



SOURCE MATERIAL TO CREATE A HIGH-PROTEIN VARIETIES OF OATS IN A ZONE OF NORTHERN TRANS-URAL

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Oats is a versatile crop usage. The most important constituent of protein in oat grain depends on the growing conditions and varietal characteristics. One of the major trends in breeding oat on quality is the increase in protein content. Of particular interest in this regard are hullless forms that are able to form in the grain is 14 - 22% crude protein. In condition of North forest-steppe of the Tyumen region assess hullless oat samples of different ecological and geographical origin by the ability of formation of protein in the grain.

The results of studying the collection samples in the conditions of North forest-steppe of the Tyumen region in the next three years (2012 - 2014) showed that the formation of protein in grain of hullless oat varieties largely depended on the growing conditions. The extent of their influence amounted to 75.8 %. The proportion of the effect of genotype was 11.1 %, and the proportion of the interaction genotype-environment - 13.1 %

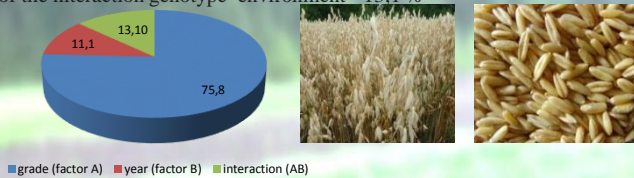


Fig. Extent of influence of factors on protein content in grain the naked of grades of oats in the conditions of Northern Trans-Ural.

Analysis of the relationship of protein content with grain yield of hullless oat varieties have shown that under conditions of Northern forest-steppe of the Tyumen region it is strongly negative ($r = -0.72 - 0.84$). Analyzing the reciprocal relationship of protein content with yield structure elements, it should be noted a negative correlation with yield per plant ($r = -0.55 - 0.57$). The relationship of protein content with grain weight plant 1, weight of 1000 grains, number of grains per panicle and productive tillering is ambiguous. The positive correlation of productivity 1 plants with protein content in grain of naked oat varieties ($r = 0.22$; $r = 0.98$) was recorded in extreme growing conditions (drought, hard, 2012, excess moisture and lack of heat, 2014). A positive effect of size of grain and number of kernels in the panicle formation to the protein ($r_1 = 0.57$; $r_2 = 0.76$) emerged only when sufficient provision of heat and moisture (2013). In other cases, the relationship was negative. The growth of productive tillage capacity positively affected the content of crude protein ($r = 0.76$) only in conditions of excessive moisture and lack of heat (2014)

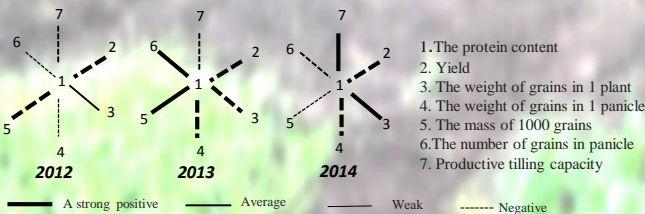


Fig. 2. Intercorrelation of protein content in grain the naked of grades of oats with productivity and elements of its structure. Tyumen, 2012 - 2014.

The result of the research, selected high-yielding samples, significantly inferior to the standard cultivar (hullless Tyumen) on protein content in grain, but provided a significant increase in yield of crude protein from 1 m².

Table 3. Sources of a high protein of oats in a zone of Northern Trans-Ural, 2012-2014.

