The quality of pasta products made from various kinds of flour

O M Zavalishina¹, T A Kuznetsova², A V Korneeva³

¹ Altai State Agrarian University, 98, Krasnoarmeyskiy ave., Barnaul, 656049, Russia
² Altai State Agrarian University, 98, Krasnoarmeyskiy ave., Barnaul, 656049, Russia
³ Altai State University, 61, Lenina ave., Barnaul, 656049, Russia

E-mail: korneevaalyona1@rambler.ru

Abstract. In Russia, pasta is one of the most common food products, the demand for which has remained stable for many decades. The average consumption of these products is 7 kg / year per person. The raw material for the production of pasta in our country is mainly macaroni semolina which is obtained from soft high-glassy wheat varieties. The main disadvantages of soft wheat pasta are its low nutritional value and high caloric value. In recent years, vitamined pasta has been becoming increasingly common, but of immediate relevance is the development of production technologies using unconventional raw materials and additives, with the help of which it is possible to increase the content of vitamins, macro- and microelements and other biologically valuable substances in a product and ensure the stability of product quality at the same time. A comparative evaluation of the quality of pasta manufactured by OJSC "Altai Macaroni" under various trade marks (TM): spiral, "Pasta Veneta" TM, group A, premium; spiral, "Almak" TM, group B, premium; spiral, "Product For Health" TM, group B, with the addition of buckwheat flour, premium; spiral, «Product For Health" TM, group B, with the addition of soy flour, premium has been undertaken. Organoleptic, physico-chemical indicators of product quality as well as its consumer characteristics have been taken as evaluation criteria.

1. Introduction

The concept of the Russian Federation state policy in the field of people's healthy nutrition for the current period is the creation of functional products that should satisfy the physiological needs of the human body in necessary nutrients and energy. In the nutrition of children and adults suffering from celiac disease, the specialists suggest the use of specialized gluten-free products made from such raw materials as buckwheat flour, rice flour and corn flour, corn starch. The use of these components is possible for imitation of traditional products: bread, cookies, pasta. According to the FAO / WHO Codex Alimentarius, the gluten content in such products should not exceed 20 mg / kg [1].

Pasta is one of the most common food products, the demand for which has remained stable for many decades. The role of pasta in the diet - and it's almost all over the world - can hardly be overestimated. A lot of statisticians consider it to be the main food of the XX-XXI centuries [2].

Every year, its consumption growth increases by 5% and production by 10% [3]. At the same time, the range of products is expanding, differing in size, shape and presence of additives of various kinds in the recipe which affect the biological value and taste indices. In Russia, the consumption of pasta averages 7 kg / year per person.
2. Materials and methods

According to the Union of Flour Mills, in Russia more than 950 thousand tons of pasta is produced annually. Of this volume, only 10% of the products are obtained from macaroni flour made from durum wheat. Pasta made from such flour is considered to be of better quality: it keeps its shape when cooked, contains more useful microelements and do not contribute to obesity. Nevertheless, the demand for durum flour is still low due to its high cost: durum wheat is 20.25% more expensive than soft wheat. As a result, there is no increase in durum wheat production, and the capacity of pasta mills is only 40% full. In this regard, the raw material for the production of pasta in our country is mainly macaroni semolina obtained from soft, high-glassy wheat varieties.

The main disadvantage of soft wheat pasta is its low nutritional value, as well as high calorie content. Soft wheat pasta contains 11-12% protein substances, 70-72% carbohydrates (mainly starch), 13% moisture and 0.5-0.7% fat, the content of minerals and fiber is very low. Therefore, it is advisable to use various fortifiers in the pasta formulation to improve its biological and nutritional value [4].

In recent years, vitaminized pasta has become more widespread, but of immediate relevance, of course, is the development of production technologies using unconventional raw materials and additives, with the help of which it is possible to increase the content of vitamins, macro- and microelements and other biologically valuable substances in the product and to ensure the stability of product quality at the same time [5]. Leading manufacturers of pasta in the Altai Territory, for example, OJSC “Altai Macaroni”, produce products with the addition of 10% buckwheat and soybean flour to the main raw material.

