ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Influence Of Growth Regulators And Mineral Fertilizers On Water Regime And Yielding Capacity Of Barley Plants.

VA Isaichev[1], NN Andreev[2]*, and KA Vinogradova[3].

[1]Doctor of Agricultural Sciences, FSBEI HE Ulyanovsk State Agrarian University, Russia.
[2]Candidate of Agricultural Sciences, FSBEI HE Ulyanovsk State Agrarian University, Russia.
[3]3rd year student, FSBEI HE Ulyanovsk State Agrarian University, Russia.

ABSTRACT

A positive influence of growth regulators and mineral fertilizers has been found on the water balance indicators and yielding capacity of feed barley under the conditions of the Middle Volga region of the Russian Federation.

Keywords: barley, growth regulators, water deficiency, water retaining capacity, yielding capacity.

Corresponding author

ISSN: 0975-8585

Introduction

One of the most dynamic processes in the plant is water exchange, which is in close correlation with other processes of plant life. With moderate transpiration and sufficient water intake, a favorable water balance is created in the plant. With intensive transpiration or the soil drying, when water stops coming into the plant, a significant loss of water from the plant cells occurs, which is not replenished by absorbing it from the soil. It results in a water deficit, which is often observed under arid vegetation conditions. In recent years, much attention has been paid to the development and use of new generation growth regulators with a wide range of physiological activity capable of coordinating, stimulating or inhibiting various processes in plants [1,3,7].

It should be kept in mind that the Ulyanovsk region belongs to the risky farming zone, where the weather and climatic conditions are characterized by a low water availability and high temperatures. In connection with the above-stated, the purpose of our studies was to investigate the effect of growth regulators and mineral fertilizers on the water balance of barley plants during cultivation in the Middle Volga region of the Russian Federation.

OBJECTS AND METHODS OF RESEARCH

Field experiments were conducted in 2015-2017 on the experimental field of Ulyanovsk State Agrarian University. The experimental crop is the barley variety Nutans 553. The area of the plot is 20 m^2, the replication of the experiment is four time, the location of plots is randomized. The soil of the experimental field is leached black soil, of medium thickness, medium loamy with the following characteristics: humus content - 4.3%, mobile phosphorus and potassium compounds (according to Chirikov), respectively 193 and 152 mg / kg soil, mobile sulfur content - 4.7 mg / kg soil, pH of the salt extract - 5.3. The objects of research were: the growth regulators - "Nagro" ("Nagro") and Megamix, as well as complex mineral fertilizers of diammophoska N15P15K15, diammophoska N15P15K15S10. At the beginning of the tillering phase, the background treatment of the crops with the growth regulators to be studied was carried out in concentrations recommended by the manufacturer. The application of experimental plant growth regulators was carried out simultaneously with the introduction of herbicides in the amount of 200 liters of working solution per hectare. Analyzes, counts and observations in the experiment were carried out in accordance with generally accepted methods and state standards. The farming technique in all the variants of the experiment is traditional - generally accepted for this natural and climatic zone of the Ulyanovsk region.

The preparation "Nagro" has a set of properties ("all in one") in their effect on crops treated with these preparations: it has the properties of a fertilizer; stimulates plant growth; strengthens the immunity of plants (to its maximum and has a long-term effect); it has fungicidal and bactericidal action; it has an insecticidal effect; restores the soil fertility; has an exceptionally high biological efficiency when applied even in very low concentrations of the working solution; it relieves pesticide stress; increases the resistance of agricultural crops to sharp changes in temperature, frost, drought, waterlogging, lack of the sum of active temperatures; increases the germination and energy of germination of seeds, survival of sprouts; increases the yield of agricultural crops from 35 to 150%; improves the quality of agricultural products. Megamix is a liquid mineral fertilizer for top dressing with a rich content of trace elements (g / L): B - 1,7; Cu - 7.0; Zn-14; Mn = 3.5; Fe - 3.0; Mo is 4.6; Co - 1.0; Cr - 0.3 and macronutrients (r \ n): N - 6; S-29; Mg-15. The wide and rich composition of the fertilizer is aimed at the complex stimulation of all processes in the plant. Synergism and antagonism of individual nutrients are also taken into account. The purpose of "Megamix" is: to eliminate the shortage of trace elements; to prevent and treat endemic diseases; to stimulate root nutrition, to activate enzymes and replenish the missing elements of nutrition; to increase the yield due to stimulation of enzyme processes and extension of vegetation; to improve the yield quality.

