Influence of nuts buckwheat on lipid oxidation in meat liver pates during storage

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Abstract

The addition of natural antioxidants is one of the way to extend the durability of meat and meat products. In nuts buckwheat rutin and isovitexin were detected, however husk buckwheat contain six flavonoids. The aim of this study was determining of the influence of addition powder buckwheat with and without husk (hydrothermal processing) into model meat liver pate inhibition of lipid oxidation during storage at 4°C by 30 days. The composition of meat liver pate was 40% shoulder pork, 45% fine fat pork and 15% liver pork. Then it was homogenized: control with 10% addition of builon, samples with addition 10% the nuts buckwheat without husk and nuts buckwheat with husk , the buckwheat was hydrated 1:3. The followings parameters pH, oxidation-reduction potential, TBA peroxidal number and composition of fatty acids were tested. During the storage time the pH of liver pate with nuts buckwheat was higher in comparison to control test. Use of the nuts buckwheat influenced on growth of oxidation-reduction potential, which could contribute to reduction the processes of oxidation. The concentration of malonic aldehyde and also peroxides were reductioned The quality of fatty acids was improved.

Introduction

Oxidative changes of lipids in food products are the main cause of lowering their quality reflected in worsening sensoric properties, interactions with other food components and change nutritional value (Morrissey et al, 1998; Ulu, 2004). The application of antioxidants offers an effective prevention method of undesirable oxidative lipid changes (Miyake and Shibamoto, 1997; Pokorny, 1991). Buckwheat hulls are a basic source of essential components with a wide range of biological activity, e.g. flavonoids, polyphenols. The groats contained only rutin and isovitexin however the hulls contained six flavonoids: rutin, quercetin, orientin, isoorientin, vitexin and isovitexin. Rutin is a dominant flavonoid in groats and hulls (Dietrych-Szóstak and Oleszek , 1999). Quercetin and rutin display effective antioxidative activities against lipid oxidation in non-meat model systems (in vitro, in cell culture and animal models) through several inhibition mechanisms (Rice-Evans et al, 1996). They have been tested for their antioxidative activities in irradiated pork patties Chen et al, 1999) and beef patties (Bekhit et al, 2003).

The this study was determining of the influence of addition powder buckwheat with and withouh husk into model meat liver pate inhibition of lipid oxidation during storage at 4^0C by 30 days.

Materials and methods

Fundamental materials used for manufacturing the test meat liver pates were 40% shoulder pork, 45% fine fat pork, 15% liver pork and nuts buckwheat without husk and nuts buckwheat with husk.Buckwheat nuts (Luba) were purchased from a local grain manufacturer in Lublin. The nuts were hydrothermal, traditional processed of 80^0C. After that dried nuts buckwheat were milled to powder. The meat ingredients were cooked. The water after cooked was used as broth to manufacturing. Three options of the samples were obtained: A – control meat liver pates; B – meat liver pates with addition of 10% nuts buckwheat without husk; C – meat liver pates with addition of 10% nuts buckwheat with husk. The buckwheat was broth hydrayed 1:3. All meat ingredients were chopped and after then were homogenized with broth hydrated nuts buckwheat. Fillings were packed into glass pots (180 ml) and pasteurized at 80^0C till achievement 75^0C inside the material. After cooking samples were stored at 4^0C. following items were determined after 1, 10, 20, 30 days.

Meat products acidity (PN – ISO 2917:2001) was measured by using digital pH/conductometer (CPC 501) and combined electrode (type ERH-111) in water extract of the product (homogenate: 10 g of product with 50 ml of distilled water). Oxidation-reduction potential (ORP) was measured by the using combined electrode (type ERPt-13)plugged into digital pH/conductomer in water extract. Achieved result was caltulated onto redox potential value in relation to standard hydrogen electrode E_H (mV), value of reference electrode potential (E_{ref}=211 mV at 20^0C) was added to measured potential. Lipid oxidation was measured as 2-thiobarbituric acid. TBARS values of samples were determined according to the modified method of Salih

according to Pikul (1989). TBARS content was expressed as mg of malondialdehyde (MDA) per kg of the products. Oxidative changes of fat were analyzed periodically based on measurement of peroxide value (PV) by iodometric method (PN-ISO 3960:1996) and expressed in millequivalent O_2 per kg fat. Fatty acid profile was determined using Helwet-Packard 6890 gas chromatograph equipped as as described in IDF methods (1999). The compare mean values of the investigated parameters analysis of variance was applied and differences between groups were evaluated using Tuckey test.

Results and discussion

Based on the statistical analysis of obtained results, it was found that there were significant differences between acidity values of samples with nuts buckwheat, they were values higher then control. Measurement oxidation-reduction potential changes during storage by 30 days revealed that it incrise was observed. The oxidation-reduction potential showed that the control samples characterized the highest value after 20 days all during the chilling storage.

