A STUDY ON THE SELECTIVITY AND EFFICIENCY OF A GROUP OF HERBICIDES IN „DUNAVIYA" WHEAT VARIETY

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Key words: wheat, herbicides, selectivity, productivity

ABSTRACT

In the experimental field of the Institute of Agriculture and Seed Science "Obraztsov Chiflik", Ruse, in 2017 - 2018, a study was conducted to determine the reaction of "Dunaviya" wheat variety, treated with herbicides for foliar fertilization at optimal and double doses - metasurfuron - methyl, fenoxaprop-P-ethyl, 2.4 amine salt. They did not have negative effects on the plants. Regarding destroyed weeds, all the three tested vegetation herbicides (metasurfuron - methyl, fenoxaprop-P-ethyl and 2.4 amine salt), applied at optimal and increased doses, showed high herbicidal efficiency against annual cereal and deciduous weeds. The use of metasurfuron - methyl, fenoxaprop-P-ethyl and 2.4 amine salt herbicides led to higher grain yield, compared to the untreated control.

INTRODUCTION

In recent years, different varieties of common winter wheat have been offered in Bulgaria. It is essential to choose a suitable variety for each district of the country, grown with appropriate technology in field crop rotations (Cheleev et.al., 1993, Ivanova et al., 2009, Ilieva, D. 2011).

The biological potential of each crop is not only genetically set, but is also influenced by the growing conditions (Bazitov et al. 2010; Hristov et al. 2010; Kuneva et al. 2014; Kuneva and Bazitov, 2014). It depends not only on the levels of fertilization, on the moisture supply during the growing season, which is especially important in the current climate, but also on the level of plant protection against weeds. Herbicide treatment is an important element of crop cultivation, which is the most effective means of weed control (Kolev, 1993; Van Himme and Bulcke, 1989; Montazeri, 1994; Camele and Rana, 1995). On the other hand, herbicides become a systemic environmental stressor and may have a specific effect on next-generation plants (De la Cruz, 1993; Liu et al., 1994). It is necessary to specify the effectiveness of treatment with plant protection products, as well as their impact on the quantity and quality of yield (Delchev, 2010; Delchev, 2012; Georgiev, 2014). Of great importance is the adaptability of varieties and crops, where a number of results show the ecological plasticity and adaptability of varieties of common wheat, under different soil and climatic conditions (Penchev and Stoeva, 2004). With the present study, the team aims to establish the reaction of wheat variety "Dunaviya", treated with herbicides for foliar application in optimal and increased doses.

MATERIAL AND METHOD

During the period 2017-2018 in the experimental field of the Institute of Agriculture and Seed Science "Obrazcov Chiflik" - Ruse, a field experiment was conducted to study the effect of vegetation herbicides metasurfuron - methyl, fenoxaprop - P - ethyl, 2,4 amine salt , applied in optimal and increased doses, on the productivity of wheat variety " Dunaviya "

The experiment was conducted by the block method in four replications, with

the size of the harvest plot 50 m^2 and randomized location of the variants on heavily leached humus.

The sowing was carried out in the optimal time for the region, after the predecessor - fodder peas. The herbicides were applied with a back sprayer at a working solution consumption of 30 l / da, applied vegetatively, immediately after the end of the vernalization. The control plot was kept free of weeds throughout the growing season by hand weeding.

To achieve the purpose of the study, the following indicators were reported: phytotoxicity of herbicides on the 7^{th}, 17^{th} and 30^{th} day after their application (on the logarithmic scale of (1-9 points) of EWRS at point 1 - without damage and at point 9 - the crop is completely destroyed); grain yield, $kg.da^{-1}$.

RESULTS AND DISCUSSIONS

The meteorological conditions during the survey, in terms of average monthly temperatures and precipitation by months are differ from the multi-year average values (climatic norm) for the period 1896 - 2005 (Fig. 1).

In terms of climate, the economic year 2017/2018 is characterized by significant rainfall in October and November 2017 and February, June and July 2018, as the total rainfall for the entire economic year exceeds the climatic norm for a 94-year period by 8.05 %. The precipitation during the months of October (81.9 mm) and November (80.4 mm) had a favourable effect on the conditions for the initial phases of the wheat vegetation.

