Effect of plant-based enriching ingredients on the cost-effectiveness of food production

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Abstract. The article presents an assessment of the cost-effectiveness from the introduction into the production of the developed method of producing a layered cookie based on a cracker enriched with food fibres and a fruit lipstick mass with amaranth dyes. Based on the analysis of the current state of the regional market and consumer preferences for enriched flour confectionery products, as well as based on innovative trends in the development of the bakery and confectionery industries, it is proposed to expand the range of enriched cookies by introducing non-traditional components from domestic vegetal raw materials obtained using resource-saving technology, namely: for baked semi-product - finely dispersed powder from squeezes of pumpkin pulp of Muscat grade dried by low-temperature vacuum evaporation; for finishing semi-product (lipstick mass) - water-and-alcohol extract from leaf mass of amaranth of Valentine grade. Theoretically justified and experimentally confirmed the positive effect of the use of technological solutions in the production of layered cookies, there was an improvement in the chemical composition and consumer properties of layered cookies, which allows to more fully satisfy market needs, increase the competitiveness of finished products along with reducing production costs. The calculation of economic efficiency from production of traditional and developed technology of enriched layered cookies is presented. Economic calculations show the profitability of layered cookies such as the cracker "Custom New".

1. Introduction

For the world community, the problem of food security and healthy nutrition is one of the most urgent today, which is associated with the increasing population growth and urbanization, the deterioration of the environmental situation in the world [1].

In the Russian Federation, the priority task of the Strategy for Improving the Quality of Products is to ensure full nutrition, prevent diseases, and increase the duration and quality of life of the population. Due to the fact that flour confectionery is a frequently consumed component of the food diet of various groups of the population, including the child age group and youth, the issue of increasing the nutritional and biological value and expanding the range of flour confectionery products through the use of natural raw materials of domestic origin becomes important. Flour confectionery is
characterized by low physiological value, high fat content, carbohydrates along with a shortage of other nutrients: proteins, vitamins, minerals, dietary fibers [2-5].

It should be noted that recently the demand of the population for healthy foods, including flour confectionery, has been increasing. However, despite the increasing need of the population to provide functional products, there is insufficient production of enriched flour confectionery products. As sources of food fibers in the production of flour confectionery products, isolated food fibers are used, including foreign ones, which affects the final cost of the finished product, significantly increasing it. In this regard, the main problem of this market segment is due to the search for domestic raw ingredients that allow to obtain products with high consumer characteristics and competitive in price [2,5-7].

The use of import-substituting resource-saving technologies in the production of flour confectionery products is currently considered as the most promising and competitive direction [2,5,6].

In view of the above, we have carried out a comparative assessment of the cost-effectiveness of the method for preparing enriched layered cookies of the Custom New cracker and a similar type of layered cookies of the traditional recipe.

2. Materials and methods

As the objects of the study, we chose: developed enriched layered cookies such as the cracker "Custom New" and a similar type of cookies - protracted with a cream filling without the content of food fibers in the recipe, sold in the retail chain. The choice as an enriching food ingredient of food fibers from pumpkin pulp refuses of Muscat varieties is explained by their chemical and technological features, prevalence, regular high productivity and adaptation to the climatic conditions of the Central Federal District. Which is an important condition that is taken into account by the producer when choosing a raw material source. In addition, refuses are a secondary product of direct squeezing juice technology. The choice of pumpkin varieties is primarily due to the provision of high quality juice.

It should be noted that the use of a low-temperature vacuum flash method for drying pumpkin pulp refuses in the production of direct squeezing juice has a greater advantage compared to other types of drying, since the selected parameters allow the vitamins to be preserved. Application of dry refuses obtained as a result of implementation of traditional technology of direct squeezing juice can lead to reduction of vitamins content. At the same time, the same result will be achieved for food fibers. The proposed technology of the new product type does not require additional costs for the implementation of new equipment. Also, due to the partial replacement of prime grade flour with pumpkin food fibers, including the use of food dyes of different colors from the same raw materials, it allows you to determine the high profitability of the layered cracker "Custom New".

Economic efficiency shows the ultimate beneficial effect of the use of means of production and living labor, in other words, the return on total investment [8].

Calculation of raw materials costs, costing, profitability, profit and price were carried out in accordance with the management [8-11].

3. Results and discussions

Calculation of raw material costs for production of 1 ton of layered cracker "Custom new" is given in Table 1.

| Raw materials and semi-finished products | Total raw material consumption per 1 ton of uncompleted products, kg | Price 1 kg, RUB | Total costs, RUB |
|------------------------------------------|---------------------------------------------------------------|----------------|-----------------|

Table 1. Calculation of raw material costs for production of 1 ton samples layered cracker "Custom new".
Prices for cookies (cracker layered with fruit lipstick filling) with plant ingredients from domestic raw materials "Custom New" are calculated based on the average cost of raw materials.

When analyzing the economic indicators of production (price and cost) from the sale of 1 ton of finished products, commercial expenses from the production cost in the amount of 12.0 %, 10.0 %, 8.0 %, the rate of profitability – 15.0 % were taken into account.

Calculation of prices and cost of 1 ton of layered cracker "Custom New" is given in Table 2, 3.

