

THE INFLUENCE OF GROWTH REGULATORS ON THE PRODUCTIVITY OF WINTER WHEAT IN THE CONDITIONS OF THE WESTERN PLAIN

Urs Mariana*

*University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048 Oradea; Romania, e-mail: mariana_mediu@yahoo.com

Abstract

Winter wheat is one of the agricultural plants that reacts positively to the application of fertilizers in all soil and climatic conditions in our country, but which can cause under certain conditions the fall of plants.

In order to avoid this, it is necessary to apply a correct cultivation technology, which also includes carrying out preventive treatments by using certain substances with retarding effect, such as growth regulators.

Growth regulators are organic compounds with retarding action that are of particular interest in wheat cultivation. They are produced on the basis of chlorocholine chloride, which is applied foliarly, during the straw elongation period.

In order to highlight the role of growth regulators in the autumn wheat cultivation technology, the level of production and its quality for the Exotic wheat variety was analyzed, using a differentiated application of the growth regulator doses: Medax Top in doses of 0.6 l/ha and 1 l/ha and Stabilan in doses of 1.8l/ha and 2 l/ha, compared to the untreated control.

Key words: growth regulators, retardant action, plant fall, chlorocholine chloride

INTRODUCTION

Wheat is demanding on fertilizers due to the following peculiarities: its root system is poorly developed and with poor solubilizing power compared to more insoluble compounds in the soil; although it has a long period of vegetation, most of the nutrients are extracted in a short time, from filling to maturity in milk: 70-92% N, 75-88% P₂O₅ 85-88% K₂O (Borcean et al., 2006).

The best results in the application of chemical fertilizers are obtained when all methods of application are used, before sowing, to sowing, during vegetation, by a judicious combination of the different forms and doses to be applied, in relation to the variable needs of the plants, so that they are provided with necessary substances throughout the vegetation (Oancea, 2005).

The fall of cereals can cause significant crop losses and occurs mainly in the years when the evolution of climatic factors favors the excessive growth of the vegetative mass and the reduction of the resistance tissues of the stem. The phenomenon is favored by high sowing density, early sowing and fertilization with excess nitrogen or without respecting the balance in the soil supply with phosphorus and potassium. (Sin, 2005).

Preventing the fall of wheat plants is a necessary task sometimes especially in wetlands and in conditions of application of high doses of nitrogen fertilizers. To prevent wheat from falling, along with the application of a correct cultivation technology, preventive treatments are recommended at the beginning of straw elongation (simultaneously with herbicide), using substances with retarding action (dwarfing) based on chlorocholine chloride, known under various trade names: Cycocel , CCC, Cycogan, Stabilan etc. (Borza, Stanciu, 2010).

The main effect on wheat plants is to reduce the size of wheat plants, especially by shortening internodes 1 and 2 or 3 and 4, depending on when the treatment is applied. At the same time, the product has a positive effect on the thickening of the internodes. Chlorocholine chloride therefore has a dwarfing action and the direct consequence of this action is to increase the fall resistance of wheat plants (Ceapoiu, 1984).

The treatment of wheat crop with Cycocel also has the effect of increasing production, different increases from 3q/ha to over 13q/ha. Cycocel is administered extraradically, in spring, at the beginning of the straw elongation. The treatment can be carried out simultaneously with the application of herbicides, because the physical mixture is compatible and, as such, the nanizant does not change its type of action. Cycocel acts on plants, in general, by blocking the synthesis of gibberellin and by reducing the biosynthesis of endogenous auxins (Bîlteanu, 2003).

Some research has considered the effect of treating wheat seeds with Cycocel. Wetting the seeds for 2.5-4 hours in 10% Cycocel solution and drying them until the state in which mechanized sowing becomes possible, I.Radonțev et al. (1969), obtained in 3 varieties of wheat, an obvious deepening of the twinning node and a significant increase in plant resistance to winter conditions. It also obtained positive results in the accumulation of dry matter in autumn and in the increase of grain production. (Bîlteanu, Bîrnaure, 1989)

By applying treatments with growth regulators, the following results are obtained: reduction of plant height by 25-30 cm, shortening and thickening of the basal internodes, developments of the sclerenchymal tissue and thus an increase to overall resistance to fall, redistribution of assimilates between plant organs and as a result, increase of the leaf area, the number of grains in ear, MMB and productions. Crops with increased fall resistance and which can be harvested mechanically without difficulty are obtained (Muntean L.S., 2001).

Medax Top is a grain growth regulator, which increases the resistance of plants to falling, and avoids production losses. The stimulating effect of rooting due to the active substance prohexadione calcium is very

pronounced, manifests itself quickly and is not matched by any other ingredient.