The winter of the economic year 2017/2018 was mild, as the absolute minimum temperature reached -11.2 ºC, which is above the critical temperature for wheat. The amount of precipitation during the autumn-winter period (October - March) is 432.20 mm and exceeds the climatic norm (228.00 mm) by 204.20 mm.

The spring period (April - May) is characterized by relatively dry and warm weather. The amount of precipitation in April was 12.7 mm with a norm of 50.6 mm, and in May - 67.6 mm (norm - 66.5 mm), which had a favourable effect on the emergence and flowering of wheat. Precipitation was unevenly distributed, with most of the annual amount at the expense of the spring-summer period.

In the survey, with the highest density, annual dicotyledonous weeds are represented by: *Anthemis arvensis* L, *Lamium purpurreum* L., *Viola tricolor* L., *Veronica hederifolia* L., *Capsella bursa-pastoris* L., *Stellaria media* L., *Chenopodium album* L., *Anagallis arvensis* L., *Galium aparine* L., *Senecio vulgaris* L., *Scandix pecten-veneris*, *Xanthium strumarium* L., *Bifora radians* L. Of the perennial deciduous weeds, the following species have been reported – *Convolvulus arvensis var. arvensis*, *Cirsium arvense* L. и в по-ниска степен на *Cardaria draba* L. и *Sonchus arvensis* L.

The results of visual reports in phytotoxicity scores, on the EWRS scale, show that the herbicides metasurfuron - methyl in doses of 1.5 and 3 g / da; fenoxaprop - P - ethyl in doses of 100 and 200 ml / da and 2,4 amine salt in doses of 150 and 300 ml / da, do not cause phytotoxic effects on the culture (Table 1). The herbicides tested show good selectivity for wheat (score 1).

After treatment with metasurfuron-methyl, fenoxaprop-P-ethyl and 2,4 amine salt in optimal and increased doses in the spindle phase, is established complete death of *Anthemis arvensis* L., *Stellaria media* L., *Anagallis arvensis* L., *Galium aparine* L., *Convolvulus arvensis var. arvensis* и *Cardaria draba* L. Partial action has also been found against *Viola tricolor* L. After treatment, are not affected by the herbicides the weeds *Xanthium strumarium* L. и *Cirsium arvense* L.

After the introduction of vegetation herbicides in wheat crops, after the 17^{th} day there is a wilting of the leaf mass of annual deciduous and some perennial weeds, followed by the appearance of chlorotic spots and stunted growth. This allowed the cultivated plants to develop and suppress the available weeds, which are located in the lower floors.

The main criterion determining the economic qualities of a variety is its productivity. Long-term research shows that the timely application of vegetative herbicides is an intensive agronomic factor that contributes to the regulation of yield.

Determining the most appropriate doses of imported herbicides depending on the genotype and specific climatic conditions is a key element of wheat farming.

The results of the obtained yields show that the herbicides metasurfuron - methyl, fenoxaprop - P - ethyl and 2,4 amine salt, applied in optimal and increased doses, can be applied to wheat variety "Dunaviya" (Table 2).

In the case of the “Dunaviya” variety, the obtained average yield by variants varies from 396 kg / da to 435 kg / da. As a result of the chemical treatment, the yield was increased, on average by 6.48% compared to the control (K). The highest yield of 435 kg / da was obtained from the variant with administration of Aminopielik 600CLfenoxaprop - P - ethyl in a dose of 150 ml / da, followed by the variants with administration of metasurfuron - methyl at a dose of 1.5 g / da and metasurfuron - methyl with a dose of 100 ml / da, treatment in optimal doses, the results being statistically proven at a significance level of differences P≤0.05.

The other variants, with the application of the optimal dose of the applied herbicides, are from the control group and have not been statistically proven.

From the three-factor analysis of the variance (Table 3) in terms of yield, it was found that the year has the strongest impact 59.25% of the total variation. The herbicide and the application dose have a very small effect on the grain yield - 1.94% and 1.57%. In the three tested factors, the strength of influence is statistically proven.

There is a well-proven interaction between the conditions of the year and the tested herbicides (AxB) at P≤0.01, which is confirmed by the fact that the weather conditions affect the applied herbicides differently.

The effect between the conditions of the year and the doses of applied herbicides (AxC) has not been proven.

