JOURNAL OF MULTIDISCIPLINARY SCIENCES AND INNOVATIONS
GERMAN INTERNATIONAL JOURNALS COMPANY
ISSN: 2751-4390
IMPACT FACTOR (RESEARCH BIB) : 9,08. Academic research index

VITAMINS IN BAKERY PRODUCTS. MINERALS IN BAKERY PRODUCTS.

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Abstract: Bakery products, with their high nutritional value, energy-giving properties and rich biochemical composition, occupy an incomparable place in human health. As one of the main types of food consumed daily, bread provides at least 30–35% of the total energy source in the diet of each person. This necessitates a thorough study of its nutritional and energy composition and the selection of the right types.
Keywords: Bread, daily consumption, carbohydrates, proteins, vitamins, minerals, fermentation.

Bread has long been known as a nutritious and biologically active food in human history. It is rich in many substances necessary for the human body - carbohydrates, proteins, fats, as well as vitamins and minerals. Especially in today's era, when the principles of healthy eating are developing, the nutritional value of bread products, in particular the content and absorption of biologically active substances, has become the main focus of modern technologies.

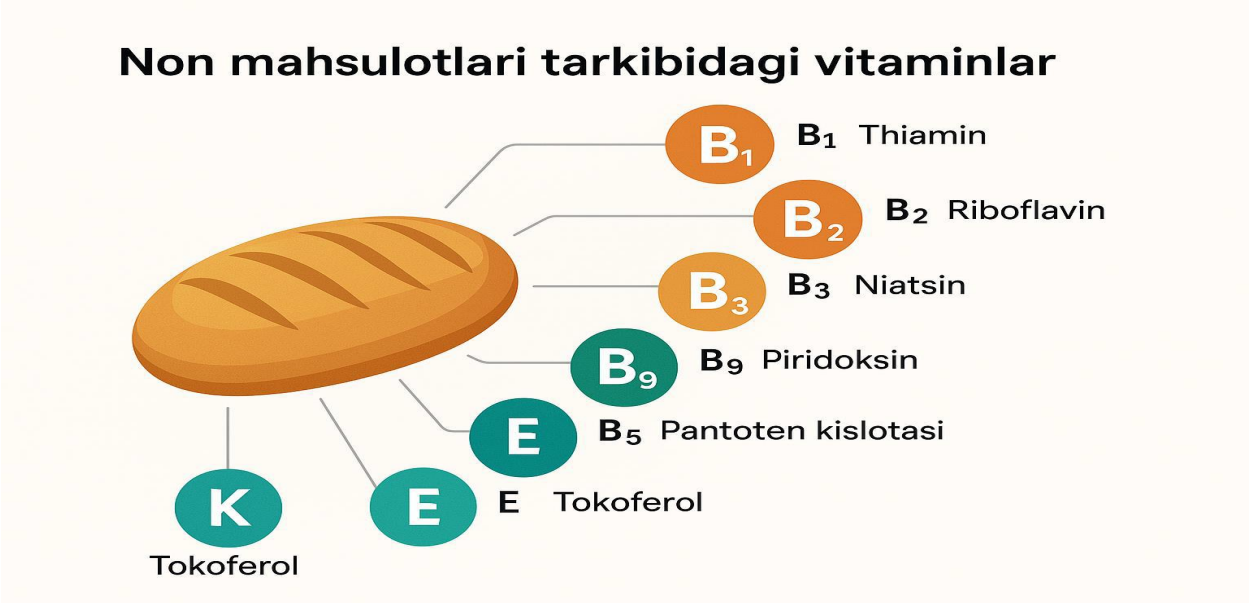


Figure 1. Vitamins in bread

The vitamins in bread products are mainly represented by B vitamins. These are B1 (thiamine), B2 (riboflavin), B3 (niacin), B5 (pantothenic acid), B6 (pyridoxine), B9 (folic acid) and PP (nicotinic acid), which are concentrated in the outer layer of the grain, especially in the bran and seed embryo. Since these layers are removed in the preparation of high-grade, that is, highly refined flours, the amount of vitamins is sharply reduced. Therefore, whole grain, bran or additionally enriched bread products are among the products with high biological value.

