Annals of the University of Oradea, Fascicle: Environmental Protection, doi.org/10.5281/zenodo.4362296, **Vol. XXXIV, 2020**
Analele Universităţii din Oradea, Fascicula: Protecţia Mediului, doi.org/10.5281/zenodo.4362296, **Vol. XXXIV, 2020**

THE EFFECT OF AUTUMN FERTILIZATION WITH NITROGEN COMPARED TO COMPLEX FERTILIZERS, ON WINTER WHEAT PRODUCTION

Urs Mariana*

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

Abstract

Fertilization is an important work in winter wheat cultivation technology that has a major impact on the level of production of winter wheat and its quality.

To retain plant nutrient requirements throughout the growing season, the application of nitrogen and phosphorus-based chemical fertilizers is a necessary and mandatory measure.

Autumn fertilization of wheat with complex chemical fertilizers results in a higher yield compared to simple nitrogen.

In order to highlight the role of nitrogen fertilization and complex chemical fertilizers used in the technology of cultivation of winter wheat varieties Glosa and Exotic, the level of production and its quality was analyzed through the differentiated use of nitrogen fertilizer and complex fertilizer doses of: $N_{150}P_0K_0$, $N_{150}P_{60}K_0$, $N_{150}P_{60}+K_{60}$, and unfertilized control.

Key words: perishable fruits**,** refrigeration, fruit quality, controlled atmosphere, period of storage

INTRODUCTION

Winter wheat is one of the agricultural plants that reacts positively to the use of fertilizers in all soil and climatic conditions in our country. Wheat consumes relatively large amounts of nutrients in the autumn-winter period. During the autumn period, the high consumption of nutrients is determined by the development of the root system, the twinning of the plants and the depositing of supplies necessary throughout the winter period (Bîlteanu, 2003).

Wheat can be difficult to fertilize due to certain features: first of all, the wheat's root is poorly developed, it uses up a small volume of soil and has a low solubilization and absorption strength of nutrients from the soil deposits. In addition, the maximum nutrient consumption of wheat plants takes place in a short period of time, from straw elongation to ripening, during which about 80% of nitrogen, over 80% of phosphorus and over 85% of potassium are absorbed; during this interval, the wheat must have at its disposal the necessary quantities of nutrients from easily accessible sources (Borza and Stanciu, 2010).

Nitrogen is an essential element for plant growth and development. It is the constituent of amino acids, structural and reserve proteins from the vegetative part and seeds, respectively. In the first period of growth, the plants use relatively low amounts of nitrogen. The largest quantities are used

during the period of maximum growth and in the development of vegetative organs, stems and leaves.

Cereal straw contains about 0.15% P_2O_5, and grains contain about five times as much. The presence of phosphorus in plants is about ten times lower than that of nitrogen, being about 0.2%, with variations depending on the species. Phosphorus increases the resistance of cereals to drought, frost and fall (Ciobanu, 2007).

The purpose of using basic fertilizers is to remove phosphorus deficiency from plant nutrition throughout the growing season. When using them, the following factors are taken into account: the time when used, the depth of incorporation, the form of the fertilizer, the dose and the interaction with other nutrients (Ciobanu, 2003).

Nitrogen fertilization is usually carried out in several stages (in installments, in fractions, in order to ensure an efficiency and a maximum coefficient of use of the active substance. NP).

Phosphorus fertilization is basically applied in autumn or spring, before or at the same time as sowing. Phosphorus is provided with nitrogen as a priority to activate the synergistic effect of N-P. Potassium fertilization is done only on soils poor in this element or on other soils previously and multiannually fertilized with N and P, in order to balance the agrochemical environment, to prevent K insufficiency and deficiency and in large potassium-consuming plants. Potassium is applied with fertilizers used as basic fertilizers (Rusu et al., 2005).

Wheat makes better use of phosphorus fertilizers compared to other crops. Doses of phosphorus are between 60 and 100 kg P2O5/ha, taking into account the expected production, the type of soil and its state of phosphorus supply. Potassium fertilization is recommended primarily on soils with an exchangeable potassium less than 150 ppmK, administering doses of 40-80 K_2O/ha, before plowing or preparing the germination bed, in the form of potassium salt or complex fertilizers.

Nitrogen fertilizers are mainly applied in two phases: 40-80 kg N/ha in winter or early spring, depending on the state of the crop; the rest of the dose in spring, during the appearance of the first node of the stem.(Gh. Sin).

