

INFLUENCE OF ANTIOXIDANTS ON THE QUALITY OF ANTIANEMIC PRODUCT WITH FOOD BLOOD

Ustinova A.V., Timoshenko N.V., Lubina N.V.

All-Russian Meat Research Institute, Talalikhina 26, 109316, Moscow, Russia

According to FAO/WHO the problem of existence and progressing development of iron deficiency anemia of practically all the groups of population results from the iron deficiency in the foods.

Meat products containing food blood are an important source of bioaccessible iron.

The Institute has developed a high-protein antianemic product for child nutrition on the basis of food blood (30 %), the composition of which is adapted to specific metabolic processes of children suffering from iron-deficiency anemia. According to medical and biological assessment and clinical tests the product is recommended for complex therapy of blood diseases, followed by a decrease of hemoglobin (1). However, high content of bioaccessible, but easily oxidative iron (up to 13,0 mg%), as well as the lipids (10-15 %) in this product necessitates its protection from the process of peroxide oxidation of lipids during heat treatment and storage, leading to reduction of its quality and storage life.

OBJECTIVE OF INVESTIGATIONS

To study the influence of different antioxidants and the composition of the fat component on the quality of antianemic product based on food blood.

OBJECTS AND METHODS OF INVESTIGATIONS

The objects of investigations were food blood, stabilized and coagulated, mixtures of coagulated blood with dried milk, butter, vegetable oil, olive oil, samples of recipe mass and samples of final product.

A natural antioxidant - vitamin E, and a synthetic one - dihydroquercetin (DQ) were used as antioxidants; ascorbic acid (vitamin C) and citric acid that are able to prevent from the oxidation of metals (which is especially important for the product containing Fe^{++}), and inhibit pro-oxidative effect of antioxidants were used as synergists. The degree of oxidation was characterized by thiobarbituric number (TN), which was determined according to Tarladgis (2) with 2-thiobarbituric acid.

RESULTS AND DISCUSSION

The following levels of oxidation products (by TN in mg/kg) were determined in the initial raw materials:

blood:	oil:
stabilized - 0;	butter - 0,03;
coagulated - 0,08;	sunflower - 0,06;
dried milk - 0,12	olive - 0,12

Results of the investigations on the effect of antioxidants on lipids oxidation in model mixtures under different conditions of heat treatment, during storage (Table 1) suggest that mixtures with vegetables oils (sunflower and olive oil) are the least stable to lipids oxidation.

Table 1. Influence of the composition of the model mixture and antioxidants on TN value

Model mixture	TN value (mg/kg) after		
	thermal coagulation	sterilization	6-month storage period
Coagulated blood + dry milk	0,11	-	-
Coagulated blood + butter	0,12	1,24	1,57
Coagulated blood + dried milk + sunflower oil	0,52	1,41	2,72
Coagulated blood + olive oil	1,27	2,01	3,74
Coagulated blood + butter + vitamin C	0,18	1,26	2,14
Coagulated blood + butter + vitamins C and E	0,15	0,14	0,16
Coagulated blood + butter + vitamins C and E + citric acid	0,18	0,19	0,19
Coagulated blood + butter + pectin + cocoa + vitamins C and E	0,18	0,22	0,19
Coagulated blood + butter + DQ	0,35	1,1	2,06

The model mixture with olive oil had the highest content of malonaldehyde after thermal coagulation of blood (TN 1,27 mg/kg) and during storage (3,74 mg/kg).

In the model mixture with butter there was also marked the accumulation of malonaldehyde during storage. Addition of ascorbic and citric acid, and DQ did not decrease the accumulation of malonaldehyde, and addition of vitamin E at 0,003 % allowed to stabilize its accumulation. The values of TN in the prepared mixture and after 6 months of storage are also practically identical (0,15 and 0,19 mg/kg).



The model mixture containing all the components of the product with vitamin E, also has practically the same values of TN, both after manufacture and during storage up to 6 months. This allows to make a conclusion that the added amount of vitamin E provides antioxidant effect in the model mixture with butter.

The data of the investigations of the antianemic product "Hemalad" (Table 2) confirmed the results of the investigation on the model mixtures.

Table 2. Influence of product composition and antioxidants on the TN value during storage of canned foods

Recipe	Product with fat composition	TN value (mg/kg) in product during storage		
		0	6 months	12 months
1	Lard			
2	Lard + vitamin E	0,15	0,72	1,91
3	Butter+ vitamin C	0,15	0,21	0,23
4	Butter+ vitamin C	0,14	0,97	1,23
5	Sunflower oil (3 %) +olive oil (4,0 %) + vitamin C	0,26	0,58	2,06
6	Sunflower oil (3 %) + olive oil (7 %) + vitamin C	0,39	1,78	3,91
7	Sunflower oil + DQ	0,37	1,63	2,97
8	Sunflower oil + vitamin E	0,22	0,36	0,53
	Butter + DQ	0,37	1,22	2,28

Addition of ascorbic acid into the final product using both vegetable oils and animal fats did not result in the decrease of malonaldehyde during storage. The TN value increased 7, 9 and 10-fold in canned foods with vegetable oils depending on their amount ratio (recipe 4 and 5).

The final product with lard (without vitamin E) also exhibited the least stability to lipids oxidation. However, the addition of vitamin E allowed to stabilize the accumulation of malonaldehyde in storage during 12 months.

The addition of vitamin E into the product with all the considered fat compositions allowed to significantly reduce lipid oxidation in canned foods, that was confirmed by the results of the investigations on model mixtures (Table 1).

The addition of the antioxidant DQ into the final product with vegetable oils at 0,03 % (for lipid part of the products) did not lead to the desired result.

A considerable accumulation of malonaldehyde was revealed after processing (TN value 0,37 mg/kg) and during storage, though some reduction of this value was marked as compared to the sample without DQ.

CONCLUSION

The influence of the fat composition and antioxidants on the accumulation of oxidation products in the antianemic product made with blood during storage was revealed. Vitamin E at 0,003 % in the product with animal fats during storage allows to stabilize the accumulation of malonaldehyde, and with vegetable oils - to decrease it by 86,5 %.

Insignificant decrease of TN value in the samples with dihydroquercetin at 0,03 % doesn't allow to recommend it as the antioxidant for this product.

The addition of ascorbic and citric acids into model mixtures and final products did not have a positive influence on the prevention of oxidation process of fats.

REFERENCES

1. Ustinova A.V., Bobrikova E.G. et al. Designing of the composition and properties of high-protein antianemic foods for child nutrition // 42nd International Congress of meat science and technology.- Lillehammer, Norway, 1996, P.589
2. Tarladgis B.G., Nalts B.M., Jounathan A distillation method for the quantitative determination of malonaldehyde in rancid foods. //J. of the Americal Oil Chemists Society, 1960, v. 37, No 1, P. 44-48