# Obtaining of starch based on wheat and legumes and production of thirst-quenching drinks by processing of secondary water

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**Abstract.** The article covers the production of starch, gluten and thirst-quenching drinks from local cereals and legumes. The chemical composition, use and beneficial effects of thirst-quenching drinks on the human body are widely covered. The article describes the effects of sodium hydroxide solution on wheat grains and the consumption of starch. In addition, the technology of obtaining soymilk from soybeans, which are legumes, is given.

## 1 Introduction

At present, the demand for safe food is growing permanently. At a time when people around the world are struggling with hunger, the cultivation of protein-rich legumes has been studied at the level of state policy, and the President has set the task of growing cereals in the regions [1].

There is almost no other sector of the food industry with such huge national economic relations as starch industry. The population uses the main part of its products for direct consumption. Starch is mainly used as a main or auxiliary raw material for food, light industry, pharmaceuticals, agriculture and other sectors of the economy. In the food industry, starch is used in the preparation of jellies, puddings and other pastries, as well as in the manufacture of confectionery products - biscuits, sweets. Starch is used as a major hardening ingredient in the production of meat products. Starch is mainly produced in potatoes, corn, wheat, legumes and in some cases artificial starches. In addition to the use of potato starch in various fields, it is widely used as a main thickener in the production of various condensed juices, acids in canning fruits. At present, the production of glucose, fructose, invert syrup and other products from potato starch is widely established. The increase in such assortments in manufacturing enterprises, especially in the production of compounds with a high molecular weight to meet the demand of people for food products, is a high result. The use of starch is used not only in the food industry but also in its various derivatives in many sectors of the economy. For example, in the textile industry in the production of woven knitwear, in the production of dyes used for dyeing fabrics, in the production of cellulose and paper, in the production of asbestos materials, in the dyeing of leather products, in the

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pharmaceutical industry, in the printing industry, in the manufacture of matches, applied in other areas [2].

In the production of starch, flour is made into a dough, which is washed to form a variety of products. These include starch, gluten, starch water and other micro and macronutrients. While starch is used in various sectors of the economy, gluten in addition to weak flours is also widely used as a raw material in the production of energy-rich products rich in gluten and amino acids. In developed countries (Japan, South Korea, European countries, China, etc.) it serves as a raw material in the production of instant energy powders with high nutritional value from wheat gluten. It is possible to use starchy water as a high-calorie beverage [3].

## 2 Results and discussion

Starch is separated by washing the wheat dough with water. All micro and macronutrients, biologically active substances, organic and inorganic substances present in the mixture are soluble in water and the biological properties of the water change. The chemical composition of the water separated from the starch in the extraction grain of wheat with water is given in Table 1.

Table 1 provides an opportunity to produce thirst-quenching beverages from the substances formed during the extraction of starch from wheat grains and the water used. These thirst-quenching drinks are distinguished by their chemical composition, biological and physiological properties, as well as the combined micro and macro elements. These secondary waters are enriched with useful elements and vitamins to create a thirst-quenching drink [4].

**Table 1.** The chemical state of water formed during starch extraction.

| No | Analysis data | mg-equivalent/l | mg/l | % mg-equivalent/l | The composition of micro components | mg/l | Palmer parameters | Sulin parameters |
|---|---|---|---|---|---|---|---|---|
| 1. | Na ++ K + | 18.5 | 425.5 | 31.9 | Fe3 + | 0 | S1 = 35.2 | $\frac{Na}{Cl} > 1$ |
| 2. | Ca 2+ | 6.0 | 120.0 | 10.3 | Fe2 + | 0 | S2 = 0 | |
| 3. | Mg 2+ | 4.5 | 54.7 | 7.8 | - | 0 | A1 = 28.6 | $\frac{Na - Cl}{SO_4} > 1$ |
| 4. | CI- | 6.1 | 216.3 | 10.5 | - | 0 | A2 = 36.2 | |
| 5. | HCO3- | 18.0 | 1098.3 | 31.0 | - | 0 | - | $\frac{Cl - Na}{Mg} < 0$ |
| 6. | HCO32- | 0.8 | 24.0 | 1.4 | - | 0 | | |
| 7. | SO42- | 4.1 | 196.9 | 7.1 | - | 0 | - | - |
| 8. | ∑ | 58.0 | 2135.7 | 100 | - | 0 | - | - |
| 9. | CO2 | 0 | 0 | 0 | - | 0 | - | - |

It can be seen from Table 1 that the presence of anions and cations of alkaline earth metals for the preparation of thirst-quenching beverages leads to a sharp change in the technological properties of the beverage produced. In the production of starch from wheat grains, water is used to separate the starch. This used water enters the water along with the starch, dissolving all the organic and inorganic substances contained in the wheat flour. The anions and cations listed in Table 1 enrich the starchy water with minerals, and as a result, the thirst-quenching drink enriches the human body with minerals. As a result, changes in the human cardiovascular system are prevented. It also prevents several diseases in people with gastrointestinal diseases and is recommended as a healing drink [5-7].

In the production of starch, gluten and thirst-quenching drink from wheat grains, analyzes are performed on all anatomical conditions of the grain. The composition of the endosperm, which is the main anatomical part of the grain of wheat, consists of starch granules. These grains can be the basis for the implementation of different ways and methods of obtaining products from wheat. In addition, the use of sodium hydroxide solution for complete separation of starch from wheat grains has been shown to be highly effective. The yield of crushed wheat grain starch with the addition of sodium hydroxide solutions is given in Table 2 [8].

