The Usage of the Fruit-Berry Raw in the Production of Bakery Products

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Abstract. The article deals with the solubility of product-line expansion and the nutrition value increasing of the bakery products making of the first quality wheaten flour with the help of fruit-berry enrichment. Bakery recipes with pear and black currant jam filling were chosen as a result of studies conducted as the most appropriate filling.

1. Introduction

Improving the food supply of the population is a social and economic task of great importance for Russia. The State’s food independence depends on basic agricultural production capacity. Elements of food independence include: physical accessibility of sufficient, safe and nutritious food; affordability of food of adequate quantity and quality for all social groups; autonomy and economic independence of the national food system; reliability, that is the ability of the national food system to minimize the impact of seasonal, weather and other fluctuations on food supply in all regions of the country; sustainability meaning that the national food system is developing in an enhanced reproductive mode [3].

Bread and bakery products occupy a special position in the nutrition of the population of Russia. These products form part of the daily diet of the vast majority of consumers, being one of the main sources of energy and food, and their functionality is of great social importance. One of the most effective ways to improve the nutritional and biological value of bread products is to enrich them with physiologically functional nutrients by the use of traditional local plant raw materials containing a complex of vitamins, macronutrients, micronutrients, food fibres, antioxidants, etc., as evidenced by the Russian and foreign authors' scientific publications. For example, mashed vegetables (carrot, pumpkin, beetroot) are used as functional additives; fruit-berry powders from the squeezing of red fruit Wild Blueberry fruit, Moroshka berries, Overalls, Grapes and others are also used [2,4-6,8,9].

The problem of expanding the range of bakery products enriched with fruit and berry fillers is therefore a topical one.

The aim of the work is to study the effect of fruit and berry filling on the technological properties and consumer qualities of bread products.
2. Research facilities and methodology

The experimental part of the research was carried out in 2020 based on a specialized laboratory of the agritechnology department of Land management and agritechnology Institute FSBEI PSAA (Ussuriisk).

The experience scheme included eight options. For monitoring were taken the variants of production of apple bun (control 1) and pear bun (control 2). The six prototypes featured different combinations of fruit and black currants (table 1).

| №  | Variant                                      | Filling content of finished product |
|----|---------------------------------------------|-------------------------------------|
|    |                                             | apple | pear | black currant berries | black currant jam |
| 1  | Apple bun (control 1)                       | 30    | -    | -                    | -                |
| 2  | Pear bun (контроль 2)                       | -     | 30   | -                    | -                |
| 3  | Black currant bun                           | -     | -    | 30                   | -                |
| 4  | Apple and black currant bun                 | 15    | -    | 15                   | -                |
| 5  | Pear and black currant bun                  | -     | 15   | 15                   | -                |
| 6  | Apple, pear and black currant bun           | 10    | 10   | 10                   | -                |
| 7  | Apple and black currant jam bun             | 15    | -    | -                    | 15               |
| 8  | Pear and black currant jam bun              | -     | 15   | -                    | 15               |

When adding black currant berries, the basic filling (apple, pear) was replaced with black currant berries and jam in the weight ratio according to the scheme of experience. The weight of the test preparation in all variants of the experience was 100 g, the weight of the filling was 30 g.

In the production of a bun with fruit-berry stuffing, raw material which meet All-Union State Standard and production requirements was used: Extra class wheat bread flour, yeast dried in bread, table salt, drinking water (SanPin), sugar, cow’s milk, margarine, eggs, vanillin, soy refined deodorized oil, apples, pears, black currant berries, quick frozen black currant berries, black currant jam of own production.

The production process for filling buns included the following operations: preparation of raw materials (sifting of flour, purification of metallomagnet impurity, preparation of yeast suspension, melting of margarine, dissolution of salt, sugar), preparation of the paste (dosing of the components of the recipe, managing the dough, fermentation of dough, dough milling during fermentation), stuffing (washing, cleaning, apples, pears, black currant berries cutting), dough cutting and product moulding (dough division to pieces of a specified mass, filling of product blanks, moulding of semi-finished products, preparatory proofing of dough blanks, finishing proofing of dough blanks), buns’ pastry [1].

3. Results and discussion

In the initial phase of research, the effects of fruit and berry stuffing on baking and moisture losses were determined. The results of the experiment are as follows. The weight of filled dough blanks was 130 g. The weight of the buns after baking ranged from 115 to 126 g, and the cool buns ranged from 113 to 124 g (table 2).

The main technological indicators of bakery products are baking and moisture losses. In the bakery industry, the optimal amount of baking loss is normalized for each type of the product according to local conditions as excessive reduction of baking loss degrades crusts, they become thin, pale, and the increase in the baking loss leads to thickening of the crust and lowering the output weight of the product. Of all the manufacturing costs of the baking process, baking loss has the largest share [7].