The combination of nitrogen and phosphorus creates interactions in the soil, favoring the growth and development of plants from the beginning of vegetation. That is why in some cases their application is made not only on the entire surface of the cultivated land, but also locally, near the seed in small quantities to determine a vigorous growth of plants, even from the beginning of vegetation. (Mocanu, Dodocioiu, 2007).

When fertilizing vegetation, it is very important that the condition of the crops is taken into account when determining the doses in order to prevent the fall and attack of foliar diseases. When wheat is scarce in the

spring, the aim is for the number of fertile siblings to become as high as possible, in which case we must fertilize as soon as possible, on frozen soil. When the density is high, we follow only the fertility of the ears, it is delayed with nitrogen fertilization until the ear is 5 cm above the twinning area.(Borcean et al., 2006).

The nutrients and the relationships between them influence both the development of the root system and the aerial organs. In wheat, sibling production is linked to root development and is stimulated by phosphorus fertilization (Caramete et al., 1980).

The best results for the use of chemical fertilizers are obtained when all methods of application are used, before sowing, at 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).

MATERIAL AND METHODS

Research on the influence of complex chemical fertilizers and simple nitrogen on wheat production and its quality was conducted on wheat varieties Glosa and Exotic, at the agricultural farm Leș Bihor, in 2018.

Three different methods of work and a control element were employed. Those methods consisted of various fertilization degrees (also known as variants) with a total of 180kg N, of which 30kg N/ha applied to the basic fertilization in autumn, 60kgN/ha applied in the spring to the first fertilization, and to the second fertilization they also applied 60 kg N/ha. To each fertilized variant a main element was added to the autumn N fertilization; NP; NPK.

The analyzed factors were:

Factor A – variety:

- Glosa
- Exotic

Factor B- nitrogen fertilization and complex fertilizers:

V_1 - $N_0P_0K_0$

V_2 – $N_{150}P_0K_0$

V_3 – $N_{150}P_{60}K_0$

V_4 – $N_{150}P_{60}K_{60}$

The analysis of the production level and its quality for the Glosa and Exotic wheat varieties was performed under the conditions of fertilization with nitrogen and complex chemical fertilizers with nitrogen and phosphorus NP 20:20 and with nitrogen, phosphorus and potassium NPK 15/15/15. The variant chosen as a control was V_1 - unfertilized.

RESULTS AND DISCUSSION

1. Efficiency of nitrogen and phosphorus fertilizers on the level of production of winter wheat.

The research on establishing the efficiency of complex chemical fertilizers and simple nitrogen on the production level of the Glosa and Exotic winter wheat varieties carried out in 4 working variants, depending on the doses administered, is presented in table 1.

Table 1

The influence of autumn fertilization with nitrogen and complex fertilizers on the production of Glosa and Exotic winter wheat varieties, Leș-Bihor, 2018

Type of wheat	Variant of fertilization	Production		Difference	
		Kg/ha	%	Kg/ha	%
Glosa	V_1 - $N_0P_0K_0$	4340	100	0.00	0.00
	V_2 – $N_{150}P_0K_0$	5170	119	+830	19
	V_3 – $N_{150}P_{60}K_0$	5850	135	+1510	35
	V_4 – $N_{150}P_{60}K_{60}$	6080	140	+1740	40
Exotic	V_1 - $N_0P_0K_0$	4250	100	0.00	0,00
	V_2 – $N_{150}P_0K_0$	5320	125	+1070	25
	V_3 – $N_{150}P_{60}K_0$	5960	140	+1710	40
	V_4 – $N_{150}P_{60}K_{60}$	6230	147	+1980	47

The level of production for the Glosa wheat variety in 2018 shows significant differences depending on the type of fertilizer applied. Thus, by applying to the autumn and spring fertilization only nitrogen, a dose of $N_{150}P_0K_0$, the production obtained was 5170 kg/ ha, obtaining a production increase of 119%, compared to the non-fertilized variant; by applying to the autumn fertilization of complex fertilizers with phosphorus, in doses of $N_{150}P_{60}K_0$, the production obtained was 5850 kg / ha, and an increase of production of 135%, and by fertilizing with complex fertilizers with phosphorus and potassium, in doses of $N_{150}P_{60}K_{60}$, the obtained production reaches a production increase of 140%, with a value of 6080 kg/ha.

