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PRODUCTIVITY OF WINTER WHEAT DEPENDING ON SOWING TIME IN THE RIGHT-BANK FOREST-STEPPE OF UKRAINE

V.A. Motornyi, postgraduate

The field studies results as for the sowing times impact on the growth, development and productivity of winter wheat are given. It has been established that latestages of sowing lead to yield decrease by 15%. The Bogdana variety appeared to be the most flexible.

Growth and development, winter wheat, sowing time, variety, yield.

An important condition for obtaining high yields of grain is the sowing in optimal agronomic times, which are specified by the varietal characteristics of soil and climatic conditions and water supply available to plants sown in the soil layer. Years of research by D.M. Alimov [6] found that the even and full sprouts of wheat can be obtained if sown in the soil layer with 10 mm of available moisture. Therefore, sowing time must agree, first of all, with reserves of soil moisture and the date of autumn growing season termination. According to I.O.Zadontsev, M.V. Kononenko [2], the duration of the autumn growing season should be 45 – 65 days, within which the plants have to form 3 – 4 shoots and accumulate the sum of active temperatures in the range 550 – 600^0. Under these conditions, plants pass the hardening stage and are able to withstand the temperature decrease in the depth of the tillering node to 16 – 18 ^{0}C.Therefore, sowing time is an important element of varietal growing technology that does not require any additional material costs, but influencesgreatly the genetic realization of wheat varieties.

There is no the onlyscientificstatement inliteratureonoptimalsowing timeofwinter wheat.Thus, according toV.N.Remeslo,V.F.Sayko[15],whensowingwheaton September, 15thandOctober, 5th yieldwas similar–3.47and3.45t /ha respectively. Research byS.M.Kalenska,O.P.Chubko [4]found that thedelayofsowingfor 10– 15 daysreduces theyieldby 15 – 20% due to poorervernalization.

Years of research by V.G. Vlokh, M.J. Bomba, V.V. Lykhochvor, [1] proved that the best calendar sowing time of wheat in the forest-steppe is 10 – 25 of September. Thus, according to the scientists of Lviv State Agrarian University, the best conditions for even sprouts and better growth and development of winter wheat plants are created at sowing on September 30. Similar results were obtained with such varieties as Myronivska 808, Kyianka, Poliska 70. When sowing on September, 30 their yield was the highest – 55.7, 57.4 and 59.5 t /ha respectively. The shift towards sowing earlier or later led to lower yields respectively by 15.4 and 20.5 % [3].

The purpose of the research - the substantiation of optimal sowing timeofnew varietiesof wheat ofintensive type, under conditions of climate change, that is of greatscientific and practical importanceand requiresfurtherresearch.

Materials and methods of research. In the research laboratory of Agricultural LLC "Rasava" in Skvirskyi district of Kyiv region the studies of the effect of sowing time on the formation of winter wheat productivitywere carried out. Research field soil istypical black medium humus, heavy powdery, medium loamy on loess. The humus content in the plow layer - 4.5 – 4.7% (according toTurin), the amount of easily hydrolized nitrogen - 14.3 mg/100 g of soil (according to Kornfild), mobile phosphorus and exchangeable potassium (according to Chyrykov) – 9.5 and 15.1 mg/100g of soil respectively. Soils belong to medium supplied by nutrients. The reaction of soil solution is neutral (pH 6,5–7,0).

The methodical basis of field studies were "Methods of the Field Experience" (B.M. Dospehov, 1985) and "The Methods of state veriety testing technique", edited by V.V.Vovkodav (2003).

The novelty of theresearch. It is the first time when in the Right-bank Forest-steppe of Ukraine on the typical black medium humus the optimal sowing time of new varieties of winter wheat has been grounded and the high efficiency of grain formation has been proved.

Schemeof the experiment:

Factor A – sowing times:

1. September 10th- control;2. September20th;3. September 30th;4. October 10th;5. October 20th.

Factor B – varieties:

1.Poliska90– control; 2.Bogdana;3. Lisova Pisnya.

Area of accountingplot– 50m^2,repetition-three times. Experiment waslaidby method ofsplitplots.

