

"STABILOTON" DECREASES RANCIDITY OF MARINATED CHICKEN BREAST

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Key words: Chicken breast, rancidity, sensory properties, TBARS, "Stabiloton"**INTRODUCTION**

Many efforts have been made to reduce lipid oxidation in poultry products. Sodium ascorbate, sodium citrate as well as polyphosphate added directly to meat during processing, delay the oxidation process in meat products (Mielnik et al., 1995). Herbs and spices are traditionally added to food for improving organoleptic properties. In addition many spices or their extracts have been assessed for antioxidant activity (Nakatani, 1994). Rosemary and sage extracts have been widely used to stabilise fat and fat-containing food (Prat and Hudson, 1990). Stabiloton WS" is a ready to use mix of rosemary and sage extracts on carrier salt, produced by supercritical CO₂ extraction. It is claimed that the product has superior antioxidative activity and can be used in various foods (Strik, 1993). The aim of this study was to evaluate the effect of "Stabiloton WS" on the oxidative stability of marinated chicken breast during long-term frozen storage produced from frozen/thawed raw material.

MATERIAL AND METHODS

As raw material, frozen stored chicken breast parts wrapped in polyethylen folio were used: breast parts stored at -25°C for 12 months and breast parts stored for 3 days. All breast parts were thawed at 4°C for 2 days before marinating. The half of the breast parts from each group was injected with marinade consisting of 11% marinade powder (Chicken brine NR. 864), 5% NaCl and 84% water. The other half breast parts from each group was injected with marinade containing 11% marinade powder, 2 % NaCl, 4 % "Stabiloton WS" (Raps&CO Kulmbach, Germany) and 83% water (S). Thus, the chicken breast were divided in to 4 groups: 1) **OR**: 3 days frozen stored raw material marinated without "Stabiloton WS", 2) **OS**: 3 days frozen stored raw material marinated with "Stabiloton WS", 3) **12R**: 12 months frozen stored raw material marinated without "Stabiloton WS", 4) **12S**: 12 months frozen stored raw material marinated with "Stabiloton WS". The concentration of NaCl was about 1% in marinated samples. All breast parts were packed in aluminium trays, covered with paper lids, frozen at -40°C and then stored at -25°C. The frozen breast parts were examined after 0 (1 week), 4, and 8 months of storage.

Sensory analysis: The breast parts were thawed overnight at 4°C, cooked in a water bath at 85°C for 50 min and served immediately at approx. 50°C. Sensory analysis was performed with a panel of 11 well trained assessors using a descriptive test (ISO 6564 -1985 E). Intensity of 18 attributes were evaluated i.e.: odour of chicken, odour of fresh chicken, odour of hay, odour of grass, odour of soap, odour of paint, flavour of chicken, flavour of fresh chicken, saltiness, flavour of hay, flavour of grass, flavour of soap, flavour of paint, metallic taste, bitterness, hardness, tenderness and juiciness (Mielnik et al. 1995). The sensory panel evaluated odours between the skin and meat and flavours on newly cut slices of a combination of skin and meat. Randomly served samples (11 in 2 replicates) were assessed according to a continuous non-structured scale ranging from the lowest intensity of each attribute (value 1.0) to the highest intensity (value 9.0).

TBA test: The thiobarbituric acid reactive substances (TBARS) were determined in cooked breast meat, stored overnight in a refrigerator, by the distillation procedure of Tarladgis et al. (1960). Propyl gallate and EDTA were added to the samples prior to homogenization. TBARS values expressed as mg of malondialdehyde per kilogram of meat were the mean of 6 replicate measurements.

Data analysis: Analysis of variance (ANOVA) was run separately on each sensory attribute at each storage period using the software package STATISTIX.4. The main trends of variation among the samples were studied by principal component analysis (PCA) using UNSCRAMBLER extended version 5.5 (Camo AS, Trondheim, Norway). Explained variance for each principal component (PC) was determined by cross-validation. The variables were mean-centred by subtraction of the mean value before the calibration procedure.

RESULTS AND DISCUSSION

Eighteen sensory attributes were used to describe the sensory quality of marinated breast. Twelve of them had a high standard deviation indicating that these attributes were depended on brine components and storage time and could give significant information (Table 1.).

Table 1. The standard deviation and correlation coefficient between TBARS and the sensory attributes

Sensory attribute	std	r
Odour of chicken	0.569	-0.566
Odour of fresh chicken	0.517	-0.850
Odour of hay	0.527	0.868
Odour of grass	0.245	0.648
Odour of soap	0.898	0.921
Odour of paint	0.720	0.774
Flavour of chicken	0.482	-0.634
Flavour of fresh chicken	0.589	-0.937
Flavour of hay	0.581	0.900
Flavour of grass	0.299	0.790
Flavour of soap	0.908	0.905
Flavour of paint	1.036	0.919
TBARS	0.465	1.000

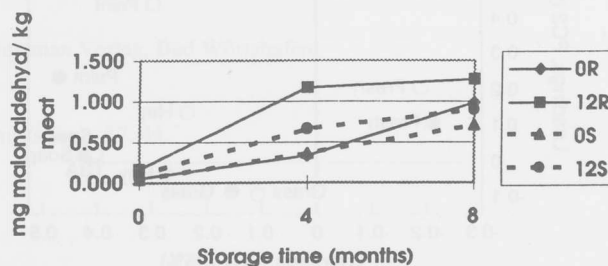


Figure 1. Effect of "Stabiloton WS" and storage time on TBARS values in cooked marinated chicken breast parts with (S) or without (R)"Stabiloton WS", stored 0 months or 12 months before production.