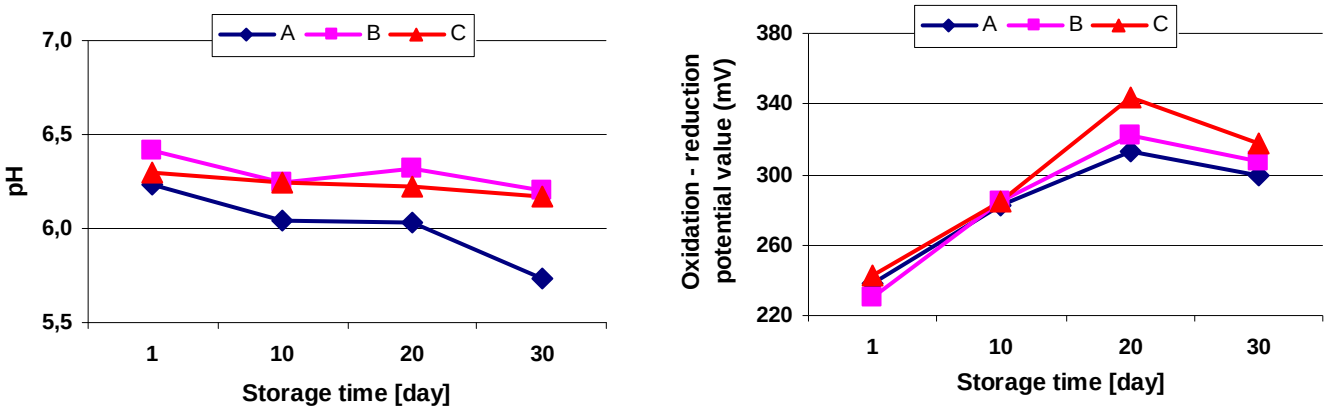

Figure 1. Acidity and oxidation reduction potential of meat liver pates stored at 4^0C.

Changes of fat oxidation (PV-peroxide value, TBARS) indicate considerable increase of fat oxidation degree in meat products during storage (fig. 2). Final period of storage showed that PV and TBARS values was higher for control samples with the nuts buckwheat addition. Based on the statistical analysis of TBARS results, it was found that there were significant differences between lipid oxidation values of both samples (C,B) with added nuts buckwheat and control samples. Samples C and B were values smaller then control and the difference between samples with nuts buckwheat and control were significantly. The peroxide value evaluation showed that the control characterized the highest peroxide value after one day since production.

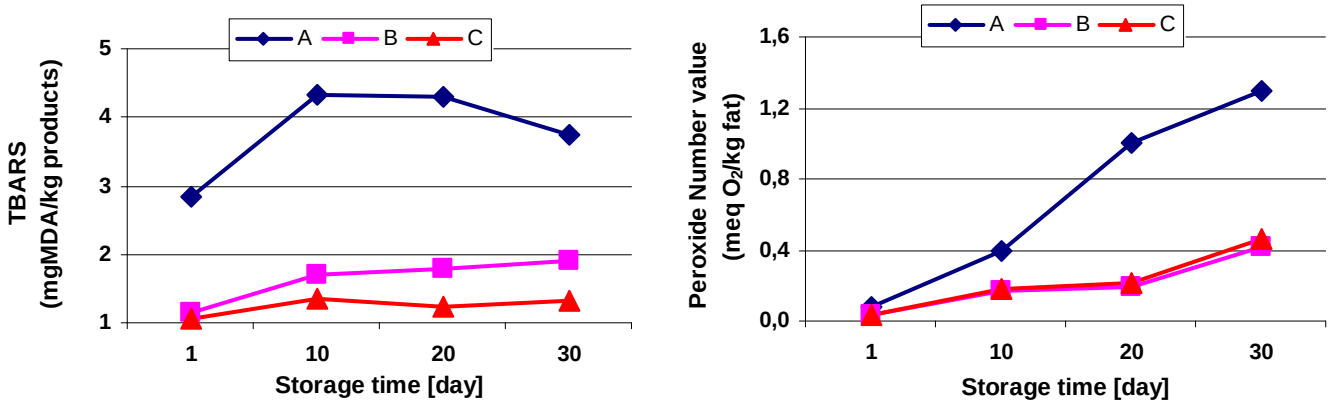

Figure 2. Lipid oxidation (TBARS, PV) of meat liver pates stored at 4^0C.

Table 1 shows the total monounsaturated fatty acid (MUFA) and polyunsaturated fatty acid (PUFA) were not significantly different among the there samples. The during chilling storages were

observed the fall content the *trans* of fatty acids form in all tests. The differences between groups were significantly.

Table 1. Fatty acid composition for liver pates stored at $4^{O}C$

Fatty acid composition [%]	Sample/ Storage time (days)					
	PC		PGO		PGL	
	1	30	1	30	1	30
trans	$0,53^{a} \pm 0,03$	$0,44^{b} \pm 0,05$	$0,61^{c} \pm 0,04$	$0,52^{a} \pm 0,05$	$0,52^{a} \pm 0,04$	$0,47^{b} \pm 0,06$
SFA	$39,68^{ab} \pm 1,78$	$40,47^{b} \pm 1,07$	$38,72^{b} \pm 2,76$	$39,99^{a} \pm 2,11$	$39,15^{ab} \pm 0,94$	$39,56^{a} \pm 1,76$
MUFA	$49,65^{a} \pm 1,12$	$49,11^{a} \pm 1,45$	$50,47^{a} \pm 0,87$	$49,05^{a} \pm 2,12$	$50,3^{a} \pm 1,76$	$49,27^{a} \pm 1,23$
PUFA	$10,67^{a} \pm 0,65$	$10,42^{a} \pm 0,45$	$10,81^{a} \pm 0,87$	$10,96^{a} \pm 0,92$	$10,55^{a} \pm 0,78$	$11,18^{a} \pm 0,34$

Averages marked with the same letters are not statistically significantly different (α=0,05) in the same verse.

Conclusions

The addition of nuts buckwheat affected the changes of oxidation stability of meat liver pates. During the storage time the storage time the pH of liver pate with nuts buckwheat was higher in comparison to control samples. Use of the nuts buckwheat without and with huls influenced on growth of oxidation-reduction potential, with could contribute to reduction the processes of oxidation. The concentration of lipid oxidation products as TBARS and also peroxides were reductioned. The quality of fatty acids was improved.

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