

STUDY OF POSSIBILITY OF STEADY EMULSION PRODUCTION ON THE BASE OF THE PLANT PROTEIN

Antipova L.V., Pereygin V.M., Kurcheva E.E.

Voronezh State Technological Academy, 394000, Voronezh., pr. Revolutsii, 19

Introduction

Under existing conditions of the growing deficit of the protein all over the world from the one hand and increased importance of food products in Russia and aggravation of competitive struggle in a market on the other hand, particular attention is devoted to the problem of the production of the protein products with high food value. Lately the tendency to use proteins instead of animal ones increases at the country.

One of the ways of solving the problem of the protein deficit of animal origin is the development of new or modified technologies with the use of native non-traditional raw materials namely legumes and first of all seeds of lentil [1]. Perspectivity of use of plant proteins in emulsion products, such as mayonnaise is explained first of all by the fact, that proteins guarantee the increased viscosity of solution and hence the necessary structure of low-fat product with taste and visco-structural properties which do not differ from the traditional ones [2]. We consider the application of plant proteins in fatty emulsion products as the possibility of production of a special group of products having low calorie value and which do not contain cholesterol, i.e. products similar to diet ones. Rational combination of plant and animal proteins guarantee high biological value calorific value and high consumer demand [4-7]. The aim of the work is the investigation of possibility of determination of conditions for the obtaining emulsion products on the base of lentil seeds.

Objects and methods

The object of investigation is lentil beans (GOST 7066-77) grown in the farm "Bort" of the Voronezh region. On the base of lentil beans we obtained 15% dispersion by extracting proteins from beans. Determination of total chemical indices we carried out according to the following methods: total protein content by -Kjeldal, amino acid content on the amino acid analyzer AAA-881, moisture content according to GOST 21094-75, fat -by method [3], reological indices by rotational viscosimeter "Reotest-2".

Results and discussion

Application of plant proteins in food industry instead of animal ones is well-known. On the base of plant proteins it is possible to make fatty emulsions with low content of cholesterol because proteins guarantee the increased viscosity of solutions and hence necessary consistency of a product. They are successfully used for stabilization and structuring of emulsion products of mayonnaise type [1,4-6].

We studied the possibility to use lentil proteins of native production for the production of emulsion products and developed the technology of mayonnaise production with lentil proteins instead of egg powder. The lentil preparation used is the isolate with the 92% protein content. It was used in the formula instead of the egg powder, the amount of oil being reduced up to 35%. When making the formula we used the accepted methods. The product is a homogenous cream-like emulsion with a sourish taste, without any bitterness, with flavour and aftertaste of mustard and acetic acid. The experimental sample was compared with the mayonnaise "Provansal" according to the composition and consumer properties. According to organoleptic indices and calorie value these products are identical.

At the production of products of mayonnaise type with low energy value it is necessary that not only their taste but visco-structural properties do not differ from traditional ones. One of the ways of solving this problem is the addition of substances, capable to stabilize it due to increase of viscosity of continuous aqueous phase and protective colloidal action to the emulsion. The assortment of food stabilizers includes milk - protein concentrates, starch and its derivatives, agar, pectins, alginates and various compositions of substances- carboxymethyl starch (CMS), phosphatic starch, sodium alginate, natural starch. We dissolved carboxymethyl starch in cold water, other stabilizers at heating up to $t = 45^{\circ}\text{C}$. We tested solutions in the interval of mass concentrations 0.5-4.0%. Effective viscosity of products obtained was chosen as the valuation criteria, because stabilizing effect of hydrocolloids is determined by the increase of viscosity of the aqueous phase.

Viscosity of mayonnaise increases with the increase of stabilizers concentration (tabl.1). Stability of emulsion after mechanical influence upon system, which is expressed in % of undistructed emulsion after centrifugation was the criteria of stabilizing action. It is shown that stability increase of model emulsions at the addition of 2.5% of CMS is more pronounced, than at the use of sodium alginate. As we see, CMS is the most effective stabilizer of emulsion oil/water. To stabilize emulsion with 30-35% of oil one should add 2.5% of CMS, at larger content of oil -3.0-3.5% of CMS (Fig. 1). Though, the application of CMS is necessary to use as the stabilizer of emulsions with reduced content of fat, one should not forget, that mayonnaise is a multicomponent system containing such destabilizing substances as acetic acid and salt. To determine conditions of obtaining such mayonnaise we prepared laboratory samples of mayonnaise with the application of CMS. In order to make product with properties similar to the traditional "Provansal" with 67% content of fat, samples have been compared according to effective viscosity of undistructed emulsion, organoleptic indices, stability of emulsion in accordance with OST 10-77-87 "Mayonnaises" (Russian standart).

