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INFLUENCE OF AGROTECHNICAL FACTORS ON THE RESISTANCE OF WINTER TRITICALE PLANTS TO OVERWINTERING

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Abstract. *The influence of agrotechnical factors on the resistance of winter triticale plants to overwintering in the conditions of the right-bank forest-steppe of Ukraine is presented in this article. It has been experimentally established that sowing winter triticale at the most optimal time, in accordance with the biological requirements of varieties, makes it possible to largely control the winter hardiness of plants.*

Ключевые слова*: тритикале, срок сева, выживаемость, сахара.*

Introduction.

Triticale is a culture of universal use. It can contribute to a significant increase in the production of food and feed grains, be used for early green fodder and as a raw material for the preparation of canned fodder [1]. The culture is distinguished by high productivity and unpretentiousness to growing conditions. The grain of modern winter triticale varieties, including Ukrainian selection, is distinguished by a balance of essential amino acids and a high protein content [6, 7]. Today, due to a number of objective reasons, among which the main one is the general warming of the climate, there is a need to adjust the sowing dates of all winter crops, including triticale. This is due, first of all, to an increase in temperature, mainly in the cold season and a change in the dominant causes of death of winter crops during the winter [5]. An important argument for clarifying the optimal sowing time for triticale is the change in the set of varieties recommended for production, which have different reactions to growing conditions [4, 7].

The aim of the research is to study and develop the technological basis for increasing winter hardiness of winter triticale, as an important factor influencing the yield of vegetative mass and grain.

Materials and research methods.

Field research was carried out at the "Agronomic Experimental Station" of the NULES of Ukraine on typical low-humus chernozems. The humus content in the arable layer is 4,34-4,68%, pH is 6,8-7,3. The object of research is winter crops:

wheat Polesskaya 90 (control), Kiev fodder rye (control) and triticale (AD 44, Polesskoe 29, ADM 11), sown in 5 calendar periods (from August 25 to October 5). The size of the sowing area is 36 m^2, the counting area is 25 m^2. The predecessor is corn for silage. The content of carbohydrates in the tillering nodes of plants was determined by the Bertrand method before the termination of the autumn vegetation and during its recovery in the spring [3].

Results and its discussion.

The physiological and biochemical state of the plant organism has a significant effect on the formation of frost and winter hardiness of plants. According to researchers [2], carbohydrates are the main energetic substances for protecting plants from the action of low negative temperatures and a number of other unfavorable factors of winter. Opinions of many researchers differ regarding the amount of sugar accumulation by plants of different sowing periods. Some believe that their greatest amount accumulates at late sowing dates, others - at early ones [5, 6].

It has been experimentally established that the ability of triticale plants to accumulate carbohydrates is determined by the degree of their development, the time of termination of active vegetation and hydrothermal conditions during the hardening period. According to the results obtained, the crops of the II-IV sowing period are marked by the highest amount of synthesized water-soluble carbohydrates – 17,9-20,9% of dry matter, depending on the variety (table 1).

1. Soluble carbohydrate content (total sugars) in plants winter crops, depending on the sowing period,%

Culture, variety	Sowing time				
	25.08.	5.09.	15.09.	25.09.	05.10.
Termination of autumn vegetation					
Rye	18,4	19,3	21,1	20,6	18,7
Wheat	16,7	17,5	19,1	18,4	16,6
Triticale AD 44	18,4	19,1	20,9	20,4	18,7
Triticale Polesskiy 29	18,2	18,7	20,5	20,4	18,5
Triticale ADM 11	17,2	17,9	19,6	19,2	17,3
Resumption of spring vegetation					
Rye	7,9	8,6	11,1	10,7	9,6
Wheat	8,4	9,1	11,2	10,5	9,2
Triticale AD 44	7,9	8,7	11,1	10,7	9,6
Triticale Polesskiy 29	7,8	8,5	10,9	10,4	9,5
Triticale ADM 11	7,4	8,2	10,5	9,9	8,8

The plants sown in August, in all the years of research, accumulated the least amount of reserve substances - (17,2-18,4%), which is explained by the consumption of carbohydrates for respiration and growth processes of the overgrown vegetative mass [8]. In connection with the intensive growth of young plants and, accordingly, the increased consumption of plastic substances, a low content of carbohydrates was also noted in the plants of the October period – 17,3-18,7%. On average, over the years of research, varieties AD 44 and Polessky 29 were characterized by the highest

intensity of sugar accumulation.

However, the high sugar content in plants at the beginning of the winter period does not always provide high winter hardiness of crops - the nature and economy of carbohydrate consumption during the winter period and the content of these substances during the restoration of spring vegetation are more important [6]. At the exit from winter, a high content of carbohydrates is typical for plants of the III-V sowing period – 8,8-11,1% of dry matter. Plants of early sowing terms contained significantly less sugars, which is associated with increased activation of respiration of overgrown plants, the intensity of which increased during winter thaws [5]. Among the varieties that were studied, the AD 44 variety was used most economically during wintering.

Resistance to unfavorable winter conditions is a genetically determined trait. Also, the level of winter hardiness is largely determined by weather conditions during the winter and the preparedness of the plant organism for stressful winter conditions. This is also confirmed by the results of counting the density of plant standing after overwintering (table 2).

2. Survival of winter crops during the winter period depending on the sowing period,%

Culture, variety	Sowing time				
	25.08.	5.09.	15.09.	25.09.	05.10.
Rye	84,5	88,4	90,3	85,6	81,7
Wheat	61,5	66,1	65,9	64,2	59,8
Triticale AD 44	83,9	88,4	90,6	85,8	80,8
Triticale Polesskiy 29	82,1	87,0	88,2	84,3	79,6
Triticale ADM 11	79,2	84,4	85,5	81,6	75,3

On average, over the years of observations, the most resistant to the complex of unfavorable conditions of the winter period were plants of the II-IV sowing period - the number of preserved winter triticale plants was at the level of 81,6-90,6%. Among the varieties that were studied, AD 44 and Polesskiy 29 were distinguished by high winter hardiness, and ADM 11 - by low.

Conclusions.

Sowing winter triticale at the most optimal, in accordance with the biological requirements of varieties, the timing allows you to largely control the winter hardiness of plants. The obtained data should be taken into account when planning the successful cultivation of valuable and highly productive cereal forage crops.

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