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# PROSPECTS OF THE METHOD OF DRYING CEREALS WITH FOAM

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**Abstract**

The current study aims to investigate the feasibility of drying high-quality cereal grains using a special foam drying technique. It was carried out by foaming the spiked grains with the addition of egg white (5, 10 and 15%) and methyl cellulose (0.5%). It was dried at three drying temperatures, i.e., 60, 70 and 80 °C in a tray dryer. The drying study showed that the drying time required for foamed cereal pulp was lower than that of non-foamed pulp at all selected temperatures. Biochemical analysis results showed a significant decrease in ascorbic acid and β-carotene content in grain powder obtained at high temperatures compared to pulp dried at a low temperature of 60 °C. Rehydration ratio and water activity values decreased with increasing temperature, but values for both parameters increased with increasing egg white concentration.

An increase in pH values was observed with increasing temperature as well as with increasing egg white concentration. From this study on drying, it was found that grain pulp treated with 10% egg white and 0.5% methyl cellulose and dried at 60 °C retained significantly higher quality characteristics than other foaming and drying methods.

**Key words:** spiked grain, foam mat drying, methylcellulose, egg albumin, moisture.

**INTRODUCTION.** Cereals are the most common nutritious plant in our country. Wheat grain has a sweet taste and is considered the main food of Uzbeks. Uzbek table cannot be imagined without bread. The main drawback of flour products produced by us is the quick hardening of the bread covered with it. Many studies have been carried out to overcome this deficiency. Secondly, the enrichment of flour products with the necessary trace elements is important in maintaining human health.

Wheat grain contains various types of macro and microelements, vitamins, proteins and enzymes. It is well supplied with vitamins A and C when consumed regularly. It contains vitamins B, D, E, K and minerals such as magnesium, sodium, iron, calcium, phosphorus and potassium. Wheat is a good source of beta-carotene, which helps prevent free radical damage, which can otherwise lead to some forms of cancer. Wheat grain is a high-calorie food [1-3].

Drying is the process of removing water to stop or slow down the growth of spoilage microorganisms and to allow a chemical reaction to occur. Drying is generally defined as removal of moisture until equilibrium with the environment, removal of moisture to a very low moisture content, almost bone dry, is called dehydration.

Drying technology has evolved from the simple use of solar energy to current technology, including oven drying, tray drying, tunnel drying, spray drying, freeze dehydration, osmotic dehydration, extrusion, using liquid and microwave ovens, radio frequency drying, shatter glass and so on. Technology. Foaming of liquid and semi-liquid materials has long been recognized as one of the ways to reduce drying time. Over the past decade, this relatively old technology, known

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as foam drying, has been used to process materials that are difficult to dry, to obtain products with desirable properties (e.g., easy rehydration, controlled density) and non-foaming storage of volatile substances lost during drying of materials, etc. [4-6].

**MATERIALS AND METHODS.** Before starting the drying process, grain products are mechanically and biochemically cleaned of impurities and excess pesticide residues. Washing is carried out by spraying water and brushing to remove adhering soil. Removal of the outer shell from the grain is carried out in the mill. Grain pieces from the mill were pulped using a laboratory mixer-grinder [7-10].

**EXPERIMENTAL PART.** Foaming agents and stabilizers were used within specified limits and based on preliminary foaming tests performed. Food foaming and stabilizing agents such as methylcellulose (0.5%) and egg white (5, 10 and 15%) were selected and used for foaming. Egg white and methyl cellulose were added later during grinding to foam and stabilize the wheat grain pulp. Foamed and unfoamed samples at different temperatures viz. It was dried in SSh-80-01 dryer at 60, 70 and 80 °C for 120 minutes. Food of uniform foam cereal pulp size (80 x 40 x 3 cm) was distributed evenly on stainless steel trays.The temperature inside the drying chamber was measured using a thermometer. At 30-minute intervals, trays are removed from the drying chamber to determine moisture loss. Drying was stopped when the mass of the samples registered a constant weight. The moisture in the sample was determined by the hot air oven method. The pH was measured with a digital glass electrode pH meter (CD 175 E), which was calibrated before measuring the sample pH using buffer solutions of pH 4.0 and 7.0. The rehydration ratio of wheat flour was determined as the ratio of the rehydrated mass to the initial dehydrated mass, which gives a measure of the ability of the wheat flour to reabsorb water.

One part of wheat powder is dissolved in 10 parts of 1% NaCl solution and boiled in a test tube for 20 minutes. Then cool for 45 minutes at room temperature. The water activity of the obtained wheat powder was measured at room temperature (28.5 ± 1 °C) using a water activity meter (Aqua Lab, Model Series 3TE, USA). Three measurements were averaged.The color of different wheat and wheat powder fractions was measured using a colorimeter with a color measuring device (Colourquest XE, Hunter lab colorimeter, Software - QC). The colorimeter was calibrated using a white plate, and then the color values (L, a, b) of the samples were measured.