### Table 2. Costing of 1 ton of layered cracker "Custom New" taking into account 12.0 %, 10.0 % and 8.0 % of commercial costs of production costs

| No. P/N | Items and Costing                          | Business expenses, % | Costs per 1 ton, RUB |
|---------|-------------------------------------------|----------------------|---------------------|
|         | Business expenses                         | 12.0                 | 10.0                | 8.0                |
| 1       | Raw materials and basic materials         | 72412.52             | 72412.52            | 72412.52           |
| 2       | Auxiliary materials                       | 4850.00              | 4850                | 4850               |
| 3       | Energy for process costs                  | 1400.00              | 1400.00             | 1400.00            |
| 4       | Wages of production workers               | 85.00                | 85.00               | 85.00              |
| 5       | Social contributions                      | 308.16               | 308.16              | 308.16             |
| 6       | Equipment maintenance and operation costs | 251.00               | 251.00              | 251.00             |
| 7       | Shop costs                                | 690.00               | 690.00              | 690.00             |
| 8       | General production costs                  | 940.00               | 940.00              | 940.00             |
| 9       | Other production costs                    | 64.00                | 64.00               | 64.00              |
| 10      | Production Cost                           | 81771.68             | 81771.68            | 81771.68           |
| 11      | Business expenses                         | 9812.60              | 81771.17            | 6541.73            |
| 12      | Total Cost                                | 91584.28             | 89948.85            | 88313.41           |
| 13      | Rate of profitability, %                  | 15.00                | 15.00               | 15.00              |
| 14      | Profit                                   | 13737.64             | 13492.33            | 13247.01           |
| 15      | Wholesale price of products               | 105321.9             | 103441.1            | 101560.4           |
At a minimum cost (8.0 %) for commercial expenses in the production of 1 ton of the layered cracker "Custom New", the retail price of 1 package weighing 200 g will be 27.65 RUB. Next, consider the impact of raw material costs of 70.0 %, 75.0 % and 80.0 %, including commercial costs of 8.0 % and a 15.0 % profitability rate on the final retail price for 1 package of finished product (Table 3).

Table 3. Costing of 1 ton of layered "Custom New" cracker taking into account the level of commercial expenses of 8.0% and raw material costs of 70.0%, 75.0% and 80.0%.

| No. | Items and Costing                              | Costs per 1 ton, RUB |
|-----|-----------------------------------------------|----------------------|
| 1   | Raw materials and basic materials             | 72412.52             |
| 2   | Auxiliary materials                            | 4850.00              |
| 3   | Energy for process costs                       | 1400.00              |
| 4   | Wages of production workers                    | 856.00               |
| 5   | Social contributions                           | 308.16               |
| 6   | Equipment maintenance and operation costs      | 251.00               |
| 7   | Shop costs                                    | 690.00               |
| 8   | General production costs                       | 940.00               |
| 9   | Other production costs                         | 64.00                |
| 10  | Production Cost                                | 103446.45            |
| 11  | Business expenses                              | 8275.72              |
| 12  | Total Cost                                    | 111722.17            |
| 13  | Rate of profitability,%                        | 15.0                 |
| 14  | Profit                                        | 16758.33             |
| 15  | Wholesale price of products                    | 128480.50            |
| 16  | VAT 20 %, thousand RUB                        | 23589.02             |
| 17  | Selling price including VAT                    | 152069.52            |

|               | 2   | 7   | 2               |
|---------------|-----|-----|-----------------|
| VAT 20.0 %, thousand RUB | 19337.10 | 18991.79 | 18646.50       |
| Selling price including VAT | 124659.0 | 122432.9 | 120206.9       |
| Trade mark-up (15.0 %)       | 18698.85 | 18364.94 | 18031.04       |
| Retail price of products      | 143357.8 | 140797.90 | 138237.9       |
| Retail price of 1 kg of finished products | 143.36 | 140.81 | 138.24       |
| Retail price of 1 package of finished products weighing 200 g | 28.67 | 28.16 | 27.65       |
Based on the calculations obtained, we can conclude that it is advisable to produce a layered cracker "Custom New" as competitive and profitable, which will also expand the assortment of the enterprise and increase demand in the consumer market.

The calculation of the cost of 1 ton of the layered cracker "Custom New" depending on the mark-up level is given in Table 5.

Table 5. Calculation of the cost of 1 ton of the layered cracker "Custom New" depending on markup level

| No. P/N | Items and Costing          | Mark-up level, % |
|---------|---------------------------|------------------|
|         |                           | 15.0  | 20.0  | 25.0  |
| 1       | Selling price including VAT| 152069.52 | 152069.52 | 152069.52 |
| 2       | Trade mark-up             | 22810.43  | 30413.90  | 38017.38  |
| 3       | Retail price of products  | 174879.95  | 182483.42  | 190086.90  |
4. Conclusion

Based on the obtained results of the calculation of economic efficiency from the method of producing the layered cracker "Custom New" in comparison with the analogue, it is possible to assume a high profitability of the proposed new type of cookies along with its social significance - the presence of natural enriching raw ingredients, which causes increased interest among buyers related to the need for healthy foods.

Currently, at the international level, one of the priorities is the need to modify the composition of food products in the direction of increasing vitamins, dietary fibers (fiber, pectin substances) and minerals, which is proved by numerous studies of the world scientific communities.

The use of non-traditional plant raw materials and their processing products contributes to the development of scientific and technological progress in the food industry, improves technological processes, expands the range of functional food products, allows rational use of raw materials, reduces material and energy costs of production, along with maintaining competitiveness, profitability and economic accessibility of food products for the population.

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|   | Retail price of 1 kg of finished products | 174.88 | 182.48 | 190.09 |
|---|---|---|---|---|
|   | Retail price of 1 package of finished products weighing 200 g | 34.98 | 36.51 | 38.02 |

Economic analysis shows that the retail price for a package of a layered "Custom New" cracker weighing 200 g was 34.98 RUB in comparison with the average cost (32 RUB) of a similar type of cookies - lingering with a cream filling without the content of dietary fiber in the recipe, in the trading network.
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