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Część 7

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INFLUENCE OF WATER-HEAT TREATMENT ON YIELD AND QUALITY OF FLOUR PROCESSING FROM NAKED OATS

Keywords: naked oats, groat production, grinding, oats flour.

INTRODUCTION

Recently, producers and consumers increased interest in new promising product – oats flour. By its chemical composition it contains on average 55,0...65,0 % carbohydrates, 11,0...13,0 % proteins, 5,0...15,0 % fat, 2,3...2,8 % dietary fiber and differs from the wheat flour with better balance for amino acid composition, increased content of micro- and macronutrients, especially the content of potassium and magnesium, contains large amounts of mucous substances, incorporates non starch polysaccharide β -glucan, which reduces the blood cholesterol levels and makes the gastrointestinal tract function easier. Due to the unique properties it uses in mixtures with other types of flour, particularly wheat, widely used in baking and confectionery industry in the production of bread, bakery and confectionery products [1; 2].

A characteristic feature of all types of oat groat products obtained in the processing of traditional varieties of oats is a relatively low yield of end products. This is due to the high hoodness of traditional oats which may contains 20...40 % of the grain hard floral hulls. For their removal complicated and energy intensive stages of dehulling and pearling are conducted during which produced a significant amount of by-products in the form of crushed core and middlings – 15...35 %, increasing the length of the technological process for the necessity of repeat dehulling stage and sorting products after it [3; 4].

In the recent years, scientists-breeders have obtained new naked forms of oats (*Avena nuda*) which have better technological and physicochemical properties [5]. For the last 5...7 years scientists conducted researches of the chemical composition and technological properties of this crop to develop optimal modes of its processing in groats products.

The problem of using naked varieties of oats in the national groat industry is located in the initial stage. The majority of researches were held by Ukrainian scientists-breeders to determine the growing conditions, some technological properties and chemical composition of the grain.

«State register of plant varieties suitable for dissemination in Ukraine in 2013 year» contains three cultivars of naked oats: «Salomon», «Samuel», «Skarb Ukrainy». These varieties are characterized by high values of indicator of 1000 grain weight and relatively higher protein content compared to traditional varieties.

In modern conditions the appearance of new naked varieties of oats Ukrainian breeding determines revision, improvement and optimization of the existing technological schemes that will be conformed to the peculiarities of the new grain crops.

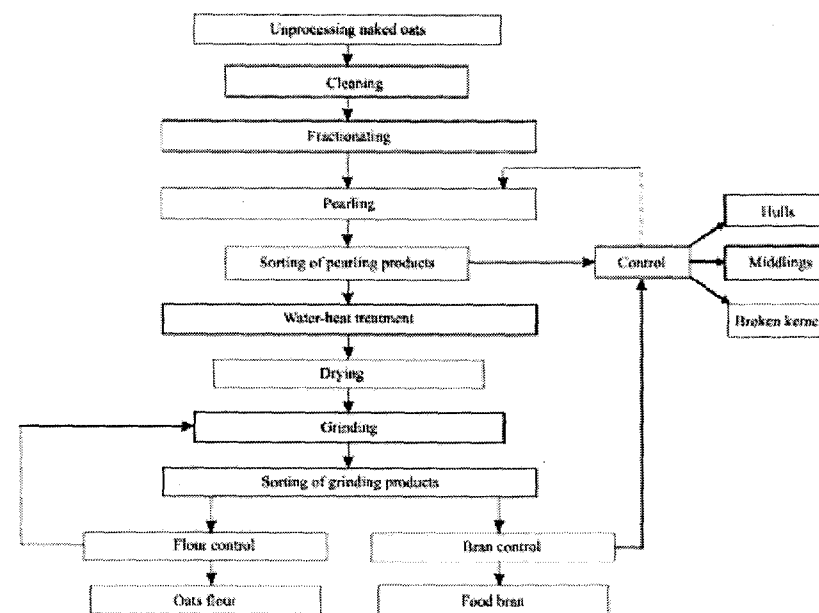


Figure 1 – The block scheme of processing naked oats into oats flour

MATERIAL AND METHODS

Samples of naked oats cultivar «Salomon» were cultivated and harvested in Kirovograd region, Ukraine in 2013 year.

Steaming of oats groat was carried out in the laboratory steamer of periodic action VK-30. Specially prepared sample of the studied material was filled in the special cartridge and placed in steamer. With help of the intake and exhaust valves the pressure and time of steaming were regulated. Groat with initial moisture content of 12,5 % was steamed at 0,20 MPa for 5 min and then sent to the drying stage.

Drying of the groat after steaming was carried out in the laboratory dryer which works on a “fluidized bed”. Mode of operation of the dryer (degree of removal of excessive moisture) was regulated by temperature changes drying agent (air) and time of the grain location in the working area of the dryer. Groat was dried to a moisture content of 10, 12 and 14 % and then sent to the grinding stage.

Grinding was carried out in the laboratory mill «Nagema» which includes a roller mill with two pairs of rollers 150 mm length and 220 mm in diameter and two receiving plansifter composed on one bed. Working gap changed depending on grinding system (gr. sist.): 0.7 at first gr. sist., 0.5 at second gr. sist., 0.3 at third gr. sist., 0.1 at fourth gr. sist. Oat flour was received by pass of the 067 sieve after each grinding system. Oat bran was received by overtail of the 067 sieve after fourth grinding system.

