

**Short Reports****PRODUCTION TECHNOLOGY  
OF FUNCTIONAL BAKERY PRODUCTS**

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Below are the results of research into quality and nutritive value indices of enriched bakery products. This paper focuses on use of such enriching agents as coarse whole meal and pureed vegetables (carrot, beet, pumpkin). It has been found that these enriching agents help to intensify production process, improve quality indices, and increase nutritive value and functionality of the products. The result has been the development of bakery products made of first grade white flour mixed with coarse whole meal, namely Olimpiets with 4,5% of pureed carrots, Marshal with 5% of pureed beets, and Patriot with 10% of pureed pumpkin. Compared to traditional types of bread made of first grade white flour protein content in the developed products has increased by 6%, dietary fibers content – by 53%. In addition, quantitative composition of vitamins and mineral substances has been expanded, and biological value has improved. Antioxidant activity level is by 1,5–2,5 times higher than control level. The developed products are recommended for enrichment of the food ration with protein, dietary fibers, vitamins, and mineral substances.

Bakery products play an important role in the food ration in Russia. Being everyday mass-consumption products, they can be used as a basis for development of enriched and functional products. We have determined the rationale for the use of coarse whole meal and concentrated vegetable purees in bakery technology in order to expand the range of products and increase their functionality [1].

For the purpose of this paper, we have conducted research into quality and nutritive value indices of enriched bakery products.

Coarse whole meal is characterized by high content of protein, dietary fibers, and micronutrients [4]. In bread production, we replaced 40% of the total weight of first grade white flour with coarse whole meal.

Pureed vegetables (carrots, beets, and pumpkins) have been produced from the corresponding purees concentrated until dry solids weight ratio of 40–50% is reached [3]. They are rich in mono- and disaccharides, vitamins, mineral substances, dietary fibers, including pectic substances. The choice of vegetables for the research was based on their specific chemical composition and physiological characteristics. Beet contains betanin and betaine that facilitate reduction of blood pressure, improve fat metabolism, and prevent atherosclerosis. Carrot is a polyvitaminic vegetable that is used as a preven-

tive measure and treatment of hypovitaminosis and avitaminosis, visual impairment issues. Pumpkin helps in case of heart and kidney diseases, obesity, and high blood pressure [2].

This paper analyses quality of dough and finished products with the share of pureed vegetables of 2–10% of total flour weight. It has been found that adding enriching agents intensifies biotechnological processes related to microorganism activity, influences the development of flow properties of the dough, and allows getting products with high organoleptical and physical and chemical quality indices. Rational doses of purees have been calculated using mathematical planning and experiment optimization methods. Relevant formulas and production methods have been developed for the following bakery products: Olimpiets with 4,5% of pureed carrots, Marshal with 5% of pureed beets, and Patriot with 10% of pureed pumpkin.

The resulting products have higher quality, nutritive and biological value compared to traditional types of bread made of first grade white flour. They have pronounced taste and flavor as they are enriched with volatile acids and spirits; specific volume of the products has increased by 4–8%.

Protein content in the developed products has increased by 6%, dietary fibers content – by 53%. In addition, quantitative composition of vitamins and mineral substances has been expanded. The average biological value of the products is 58%, exceeding control level by 13%. It has been estimated that consumption of average of 100 grams of bread satisfies the recommended daily needs in the food ration in: protein – by 10%, dietary fibers – by 23%, phosphorus and B<sub>1</sub> vitamin – by 15%, ferrum – by 13%.

Antioxidant activity of the products has been determined using TsvetYauza-01-AA analyzer. The content of antioxidants in bread has been set as follows (mg/100 g): Marshal-1.7, Olimpiets-1.1, Patriot-1.2, which is 1,5–2,5 times higher the control level. The developed products are characterized by improved functionality and recommended for enrichment of the food ration with protein, dietary fibers, vitamins, and mineral substances.

**References**

1. Lukina S.I., Ponomaryova E.I., Magomedov M.G., Vavilova A.A. Concentrated semi-finished vegetable products in bakery technology // New and unconventional plants and their potential usage: materials from XI International symposium. – Pushchino, 2015. – P. 464–467.
2. Magomedov G.O., Oleinikova A.Ya., Plotnikova I.V. and others. Functional nutritive ingredients and additives in production of confectionery products. – St. Petersburg: GIOR, 2015. – 440 p.
3. Patent of the RF № 2528686. Production facility for concentrated fruit, vegetable and berry purees // G.O. Magomedov, M.G. Magomedov, A.S. Shcherbachenko. – 2014. – Bul. № 26.
4. Zastrogina N.M. Use of coarse whole meal in production of bread of different functionality // Agricultural goods production and processing: quality and security management: materials from III International theoretical and practical conference. – Voronezh, 2013. – P. 137–140.