Fluctuations in rainfall and temperature from the average long-term data were observed in 2010-2012. It caused a significant impact on reducing the productivity of wheat from 20 to 40%. With an average long-term rainfall of 335 mm, during the whole growing season the rainfall of 316,9 mmin 2010, and of 310,2 mm in 2012 was observed. As for 2011, this year marked the worst conditions of dampness supply because during the growing season only 187.7 mm of rainfall, and in the period of maximum water consumption (stem elongation - flowering) - only 17.7 mm was observed. In addition, the average temperature for the years of the study exceeded the annual average by 4,1–6,7 ^{0}C.

Results of the research and their analysis.

Sowing time causes the emerging of even sprouting, further growthand development of plants, and, consequently,the yield.Bysowing inthe optimaltime plants canmake full use ofnatural factorsto uncovergenetic potential.

According to our researchthebestsowing timeisfrom 20to 30 Septemberbecauseduring this periodtemperature and moisture supplies corresponded to the biological features of the crop (Table 1).

1. Availability ofmoistureto plantsinthe soil layer0-10cm at the time ofsowing, mm

Time	Year			Average for three years
	2010	2011	2012	
10.09 (control)	10,9	10,5	12,1	11,2
20.09	19,1	18,3	21,2	19,5
30.09	19,9	19,4	22,1	20,5
10.10	21,2	29,8	23,5	24,8

20.10	22,8	33,2	25,3	27,1

At early stages of sowing the available water suppliesdecreased. It is so because of higher temperatures, which leads to increased evaporation. At later stages of sowing the moisture reserves increased due to greater rainfall intensity and evaporationdecrease. However, when late sowing the duration of sowing - sproutingperiod is prolonged, due to excessive moistening of topsoil (Table 2).

According to our observation, the period of autumn growing seasondecreased together with each sowing time, starting from the early one to the late. In our trials, during the number of these days in 2010 and 2012 only the first, second and third sowing times passed, and the plants gained the sum of active temperatures 500 - 650^0. At the latesowingtime, the duration of autumn vegetation declined significantly and plants did not get enough temperatures, leading to further reductionof winter hardiness and liquefaction of sowings.

2.Duration of autumn vegetation of winter wheat depending on sowing time, days

Variety	Time	Year					
		2010 (5.11)		2011 (23.11)		2012 (10.11)	
		Sprouting.	Autumn vegetation.	Sprouting.	Autumn vegetation.	Sprouting.	Autumn vegetation.
Poliska90 (control)	10.09 (control)	9	56	12	74	9	61
	20.09	11	46	16	64	11	51
	30.09	12	36	19	54	12	41
	10.10	14	26	22	44	15	31
	20.10	19	16	24	24	17	21
Lisova Pisnya	10.09 (control)	9	56	12	74	9	61
	20.09	10	46	15	64	10	51
	30.09	12	36	18	54	12	41
	10.10	14	26	21	44	14	31
	20.10	18	16	23	24	17	21
Bogdana	10.09(control)	9	56	12	74	9	61

	20.09	10	46	15	64	10	51
	30.09	12	36	18	54	12	41
	10.10	14	26	21	44	14	31
	20.10	16	18	23	24	17	21

The research results indicate that the weather conditions were better in 2011.Exactly this year winter wheat formed by 4 – 6 centners of grain more than in 2010, and the lowest - in 2012, due to lower rainfall during the formation of generative organs. Regarding the sowing time, the third time (September, 30) appeared to be the best, which provided an increase of grain yield by 4.4 – 6.3 kg / ha or 9,6 – 14,2 % more compared with control. During the fourth period of sowing, harvest increment was only 0,9 – 4 kg / ha or 2,8 – 9 %. Thus we can state that the optimal sowing time is from 20 to 30 September. This is connected to the fact that when early sowing time the plants grow and come into the winter at the phase of stem elongation having consumed the nutrients reserve already. When late sowing time - plants do not have time to go through the necessary conditions of hardening and finish the fall growing season in phase oftwo leaves.

