

The value of vegetable enriched casseroles in schoolchildren's nutrition

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Abstract. The article provides information on the daily need for nutrients and energy value of students in the age category from 7 to 11 years and older. The developed protein-enriched vegetable casseroles are products of increased nutritional value. The protein-to-fat ratio in the casseroles ranged from 0.93 to 1.7. The degree of saturation of breakfast with protein in vegetable casseroles for control samples was from 10.22 % to 20 % for the first age group and from 10.22 % to 17.1 % for the second age group. Vegetable casseroles are most often recommended for breakfast or dinner.

1 Introduction

Children's health is the main life value. At the same time, the health of the child population is currently causing concern among specialists and parents. According to the Scientific Center for Children's Health of the Russian Academy of Medical Sciences, currently no more than 2-15% of children can be considered healthy. In the dynamics of children of all age groups, there is an increase in chronic pathologies, which is a medical and social problem [1-2].

One of the most important preventive factors of children's health and improvement of the demographic situation is the enhancement of the nutrition system. A complete and balanced diet in childhood contributes to the prevention of alimentary-dependent diseases, increases endurance and academic performance, creates conditions for physical and intellectual development, increases the adaptive capabilities of the body, and has a significant impact on the formation of a child's health throughout life.

Problems that are difficult to solve through the traditional organization of children's nutrition have accumulated in the preschool nutrition system. The modern type of nutrition of the adult part of the population determines the food preferences of children which is not always healthy. This determines the need to develop evidence-based measures to optimize the nutrition of preschoolers.

The quality of school meals depends on compliance with the requirements of rational nutrition. Rational nutrition involves the inclusion in the school diet of food products, the assortment, quantity and quality of which corresponds to the age-related physiological needs

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of children in nutrients and energy. However, food that is healthy for a child's body is not always liked by children. Taking into account the stereotypes of children's eating behavior, adjustments should be made to the technology for the production of culinary products and make creative names to the dishes [2-4].

Another important aspect of ensuring the rational nutrition of schoolchildren is the need to take into account the degree of assimilation of nutrients. The degree of protein utilization and carotene assimilation depends on the correctness of the technological process and the selection of food components in the dish.

It is possible to improve the quality and balance the diet of school meals through the use of modern technologies. At present, there is a need to revise traditional recipes in practice, to select a combination of products in dishes. It is necessary to use technological processing methods that "save" the biological and nutritional value of used materials, to improve the absorption of components [5].

A scientific approach to the formation of the menu, the implementation of modern technologies, equipment and products in practice make it possible to implement the main idea of the cyclic menu - to improve the quality of schoolchildren's nutrition.

2 Materials and methods

The methodological basis is the works of native and foreign scientists, their developments in the field of application of dry protein composite mixtures for the creation of enriched food products with improved consumer properties acceptable for school meals.

When conducting research, we used the existing standard organoleptic, physico-chemical and microbiological methods for studying raw materials, semi-finished products and finished products.

The recipes of vegetable casseroles prepared according to traditional technologies were used as original samples. The evaluation of qualitative properties was carried out by organoleptic method, and then by physicochemical methods. The organoleptic evaluation of the quality of the developed casseroles was carried out on a 10-point scale.

Recipe optimization was carried out according to the criterion of maximum energy value in multicomponent vegetable casseroles with "Nutrinor" mixture in MS Excel system [6].

3 Results and discussion

Based on the tasks set by the government of the country for the organization of nutrition for schoolchildren, the quality of the products used is the most important indicator. The developed enriched casseroles, included in the diet of students of the age category from 7 to 11 years old and from 11 years old and older, will allow to adjust the target numbers for the consumption of basic nutrients and energy, as well as the level of daily requirement for these nutrients. Daily nutritional satisfaction is calculated for the main nutrients, individual vitamins and minerals for two age groups studying in educational institutions [7-9].

Analyzing the data in Table 1, the authors found that protein-enriched vegetable casseroles developed using innovative technologies are products of high nutritional value. The degree of gratification with the daily norm was: protein from 11.81 % to 13.48 % – for the first age group and from 10.1 % to 11.53 % – for the second age group; fat – from 6.61 % to 12.34 % and from 5.67 % to 10.6 %; carbohydrates from 4.95 % to 5.91 % and from 3.93% to 5.17 %, according to age groups.

