

ОДЕСЬКА НАЦІОНАЛЬНА АКАДЕМІЯ  
ХАРЧОВИХ ТЕХНОЛОГІЙ

**ЗБІРНИК  
НАУКОВИХ ПРАЦЬ**  
*МОЛОДИХ УЧЕНИХ,  
АСПІРАНТІВ ТА СТУДЕНТІВ*



ОДЕСА  
2018

ББК 36.81 + 36.82  
УДК 663 / 664

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Міністерство освіти і науки України. – Одеса: 2018. – 240 с.

Збірник опубліковано за рішенням вченої ради від 03.07.2018 р., протокол № 15  
За достовірність інформації відповідає автор публікації

РОЗДІЛ 1

**АКТУАЛЬНІ ПИТАННЯ ЗБЕРІГАННЯ  
ТА ТЕХНОЛОГІЇ ПЕРЕРОБКИ ЗЕРНА,  
ОВОЧІВ ТА ФРУКТІВ**

## MILLING AND RHEOLOGICAL PROPERTIES OF FLOUR FROM DIFFERENT KINDS OF WHEAT

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Today in Ukraine, the varieties of hard (baking) wheat are mainly distributed, however, recently the work has been carried out to develop and spread varieties of soft (confectionery) wheat, as well as wheat varieties for special purposes (Toporash, Ribalka, 2008).

Taking into account the current requirements and the active growth production of food products, in particular bakery and pasta products, the issue of expanding the range of end-use products of various intended uses is very actuality. This problem can be solved by the processing of new types of wheat varieties, as well as for account of the optimization of the process of forming varieties of flour.

Four new varieties of wheat, Oksana (soft red winter), Belyava (soft white winter), Sofiyka (hard red winter waxy) and Chornobrova (hard black winter) were studied according to their different qualities and rheological characteristics compared to ordinary baker's wheat Kuyalnik (hard red winter).

The technological and biochemical parameters of flour quality from various modern varieties of Ukrainian wheat, obtained in experimentally milling on CD1 were studied in this work (Fig.1). The CD1 mill complies with AACC 26-70.01 standard, which describes its use for experimental milling. It also complies with NF EN ISO 27971 standard, which describes the test milling methodology for the Alveograph test (ring tests, wheat-market transactions). Physical and biochemical properties of flour from different modern varieties of Ukrainian wheat studied. It is shown that the flour produced from the soft wheat compared with the hard wheat has low particle size, low ash and protein content, but high whiteness (Fig.2). In opposite of this, flour from the waxy wheat has high particle size, high ash content.

The total yield of Kuyalnik wheat was about 70%, as with the traditional 70% classic grinding of the MLU-202 pneumatic mill. This is typical for milling hard wheat, where in the main part of the flour – reduction flour (RF), and yield break flour (BF) does not exceed 20 - 25%.

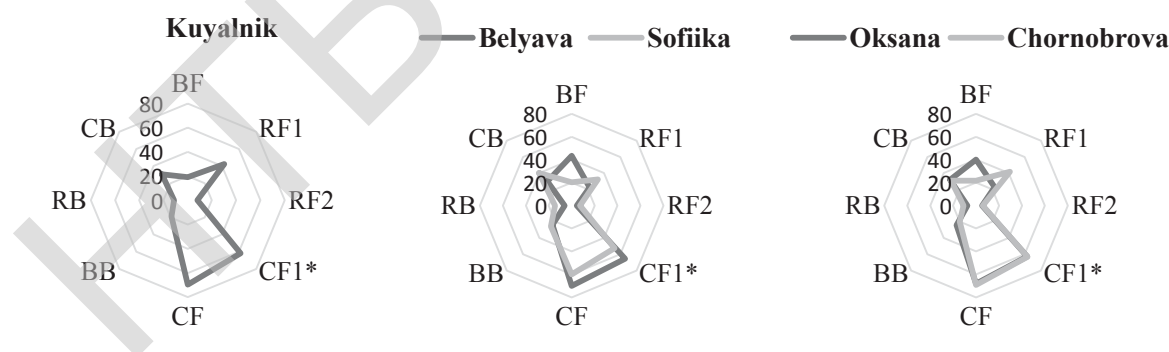


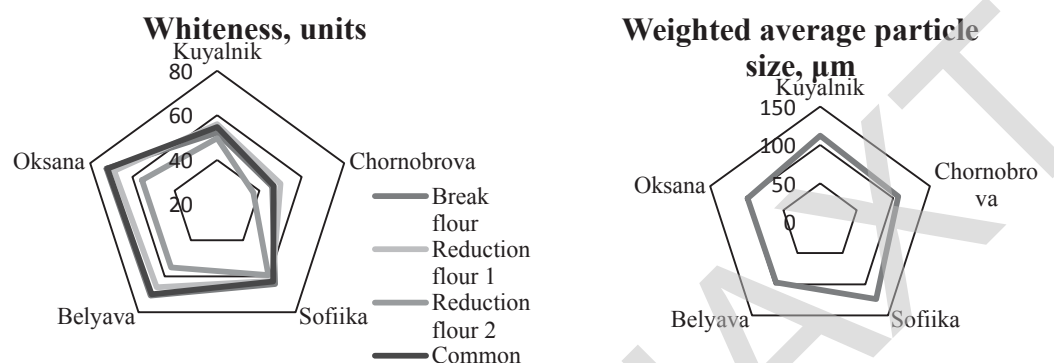
Fig. 1 - Results of laboratory 70% milling test

**Note:** \* this flour sample was used, to further study the rheological properties on the alveograph, in accordance with ISO 27971, BF – break flour, RF1 – reduction flour 1, RF2 – reduction flour 2, CF1 – common flour mixed without RF2, CF – common flour included RF2, BB – break bran, RB – reduction bran, CB – common bran (the sum of BB and RB).

