed a very good control effect 96-89% for the annual dicotyledons: *Anthemis arvensis, Veronica hederifolia*, followed by a more moderate effect of 72% for *Galium aparine* and *Polygonum convolvulus*.

Weed species *Avena fatua* and *Apera spica venti* had an effect of 92-93%.

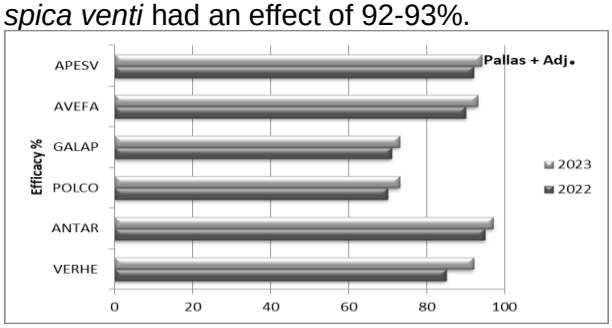

Figure 4 **The efficacy (%) of the herbicides Pallas 75WG + for the weeds control from the wheat crop (Fundulea, 2022-2023).**

Figure 5 shows the average productions obtained in the wheat crop, where in 2022 the productions obtained were significantly higher compared to the untreated control (3.4 t/ha) due to the favorable climatic conditions and the effectiveness of the herbicide treatments: Floramix + Dasoil 26-N; Omnera + Foxtrot 69W; Pallas 75WG + adj being between (7.8 - 7.2 t/ha).

In the following year (2023), the productions obtained were much lower, where the untreated control recorded an average production of 2.9 t/ha lower than in 2022.

After harvesting the experimental variants of the herbicide treatments: Floramix + Dasoil 26 -N; Omnira + Foxtrot 69W; Pallas 75WG + adj production was between 6.5-5.9 t/ha).

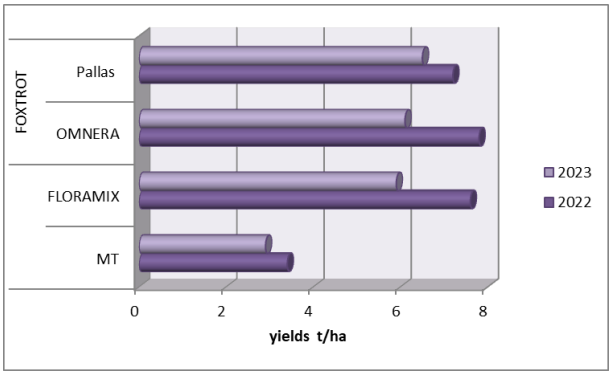

Figure 5 **The wheat yields (t/ha) under the four experimental treatments**

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

CONCLUSIONS

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

The efficiency 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;
- climatic conditions.

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.

ACKNOWLEGMENTS

This paper was conducted under an ADER project (Contract ADER 2.1.4./2023 Cercetări privind perfecționarea managementului integrat de combaterea buruienilor la principalele culturi de câmp, în contextul schimbărilor climatice și a

restricțiilor Green Deal privind exploatarea durabilă a resurselor agricole de mediu)

REFERENCES

Abbas, G., Ali, M., Abbas, Z., Aslam, M., & Akram, M. **2009b –** *Impact of different herbicides on broadleaf weeds and yield of wheat. Pakistan Journal of Weed Science Research, 15(1), 1–10.*

Anghel, G., Chirilă C., Ciocârlan, V., Ulinici, A., 1972 – *Buruienile din culturile agricole şi combaterea lor. Edit. Ceres, Bucureşti.*

Barberi, P., 2002 – *Weed management in organic agriculture: are we addresing the right issues? Weed Research, 42(3): 177-193*.

Bonciu, E. 2023a. *Genetic transformation in agriculture: the real chance for ensuring worldwide sustainable food security. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol. 23(1): 73-80.*

Bonciu, E. 2023b. *Clastogenic potential of some chemicals used in agriculture monitored through the allium assay. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol. 23(3): 63-68.*

Bonciu, E. 2023c. *Some sustainable depollution strategies applied in integrated environmental protection management in agriculture. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol. 23(3): 69-76.*

Chirila, C., 2001 – *Weeds biology, Organography, chronology, dynamics, importance. Ed. Ceres Bucureşti, ISBN 973-40-0516-2.*

Fetvadzieva, N., Zhelev, A., Dechkov, Z., Pavlov, P., Dimov, A., Spasov, V., Topalov, V., Kondarev, R., 1991 – *Herbology. Publisher "Zemizdat" Sofia. (In Bulgarian)*

Georgiev, G., Encheva, V., Encheva, Y., Nenova, N., Valkova, D., Peevska, P., & Georgiev, G., 2019 – *Breeding of Sunflower (Helianthus annuus L.) at Dobrudzha Agricultural Institute – General Toshevo. Field Crop Studies, XII(2), 5–16.*