The beneficial properties of the product enriched in soy flour determine its chemical composition. The composition of soy flour includes calcium, potassium, sodium, magnesium, phosphorus, iron, vitamins PP, A, E, beta-carotene, group B (thiamine and riboflavin). Compared to wheat flour, soy flour has a lower calorie content of 291 cal / 100 g. In terms of protein and essential amino acids, soy has no equal among grains, oilseeds and other grain legumes; soy proteins are represented mainly by albumin and globulin (68.4-78.7%). Soybean lipids are 95-97% composed of triglycerides, biologically active substances are present in small quantities: phospholipids (1.5-2.5%), unsaponifiables (1.6%), sterols (0.33%), tocopherols (0.15-0.21%), free fatty acids (0.3-0.7%). Soybean oil triglycerides have a favorable ratio of omega-6 and omega-3 acids [6].

Buckwheat flour is equally valuable in relation to the content of substances which are useful for human beings. It is characterized by a high degree of balance in the presence of essential amino acids in it: leucine, valine, methionine, phenylalanine, lysine. The content of vitamins B1, B2 and PP in buckwheat flour is on average 4 times higher than their content in premium wheat flour. It contains such microelements as iron, manganese, phosphorus, magnesium, potassium, molybdenum, cobalt.

The purpose of our research has been to undertake a comparative assessment of the quality of pasta manufactured by OJSC “Altai Macaroni” under various trademarks (TM): spiral, “Pasta Veneta” TM, group A, premium; spiral, “Almak” TM, group B, premium; spiral, “Product for Health” TM, group B, with the addition of buckwheat flour, premium; spiral, “Product for Health” TM, group B, with the addition of soy flour, premium. Organoleptic and physico-chemical indicators of product quality as well as its consumer characteristics have been taken as evaluation criteria. The analyzed samples of the products were made according to the traditional technological scheme, including the following operations: raw material preparation, dough-making, dough-pressing (molding) (extrusion), carving of raw products (blowing, cutting, laying-out), drying of products, cooling of dried products, sorting and rejection of finished products, packaging.

3. Results

The results of the examination have shown that the colour of all the product samples corresponds to the type of raw material: amber yellow for pasta of group A, cream, homogeneous - for group B, light brown for the products with the addition of buckwheat flour, light yellow for the products with the addition of soy flour. No impurities were observed in the products. The pasta was characterized by a smooth surface, a glassy fracture. The taste and the colour matched the type of the product.
According to the requirements for the quality of pasta with normative documentation, the moisture content of the product should not exceed 13%. The analyzed samples for this quality indicator corresponded to the established standards. The humidity of the products ranged from 11.7 to 12.1 depending on the type of pasta (table 1).

| Sample                                      | Humidity, % | Acidity, °H | Crumb content, % | Deformed product content, % |
|---------------------------------------------|-------------|-------------|------------------|-----------------------------|
| Pasta, group A, premium                     | 12.1        | 2.9         | 0                | 0                           |
| Pasta, group B, premium                     | 11.8        | 3.0         | 0.5              | 1.1                         |
| Pasta, group B, with the addition of buckwheat flour, premium | 12.0 | 3.5 | 1.8 | 4.2 |
| Pasta, group B, with the addition of soy flour, premium | 11.7 | 3.2 | 2.2 | 3.6 |

According to the requirements established by GOSTs, the acidity of traditional products and products with enriching additives should not exceed 4 °H. According to the results of the study, the highest acidity has been observed in the products with the addition of buckwheat and soy flour – 3.5 and 3.2 °H, respectively, and the lowest one in the products of group A – 2.9 °H.

The crumb and deformed products worsen the appearance and reduce the consumer qualities of pasta. Figured articles with deviations from the given shape are considered to be deformed: those which have a shape unusual for its name, those which are wrinkled in whole or in part.

Pieces, cuttings and scraps of pasta are considered to be crumbs, regardless of their size.

The result of the undertaken assessment has shown that no deformed products were found in group A pasta, and as to the goods made with the addition of unconventional raw materials, 4.2% of deformed products was observed in the pasta made with the addition of buckwheat flour and 3.6% in the products with soy flour. Moreover, for all the samples, this indicator is significantly lower than the norm allowed by the standards (5% for packaged products and 7% for catchweight products).

