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YIELD AND GRAIN QUALITY OF WINTER WHEAT AFTER DIFFERENT PREDECESSORS

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Studies have shown that predecessors affect the yield and grain quality of winter wheat. The best quality grain per years was after peas, black fallow, soybean and mustard.

***Keywords**: winter wheat, predecessors, productivity, grain quality.*

Introduction. One of the important factors to improve production efficiency and grain quality of winter wheat is to optimize the conditions for its cultivation, especially posting in crop rotation after the best predecessors.

State of the problem study. Researchers variously characterize the impact of predecessors on the formation of the main indicators of winter wheat grain quality. Thus, G.P. Zhemela differentiates the predecessors, by their relative value, for growing winter wheat and grain formation. Long-term studies in Poltava State Agrarian Academy established that in the steppe zone and in the south-eastern part of the partially-wooded steppe, the predecessors after which conditions are favorable for the formation of high grain quality of winter wheat, are: black fallow, alfalfa for one hay-crop and sainfoin . Winter wheat grown after applied fallows and pea for grain, forms the worse quality of grain than after black fallow. At the cultivation of winter wheat after barley, wheat and corn for silage, and after other non-fallow predecessors (except for perennial legumes), the conditions for obtaining of grain with low protein and gluten content, poor physical properties of dough and baking quality are formed. [1].

Methods of research. Experimental work was carried out during 2005-2008 on the training farm by Trofimov ODAU. The variety of winter wheat Albatross of Odessa was used in the experiment. The predecessors of winter wheat were a number of oil seeds: mustard and white mustard, winter and spring rape, amaranth, flax oil, castor and sunflower; and the following options were used for comparison: from stubble plants – wheat, from legumes - soybeans, peas and black fallow. During the laying of the experiment, conducting of related research and data processing, the accepted methods of agronomy scientific research were used. [2].

Results. As can be seen from Table 1, the conditions of the research year had a significant impact on the productivity of wheat in the experiment. 2007-2008 were the most favorable agricultural years. This year of studies we obtained 47.1 cwt / ha of winter canola grain, which is 6.2% higher than in the 2005-2006 agricultural years. Adverse weather conditions in 2006-2007 resulted in reduced yield of this option by 31.8% compared to the best year. The same trend in grain productivity per years was observed in all variants of the experiment.

Table 1

Effect of predecessors on the yield of winter wheat, cwt/ ha

Variety	Predecessor	Year of Studies			Average
		2005-2006	2006-2007	2007-2008	
Albatross of Odessa	Winter wheat	25,8	21,7	33,2	26,9
	Brown mustard	48,6	40,2	52,7	47,2
	Peas	46,0	36,1	50,1	44,1
	Winter rape	44,2	32,1	47,1	41,1
	Sunflower	35,0	22,8	37,2	31,7

	Soya	43,6	35,9	48,7	42,7
	Black fallow	49,9	43,1	54,2	49,1
	Castor plant	39,2	29,0	44,7	37,6
	Spring canola	44,8	33,6	48,3	42,2
	Amaranth	39,6	24,5	42,0	35,4
	Mustard	47,4	38,8	51,5	45,9
	Flax	41,1	29,6	45,6	38,8
	$НСР_{05}$, cwt/ ha ц/га	3,56	3,82	4,09	

Such non-fellow predecessors as winter wheat, peas, soybeans and canola showed good results. Sunflower and wheat in the second year of use were the worst predecessors. Compared with black fallow the yield of Odessa Albatross after these predecessors was lower by 35 and 45.2%. This is due, primarily, the lowest soil fertility, that was confirmed by the conducted agrochemical analysis of soil.

The basic parameters of grain quality of winter wheat is its protein and gluten content. One of the factors affecting wheat protein is the amount of nitrogen absorbed by plants during the growing season. The accumulation of nitrogen in plants is directly dependent on the concentration of available forms of nitrogen in the root soil layer [3, 4].

Predecessors, affecting water and nutrient regimes changed level of baking properties of wheat grain in our study (Table. 2).

The best quality grain per years turned after peas, black couple, soybean and mustard. In these embodiments, the protein and wet gluten content was 13,1-13,6 and 25,5-27,5% and elasticity of gluten equal to 71-73 units VDK, which attributed it to the first group of quality.