RESULTS AND DISCUSSION

Directly or indirectly, water is involved in all life processes that take place in the cell. Water is the main medium in which all metabolic reactions take place. The enzyme activity depends on its quantity in the cell. It participates in photosynthesis, respiration, hydrolytic processes. With a low water content, the metabolism in cells almost stops. Water helps transport organic and mineral substances, connects cells, tissues and organs with each other. Evaporation of water regulates the temperature of plant tissues. The plant cell must

be saturated with water for normal functioning. The green parts of the plant are known to contain 80-95% of water. The water content varies greatly in different species, depends on the type of tissue, the age of the plant and its physiological state, it changes during the day and during the season. Even small changes in the water content cause a disorder of physiological functions. The saturation state is maintained by means of two processes: the supply and release of water.

With insufficient water intake, water deficiency is observed in plants. Long-term disturbance of the water balance in plants leads to changes in some physiological processes. Lack of moisture causes disruption of normal metabolism; osmotic properties change, the permeability of the cytoplasm considerably increases, the sucking force, the intensity of the respiration increase, the growth processes are slowed down, the leaf surface and the assimilating capacity of the organism decrease - all this leads to a sharp decrease in the yield and product quality. The water retaining capacity of plants is a good indicator of the water exchange of plants and their resistance to unfavorable environmental conditions. The higher the water retaining capacity of plants is, the more stable it is. Thus, the problem of reducing the water deficit and increasing the water retaining capacity of crops is the most important in production.

The results of the conducted studies show that the factors used have a positive effect on the water balance of plants of feed barley (Table 1). Under the influence of growth regulators and mineral fertilizers, the water deficit is reduced by 0.8 - 5.86%, depending on the variant. The water retaining capacity of barley in the phase of shooting increased by 1.6-5.9% (2 hours), 2.1-7.5% (4 hours), 0.3-6.4% (6 hours). The greatest increase is provided by Megamix, both in pure form and in combination with mineral fertilizers. A similar trend is observed in the ear formation phase. This indicator increases by 0,4-5,9% (2 hours), 0,9 - 7,5% (4 hours), 0,5-8,1% (6 hours).

Table 1 – Influence of growth regulators and mineral fertilizers on the water balance values of plants of the barley variety Nutans 553, %

Variants	Water deficit	Water retaining capacity					
		Shooting			Ear formation		
		2h.	4h.	6h.	2h.	4h.	6h.
Control group	14,15	79,6	66,9	56,0	75,0	61,4	53,3
Nagro	13,35	81,4	68,9	58,0	75,6	62,8	56,4
Megamix	13,10	82,2	70,9	59,4	78,9	66,1	58,2
Control + NPK	12,25	81,2	69,0	57,2	75,4	62,1	52,3
Nagro + NPK	9,97	81,3	71,1	60,7	77,0	62,3	54,7
Megamix + NPK	9,92	81,7	74,4	62,4	80,9	68,8	57,8
Control + NPKS	11,65	78,7	65,6	56,3	76,5	63,5	53,8
Nagro + NPKS	9,15	82,3	71,1	60,8	79,8	65,8	56,9
Megamix + NPKS	8,29	85,5	71,5	61,2	80,7	68,9	61,4

The introduction of crops and varieties with a high yielding capacity and improvement of their cultivation technology belongs to one of the most important reserves of the crop yield growth. In recent years, world agriculture has been paying considerable attention to the development of the application technologies of physiologically active substances (liquid fertilizer mixtures of growth-stimulating and growth-regulating effect) in the cultivation of crops, including feed barley. The positive influence of these compounds on production processes and the yield of cereals has been outlined in the studies of many authors [2,4,5,6,8].

Yield is the main indicator of field crops, which characterizes the effectiveness of various agricultural practices and is the main measure in assessing the impact of any factors on agricultural crops. In addition to varietal characteristics, in order to obtain stable and high yields, it is required to provide plants with nutrients as much as possible during the entire growing season. The intensity of growth and development of agricultural crops, and, consequently, the yield are largely determined by the temperature regime and moisture conditions during ontogenesis.

