

UTILIZATION OF POWDERED HEMOGLOBIN IN FORMED MEAT PRODUCTS

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Introduction

Anemia, caused by insufficiency of iron intake, presents health problem in one third of population in the World. It is well known that powdered hemoglobin contains 20 to 100 times more of nutritive iron than food which is considered rich in iron (Matekalo-Sverak Vesna, Turubatovic L. 2003; Turubatovic et al 2006).

Main aim in our work was to analyze the possibilities to build nutritive reasonable quantities of powdered hemoglobin into formed meat products, so the sensory characteristics should be accepted.

Materials and Methods

To prepare formed meat products we used beef with 10% fat, powdered hemoglobin, water, 1.6% salt, spices. Five series of products were made: i) 95% minced beef and 5% water, ii) 92.50% minced beef, 7% water and 0.50% powdered hemoglobin, iii) 91.25% minced beef, 8% water and 0.75% powdered hemoglobin, iv) 0.02% rosemary extract added to the second recipe, v) 0.02% rosemary extract added to the third recipe. Each of the five formed meat products was well homogenized and then shaped into 100g hamburgers.

Mass losses during grilling in formed meat products was determined by measuring final products after 7 minutes grilling, 3.5 minutes per side and 2 minutes cooling. Mass losses during grilling represents the average difference in measured mass of 6 samples before and after grilling. Sensory evaluation represents sum of individual marks given by 8 evaluators for overall acceptance – color, odor, flavor, texture, juiciness – using rang test (Baltić, M.1994). The highest rated product was the one with the smallest sum of individual marks. The results of testing were grouped in appropriate statistic series and processed through Microsoft Excel 2002 software (Hadživuković, 1991). Iron content was determinate by atomic adsorption spectrophotometer using AAS SPECTRAAA 220Varian. Peroxide and acid value were determinate after lipid extraction by chloroform from samples using standard ISO methods: JUS ISO 660/2000 for acid value and JUS ISO 3960/2001 for peroxide value.

Mass losses during grilling determination, sensory evaluation, peroxide and acid value were done on the first and the fourth day upon producing formed meat products and stored at the temperature of 4°C.

Results and Discussion

Mass losses during grilling in samples with added hemoglobin were smaller than in control sample (table 1), which is quite understandable since powdered hemoglobin also serves as the stabilizer. It is noticeable that the mass losses from the fourth day were somewhat over 1% bigger than on the first day, however samples with added powdered hemoglobin were still having smaller mass loss.

Table 1. Mass losses during grilling in formed meat products in %

investigation time	sample i	sample ii	sample iii	sample iv	sample v
1 st day	10.28 %	9.30 %	8.70 %	9.53 %	8.64 %
4 th day	11.30 %	10.52 %	10.00 %	10.64 %	9.90 %

Results of overall sensory evaluation (Table 2) showed that on both first and fourth day the best rated sample was the one without powdered hemoglobin. The statistic result procession analysis within tested groups showed that there were no significant differences in the results from the samples i, ii, iv and v. The differences in overall sensory evaluation are statistically very significant between samples i and iii (99%), and statistically significant between samples ii and iii (95%). It was noticeable in the results of samples testing that the rosemary addition has positive influence on sensory characteristics of the products. By adding just 0.5% powdered hemoglobin the nutritive iron content in formed meat products was increased by more than double (Table 3) which is significant from the nutritive point of view. The results show that one hamburger made with the addition of 0.5% powdered hemoglobin can provide the third of recommended daily intake of iron.

Table 2. Results of overall sensory evaluation of formed meat products during grilling

investigation time	sample i	sample ii	sample iii	sample iv	sample v
1 st day	sum 17 average 2.125	sum 21 average 2.625	sum 34 average 4.25	sum 24 average 3	sum 24 average 3
4 th day	sum 17 average 2.125	sum 25 average 3.125	sum 31 average 3.875	sum 23 average 2.875	sum 24 average 3

Table 3. Iron content in samples of formed meat products

sample	sample i	sample ii	sample iii	sample iv	sample v
Fe, mg/ 100g	1.691	3.119	3.799	*	*

· differences between samples ii and iv and samples iii and v are just in 0.02% rosemary addition

After four days the results of acid and peroxide analysis showed that no oxidative changes occurred (Table 4). Considering the fact that iron has prooxidative influence and powdered hemoglobin is rich in iron (295mg/100g) that results are very optimistic, but on some way expected because of small fat content in tested meat products. It will be very interesting to examine in future experiments what happened with hamburgers with powdered hemoglobin after storage for a few months at the temperature on - 18°C.

Table 4. Results of oxidative changes in formed meat products during for days

sample	1 st day	4 th day
	acid value	peroxide value mmol/kg
sample i	0.09	0.00
sample ii	0.08	0.00
sample iii	0.08	0.00
sample iv	0.05	0.00
sample v	0.05	0.00

Conclusion

On the basis of the obtained results it can be concluded:

1.Addition of powdered hemoglobin up to 0.5% is reasonable for this kind of meat products. Addition of 0.75% powdered hemoglobin, because of sensory characteristics, is reasonable only with rosemary extract included.

2. Addition of 0.5% and 0.75% powdered hemoglobin in formed meat products significantly increase available iron which is very important from the nutritive point of view.

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