Increased root growth means improved anchoring of plants in the soil, additional access to water and nutrients, reduced stress due to root diseases and drought, increased production of cytokinins (cytokinins play a major role in improving production factors). Medax Top can improve twinning in winter wheat more than untreated crops or those treated with other substances with a growth regulator effect (BASF, 2017).

Stabilan is a versatile growth regulator, capable of producing a wide range of physiological changes in different species of plant varieties. It is quickly absorbed into plants within 2-4 hours, especially in conditions of high humidity. It acts on the waist of plants as a growth inhibitor, stimulates fruiting and fruit quality. Stabilan applied to wheat, causes the straw to thicken and it shortens the internodes, thus preventing the plants from falling. (<https://www.ultrasunetedaunatori.ro/produs/tratamente-agricole/plante/ingrasamant-foliar/regulator-de-crestere-stabilan>).

MATERIAL AND METHOD

Research on the influence of growth regulators on wheat production and its quality was carried out at the Exotic wheat variety, at the Leș Bihor agricultural farm, in 2020.

The factors looked at were:

- Factor A - Type of growth regulator
 - Medax Top
 - Stabilan
- Factor B - Doses of growth regulators:
 - V1 - Witness
 - V2 - dose of 0.6l/ha - Medax Top
 - V3 - dose of 1.0 l/ha - Medax Top
 - V4 - dose of 1.8 l/ha - Stabilan
 - V5 - dose of 2.0 l/ha - Stabilan

Two working variants and a common control of each type of growth regulator were studied. The 2 variants studied were treated with doses of 0.6 l/ha and 1 l/ha in the case of Medax Top application, which is in the form of a concentrated suspension, having active substances 300g/l mepiquat chloride + 50g/l prohexadione– calcium, and Stabilan was applied in doses of 1.8 l/ha and 2.0 l/ha, which has as active substance 400 g/l chloromecate chloride.

The cultivation technology applied to the Exotic wheat variety complied with the specific technological requirements of the wheat in the

conditions of a luvic brown soil, and the sowing was carried out in the optimal period October 10-20.

The application of growth regulators was done during the vegetation period, from the elongation of the stem up until the appearance of the standard leaf, in a single treatment.

The analysis of the production level and its quality for the Exotic wheat variety was performed under the conditions of nitrogen fertilization and complex chemical fertilizers with nitrogen and phosphorus NP 20:20. The variant chosen as a control was V1 - untreated.

RESULTS AND DISCUSSION

1. Efficiency of growth regulators on the level of production of winter wheat.

The research on the efficiency of the application of growth regulators on the production level to the Exotic winter wheat variety carried out in 2 working variants for each type of growth regulator depending on the administered doses, is presented in table 1.

Table 1

The influence of the application of growth regulators on the production of the Exotic winter wheat variety, Leş-Bihor, 2020

Type of growth regulator	Dosage	Production		The difference	
		Kg/ha	%	Kg/ha	%
Medax Top	V ₁ - Martor	4750	100	-	-
	V ₂ - 0.6 l/ha	5460	115	+710	15
	V ₃ - 1.0 l/h	5680	120	+930	20
Stabilan	V ₁ - Martor	4750	100	-	-
	V ₄ - 1.8 l/ha	5320	112	+570	12
	V ₅ - 2.0 l/ha	5610	118	+860	18

The level of production for the Exotic wheat variety in 2020, shows significant differences compared to the control depending on the type and dose of growth regulator applied.

By applying the Medax Top growth regulator, at a dose of 0.6 l/ha, the production obtained was 5460 kg/ha, achieving a production increase of 115%, compared to the untreated control variant; and by applying the maximum recommended dose of 1.2 l/ha, the production achieved was 5680 kg/ha, and a production increase of 120%.

When applying the Stabilan growth regulator, production increases are also achieved depending on the dosage. By applying a dose of 1.8 l/ha, the production was 5320 kg/ha, obtaining a production increase of 112% compared to the untreated Control variant; and by applying the dose of 2 l/ha, the production obtained was 5610 kg / ha, with a production increase of 118%.

At the Medax Top growth regulator, the production increase was between 710-930 kg/ha, and the percentage between 15-20%, compared to Witness, and Stablan, achieved a production increase between 570-860 kg/ha, the percentage being 12-18%.

2. Influence of the application of growth regulators on the mass of 1000 grains of winter wheat

The application of growth regulators together with fertilization with higher doses of nitrogen, determines the shortening of plant height, combating the phenomenon of fall and an increase in production of 10-20%, by increasing the number of grains in the ear and an increase in mass of 1000 grains.