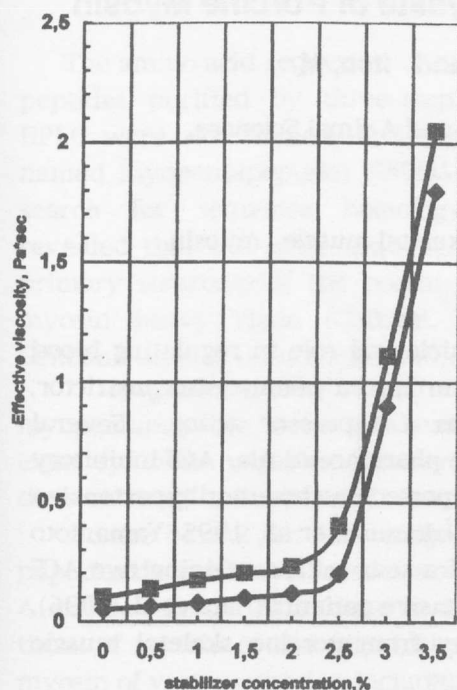


Fig.1 Influence of stabilizer concentration on viscosity of stabiliser solutions
1-CMS 2- sodium alginate

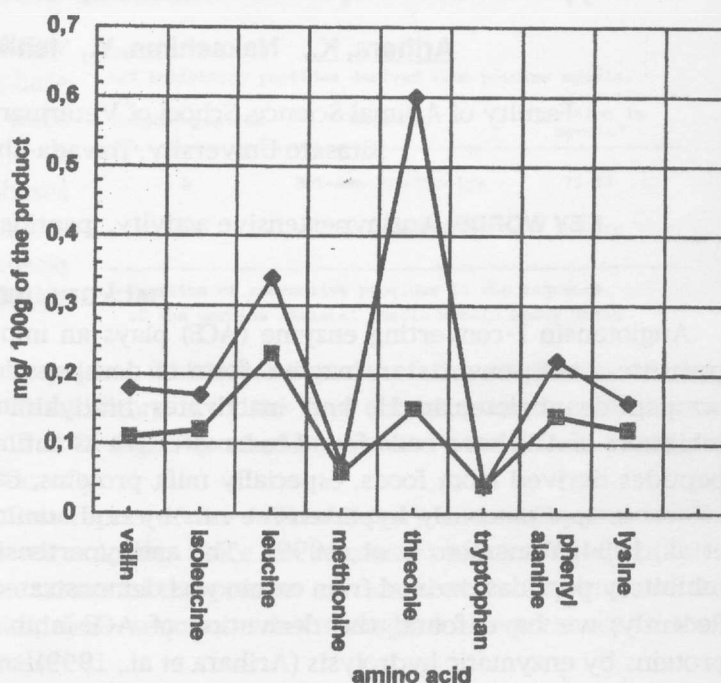


Fig.2 Amino acid composition of experimental mayonnaise in comparison with the mayonnaise "Provansal"
1- experimental 2- "Provansal"

Results of the experiment showed that mayonnaises with the content of CMS 2.5%, fattiness 35% and with 3.0% of CMS, fattiness 40% have the best consistency, the best stability and the best organoleptic indices. Samples with smaller concentration of CVS were not stable enough, with weak consistency; sample with higher consistency of CMS became extremely viscous and pasty, that is not characteristic of mayonnaise.

As a result of comparative study of chemical composition and consumer properties of the experimental mayonnaise with those of "Provansal" it has been established that according to the organoleptic indices these products are identical, energy value of the experimental mayonnaises was 350 kcal per 100 g of a product which is 26% less than of a control variant. It is very important that in the case of experimental samples of mayonnaises, the protein content increases 2 times and besides that, they are enriched by vitamins. At the valuation of biological value of food products, the most important indice is the quality of proteins, determined by ratio of essential amino acids. The product being developed is similar to "Provansal" according to the content of methionine and tryptophan. As far as the other essential amino acids are concerned, their mass content increases, especially the content of threonine (Fig.2).

All the results, obtained give the real possibility to use lentil proteins in the technology of emulsion products, specifically, mayonnaises at decrease of caloricity, good consumer properties, increase of biological value. Application of plant proteins will guarantee the conditions of saving animal proteins, reduction of production cost.

Reference

1. Aslanov S.I., Antipova L.V., Krylova V.B., Stupin V.E. Functional properties of lentil protein preparation (LPP) in the system protein- water // jornal "Natural and applied sciences, technology".-Dep. in VINITI, 1992- №8.
2. Babak V.I., Chermaryova I.B., Degtyarenko N.D., Petrova M.K., Paronyan V.K. Influence of physico-chemical factors on stability of reversible emulsions.- Pishevaya prom., 1995, №3
3. A.E.Ermakov, V.A. Arasimovich et. al. Methods of biochemical study of plants // L.: Kolos.- 1976, 456p.
4. Leontev N.N. Lentil- L.:Kolos, 1996.-179p.
5. Shaternikov V.A., Vysotski V.I. The problem of protein and the main trends of its further processing// Questions of nutrition, 1980, №5
6. Krylova V.B. Production of protein preparation from lentil, their properties and application // Pishevaya prom. - 1998.-№3
7. Krylova V.B. Production and application of concentrated preparation from the lentil protein // Materials of the international conference "Scientific and technical progress in the processing branches of APC.- M., 1995.