The energy value of vegetable casseroles when meeting the daily requirement ranged from 7.83 % to 8.21 % for the first age group and from 6.78 % to 7.11 % for the second age group.

The ratio of protein-fat in the developed vegetable casseroles ranged from 0.93 to 1.76, in control samples – from 0.73 to 1.95. This ratio of protein to fat is excellent for the absorption of protein substances.

The content of vitamins and minerals in the developed vegetable casseroles is higher compared to the original samples.

The developed products, in comparison with the original samples, have an increased content of proteins and fat, which are in the ratio of 1:1 or 1:0.95. This ratio of proteins and fats in casseroles leads to better absorption of fats.

Vegetable casseroles are most often recommended for breakfast or dinner. The degree of saturation of vegetable casseroles with protein is presented in Table 1.

Table 1. The degree of saturation of vegetable casseroles with protein

Name of casseroles	Original samples			Designed samples		
	Content, %	% of diet		Content, %	% of diet	
		from 7 to 11 years old	from 11 years and older		from 7 to 11 years old	from 11 years and older
Vegetable casserole	3,2	15,58	14,2	9,19	47,74	40,84
Cabbage casserole	3,85	20,0	17,1	9,09	47,22	40,4
Carrot casserole	2,78	14,44	12,36	10,38	53,92	46,13
Potato casserole	2,30	11,95	10,22	10,38	53,92	46,13

The degree of saturation of vegetable casseroles with protein for control samples was from 10.22 % to 20 % for the first age group and from 10.22 % to 17.1 % for the second age group.

For the developed casseroles, the level of providing breakfast with protein was: for the first age group from 47.22 % to 53.92 %, for the second age group from 40.4 % to 46.13 %, depending on the type of casserole [10-15].

The theory of adequate nutrition provides not only the presence of high-grade proteins and fats in products. It is necessary to all nutrients, including minerals and vitamins, enter the body simultaneously and in optimal proportions.

Currently, a large number of substances with vitamin activity are known. Given that P-active substances, vitamin C and β -carotene are of particular importance in nutrition, because are part of the enzymes that regulate many important functions of the body, as well as the fact that the need for them is satisfied mainly by products of plant origin, in the developed enriched vegetable casseroles, we determined the content of these vitamins.

It has been established that all samples of the developed vegetable casseroles have a high content of potassium – from 618 to 723mg/100g compared to the original samples (from 216 to 408mg/100g); iron – from 2.68 to 4.11mg/100 g compared to the original samples (from 0.56 to 1.00mg/100 g).

The content of vitamin C in the developed vegetable casseroles is 1.16-16.7 times higher than in the original samples, the content of potassium and β -carotene in the developed casseroles (carrot and potato) is 6-21 times higher. Also, the content of P-active substances in the developed casseroles is 3.27-4.15 times higher than in the original samples.

It has been established that the developed vegetable casseroles are functional products, since their use will fill the daily requirement for vitamin C by 4.89-20.44 %.

To assess the functional orientation, we conducted research to study the level of gratification of the daily need when using the developed enriched vegetable casseroles.

According to GOST R 52349-2005 “Food functional products. Terms and Definitions” a product is functional if the content of the functional ingredient is at least 15 % of a person's daily requirement.

With this requirement in mind, the developed products can be considered as a functional source of protein, organic acids, calcium, and vitamins.

Therefore, the developed vegetable enriched casseroles can be recommended for use in the nutrition of students in educational institutions, in rational, preventive and dietary types of nutrition and with a protein deficiency in the body.

4 Conclusion

It has been established that the addition of a dry protein composite mixture increases the nutritional value of the diet. The degree of saturation of vegetable casseroles with protein for control samples was from 10.22 % to 20 % for the first age group and from 10.22 % to 17.1 % for the second age group.

For the developed casseroles, the level of providing breakfast with protein was: for the first age group from 47.22 % to 53.92 %, for the second age group from 40.4 % to 46.13 %, depending on the type of casserole.

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