In terms of the quality of wheat production, at the level of 2020 studied, by applying growth regulators in crop technology, the mass of 100 grains, there are differences depending on the type of growth regulator and the dose applied (Table 2).

Table 2

The influence of the application of growth regulators on quality production for the Exotic winter wheat variety, Leş-Bihor, 2020

Type of growth regulator	Dosage	Mass to 1000 grains		The difference
		g	%	%
Medax Top	V ₁ - Martor	48.0	100	-
	V ₂ - 0,6 l/ha	49.4	102.9	2.9
	V ₃ - 1,0 l/h	50.5	105.2	5.2
Stablan	V ₁ - Martor	48.0	100	-
	V ₄ - 1,8 l/ha	49.0	102.1	2.1
	V ₅ - 2,0 l/ha	49.9	103.9	3.9

The mass of 1000 grains represents the weight of 1000 grains at the moisture content they contain at the time of determination, and it is an indicator of the quality of the wheat for baking.

In case of application of the growth regulator Medax Top, in a dose of 0.6 l/ha, the value of the Mass of 1000 grains is 49.4 g, representing an increase of 102.9%, compared to the untreated variant, and at the administration of the dose maximum of 1 l/ha, the mass level of 1000 grains is 50.5 g, respectively an increase of 105.2% compared to the untreated variant.

The mass value of 1000 grains when applying the Stablan growth regulator shows lower increases than when using Medax Top. By applying a dose of 1.8 l/ha of Stablan The mass of 1000 grains is 49.0, representing a slight increase of 102.1%, and at a dose of 2 l/ha, the increase of the Mass of 1000 grains is 3.9%, corresponding to a value of 49.9 g.

By comparing the two types of growth regulators, it is observed that the mass level of 1000 grains is higher, being between 49.4-50.5g in the variants treated with Medax Top and 49.0-49.9 g in Stablan, depending on the dose applied, compared to the untreated variant, which is 48.0 g.

CONCLUSIONS

In order to obtain wheat yields exceeding 5 t/ha, it is necessary to use growth regulators, which prevent the plants from falling and breaking. Growth regulators began to be used mainly by large farmers to protect their plants from the main factors that lead to wheat fall: the type of cultivated variety, fall resistance and stem height. Humidity, rainy weather and wind also directly contribute to this phenomenon, which can cause losses of up to 40% of total production.

Growth regulators contain active substances that behave similarly to the plant's natural hormones, regulate their growth and help strengthen the stem. The effect of growth stimulants on winter wheat is manifested by: stimulating the development of the root system to advanced stages of vegetation, which determines the stronger anchoring of plants in the soil and reduces the risk of falling; improving the physiological activity of the roots, which favors improved absorption of nutrients and water and increased tolerance to drought-induced stress.

Growth stimulators reduce the length of the wheat stalk, help slow the development of the primary sibling and stimulate the development of the secondary siblings, causing straw thickening and shortening of internodes, thus preventing plant fall, regardless of the choice of nitrogen-based fertilization program.

Growth regulators limit the development of the stem by height, which means that they have a flexible application window, from the beginning of the elongation of the stem, up until the appearance of the standard leaf, and the optimal application temperatures are between 5-20° Celsius.

By applying the growth regulators in the winter wheat cultivation technology, production increases of 115-120% were obtained, in the case of the Medax Top growth regulator, depending on the administered doses, and at the Stabilan growth regulator a production increase between 112-118%, depending on the doses administered.

REFERENCES

1. Bîlteanu Gh., V.Bîrnaure, 1989, Fitotehnie, Editura Ceres, București, pag.112
2. Bîlteanu Gh., 2003, Fitotehnie, Editura Ceres, București, pag. 165-166
3. Borza I.M., A.Ș. Stanciu., 2010, Fitotehnie, Editura Universității din Oradea, pag.56
4. Borcean I., Gh. David, A.Borcean, 2006, Tehnici de cultură și protecție a cerealelor și leguminoaselor, Editura de Vest, Timișoara, pag.49
5. Ceapoiu Nechifor, 1984, Grâul, Editura Academiei RSR, București, pag. 441
6. Muntean Leon Sorin, I.Borcean, M.Axinte, Gh.V. Roman, 2001 – Fitotehnie, Editura Ion Ionescu de la Brad, Iași, pag.120
7. Oancea I., 2005, Tehnologii agricole performante, Editura Ceres, București, pag.113
8. Sin Gheorghe, 2005, Tehnologii moderne pentru cultura plantelor de câmp, Editura Ceres, București, pag. 29
9. <https://www.ultrasnetedaunatori.ro/produs/tratamente-agricole-plante/ingrasamant-foliar/regulator-de-crestere-stabilan>
10. BASF, 2017, Produse pentru protecția plantelor, pag.168