The sample of the product of group A did not contain crumbs; while the products made with the addition of buckwheat flour and soy flour were characterized by their presence, 1.8 and 2.2%, respectively.

Such difference in numbers is explained by the fact that buckwheat flour and soybean flour are referred to BCS, and, therefore, the addition of these kinds of flour to wheat one negatively affects the plasticity and density of dough and finished products.

The cooking properties of pasta are characterized by the duration of cooking until done, the amount of absorbed water, the loss of dry matters, the strength of cooked products, the degree of adhesion.

The cooking time until done is determined by the period of time from the placement of products in boiling water until the moment when a mealy, uncleared layer disappears. The samples of the pasta of group A differed by the longest period of time until ready (table 2), which is associated with the presence of strong quality gluten in the composition. The pasta of this group was characterized by the lowest coefficient of increase in the mass of products, which is also due to the characteristics of gluten proteins.

The products produced from durum wheat flour also lose the least amount of dry matters. The greatest loss of dry matters was observed when cooking the products with the addition of soy flour.

The preservation of the shape of all the samples was 100%.
Table 2. Cooking properties of pasta

| Sample | Cooking time until done, min. | Coefficient of increase in the mass of products | Dry matter content moved into cooking water, % |
|--------|-------------------------------|-----------------------------------------------|-----------------------------------------------|
| Pasta, group A, premium | 7                             | 1.6                                           | 4.1                                           |
| Pasta, group B, premium | 6                             | 2.0                                           | 5.2                                           |
| Pasta, group B, with the addition of buckwheat flour, premium | 5                             | 2.3                                           | 6.8                                           |
| Pasta, group B, with the addition of soy flour, premium | 6                             | 2.4                                           | 7.2                                           |

In order to assess the quality of cooked pasta more objectively, a scale for scoring its consumer properties has been developed. The following quality indicators have been selected for organoleptic evaluation: appearance, colour, smell, taste, texture and condition of cooking water.

According to the results of scoring consumer properties, pasta is divided into four groups. “Very good” includes the products that keep their shape after cooking, separate easily from each other, and have a smooth surface. The taste and smell of the products are well-defined and are a characteristic of these products. The colour is typical, well-defined; the consistency is elastic without a mealy core. The cooking water has a low content of suspended particles. The scores point is not less than 90.

For products of the “good” group slight sticking, more turbid water after cooking, slight darkening or lightening of the products are allowed. The taste and smell are well-defined, typical. The scores point is from 80.

The products of the “satisfactory” group have a less pronounced taste and smell, noticeable sticking after cooking, a darkish or excessively light colour, turbid water, and softened consistency. The scores point is from 70.

The products with the rating below 70 are considered to be “unsatisfactory”. In the process of cooking their integrity is violated, they stick together, acquire a faded colour, have “empty” or very weakly expressed smell and taste. The water after boiling is very turbid or translucent with a high content of pieces.

As a result of the scoring of consumer properties of pasta, the traditional products of groups A and B have been rated as “very good”. The products of “Product for health with the addition of buckwheat flour and soybean flour” TM have received a lower rating; therefore, they have been assigned to the “good” group (table 3).

Table 3. Scoring of consumer properties of pasta

| Sample | Appearance | Colour | Smell | Taste | Consistency | Cooking water | Total |
|--------|------------|--------|-------|-------|-------------|---------------|-------|
| Pasta, group A, premium | 25 | 15 | 10 | 25 | 15 | 10 | 100 |
| Pasta, group B, premium | 23 | 12 | 10 | 23 | 12 | 10 | 90 |
| Pasta, group B, with the addition of buckwheat flour, premium | 23 | 12 | 8 | 20 | 12 | 9 | 84 |
| Pasta, group B, with the addition of soy flour, premium | 23 | 12 | 10 | 23 | 12 | 9 | 89 |
4. Conclusion

Based on the obtained experimental data, it has been found that pasta produced with the addition of buckwheat and soybean flour in terms of quality indicators meets the requirements established in the Russian national standards and is comparable with the quality indicators of products obtained from wheat flour without additives. This makes it possible to expand the assortment of manufactured products with a directionally changed chemical composition, which possess increased nutritional value and meet the demand of various population groups in a rational, healthy diet, taking into account their traditions, habits and economic situation.

References

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