**Table 2.** Yield of starch from wheat grains to which sodium hydroxide solutions was added.

| No. | Samples | Swelling duration, h | | | | |
|---|---|---|---|---|---|---|
| | | 6 | 12 | 18 | 24 | 48 |
| 1. | With water | 21.4 | 24.6 | 26.2 | 25.1 | 22.7 |
| 2. | 0.1% NaOH | 22.3 | 26.4 | 28.1 | 26.9 | 24.5 |
| 3. | 0.2% NaOH | 22.4 | 27.0 | 30.8 | 27.2 | 25.3 |
| 4. | 0.3% NaOH | 23.1 | 28.8 | 35.9 | 31.3 | 26.2 |
| 5. | 0.5% NaOH | 20.2 | 24.2 | 23.6 | 22.8 | 22.1 |

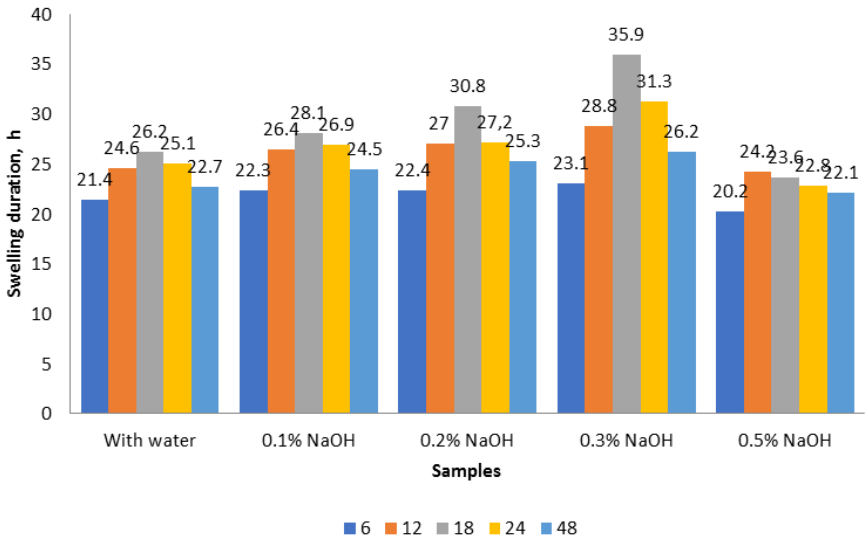


**Fig. 1.** Yield of starch from wheat grains to which sodium hydroxide solutions was added.

It can be seen from Table 2 that in the process of soaking the wheat grain with water to separate the starch is carried out, after 24 hours, the structure of the starch is broken and the separation of the starch is different from other hours. In order to further increase the starch yield, ground wheat grain was treated with 0.1; 0.2; 0.3 and 0.5 % sodium hydroxide solution. It can be seen from the table that the exposure time of the solutions and the yield of starch are different for solvents with different concentrations. In subsequent studies it was recommended to remove the starch by exposing 0.3% sodium hydroxide solution to wheat flour for 18 hours. 35.9% of starch was extracted from wheat flour soaked in 0.3% sodium hydroxide solution for 18 hours [9,10].

The gluten content is 15-17% of starch. This leads to an increase in the cost of the product in production. When extracting starch in the form of a suspension, it is possible to extract 60-65% of starch. However, the disadvantage of this method is that the proteins in the starch are also included in the composition of the suspension and affected the physical-chemical,

technological and other parameters of pure starch. The protein concentrate can be separated from the aqueous liquid phase using several different methods. For example, it can be separated by centrifuges, hydrocyclones and in some cases by hydrogels. After the wheat grain is ground in a mill, a mixture of water and flour is prepared and then placed in a blender to distribute the moisture evenly over the flour mass. Flour stored in the oven for 30-40 minutes serves to distribute the moisture evenly. The gluten in the flour completely absorbs moisture and increases the release of starch from the mass. The released gluten is stored in sieves and can be used as a raw material for various purposes in the food industry, pharmaceuticals, various sectors of agriculture. The chemical composition of starch derived from local grains is given in Table 3.

**Table 3.** Chemical composition of starch obtained from local grains.

| No. | Components | For 100 g of starch |
|---|---|---|
| 1. | Protein | 0.2 |
| 2. | Carbohydrates | 78.6 |
| 3. | Water | 11 |
| 4. | Natural fibers | 2.5 |
| 5. | Mono- and disaccharides | 4.8 |
| 6. | Minerals | 0.6 |
| 7. | Pectin-containing substances | 2.3 |

It can be seen from Table 3 that starch derived from local grains is distinguished by its carbohydrate content. The results obtained were determined for wheat grains.

The table shows that when soybean varieties are exposed to water, the water is evenly distributed throughout the entire shape during the first six hours. Over time, the waters may be in a different state according to the anatomical condition of the soya bean. (2-review). It was determined that the “Dustlik” variety retains moisture more than other varieties or absorbs more moisture than other varieties. This is due to the high concentration of proteins, amino acids, fats and other organic and inorganic substances in the soy bean grain of the “Dustlik” variety [5].

## 3 Conclusion

The natural fiber in wheat grains also has its own characteristics, and the use of starch in the food industry has a great effect on the removal of nucleotides from the human body, increasing the strength of tissues in the human body and recommending quality and consumable starch to other areas. Laboratory results showed that the higher the pH of the medium, the higher the content of amylose and amylopectin in the starch, and is the more complete and richer in carbohydrates the resulting starch content. It was established that the viscosity of wheat starch stored for 5 years was gradually reduced during the formation of jelly with alkali at room temperature. Other researchers have shown a similar decrease in viscosity for starch paste. If wheat was stored in a cold, dry, well-aerated room for 3 to 15 years, freshly separated starch showed no change in physical properties. The properties of similarly separated starch from broken wheat samples vary significantly.

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