The interaction between the factors herbicide and application dose (BxC) - 0.526%, at P≤0.05, has also been proven. This means that the applied herbicides in the optimal and increased dose can have a negative effect on the cultivated plants.

Varietal susceptibility to the tested herbicides and the applied doses are also observed here.

CONCLUSIONS

- ✓ Metasurfuron - methyl, fenoxaprop - P - ethyl and 2,4 amine salt, applied in optimal and increased doses, are highly selective for the tested wheat variety "Dunaviya" and do not have a negative effect on cultivated plants.
- ✓ Regarding destroyed weeds, all three tested vegetation herbicides (metasurfuron - methyl, fenoxaprop - P - ethyl and 2,4 amine salt), applied in optimal and increased dose, show high herbicidal efficiency against annual cereal and deciduous weeds.
- ✓ The use of the herbicides metasurfuron - methyl, fenoxaprop - P - ethyl and 2,4 amine salt leads to higher grain yields compared to the untreated control.
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BIBLIOGRAPHY

1. **Bazitov, R., Ganchev, G., Bazitov, V., Michailova, M.**, 2010 - The role of processing and soil fertilizacion on changes in chemical composition of pea-wheat mixture. International scientific online journal “Science & Technologies”, Plant studies (6):205-208. 6

2. **Camele, I. ,Rana, G.**, 1995 - Danni da deserbanti su grano duro e ortive, Informatore Agrario, 51 (26), 76-79.

3. **Cheleev, D., Todorov, S., Belcheva, L.,** 1993 - Ecological stability of winter soft wheat varieties, Plant Sciences, 5-6, 17-23.

4. **De la Cruz, E.,** 1993 - Efecto de la fitotoxicidat de 8 herbicides para el control

de maleza sorbe 17 materiales de trigo, Avances de la Investigatios, №27, 55-56.

5. **Delchev, Gr.,** 2010 - Stability valuation of some mixtures between foliar fertilizers and antibroadleaved herbicides for the grain yield of durum wheat. Soil Science, Agrochemistry and Ecology, 44 (2) 41-46.

6. **Delchev, Gr**., 2012 - Stability valuation of some mixtures between retardants and combined herbicides for the grain yield of durum wheat. Plant Science, 49 (1) 59-64. 8

7. **Georgiev, M.,** 2014 - Influence of some herbicides and herbicide combinations on the yield and harvest index in ordinary wheat variety "Diamond". Science and Technologies, Plant studies, Vol. IV, Number 6, 280-286.

8. **Hristov, I., Davidov, E., Georgiev, D., Angelova, V., Petrov, P., Tsvetanova, G.**, 2010 - Dry mass yield and energy efficiency of crops in five-crop rotation depending on fertilization. International scientific online journal “Science & Technologies”, Plant studies (6), 154-159.

9. **Ilieva, D.,** 2011 - A comparative study of common wheat varieties in north-eastern Bulgaria. Scientific papers of the University- Volume 50, series 1.1

10. **Ivanova, A., Tsenov, N.,** 2009 - Biological and economic characteristics of common wheat varieties according to growing conditions. Field Crops Studies, Vol. B-1, 173-182.

11. **Kolev, T.,** 1993 - Integrated weed control in durum wheat crops and its influence on grain yield and quality, Dissertation for the acquisition of ONS "Dostor".

12. **Kuneva, V., Bazitov, R.** 2014 - Influence of the level of fertilization on the biometric indicators in maize hybrid LG35.62, Scientific works, University of Ruse, volume 53, series 1.1, Ruse, 44-47, ISSN 1311-3321.

13. **Kuneva, V., Kalaydzhieva, R., Matev, Al.,** 2014 - Correlation dependences between the structural elements of the yield of soybeans grown under different irrigation regime, Scientific papers, University of Ruse, volume 53, series 1.1, Ruse, 40-43, ISSN 1311-3321.

14. **Liu, S., Hsiao, A., Quick, W.,** 1994 - Interaction between imazamethabenz and fenoxapropethyl in wild oat control and crop tolerance, Crop protection, 13 (7), 525-530.

15. **Montazeri, M.,** 1994 - Efficiency of several herbicides in control of weeds in wheat, Iranian Journal of Plant Patology, 30 (1-4), 69-77.

16. **Penchev, E., Stoeva, I.,** 2004 - Evaluation of ecological plasticity and stability of the group of varieties winter wheat. Study of field crops, Tom I-1, 30-33.