№Catalogue WIR	Variety	Provenance	Yield, g/m ²	The substance protein, %	Collecting crude protein, g/m ²
High-protein forms					
14784	Тюменский гол. (St)	Тюменская область	179,3	16,68	29,91
11278	Успех	Ленинградская обл.	200,7	18,03	36,19
15117	Помор	Кемеровская обл.	194,0	18,28	35,46
15089	MF 9224-106	США	252,0	18,22	45,91
1926	HULL-LESS	Китай	260,7	18,46	48,12
14616	HULL-LESS	Китай	283,3	18,50	52,41
Highly productive form					
15275	Першерон	Кировская область	265,3	15,51	41,15
15339	Прогресс	Омская область	355,3	16,62	59,05
14227	Бер 2	Белоруссия	283,3	17,70	50,21
15088	MF 9224-101	США	262,0	17,51	45,88
11003	VICAR	Канада	290,7	16,46	47,85

The maximum amount of protein (average of the experience - 20,07 %) was noted in drought conditions (2012), minimum sugar content (average of the experience - 15,20 %) were in conditions of lack of heat and surplus of moisture (2014). The role of variety in protein formation shows a wide variation in this indicator. So in the dry conditions of 2012, the content of protein in grain collection samples ranged from 15,92 % (14564) to 23,79 % (K - 2353, K - 15225) in cold, wet 2014, it ranged from 11,54% (14440) to 18,25% (14944, K - 15158). The variability of genotypes for protein content in grain (V) was in the range of 6.5 - 10.3 percent

Table 1. Influence of conditions of cultivation on formation of protein in grain the naked of grades of oats in a zone of Northern Trans-Ural, 2012 - 2014.

Years	The protein content in grain, %		
	Average	The scope of variation	The coefficient of variation (V)
2012	20,07 ± 0,22	14,49 - 23,79	10,3
2013	15,56 ± 0,17	12,83 - 18,31	8,7
2014	15,20 ± 0,10	11,54 - 18,25	6,5

Multi-year evaluation of collection samples of hullless oats for grain protein content yielded a number of protein-rich forms that can be recommended for use in breeding for improvement of quality. A lot of interest in this regard are: Success (Leningrad oblast), Pomor (Kemerovo oblast), local (Norway), as well as a number of samples from the USA, Canada and China. The protein content of the data sortooobraztsov on average over three years (2012-2014) made up of 18.03 - 19.20 %, while the standard varieties Tyumen naked the figure was of 16.68 %. Great interest in this respect are the samples: K - 2299, Polard (Canada); K - 14616, Hull-less (China); K - 12563 for the local (Norway) and others. It should be noted that most high-protein forms have a low yield. As a result, the collection of crude protein per unit area at them was not high. The increase in protein yield per unit area can be achieved both by increasing below and growth in productivity.

Table 2. Sources of a high protein of oats in a zone of Northern Trans-Ural, 2012-2014.

№catalogue WIR	Variety	Provenance	The protein content in grain, %			
			2012	2013	2014	Average
14784	Тюменский гол. (St)	Тюменская обл.	20,99	14,58	14,46	16,68
11278	Успех	Ленинградская обл.	20,99	16,79	16,32	18,03
15117	Помор	Кемеровская обл.	21,74	17,66	16,45	18,28
12563	Местный	Норвегия	21,98	16,79	16,15	18,31
15089	MF 9224-106	США	21,74	17,66	15,27	18,22
15220	MF 9424-13	США	21,28	17,49	15,45	18,07
2299	POLARD	Канада	23,38	16,73	17,49	19,20
1926	HULL-LESS	Китай	21,86	17,70	16,32	18,46
14616	HULL-LESS	Китай	22,56	18,31	14,64	18,50

Insights

In the conditions of Northern Trans-Ural evaluated 213 samples of hullless oats of different ecological and geographical origin on the content of protein in grain. Identified the degree of influence of growing conditions, varietal characteristics and their interaction on the formation of protein in grain of hullless varieties of oats in a zone of Northern Zauralye. A close negative correlation between protein content and grain yield of hullless oat varieties under conditions of Northern forest-steppe of the Tyumen region. A positive correlation between the protein content of the endosperm in the grain. Sources that generate high protein content, which are recommended for use in breeding for improving belkovi: Polard (Canada), Hull-less (China), local (Norway) and other sources, combining high protein content with high productivity: Run 2 (Belarus); 9224-106 MF, MF 9224 - 101 (USA); Hullless Oats, Brighton(Canada), etc.