In the experience, the smallest baking loss was recorded at an apple and black currant bun and was equal to 3.6 g or 2.8%. The biggest baking losses were noticed in an apple and black currant bun and were equal to 14 g or 11%. This process is due to the fact that when a fresh black currant berry is added to the filling, the moisture content is increased and evaporates during the baking process.
Table 2. The effects of fruit and berry stuffing on baking and moisture losses.

| №  | Variant                              | Weight of semi-finished product, g | Bun weight, g after baking | Baking loss g | Moisture loss g | Moisture loss % |
|----|-------------------------------------|-----------------------------------|---------------------------|---------------|-----------------|-----------------|
| 1  | Apple bun (control 1)               | 130                               | 121.11                    | 115.65        | 8.89            | 6.70            | 4.50            |
| 2  | Pear bun (control 2)                | 130                               | 120.30                    | 118.50        | 9.70            | 7.50            | 1.50            |
| 3  | Black currant bun                   | 130                               | 117.75                    | 115.67        | 12.25           | 9.40            | 2.08            | 1.80            |
| 4  | Apple and black currant bun         | 130                               | 115.65                    | 113.36        | 14.35           | 11.00           | 2.29            | 2.00            |
| 5  | Pear and black currant bun          | 130                               | 119.57                    | 117.29        | 10.43           | 8.00            | 2.28            | 1.90            |
| 6  | Apple, pear and black currant bun   | 130                               | 121.73                    | 119.28        | 8.27            | 6.40            | 2.45            | 2.00            |
| 7  | Apple and black currant jam bun     | 130                               | 126.37                    | 124.08        | 3.63            | 2.80            | 2.29            | 1.80            |
| 8  | Pear and black currant jam          | 130                               | 124.98                    | 122.95        | 5.02            | 3.90            | 2.03            | 1.60            |

Moisture loss is a reduction in the weight of the product when cooled and stored by evaporation of part of the water and volatilization of some fermentation products. In the studying variants, the rate of buns’ moisture losses with filling ranged from 1.5 to 4.5 per cent. The minimum value is noted in the pear bun sample and the maximum in the variants where the apple filling was used.

Depending on the ratio in the filling of fruits, black currant berries and black currant jam the organoleptic performance of the bun differed according to its appearance, taste and smell. The surface of the finished product in all variants of experience was smooth and glossy; the shape of the item – a rose; light brown colour, free of burnt place. The flavor of the buns differed depending on the filling, from apple, pear to black currant, the smell of finished products differed similarly: apple and pear buns have the smell of the apple and pear, If a black currant filling was present in the product, the smell was characteristic to the berry, if there was a currant jam filling in the product, the smell was currant-toned.

Consumer qualities of buns, such as appearance (shape, surface, colour), state of the crumb (colour, roast, grain, taste, smell) were evaluated by the tasting panel on a 5-point scale. By the appearance, all the studying samples got 5 points. In assessing the condition of the mince in the buns, it has been determined that the use of fresh black currant berries as filling contributes to a slight deterioration in the quality of the finished product, this is why variant 3 (black currant bun) has a score of 4.8. Estimates for product taste ranged from 3.8 (control 1) to 5.0 (variant 7).

The results of the tasting evaluation ranged from 38.8 to 40.0 points (figure 1).
Figure 1. Results of the tasting evaluation (sum of points).

A bun with a pear and jam from a black currant received the maximum possible number of points and the smallest is indicated in the control variants. This demonstrates that the use of black currants, both in the form of fresh-frozen berries and in the form of jam, improves the consumer qualities of bread products. According to the results of the studies, the protein content of the buns with filling varied from 7.7 to 7.9 g, fat from 10 to 10.1 g and carbohydrates from 40 to 48 g (Table 3). The energy value of the buns was 284.31-312.81 kcal. The minimum value is indicated in variant 2 (pear bun) and maximum in variant 7 (apple and black currant jam bun).

Table 3. Food and energy value of fruit and berry filling bun (per 100 g of product).

| Variant                      | Proteins, g | Fats, g | Carbohydrates, g | Caloric value |
|------------------------------|-------------|---------|------------------|---------------|
| Apple bun (control 1)        | 7.78        | 10.09   | 40.72            | 285.46        | 1195.16     |
| Pear bun (control 2)         | 7.78        | 10.07   | 40.98            | 284.31        | 1190.35     |
| Black currant bun            | 7.92        | 10.09   | 40.15            | 284.77        | 1192.28     |
| Apple and black currant bun  | 7.85        | 10.09   | 40.43            | 285.12        | 1193.74     |
| Pear and black currant bun   | 7.85        | 10.08   | 40.56            | 284.54        | 1191.31     |
| Apple, pear and black currant bun | 7.83  | 10.08   | 40.62            | 284.85        | 1192.61     |
| Apple and black currant jam bun | 7.81  | 10.06   | 48.00            | 312.81        | 1309.67     |
| Pear and black currant jam   | 7.81        | 10.05   | 48.13            | 312.23        | 1307.24     |

Thus, the use of black currant berries as self-supporting fillings and their addition to the main fillings contributes to a slight increase in proteins and a reduction in carbohydrates of 100 g of the product, with no change in the fat content and a reduction in the energy value. The use of black currant jam in filling increases the carbohydrate content of products as the share of sugar in products increases.

4. Conclusion
To increase the range and value of baked goods fruits (apple, pear), black currant berries and black currant jam were proposed as filling of the buns. In the comparative evaluation of all experiences, the best is the pear and black currant jam bun sample. The presented product is characterized by high
technological and consumer qualities, with product weight of 120±2 grams and a calorie value of 312 kcal (1307 kJ).

5. References

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