http://www.moderntechno.de/index.php/meit/article/view/meit13-02-043
DOI: 10.30890/2567-5273.2020-13-02-043

UDC 633.11 / .14 "324": 636.085.51: 631.5

THE INFLUENCE OF SOWING TIME ON THE GROWTH AND DEVELOPMENT OF WINTER CROPS IN THE AUTUMN PERIOD

Svystunova I.
c. a. s.,
National university of life and environmental sciences of Ukraine, Kiev
Poltoretskyi S.
d. a. s., professor
National university of horticulture, Uman, Ukraine
Voitsekhivska O.
Ph.D., associate professor,
Taras Shevchenko National University of Kyiv, Ukraine
Baranovskyi O.
Student,
National university of life and environmental sciences of Ukraine, Kiev

Abstract. *This article considers the influence of sowing dates of winter crops on their growth and development during the autumn growing season. It is established that the shift of calendar dates of sowing significantly affects the morphological parameters of plants before the end of autumn vegetation. The significance of such differences is determined by weather conditions and biological characteristics of the variety and species. The shift of sowing dates towards the early ones causes an increase in the number of shoots, plant height, number of nodal roots and mass of raw above-ground mass. During sowing in October, the plants lag far behind both in stage development and in the parameters of phytometric parameters.*

Key words: *triticale, sowing period, tillering, plant mass, nodal roots.*

Introduction. The vegetation period of winter crops takes place in 2 cycles, separated by a period of forced dormancy. The first winter cycle takes place in autumn and the state in which they complete the autumn vegetation, which is the most important prerequisite for good overwintering and high stable yields [2, 4, 7, 8]. Futhermore the physiological, biochemical and morphological development of winter crops at the end of the growing season is influenced by sowing dates, which in combination with weather and climatic factors determine the growth and stage development of plants in the autumn [1, 3, 6, 10].

According to some authors, the optimal development of plants in the autumn period and their resistance to adverse winter conditions is provided when the autumn growing season from sowing to the end of autumn growing season lasts 50-70 days. This allows to accumulate the sum of effective temperatures ($\geq 50\ ^0$C) about 450-580 ^{0}C, which causes, with sufficient moisture supply, the formation of the optimal number of shoots, which is the main criterion for determining the biological sowing time. However, there is no consensus on the optimal parameters of plant development at the end of the growing season and the required amount of effective temperatures, which is due to both zonal growing conditions and varietal characteristics of the culture [5, 9].

Materials and methods of research. Field research was conducted in the NULES of Ukraine "Agronomic Experimental Station" on typical low-humus

chernozems (black soil). The object of research were winter crops: rye (control), wheat (control), also triticale varieties of different maturity groups: AD 44, Polesskoe 29, ADM 11), sown in 5 calendar terms.

The aim of the research was to study the influence of sowing dates of winter crops on their growth and development during the autumn vegetation period.

Results and discussion. According to the results of research, the sowing of different calendar terms for hydrothermal supply and the duration of the sowing-cessation period of autumn vegetation differed significantly. These differences were due not only to the controlled factor - sowing dates, but also uncontrolled - the date of termination of autumn vegetation. On average, depending on the date of sowing, the period of sowing-cessation of autumn vegetation was 33.3-74.3 days, with significant variation over the years of research, the period of germination-cessation of vegetation ranged from 10.7 to 64.0 days.

One of the indicators that most fully characterizes the state of crops at the end of the growing season is the degree of tillering - a parameter that significantly determines the viability of the plant and its overwintering and is a reflection of the effect on the plant organism of a complex of meteorological, agrotechnical and soil conditions during the autumn period. In the course of our research, we also found a clear dependence of the degree of tillering of plants on the time of sowing, variety and weather conditions during the growing season (table 1).

Table 1

Tillering of rye, wheat and triticale plants before the end of autumn vegetation depending on the sowing date and variety, pcs / plant

Culture, variety	Sowing period				
	25.08.	5.09.	15.09.	25.09.	05.10.
Rye (control)	7,3	6,3	4,5	2,6	1,5
Wheat (control)	6,1	5,1	3,5	2,0	1,3
Triticale AD 44	5,8	4,9	3,3	2,0	1,2
Triticale Polisky 29	6,1	5,0	3,7	2,1	1,3
Triticale ADM 11	6,8	5,5	3,7	2,1	1,2

The most favorable conditions for the formation of the optimal number of shoots were on average for sowing on September 5-25. At the same time, the degree of development of plants of the same sowing dates in different vegetation years varied significantly, which was due to different hydrothermal resources during the autumn. It is noted that with the reduction of vegetation duration the shoot-forming ability of all crops decreases - in rye from 7.3 to 1.5, in wheat - from 6.0 to 1.3 shoots / plant; triticale on this indicator, in terms of varieties, occupied an intermediate position - the coefficient of tillering ranged from 5.8-6.8 (August 25) to 1.2-1.3 (October 5).