Thiamine (B1) regulates carbohydrate metabolism in the body and plays an important role in the functioning of the central nervous system. B1 deficiency leads to heart rhythm disorders, fatigue, memory impairment and a disease known as "beriberi". Riboflavin (B2) contributes to the healthy functioning of the skin, eyes, nerves and liver. Niacin (B3) is directly involved in the production of energy in cells, is important in the body's regeneration processes, in particular, in wound healing, hormone synthesis and cholesterol regulation. Folic acid (B9) is especially important for pregnant women - it is necessary for the proper formation of the fetus's nervous system. B6 (pyridoxine) is involved in metabolism, in particular, accelerates the absorption of proteins. The presence of these vitamins in bread indicates their great value not only in nutrition, but also as a functional food. Vitamin E (tocopherol) has antioxidant properties, protects cells from free radicals, improves oxygen delivery in the blood. Vitamin E is more abundant in fatty bakery products (buns, breads with additives). Today, vitamins D, A, and K are also artificially added to some bakery products, increasing their dietary and therapeutic value.

In terms of mineral content, bread is a very important food. It is rich in elements necessary for the body, such as iron (Fe), zinc (Zn), magnesium (Mg), calcium (Ca), phosphorus (P), selenium (Se), copper (Cu). For example, 100 grams of whole grain bread contains an average of 3–4 mg of iron, 30–50 mg of magnesium, 25–40 mg of calcium, and 2–4 mg of zinc. Their amounts vary depending on the type of flour, which part of the grain is used, and the preparation technology.

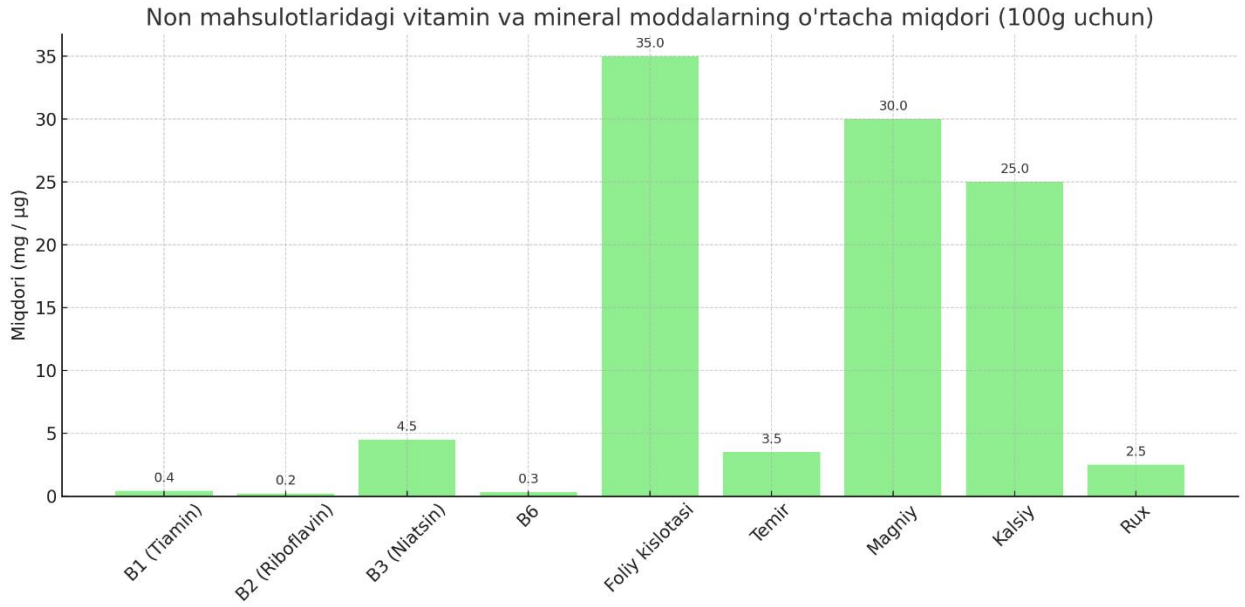
Iron is involved in the synthesis of hemoglobin and provides oxygen transport. Iron deficiency, especially in women and children, leads to anemia. Therefore, many countries are pursuing a policy of mandatory enrichment of bakery products with iron. In Uzbekistan, the Ministry of Health and the Sanitary and Epidemiological Service have also recommended bread enriched with iron and folic acid.

