4. Expert System for Ice Cream Recipes Modeling

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Introduction. The paper studies a hybrid expert system which is aimed at the ice cream recipe modeling as one of the most complex in the foodstuff structure.

Materials and methods. Such methods, as scientific abstraction, synthesis, analysis, comparison and deductive method were used.

Results. A new method of ice cream recipe modeling was developed. Unlike traditional ones, it is based on the application of processing expert data and optimization methods. It allows to significantly expand the range of tasks. The solutions to these tasks can bring a significant economic effect. To create a database and a knowledge base, a relational database under the control of Firebird DBMS was used. IBExpert software tool was used to ease the database structure development. While creating a user interface, the integrated Microsoft Visual Studio software development environment was used. Materials for the formation of the database and knowledge, put into the expert system, were the results of the work, obtained in cooperation with scientists of the Department of Milk Technology and Dairy Products of the National University of Food Technologies.

The hybrid expert system for modeling ice cream recipes is intended to improve the existing or develop new types of ice cream in a wide range of changes in the chemical composition by applying fundamentally new functional and technological ingredients. The expert system allows, in production conditions, in a minimal time, to calculate the chemical composition of the ice cream recipes of guaranteed quality taking into account the available raw materials. The knowledge base formed in the expert system will improve the nutritional structure of the population of Ukraine due to the exclusion of chemically modified and synthesized food additives from the ice cream recipe and their replacement with natural, biologically complete ingredients of domestic production.

Using an expert system in the production environment will allow you to constantly update and accumulate knowledge of expert technicians who work in this field. The constant accumulation of new knowledge about the ice cream recipe will enable the creation and expansion of partnership programs with domestic and foreign enterprises. Using this expert system will reduce the cost of modeling new ice cream recipes.

Conclusions. A result table presents an experimental proof of the efficiency of the expert system usage taking into account the calculation of a new ice cream recipe named "Milk Ice Cream with Wheat Germs". It was based on the standard milk ice cream recipe in accordance with the standard technological instruction for the ice cream production (TTI 31748658-1-2007 to SSU 4733:2007, 4734:2007, 4735:2007). The expert system calculated a new optimal recipe, taking into account the partial replacement of the stabilizer Cremodan SE 406 (the manufacturer is the company "Danisco", Denmark) with the natural structuring complex named wheat germ. As a result, this new recipe satisfies the quality requirements of the finished product. The cost of 1000 kg of milk ice cream with wheat germs according to a new recipe made up 16713.2 UAH, which is 8.64% cheaper than the base one.

References
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