A similar situation observed during grinding Chornobrova wheat. The common yield of flour was about 70%. By the particle size Kuyalnik and Chornobrova showed similar results (Fig.2).

For soft wheat, the total yield of flour also amounted to about 70%. Main part of flour obtained at the break system and only a small part in the reduction system. At the same time, the flour from soft wheat was visually more dispersed and very compressed, and it has a smaller particle size.

Waxy wheat Sofiika is very hard, so grinding is less intense, especially with a smaller gap in the reduction system. The flour particles are larger, therefore the total yield on the sieves with the same hole diameter is less – about 60%.



**Fig.2 - Results of whiteness and particle size determination**

According to the totality of the Kuyalnik wheat data obtained in our experiment, it can be concluded that it is typical bakery wheat, and the results of the experiments corresponded to the values characteristic for hard wheat.

The results of studies of wheat Chornobrova correlate with the results of wheat Kuyalnik, but the baking properties were worse. Therefore, this wheat can be recommended for making bakery products when added in a mixture with patent flour, in an amount up to 20-30% (requires further study).

Quality indicators of flour from waxy wheat are characteristic for hard wheat flour, at the same time, flour from waxy wheat contains less ash and protein, has a larger size. The yield of wheat flour from waxy wheat was lower because of the high flour size and because the grain is very hard. However, in any case waxy wheat is recommended for the production of pasta.

Flour from soft wheat differs significantly from hard wheat: it is characterized by less ash content and protein content. Flour from it has a smaller particle size and accordingly low sifting. Wheat flour Oksana has less elasticity, but greater extensibility, but higher whiteness. Soft wheat flour can be added to special types of bread to give a lighter color to the crumb, but in a small amount (no more than 10-20%). Obviously, according to foreign experience because of small particles, low protein content, high whiteness is recommended for making cookies.

For non-standard varieties of flour (soft and waxy), it is recommended to determine the rheological properties according to the method with the adapted moistening (on the alveoconsistograph).

According to the results of experimental milling on CD1, we recommend this method: for soft wheat – 1 passage of flour on the reduction system, for hard and black wheat – 2

passes, for waxy wheat – 3 passes, which will be better matched to flour that can be obtained in industrial conditions.

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## CONSUMER PROPERTIES OF SMALL-SEEDED BEAN CULTURES

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Lentil and golden gram are small-seeded bean cultures of diversified usage: food, forage and technical. A food industry manufactures canned food, sausages, protein formulations, chocolate, cookies, soups, and others from the seeds. A large-seeded lentil is particularly appreciated for food purposes, but the seeds of small-seeded lentil and golden gram in spiced form are a valuable concentrated animal feed. They are used as a protein component in the production of combined concentrated animal feed. The green mass, hay, straw and chaff of a lentil are also used as an animal feed. The straw contains up to 14% of protein, and in terms of nutrition it is almost as good as meadow hay.

Golden gram and lentil contain almost all the nutrients that are needed for the functioning of our body. The chemical composition of seeds of small-seeded bean cultures in comparison with other bean cultures is given below (Table 1).

**Table 1 – The chemical composition of the grain of small-seeded bean cultures**

Culture	Fraction % ( of total mass)				
	Protein	Fats	Carbohydrates	Fiber	Ash
Lentil	24...35	0,6...2,1	48...53	2,4...4,9	2,3...4,4
Golden gram	20...39	2,0...3,0	20...42,2	5,0...11,1	2,5...5,8
Pea	20...35	1,3...1,5	30...50	3,0...6,0	2,0...3,3
Bean	22...32	2,3...3,6	50...60	5,0...7,1	2,5...4,6
Chick-pea	18...34	4,0...7,2	47...60	2,4...12,0	2,5...4,9
Peavine	25...34	0,5...1,2	24...25	4,0...5,4	2,5...3,0

Lentil and golden gram seeds contain from 20 to 39% of protein, carbohydrates – from 20 to 53%, fats – from 0, 6 to 3,0%, minerals – from 2,3 to 4,4%. The culture data is also a good source of vitamin B. The protein of the lentil and golden gram, which contain vital amino acids, are well absorbed by the human body. Lentil and golden gram do not accumulate nitrates, toxic elements, radionuclides and can be considered as ecologically pure products.

Lentil and golden gram contain more protein than peas and beans. Lentil and golden gram's proteins, like the proteins of other bean cultures, are rich in essential nonreplaceable

## З М І С Т

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Ум. друк. арк. 27,9.