INFLUENCE OF ADDITIVES ON HYDROLYTHICAL CHANGES IN LIPIDS

Kozina Z.A.[1], Uzhukina L.V.[1], Krakova V.Z.[1]

[1] V.M. Gorbatov The All-Russian Meat Research Institute, Moscow, Russia

Background

Introduction into the ration of new non-traditional kinds of vegetable raw materials incorporating a balanced complex of proteins, lipids, mineral substances, vitamins and having high nutritive and curative-preventive properties is one of the ways to increase the product nutritive value and improve the structure of food consumption [1].

Among the most perspective kinds of non-traditional raw materials used for obtaining various functional-purpose food additives is the amaranth corn and products of its processing in the food industry, due to a high content of protein balanced by non-essential amino acids, lipids, pectin, coloring agents, and flavonoids having antioxidant effect. It is characterized by availability of a large amount of physiologically active substances: styrenes and tocopherols [2, 3]. Among grain cultures amaranth is characterized by a high content of potassium, manganese, zinc and especially iron and magnesium – the latter promotes inhibition of atherosclerotic processes and reduction of the cholesterol content level in blood.

The food quality greatly depends on the changes taking place in its main components: proteins, carbohydrates, lipids. Thus, at the initial stage of lipid oxidation peroxides and hydroperoxides (lipid decomposition primary products) having toxic influence on the human organism are formed, although, as this takes place, they don't affect functional-technological and organoleptic properties of the finished product. During further oxidation aldehydes and ketones (lipid decomposition secondary products) giving product specific rancid taste are formed [4, 5].

To suppress oxidizing processes in the product, natural or synthetic food additives - antioxidants are used [6]. Numerous investigations of the last decade testify that antioxidants deficiency in foods is one of the reasons for progress of atherosclerosis, formation of malignant tumors and other illnesses [7].

Nowadays natural antioxidants which, in contrast to chemically synthesized ones, have no negative side effect on the human organism, as well as improve the product quality indices by enriching it with micro- and macroelements, such as α-tocopherol, β-carotene, pyridoxine, niacin and others, are the most demanded on the Russian market.

Objectives

To study antioxidant properties of the protein-carbohydrate product (PCP) obtained during the amaranth corn processing.

Methods

Antioxidant properties of the vegetable PCP obtained during the amaranth corn processing were evaluated. The choice was based on the results of preliminary tests with PCP, as well as on the analysis of reference literature [6].

Model samples of chopped semi-products incorporating second-grade trimmed beef with 20% fat tissue content were manufactured as a model meat system for studying PCP antioxidant properties.

20, 30 and 50% of hydrated PCP were introduced into test samples of chopped semi-products. Semi-products manufactured without PCP and those with 30% hydrated modified wheat flour (MWF) substitute for meat raw material, obtained by the thermoplastic extrusion method served as control. The samples under investigation were stored at 2-6°C during 7 days.

To evaluate the influence of introduced additives on the oxidation rate of model sample lipids, changes in peroxide and thiobarbituric number indices, characterizing accumulation of primary and secondary lipid decomposition products, specifically malonic aldehyde, were fixed [8].

Results and Discussion

By the results of experimental investigations it was established that up to the second day of storage in model samples including the antioxidant additive PCP, accumulation of primary decomposition products - peroxides, was not revealed, as compared with the control sample without additive having a high index of this number throughout the experiment. Thus, on the 7th day of storage its meaning was two times as much as in the experimental samples.

The lowest values of the index being studied were fixed in samples with 30 and 50% of hydrated PCP, then in samples with 20% of PCP. The control sample with 30% MWF on the second day had the peroxide number index at the level of the experimental sample with introduction of 30% PCP.

Correlation of data on investigated indices made it possible to conclude that model samples with introduction of 30 and 50% of hydrated PCP and the control sample with 30% MWF, whose peroxide number values were twice as low as the control sample without additive, turned out to be the most oxidation-resistant.

Results of determination of peroxide numbers of chopped semi-products fat fraction testify to the fact that introduction of vegetable additives leads to inhibition of oxidative processes.

Analysis of the results of experimental data on changes in thiobarbituric numbers (TBN) in experimental samples of chopped semi-products shows that with the increase in storage duration of semi-products step-by-step deterioration of fat quality characteristics related to accumulation of secondary oxidation products takes place. However, introduction of PCP into the meat system has a considerable stabilizing effect on the state of lipids in experimental samples. Thus, on the 7th day of storage TBN value in samples with 20, 30 and 50% of hydrated PCP was, correspondingly, 1.5, 5 and 6 times lower than the analogous index in the control sample without additive.

The control sample with 30% MWF on the 7th day of storage had the thiobarbituric number value 1.07, what increased this value in experimental samples with 30 and 50% of hydrated PCP 3.6-fold and 4.3-fold, respectively. The sample with 20% hydrated PCP substitute had the above value at the level of the control sample with MWF.

Samples with introduction of 30 and 50% of hydrated PCP, whose antioxidant activity is stipulated by availability of a great amount of flavonoids –natural antioxidants in its composition, distinguish by high antioxidant activity. However, introduction of 50% of hydrated PCP into chopped semi-products negatively tells on organoleptic properties of the finished product, such as taste and consistency. Introduction of

30% of hydrated PCP also affects the lipid fraction stability, has a distinct antioxidant effect, favours improvement of the finished product consistency and taste.

Conclusions

By investigations carried out it was established that introduction of additives into chopped semi-product farces had an inhibiting influence on lipid peroxide oxidation processes what, in all probability, is connected with decrease in the share of hem pigments in farce with MWF and availability of oxidation inhibitors in PCP.

The presented vegetable additive – PCP – has a stabilizing influence on lipids of modern farce systems. The data obtained during experimental investigations testify to the possibility of usage of 30% of hydrated PCP as an antioxidant in composite chopped semi-products.

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