Ash content of obtained oats flour and bran was determined according to the method GOST 10847-74. Oats flour and bran were ground in Olis Laboratory Mill weighed and

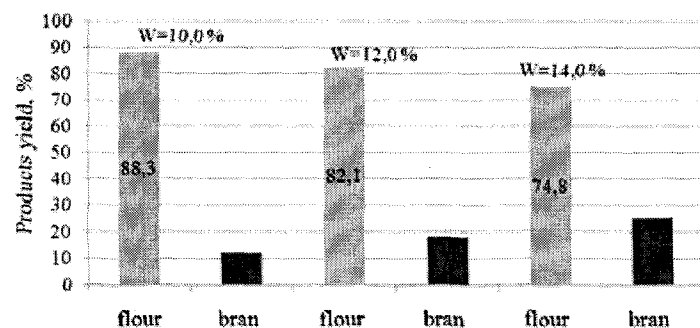


Figure 2 – Changing the yield of oats flour depending on moisture content of groat before grinding

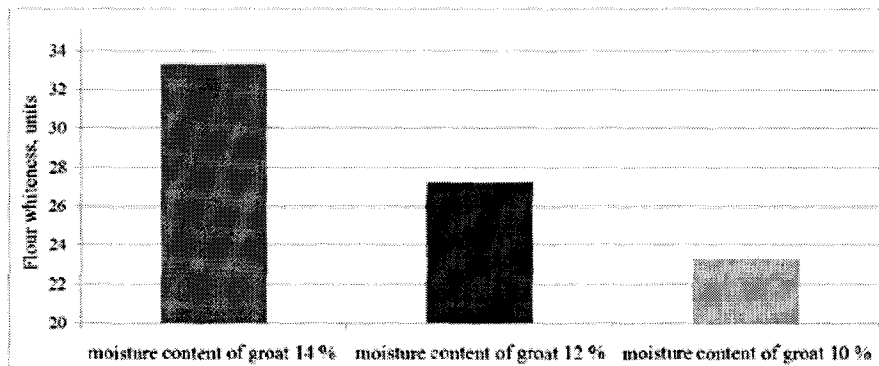


Figure 3 – Changing the whiteness of oats flour depending on moisture content of groat before grinding

placed in a special ash cup. Then the samples were heated at 900 °C in an electric muffle furnace until its weight was stable. The residue in ash cup was cooled to room temperature and then weighed on analytical scales.

Whiteness of obtained oats flour was measured on express flour whiteness meter BLIK-R3. A sample of oats flour was placed into the special cartridge and tamped. After this cartridge was placed in device and measurements were carried out.

RESULTS AND DISCUSSION

In the course of research the block scheme of processing oats flour has been developed with using of water-heat treatment which involved the production of oats flour and oats bran. Processing naked oats under this scheme includes the following stages: cleaning of typical impurities, pearling, water-heat treatment of pearling groat, drying and grinding (fig. 1).

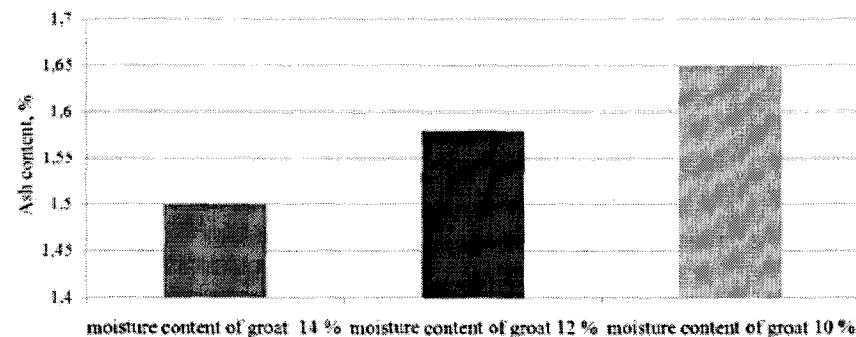


Figure 4 – Changing the ash content of oats flour depending on the moisture content of groat before grinding

To determine the grinding modes of naked oats grain into flour a research was conducted about the influence the modes of water-heat treatment on yield and quality of end products – flour and bran. The results of researches are presented in fig. 3.

From given results it can be seen that for samples of groat (pearling kernel of naked oats) the degree of grinding varied depending on humidity. Increasing the moisture content of the groat before grinding led to an increase in its plasticity which in its turn reduced the yield of flour with increasing yield of bran. Maximal yield of oats flour was obtained by grinding of groat with moisture content of 10 %, and it was received the minimal yield of bran – 11,7 %. The biggest yield of bran was observed at humidity of groat 14 % which respectively led to the lowest yield flour – 74,8 %.

To determine the quality of obtained products the determination of whiteness was carried out. The results of researches are presented at fig. 4.

As it can be seen from fig. 4 the biggest whiteness 33,3 units was observed in flour obtained by grinding the groat with the moisture content of 14 %, the smallest 23,2 units – in flour obtained by grinding the groat with the moisture content of 10 %. The relatively high value of whiteness of the sample was obtained from groat with the moisture content of 14 % in comparing with other samples (with the moisture content of 10 and 12 %) explained by the higher plasticity of the kernels which leads to less grinding of membranes which fell into flour and reduced the whiteness index.

An important indicator of the quality of end products, which characterizing the overall mineral content is ash content. The results of researches of ash content are presented at fig. 5.

The indicator of ash content of obtained oats flour depending on the initial moisture content of groats was in the range of values 1,48...1,65 %. The indicator of ash content of oats bran was in the range of values 2,25...2,43 %.

CONCLUSIONS

The main difference of the developed technological scheme of processing oats flour from the technologies which are widely used in Ukrainian groats industry is the lack of energy-intensive operations of dehulling, sorting of dehulling products, which greatly simplifies the technological process, reduces expenses for production of these products.

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