ISSN: 0975-8585

Table 2- Influence of liquid fertilizing mixtures and mineral fertilizers on the yielding capacity of the feed barley variety Nutans 553 (2015-2017), c/ha

Variants	Yielding capacity				Yield gain	
	2015	2016	2017	Average	c/ha	%
Control group	28,57	29,44	30,23	29,41	-	-
NAGRO	32,30	32,97	31,77	32,35	2,94	10,0
Megamix	34,15	35,40	33,14	34,23	4,82	16,4
Control + NPK	32,98	31,70	31,01	31,90	2,49	8,5
NAGRO + NPK	33,65	34,05	32,90	33,53	4,12	14,0
Megamix + NPK	36,63	37,16	34,52	36,10	6,69	22,7
Control + NPKS	34,65	32,00	34,53	33,73	4,32	14,7
NAGRO + NPKS	35,79	36,04	35,36	35,73	6,32	21,5
Megamix + NPKS	36,97	38,52	37,95	37,81	8,40	28,6
LSD_{05}	0,58	0,48	0,46			

The data obtained over the years of the study show that the new generation preparations applied in the experiment significantly enhance the growth and physiological processes, ensure the best mineral and air nutrition of the plants during the individual development of the plants of feed barley, as a result, the yield increases. The studies have shown that the factors used increase yields by 2.94-8.40 centners(hundredweight) per hectare, the greatest increase in the control group is achieved by the use of Megamix in view of the previous application of complex sulfur-containing mineral fertilizers, which is 28.6% (Table 2).

CONCLUSIONS

Thus, the use of growth regulators of plants makes it possible to reduce the risk of frequent droughts in the Middle Volga region due to optimization of the water balance of the experimental crop, which is the basis of increasing the yield and quality.

REFERENCES

[1] Andreev, N.N. Influence of growth regulators on production processes and yielding capacity of the spring wheat variety Zemlyachka under the conditions of the Middle Volga forest-steppe zone/ N.N. Andreev, A.V. Kaspirovsky // Materials of All-Russian Scientific and Practical Conference. - Izhevsk, 2012. - pp. 3 -7.

[2] Vakalova, E.A. Influence of powdering seeds with microelements (Zn, Cu, Mn) on yielding capacity and spring wheat quality under conditions of the Western Siberia forest-steppe zone / E.A. Vakalova // Collected scientific works of the State Scientific Institution, Stavropol Scientific Research Institute of Livestock Breeding and Fodder Production - 2013. - №6. pp. 166-170.

[3] Vakulenko, V.V. Application of growth regulators on cereals / V. V. Vakulenko // Grain economy of Russia. - 2013. - No. 3. - pp. 36-38.

[4] Eryashev, A.P. The influence of plant protection products and the "Albit" preparation on the yield and quality of pea grain / A.P. Eryashev, A.G. Katayev, P.A. Katayev // Fodder production. - 2014. - No. 8. - pp. 18 - 21.

[5] Zhdanov, V.M. Yield of soft spring wheat in the Orenburg Cis-Urals region / VM. Zhdanov, V.Yu. Skorokhodov, V.V. Kaftan // Proceedings of Orenburg State Agrarian University. - 2015. - No. 1 (51). - pp. 24-26.

[6] Zhelezova, S.V. Yield and quality of winter wheat grain, depending on the technology of cultivation in the field experiment of the Precision Agriculture Center / S.V. Zhelezova, I.F. Shambingo, A.V. Melnikov, E.V. Berezovsky // Bulletin of Altai State Agrarian University. - 2014. - No. 10 (120). - pp. 10-14.

[7] Isaichev, V.A. Influence of growth regulators on the photosynthetic activity of spring wheat plants under the conditions of the Middle Volga forest steppe zone/ V.A. Isaichev, N.N. Andreev, A.V. Kaspirovsky // Bulletin of Bashkir State University. - 2013. - No. 3 (27). - pp. 18 - 22.

[8] Isaichev, V.A. The formation of crop yield in winter wheat in view of the application of mineral fertilizers and growth regulators / V.A. Isaichev, N.N. Andreev, V.G. Polovinkin, S.V. Antonova // Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2017. Vol.8. №2. pp. 1974-1983.