For the Exotic wheat variety, the production obtained also varies depending on the type and dose of fertilizers applied. When applying nitrogen fertilizers in a dose of $N_{150}P_0K_0$, the end production is of 5320 kg/ha, with a production increase of 125%, compared to the non-fertilized variant $N_0P_0K_0$. By applying complex fertilizers based on nitrogen and phosphorus, with doses of $N_{150}P_{60}K_0$, the production level reaches 5960 kg / ha, obtaining an increase of 140%, and by fertilizing with complex fertilizers based on NPK, the production obtained is 6230 kg/ha, with an increase in production of 147%.

For the Glosa wheat variety, the production increases are between 119-140%, depending on the fertilization doses, and in the case of the Exotic variety, the production increases have values between 125-147%, at the same fertilization doses.

2. The influence of nitrogen and phosphorus fertilizers on the amount of wet gluten in winter wheat

In terms of the quality of wheat production, at the level of 2018 studied, by administering complex chemical fertilizers and nitrogen, the gluten content of the analyzed varieties shows significant differences.

By applying nitrogen in winter wheat cultivation technology, it causes significant increases in gluten content for wheat grains (Table 2).

Table 2

The influence of autumn fertilization with nitrogen and complex fertilizers on the gluten content of winter wheat varieties Glosa and Exotic, Leș-Bihor, 2018

Type of wheat	Variants of fertilization	Wet gluten	
		Content	%
Glosa	V_1 - $N_0P_0K_0$	23.0	100
	V_2 – $N_{150}P_0K_0$	24.8	107.8
	V_3 – $N_{150}P_{60}K_0$	25.2	109.5
	V_4 – $N_{150}P_{60}K_{60}$	25.4	110.4
Exotic	V_1 - $N_0P_0K_0$	24.2	100
	V_2 – $N_{150}P_0K_0$	27.3	112.8
	V_3 – $N_{150}P_{60}K_0$	28.5	117.7
	V_4 – $N_{150}P_{60}K_{60}$	28.6	118.1

The wet gluten content of winter wheat is of particular importance on its baking quality.

In the case of the autumn fertilization of the Glosa wheat variety with nitrogen, the wet gluten content has the value of 24.8, achieving an increase of 107.8% compared to the unfertilized control variant. By applying complex fertilizers with phosphorus and the same dose of nitrogen, the value of wet gluten is 25.2, an increase of 109.5% compared to the non-fertilized variant, and by administering complex fertilizers of NPK type, the gluten level is 25.4, respectively an increase of 110.4% compared to the non-fertilized version.

The gluten content of the Exotic wheat variety shows significant increases. By applying nitrogen fertilizers, there is an increase in gluten content of 112.8% compared to the non-fertilized version; by the additional addition of NP-type complex fertilizers, the gluten content increases by 117.7%, having the value of 28.5, and by the administration of NPK-type complex fertilizers, the gluten content is 28.6.

By comparing the two varieties of winter wheat, the Glosa winter wheat variety has a gluten level of 23.0 in the non-fertilized version, and in

the fertilized variants it is between 24.8-25.2, depending on the doses. of applied fertilizers.

In the Exotic winter wheat variety, the gluten in the non-fertilized version is 24.2, and in the fertilized version the level is between 27.3-28.6.

CONCLUSIONS

By applying nitrogen fertilizers and complex chemical fertilizers to winter wheat, an increase in production was achieved between 119-140%, in the case of Glosa variety and 125-147%, in the case of Exotic variety, depending on the dose of N, NP and NPK applied.

The production increases obtained vary depending on the fertilization variant applied: by applying a dose of $N_{150}P_0K_0$, the production difference obtained compared to the non-fertilized variant is 830 kg/ha for the Glosa variety and 1070 kg/ha for the Exotic variety; by applying complex fertilizers, in a dose of $N_{150}P_{60}K_0$, the production difference is 1510 kg/ha for the Glosa variety and 1710 kg/ha for the Exotic variety, and by administering fertilizers in doses of $N_{150}P_{60}K_{60}$, the production difference is 1740 kg/ha to the Glosa variety and of 1980 kg/ha to the Exotic variety.

The use of nitrogen fertilizers and complex fertilizers, in addition to quantitative increases in production, also determines qualitative increases. By applying nitrogen fertilizers $N_{150}P_0K_0$, the gluten content for the Glosa variety is 24,8, and for the Exotic variety 27.3; by administering complex fertilizers $N_{150}P_{60}K_0$, the gluten content reaches 25.2 for the Glosa variety and 28.5 for the Exotic variety, and by using the $N_{150}P_{60}K_{60}$ fertilizer, the gluten is 25.4 for the Glosa variety and 28.6 for the Exotic variety.

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