Table 2

Technological quality parameters of winter wheat grain depending on predecessors (average per years)

Predecessor	Protein content %, %	Indicators of gluten			Falling number	Determination of flour force on alveohraf		
		Wet gluten content,% %	Glutinous quality	Quality group		Specific job of dough deformation J, Дж	elasticity of dough mm мм	Relation elasticity to its extensibility
Winter wheat	11,4	22,4	82	II	332	138	69	0,82
Brown mustard	13,2	25,7	71	I	337	284	80	1,57
Peas	13,6	26,3	73	I	331	286	84	1,65
Winter rape	12,8	25,5	75	I	349	226	76	1,22
Sunflower	11,6	21,0	83	II	324	137	70	0,80
Soya	13,3	25,7	72	I	328	285	82	1,63
Black fallow	13,5	27,5	71	I	344	281	80	1,60
Castor plant	12,4	23,5	79	II	362	165	72	0,96
Spring canola	12,6	24,6	75	I	348	229	75	1,26
Amaranth	12,1	22,6	82	II	333	158	72	0,91
Mustard	13,1	25,5	71	I	337	284	80	1,58
Flax oil	12,7	24,8	75	I	333	211	76	1,08

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of gluten equal to 71-73 units VDK, which attributed it to the first group of quality.

The worst technological parameters of grain quality of winter wheat were obtained after sunflower and wheat. The protein and gluten content at this time was equal to 11,6-11,4 21,0-22,4% and elasticity of gluten was equal to 83-82 units VDK, which corresponded to the second group of quality.

Wheat planting after the other investigated predecessors led to a variation of these parameters between the above limits. So, after winter rape the protein and wet gluten content in winter wheat in average per years of research declined by 0.8% in both cases compared to wheat sowing after peas. Reducing these parameters in grain obtained from areas where the predecessor was sunflower was respectively 2.0 and 5.3%. The calculated coefficient of determination between the protein and gluten indicates a strong influence of one value on changing the other ($r = 0,90 \pm 0,14$).

Analysis of the three-year researches of change in the number of fall suggests that the investigated factors did not affect the activity of amylolytic enzymes. According to the data of average annual maximum level (362 s), this figure was reached in variant where castor plant was a predecessor of winter wheat and the plunger of viscometer immersed the fastest in pasted mash of wheat, the predecessor of which was peas (331 s).

The method of determining the physical properties of dough is also the method for determining flour strength. As can be seen from the data, the highest labor costs for blowing the dough into a ball to break were spent in analysis of material obtained from corn grown after pea, soybean and mustard - from 286 to 284 J. Gas keeping ability was the weakest in dough obtained from wheat by amaranth, wheat and sunflowers.

Distance from the base to the highest point of alveohram characterizes the elasticity of dough and is defined in mm. In strong wheat this figure should not be below 80 mm. As a result of our research, the alveographyc dough curve in variants where soybean, pea, mustard and fallow were predecessors was above this mark.

The ratio of elastic to stretch is also an indicator that characterizes the technological value of wheat flour. Published data argue that in strong wheat the quotient of the above parameters should be between 1 and 2. The results of the analyzes show that the established marks did not include data obtained from the variants with predecessors of wheat, castor, sunflower and amaranth.

Conclusions. Thus, in the zone of insufficient moistening the basic cultural practices of winter wheat grain quality improvement should be regarded the placing of its sowing after best predecessors in rotation saturated with oilseeds. This creates the conditions for a high yield of winter wheat.

References

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Анотація

Когут І.М. ***Урожайність та якість зерна озимої пшениці після різних попередників.*** *Дослідження показали, що попередники впливали на урожайність та якість зерна озимої пшениці. Найбільш якісне зерно по рокам виявилось після гороху, чорного пару, сої та гірчиць.*

Ключові слова: озима пшениця, попередники, урожайність, показники якості зерна.

Аннотация

Когут И.Н. ***Урожайность и качество зерна озимой пшеницы после разных предшественников.*** *Исследования показали, что предшественники влияли на урожайность и качество зерна озимой пшеницы. Наиболее качественное зерно по годам оказалось после гороха, черного пара, сои и горчицы.*

Ключевые слова: озимая пшеница, предшественники, показатели качества зерна.