Among the color component, L represents the value (lightness) of the color, and it is larger for light color, negative for green and positive for red, b is negative for blue and positive for yellow. Ascorbic acid was calculated by visual titration of 2,6-dichlorophenol indophenols using a standard procedure. β-carotene in wheat flour was determined by recording the optical density at 452 nm using petroleum ether as a blank (Ranganna, 1999). Drying of foamed wheat pulp using egg white at concentrations of 5%, 10% and 15% as foaming agent and methyl cellulose (0.5%) as foam stabilizer (Rajkumar and Kailappn, (2006) and performed at three different drying temperatures. 60, 70 and 80 ° C. Drying studies were carried out using a thin layer of the sample under constant drying conditions of temperature, speed and humidity. Basically, steady-state batch thin-layer drying experiments consist of measuring moisture loss over time. A plot of moisture versus time is called a drying curve.

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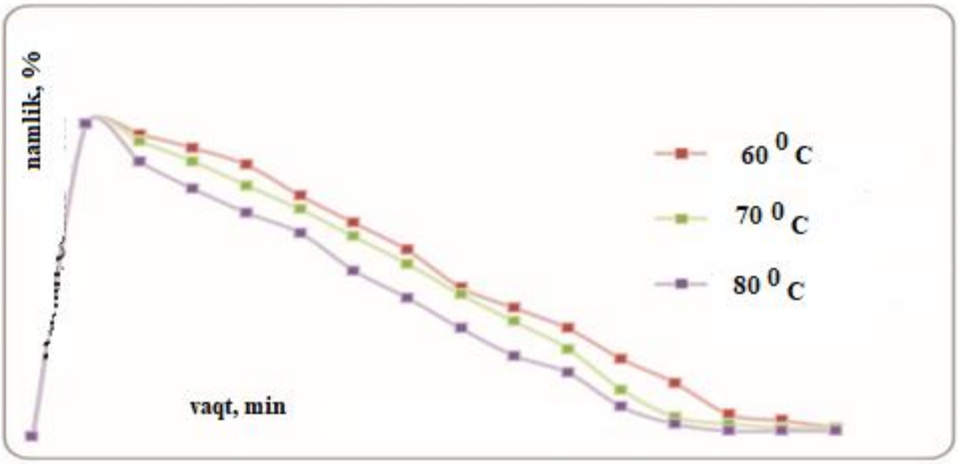


**Figure 1. Effect of wheat grain drying at different temperatures on moisture content.**

The rehydration ratio of dried wheat was defined as the ratio of the rehydrated mass to the initial dehydrated mass, giving a measure of the ability of the wheat powder to reabsorb water. The rehydration coefficient values were observed to decrease with increasing drying temperature.Rehydration is maximized when cellular and structural disturbances such as compression are minimized. In addition, changes in rehydration ratio values can be affected by drying temperature, soaking time, air exchange, pH, and ionic strength. And since there may be more shrinkage and cell disruption due to increased temperature (Fenemma, 1975), a change in values was observed. A gradual increase in rehydration ratio values was observed with increasing egg white concentration. The reason for this may be the increased porosity of wheat flour. Porosity can be developed by frothing or frothing a food liquid or puree before drying. Ascorbic acid was estimated by a titration method, in which a solution of wheat flour in oxalic acid was titrated against 2,6 dichloroindophenol dye.

Ascorbic acid content was observed to decrease significantly with increasing drying temperature, because ascorbic acid is sensitive to heat, another reason may be oxidation of ascorbic acid. The loss of ascorbic acid was in the range of 70.87 - 81.57% for 60 °C, 74.94 - 85.44% for 70 °C and 79.92 - 88.44% for 80 °C. The amount of ascorbic acid slightly increased with the increase in egg white concentration.

The reason for this is that there is a small amount of ascorbic acid in egg white, and therefore the increase in its concentration leads to a slight increase in the amount of ascorbic acid. The amount of β-carotene in wheat flour has decreased significantly. A gradual decrease in β-carotene content was observed with increasing drying temperature. The decrease in β-carotene content may be due to the thermolabile and photosensitive nature of carotenes (Gover, 1973; Mir and Nath, 1993). Negligible changes in β-carotene values were observed with increasing egg white concentration.

**CONCLUSION.** For 5%, 10% and 15% of observed egg whites, the time required to obtain a powder at 60°C was observed to be 390, 360 and 360 minutes, respectively. The time required for 5%, 10% and 15% at 70°C and 80°C was 360, 330 and 330 minutes and 330, 330 and 300 minutes, respectively. The retention of ascorbic acid and β-carotene was relatively high for 10% egg white at 60 °C. For 10% egg white, the rehydration rate at 60°C is also higher. Thus, the optimal condition for the production of wheat flour was drying at 60 °C with the addition of 10% egg white.

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