Along with the intensity of shoot formation, an important characteristic of the degree of development of winter cereals at the end of autumn vegetation is the linear growth of plants, the power of root system development and the value of above-ground mass. According to the data of range of scientists, for successful

overwintering, the optimal height of triticale plants should be within 12-20 cm, which with a sufficient degree of tillering provides the formation of vegetative mass of about 120-140 g.

As a result of our research, it was found that the weight of 100 raw winter triticale plants in October crops was 30-39 g, which is 17-18 times less than in August - 541-634 g. Under the same conditions, the weight of 100 raw rye plants and wheat, depending on the time of sowing was - respectively 42-716 and 30-601 g. Depending on the time of sowing and, accordingly, the development of vegetative mass of plants, the power of the root system also changed significantly: on October crops the number of roots of the secondary root system was 1.0-1.9 pcs / plant, on plants for August sowing - 10.3-13.6 pcs / plant.

Conclusions and suggestions. Plants that differ in age differ significantly in morphological parameters before the end of the autumn growing season. The significance of such differences is determined by weather conditions and biological characteristics of the variety and species. The shift of sowing dates towards the early ones causes an increase in the number of shoots, plant height, number of nodal roots and the mass of raw aboveground mass. During sowing in October, the plants lag far behind both in stage development and in the parameters of phytometric parameters.

References:

1. Bilitiuk A.P., Hirko V.S., Kalenska S.M., Andrushkiv M.I. (2004). Trytykale v Ukraini. [Triticale in Ukraine]. Kiev. 376 s.

2. Bilitiuk A. P. (2007). Stroky sivby ozymoho trytykale v Zakhidnomu Polissi. [Terms of sowing of winter triticale in Western Polissya]. Visn. ahrar. nauky. № 6. S. 17-22.

3. Hirko V. S., Sabadyn N. A. (2004). Trytykale ozyme. [Winter triticale]. Nasinnytstvo. № 5. S. 21–25.

4. Zaiets S.O., Fundyrat K.S. (2019). Osinnii period rostu i rozvytku roslyn ta formuvannia nasinnievoi produktyvnosti sortiv trytykale ozymoho (triticosecale witt.) v umovakh zroshennia. [Autumn period of plant growth and development and formation of seed productivity of winter triticale varieties (triticosecale witt.) Under irrigation conditions]. Naukovi dopovidi NUBiP Ukrainy. № 2(78). http://journals.nubip.edu.ua/index.php/Dopovidi/article/view/dopovidi2019.02.005 doi:10.31548/dopovidi2019.02.005

5. Kliuchevych M. M., Storozhuk V. V. (2016). Vplyv strokiv sivby ta norm vysivu nasinnia trytykale ozymoho na rozvytok mikoziv y urozhainist kultury v Polissi Ukrainy [Influence of sowing dates and sowing norms of winter triticale seeds on the development of mycoses and crop yield in Polissya of Ukraine]. Silske hospodarstvo ta lisivnytstvo. № 3. S. 84–94.

6. Lykhochvor V. V. (2002). Roslynnytstvo. Tekhnolohii vyroshchuvannia silskohospodarskykh kultur. [Plant growing. Technologies for growing crops]. Lviv : NVF «Ukrainski tekhnolohii». 800 s.

7. Moskalets V. V., Moskalets V. I. (2006). Formuvannia produktyvnosti trytykale iz tsinnymy ekoloho-adaptyvnymy vlastyvostiamy [Formation of triticale productivity with valuable ecological and adaptive properties]. Zbirnyk naukovykh

prats Natsionalnoho naukovoho tsentru "Instytut zemlerobstva NAAN". Vyp. 1-2. S. 95-99.

8. Netis I.T. (2011). Pshenytsia ozyma na pivdni Ukrainy. [Winter wheat in the south of Ukraine]: Monohrafiia. Kherson: Oldi-plius. 460 s.

9. Banaszak Z., Marciniak K. Wide adaptation of Danko triticale varieties. In E. Arseniuk, ed. Proc. 5th Int. Triticale Symp., Radzikow, Poland, 30 June – 5 July 2002. Radzikow, Poland : Plant Breeding and Acclimatization Institute. 2002. Vol. I. P. 217–222.

10. Takeda, S., Matsuoka, M. (2008). Genetic approaches to crop improvement: responding to environmental and population changes. *Nat. Rev. Genet.*, *9*(6), P. 444-457. doi: 10.1038/nrg2342.

Article sent:24.09.2020 г.

© Svystunova I., Poltoretskyi S., Voytsekhivska O., Baranovskyi O.