Hanzlik, K., Gerowitt, B., 2011 – *The importance of climate, site and management on weed vegetation in oilseed rape in Germany. Agr. Ecosyst Environ Agriculture, 141: 323-331.*

Kalinova, Sht., Zhalnov, I., & Dochev, G., 2012 –*Overview of indirect weed harm as hosts of diseases 622and pests on crop plants. Scientific Works of the Agricultural University of Plovdiv, LVI. 291–294.*

Khalil, G., Ahmad, G., & HussainSha, N., 2008 –*Individual and combined effect of different weed management practices on weed control in wheat. Pakistan Journal of Weed Scien*

Klaus, M., 1992 – *Integrated weed control illustrated in the case of winter rape. Gesunde Pflanzen, 44(8): -251-254.*

Măturaru, Gheorghe, Șerban, Mihaela, Partal, Elena, 2022 – *Noi secvenţe tehnologice privind controlul buruienior monocotiledonate şi dicotiledonate din cultura de grâu;Anale Fundulea volumul 90/2022.*

Nenova, N., 2017 – *New Bulgarian sunflower hybrid "LINZI". Field Crops Studies, XI(1), 97–102.*

Nenova, N., Valkova, D., & Penchev, E., 2019 – *Analaysis of importatant indices in new Bulgarian hybrids Linzi and Deveda. International Journal of Innovative Approaches in Agricultural Research, 3(3), 505–509.*

Nenova, N., 2019 – *New perspective Bulgarian sunflower hybrid Deveda. Field Crop Studies, XII(1), 9–16.*

Partal, E., Oltenacu, C.V., Paraschivu, M., Cotuna, O., Dima, M., Contescu, L., 2023 – *Effects of different soil tillage on soil moisture, weed control, yield and quality of maize (Zea mays L.). Romanian Agricultural Research, 40: 475-482.* https://doi.org/10.59665/rar4044.

Paunescu, R.A., Bonciu, E., Rosculete, E., Rosculete, C.A., Paunescu, G. 2024. *Productivity and baking quality of autumn wheat varieties under different technological conditions on the Caracal chernozem. Scientific Papers. Series A. Agronomy, Vol. LXVII (1): 600-611.*

Paunescu, R.A., Bonciu, E., Rosculete, E., Paunescu, G., Rosculete, C.A. 2023. *The Effect of Different Cropping Systems on Yield, Quality, Productivity Elements, and Morphological Characters in Wheat (Triticum aestivum). Plants, 12, 2802.*

Penchev, E., & Petrova, Z., 2015 – *Effect of the date of application of herbicides on the productivity of common winter wheat. VI International Scientific Agriculture Symposium "Agrosim 2015", 15-18 October 2015, Jahorina, Bosnja and Hercegovina, Book of proceeding, 137–141. 62.*

Petcu, V., Toncea, I., Galit, I., Radu, I., Grădilă, M., Cuculici, R., 2022 – *Camelina sativa Genotypes response to downy mildew and weed suprresion in Organic Agriculture. Romanian Agricultural Research,39:239-246. https://doi.org/10.59665/rar3923.*

Petrova, Z., & Sabev, G., 2014 – *Effect of the date of application of a set of herbicides in common winter wheat crops on weed infestation. Agricultural Science and Tehnology, 6(3), 300–303.*

Petrova, Z. 2017 – *Effect of the herbicide treatment dose on the weed infestation in common winter wheat. Agricultural Science and Technology, 9(4), 306–310.*

Petrova, Z., 2017 – *Effect of the herbicide treatment dose on the weed infestation in common winter wheat.*

Petrova, Z., Georgiev, G., & Nenova, N., 2019 – *Effect of some herbicides on the productivity of sunflower hybrid Velko. Field Crop Studies, XII(2), 157–164.*

Sălceanu, C., Paraschivu, M., Popescu, C.V., Olaru, A.L. – 2024. *The management of weeds using new generation herbicides in maize.* Scientific Papers. Series A. Agronomy, Vol. LXVII, No. 2, p. 369-379,

Sherawat, M, & Ahmad, M., 2005 – *Bio-efficacy of different graminicides and their effect on the growth and yield of wheat crop. International Journal of Agriculture & Biology, 7(6), 438–440.*

Shopova, N., & Cholakov, D., 2014 – *Effect of the age and planting area of tomato (Solanum licopersicum L.) seedlings for late field production on the physiological behavior of plants. Bulgarian Journal of Agricultural Science, 20(1), 173–177.*

Shopova, N., & Cholakov, D., 2015 – *Economic efficiency of late tomato field production with seedlings grown in containers of different substrate composition. Agricultural University – Plovdiv, Scientific Works, 59(4), 131–136.*

Spasov, V., 1995 – *Habilitation for the academic title. „Professor" (In Bulgarian).*

Şarpe, N., Dinu, C., Popescu, A., Penescu, A., 1983 – *Opinii, concepţii şi rezultate privind combaterea integrală a buruienilor din culturile de câmp. Probleme de agrofitotehnie teoretică şi aplicată, 5(4): 333-358.*