The major source of variation was largely associated with rancidity parameters as flavour of paint and soap as well odour of paint and soap which were highly correlated with TBARS values (Table 1.). Remaining attributes such as texture variables, saltiness, bitterness and metallic taste with low standard deviation did not distinguish the different treatment groups. The changes of TBARS during 8 months of frozen storage are presented in Figure 1. The chicken breast stored for 12 months at -25°C before marinating (12R and 12S) had higher TBARS values than 3 days-stored breast (0R and 0S) at zero time. During 8 months storage TBARS increased progressively, however the highest increase was noted in group 12R which contained twice as much malonaldehyde as group 12S at 4 months. No significant difference was found between group 0R and 0S after 4 months storage. At 8 months a considerable increase in TBARS was noted in 0R. Both groups 0R and 12R contained significantly higher TBARS amount than the respective groups with natural antioxidants i.e. 0S and 12S. Groups 0R and 12S reached the same level of TBARS after 8 months storage. This indicated that natural antioxidants from rosemary and sage had particularly positive effects on the repression of oxidative rancidity in marinated chicken breast where the oxidative process was greatly advanced.

PCA-analysis. The mean values of 12 sensory attributes and TBARS were used in the multivariate analysis to describe similarities and differences among the "new" and "12 months "old"" chicken breast parts injected with and without "Stabiloton WS" and stored for different periods. It was possible to describe 91% of the total variation among the samples with two principal components (PCs). The loading and score plots for the first two principal components are presented in Fig. 2 and 3, respectively. The first PC (85%) was largely associated with flavour and odour of fresh chicken which gave high negative loadings. Rancidity attributes such as flavour and odour of soap together with TBARS values and to a lesser extent flavour and odour of hay contributed to the positive loadings of PC1. These variables were highly correlated to each other. PC2 (6%) appears to be composed of flavour and odour of chicken on the one side and odour of paint on the opposite side. Distribution of the samples on the score plot indicates that the first principal component (PC1) is mainly related to the storage time before and after processing. The second PC appears to be strongly linked to the addition of "Stabiloton WS" to the product. The score plot indicates that the sensory quality of marinated chicken breast changed during frozen storage depending on the content of natural antioxidants in brine. The 0R group was mostly described by flavour and odour of chicken while the 0S group had the highest level of fresh flavour and odour. Thus, the strong flavour of rosemary and sage may have covered the origin flavour and odour of chicken in the group 0S. Chicken breast marinated after 12 months of frozen storage (12R and 12S) are mostly on the right side of the plot according to 0R and 0S which indicate that fresh flavour and odour of 12R and 12S groups were assessed lower than 0R and 0S groups at zero time. During storage time all samples show a clear tendency to move from the left to the right side of the plot which means a notable increase in rancidity. PC2 which explains 6% of the total variation reveals the difference between chicken breast marinated with or without "Stabiloton WS". All samples with natural antioxidants are found on the lower part of the plot, while the samples without them are grouped on the upper part of score plot. Addition of "Stabiloton WS" probably altered the course of oxidative reaction in marinated breast parts preventing the development of varied rancidity flavour and odour i.e. paint, soap, hay and grass.

CONCLUSION

Negative changes in marinated breast during frozen storage are mostly associated with increased rancidity. Long-term frozen stored raw material is more exposed to oxidation than short-term stored. "Stabiloton WS" contains natural antioxidants which delay oxidative reactions in marinated breast and decreases the amount of TBARS. "Stabiloton WS" is especially useful in the production of marinated chicken breast based on frozen/thawed chicken.

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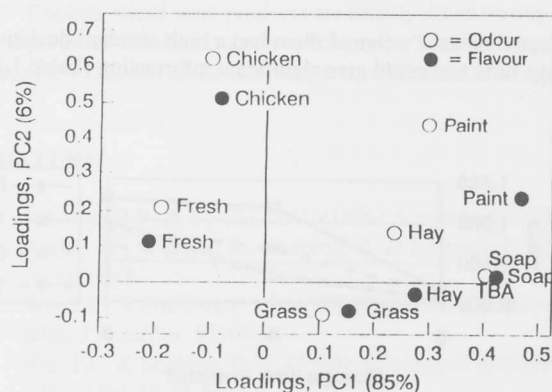


Figure 2. Loadings plot for PC1 and PC2 of the sensory attributes and TBARS which explained together 91% of total variation.

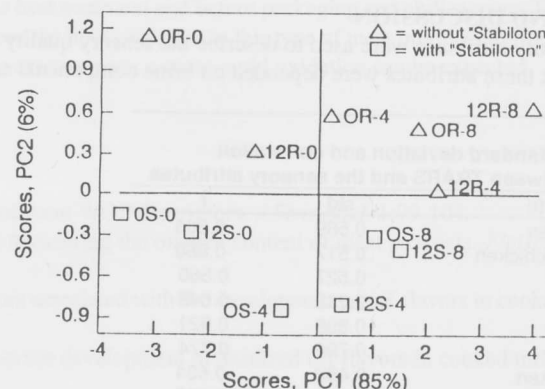


Figure 3. Score plot for PC1 and PC2 obtained by PCA for the sensory attributes and TBARS of (0) or (12) months chicken breast parts marinated with (S) or without (R) "Stabiloton WS" and stored for 0, 4 and 8 months at -25°C.