17. **Van Himme, M., Bulcke, R.,** 1989 - Vergeliking van de systemische bladgramiaden fenoxapropethyl en tralkoxydim van duist, Alopecurus miosoroides, Centrumvoor Oncuidonder zoek, 50, 24-28.

Table 1.

Selectivity of the herbicides used in wheat variety "Dunaviya", in points

Herbicides \ Reporting day		7th day	17th day	30th day
Metasurfuron - methyl	1,5 g/da	1	1	1
	3 g/da	1	1	1
Fenoxaprop-P-ethyl	100 ml/da	1	1	1
	200 ml/da	1	1	1
2.4 Amine salt	150 ml/da	1	1	1
	300 ml/da	1	1	1

Table 2.

Influence of herbicides on the yield of wheat variety " Dunaviya ", kg/da

Variant	Seeds yield, kg / da	
	Yield	**%**
Control - untreated	396[a]	-
Metasurfuron - methyl **– 1,5 g/da**	**426[ab]***	107.58
Fenoxaprop-P-ethyl **– 100 ml/da**	**427[ab]***	107.83
2.4 Amine salt **– 150 ml/da**	**435[ab]***	109.85
Metasurfuron - methyl **– 3 g/da**	411[a]	103.79
Fenoxaprop **– П - етил – 200 ml/da**	421[a]	106.32
2.4 Amine salt **– 300 ml/da**	410[a]	103.54
Average	**418**	**106.48**

Legend: The differences between the variants are statistically proven at P≤0.05, if they have different letters. *, **, *** Statistical significance of the differences between the options and the control for P≤0.05; 0.01; .001.

Table 3.

Dispersion analysis for grain yield

Sourse of variation	Degrees of freedom	Sum of squares	Influence of factor, %	Mean square
Total	83	1664.960	100	-
Factor A-Years	2	975.916	59.255	**487.958****
Factor B-herbicides	2	32.020	1.944	**16.010****
Factor C-dose	1	12.971	1.575	**12.971****
AxB	4	17.774	0.540	**6.750****
AxC	2	13.499	0.820	4.331
BxC	2	8.662	0.526	**4.443***
AxBxC	4	21.372	0.649	5.343
Pooled error	63	518.795	6.959	8.235

Legend: Differences between variants are statistically proven at P <0.05 if they have different letters. *, **, *** Statistical significance of the differences between the variants and the control for P <0.05; 0.01; 0.001.

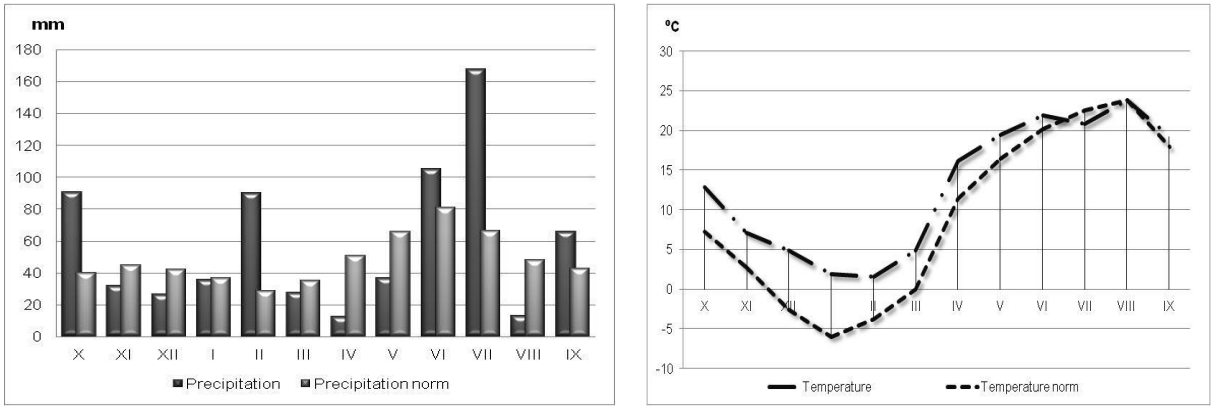

Fig. 1. Deviation of the sum of precipitation and active air temperatures for the period IX. 2017 - IX. 2018, from the climatic norm for the period 1896 - 2005