Magnesium is necessary for muscle and heart function, increases stress tolerance. Zinc strengthens immunity, accelerates wound healing. Selenium protects the body from oxidative stress and is an important element of the antioxidant system. Selenium deficiency increases the risk of cardiovascular, thyroid and cancer diseases. Therefore, bakery products enriched with selenium are recommended as a biological protective agent.

During the fermentation process, these vitamins and minerals are converted into a form that is more easily absorbed by the body. This property is especially strong in naturally fermented breads, where enzymes and bacteria break down phytic acid, which “liberates” salts that were previously bound to minerals in the flour and were not absorbed. As a result, for example, the absorption of iron increases by 2 times, and that of calcium by 1.8 times. These breads can be considered biologically activated foods.

The 2020 FAO (Food and Agriculture Organization of the United Nations) report notes that the risk of cardiovascular disease, type 2 diabetes, osteoporosis, and obesity in people who regularly consume whole grain bread products has decreased by 20–40%. This is due to the regular intake of biologically active vitamins and minerals through grain products. Today, fortified bread is considered an important solution in the world not only for disease prevention, but also in terms of economic efficiency. In the USA, Canada, Australia, India, and China, such products are controlled by the state and widely distributed to the population. In particular, special types of bread produced for pregnant women, growing children, the elderly, and diabetics have become an integral part of official health policy.

The vitamins and minerals contained in bread products allow them to be valued not only as nutritious, but also as a preventive and therapeutic tool. At the current stage of food technology development, bread production is being adjusted not only to energy value, but also to biological value, functional effect and individual nutritional needs. High-quality, whole-grain, fermented and vitamin-mineral enriched bakery products are becoming an integral part of a healthy lifestyle.



Scheme 1. Average amount of vitamins and minerals

Bakery products are a very important food source not only for energy, but also biologically. In particular, due to the vitamins and minerals they contain, they become a functional product that supports health in everyday life, and in some cases also serves as a therapeutic agent. The presented graph depicts the average amount of B vitamins and important minerals most commonly found in bakery products, each of which is involved in important biological processes in the body. For example, 100 grams of bakery products contain an average of 0.4 mg of vitamin B1 (thiamine), which is mainly necessary for the nervous system and carbohydrate metabolism. B1 deficiency can lead to fatigue, weakness, and heart rhythm disorders. Vitamin B2 (riboflavin) is around 0.2 mg, which supports the functioning of the skin, eyes, and liver. Vitamin B3 (niacin) is present in a relatively high amount — around 4.5 mg, which controls the intracellular energy production system. B6 (pyridoxine) is involved in protein metabolism, the immune system and hemoglobin synthesis. Folic acid (B9) is present in an average of 35 micrograms per 100 grams of bread, which plays an important role in the proper formation of the embryonic nervous system, blood formation and cell division during pregnancy. Bread is also rich in minerals such as iron, magnesium, calcium and zinc. The average iron content is 3.5 mg, which plays a key role in hemoglobin synthesis, oxygen transport and strengthening the immune system. Iron deficiency is a common problem, especially for women, children and pregnant women, and iron-rich bread products directly help solve this problem. Magnesium is an important substance for the heart, nervous system, muscle function and stress tolerance; its amount is on average 30 mg. Calcium is necessary for bones and teeth, and is found in up to 25 mg per 100 grams of bread. Zinc (Zn) is a microelement that boosts immunity, helps with wound healing, and ensures hormonal balance. Its average amount is 2.5 mg.

Based on the infographic, it can be seen that bakery products, especially whole grain or enriched types, serve as a natural source of many biologically active substances for the body. Breads with such a composition actively help prevent many conditions, such as cardiovascular diseases, anemia, osteoporosis, complications during pregnancy, and immunodeficiency. During the fermentation process, these vitamins and minerals are converted into a form that is better absorbed by the body, which further increases their benefits.

The vitamins and minerals contained in bakery products determine not only their nutritional value, but also the level of health benefits. Choosing quality bread is not just a matter of food, but also a conscious choice aimed at maintaining the body in balance, prevention, and improving the quality of life.

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