3. Winter wheat yield, t/ha

Variety	Time	Year			Average for three years	Deviation, +/–
		2010	2011	2012		
Poliska 90 (control)	10.09 (control)	3,56	3,96	2,85	3,46	-
	20.09	3,95	4,39	3,68	4,01	+0,55
	30.09	4,02	4,47	3,63	4,04	+0,58
	10.10	3,87	4,30	3,40	3,86	+0,4
	20.10	3,88	4,31	3,43	3,87	+0,41
Lisova Pisnya	10.09 (control)	3,61	4,01	3,23	3,62	-
	20.09	3,96	4,40	4,41	4,26	+0,64
	30.09	3,94	4,38	4,44	4,25	+0,63
	10.10	3,79	4,21	2,99	3,66	+0,04
	20.10	3,82	4,24	3,08	3,71	+0,09
Bogdana	10.09 (control)	4,05	4,5	3,83	4,13	-
	20.09	4,46	4,95	4,21	4,54	+0,41
	30.09	4,52	5,02	4,16	4,57	+0,44
	10.10	4,22	4,69	3,76	4,22	+0,09

	20.10	4,25	4,72	3,81	4,26	+0,13
Average for varieties	Poliska 90 (control)	3,86	4,29	3,40	3,85	-
	Lisova Pisnya	3,82	4,25	3,63	3,90	+0,05
	Bogdana	4,30	4,78	3,95	4,34	+0,50
Average for time	10.09	3,74	4,16	3,30	3,73	-
	20.09	4,12	4,58	4,10	4,27	+0,53
	30.09	4,16	4,62	4,08	4,29	+0,55
	10.10	3,96	4,40	3,38	3,91	+0,18
	20.10	3,98	4,42	3,44	3,95	+0,22
$HIP_{0,5}$	A				0,62	
	B				0,8	
	AB				1,39	

It is grounded in our research that the variety of wheat crop Bogdana provided a yield increaseby 5 t / ha or 10 %, compared with the control –variety of Poliska 90. ThevarietyLisovaPisnyadid notformasignificantincrease.Thus,theBogdanavariety is more flexible to the soil-climatic conditions of this Forest-Steppe zone.

Results of analysis of variance show that the effect of factor A (varieties) made 39%, share of the factor B impact (sowing time) appeared to be larger– 45%, AB (other factors) - 16%.

The least significant difference for the factor A (varieties) was 0.062 t, factor B (sowing time) – 0.08 t (Table 3). That means that the most significant variations in yield wereobserved by sowing varieties Bogdana (+0,5t), regardless of the period of sowing time, although the best result – 30 September (+0.55 t).

Conclusion. Based onthe above mentioned,it can be statedthat thesowing timeseffected thegrowth, developmentandproductivityformation ofwinter wheat. The results offield studieshave shown thatearly and latesowing stages resulted inlower yieldsby 15%.The most flexible to the sowing time variety was Bogdana.

REFERENCES

1. Handbook of winter wheat cultivation /[V.G.Vloh,V.G., M.Y. Bomba, V.V. Lyhochvorandothers].-// Lviv,: Ukrainiantechnologies, 1998. – 150p.
2. ZadontsevA.I.Sowingtimeimpactonhardinessandproductivityofvarietiesofwinterwheat / A.I. Zadontsev, M.V. Kononenko//TheoutcomeofworkoftheKuibyshev UkrainianScientific-ResearchInstituteofGrainFarmingfor 1939 /OCDUSSA,

USRIGFofV.V. Kuibysheva. – Dnepropetrovsk, 1941. – P.3, Issue 11. – P. 37-42.- (Scientific series).

3. ZinchenkoO. Sowingtimeandsowingrateasfactorsofwinterwheatproductivityofdifferentvarieties / O. Zinchenko // HeraldBDAU: Collection of scientific papers. – Bila Tserkva, 2007. – Issue. 46. – P. 5-8.
4. Kalenska S.M. Winterresistance ofwinterwheatvarietiesdependingonsowingtime / S.M. Kalenska, O.P. Chubko, N.V. Zhuravlova // Arable farming. – K.: 2004. – Issue 76. – P.78 – 81.
5. Remeslo V.M., Sayko V.F.. Variable agrotechnics of wheat / V.M.Remeslo, V.F. Sayko - K.: - Yield, 1975. – 176 p.
6. Crop farming: Laboratory–practicalclasses: - Textbook / D.M.Alimov, M.A. Bilonozhko, M.A. Bobroandothers] // - K.: Yield, 2001. – 286p.
7. TupytsynN. V. Winterwheatsowingtime/ N. V. Tupitsyn, S. V. Valiaikin, A. V. Zhyrnov. // Farming. – 2004. – №4. – P. 20.
8. UlichL.I. Sowingtimeofwinterwheatintheconditionsof climate change / L. I. Ulich. //Herald of agrarian science. – 2007. – №10. – P. 26-29.