OXIDATIVE PROPERTIES OF SUCUK PRODUCED WITH OLIVE OIL DURING FERMENTATION AND RIPENING

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Abstract –The aim of our work was to investigate the changes in oxidative quality parameters of sucuk (Turkish dried fermented sausage) related to partial beef fat replacement with olive oil during fermentation and ripening. Three different sucuk formulations were prepared with 100% beef fat (C), 85% beef fat+15% olive oil (O15) and 70% beef fat+ 30% olive oil (O30). It was found that usage of olive oil at high concentrations significantly increased both TBARS value and total carbonyl content of samples during fermentation and ripening. Our results indicated that both lipid and protein oxidation reactions are considerably affected by modification of fatty acid composition and considerable oxidative changes occur in sucuk during production stages.

Key Words – fat replacement, olive oil, oxidation, sucuk.

I. INTRODUCTION

Sucuk is a Turkish traditional dry fermented meat product widely consumed in Turkey. During fermentation and ripening of this kind of product, many reactions take place in the matrix such as proteolysis and lipolysis affecting final product quality in terms of sensory quality, safety and shelf life [1]. Since lipids play a major role in sucuk including sensory, chemical, textural and technological quality attributes, it is important to analyse the oxidative changes during production stages related to lipid type used in the formulation. Olive oil is known as a functional oil which is consisted of unsaturated fatty acids, tocopherols and phenolic substances [2]. In this study, we targeted to search the effects of partial olive oil utilization as beef fat replacer on lipid and protein oxidation of sucuk during fermentation and ripening.

II. MATERIALS AND METHODS

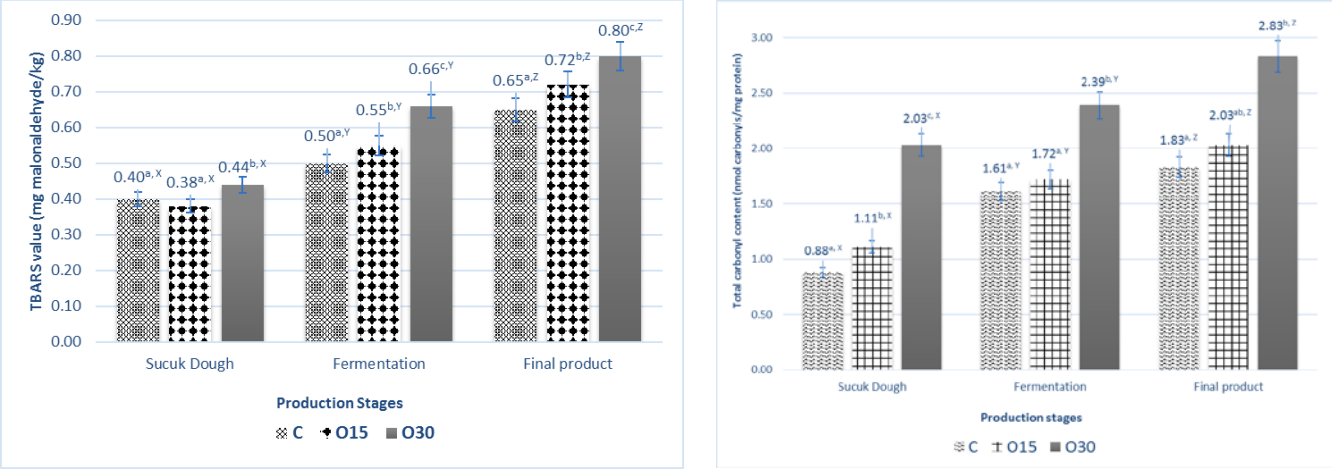
Fresh boneless lean beef, beef fat, olive oil and other additives were supplied from local market. Each treatment was formulated to contain 20% total fat. Control **(C)** group was consisted of 100% beef fat. Olive oil was added to the formulations by replacing 15% **(O15)** or 30% **(O30)** of beef fat. Sucuk production was performed according to Zungur *et al.* [3] with modifications as follows: Samples were allowed to stand at 22.5°C and 60% relative humidity (RH) for 3 h, fermented at 23°C and 88% RH until the pH reached 5.4 and ripened at 21°C and 83% RH for 3 days and at 19°C and 73% RH to drop the moisture under 40%. Thiobarbituric Acid Reactive Substances (TBARS) value [4] and total carbonyl [5] content were determined to evaluate lipid and protein oxidation rate, respectively. Sampling was performed in sucuk dough, at the end of fermentation (pH=5.4) and at the end of ripening (final product). Data was analyzed by ANOVA and Duncan Post-Hoc tests using the SPSS software.

III. RESULTS AND DISCUSSION

Oto-oxidation reactions are major cause of deterioration in the quality of meat and meat products. TBARS value is an indicator of malonaldehyde (MA), which is one of the main secondary products of lipid peroxidation. TBARS values of the sucuk samples measured at different production stages are presented in Figure 1(a). In sucuk dough, TBARS values were between 0.40-0.44 mg MA/kg, the highest value was detected in O30 samples (P<0.05). During fermentation and ripening, there was a significant increment in TBARS values with the increasing concentrations of olive oil used in the formulation (P<0.05). This result could be attributed to high unsaturated fatty acid composition of olive oil leading an increase in lipid oxidation rate. In the final product TBARS values ranged between 0.65-0.80 mg MA/kg, indicating that fermentation and ripening steps had significant effect on propagation of lipid oxidation in all treatments (P<0.05), in accordance with previous research [2, 3].

The formation of carbonyl compounds is one of the most marked changes occurring during the oxidation of proteins. The results of total carbonyl content of the samples during production are shown in Figure 1(b). The values were between

0.88-2.03 nmol carbonyl/mg in dough, the lowest value was detected in C samples and carbonyl content of the samples was increased with added olive oil (P<0.05). At the end of both fermentation and ripening, O30 samples had higher carbonyl content compared to C samples (P<0.05). It could be concluded that increased olive oil concentrations may have a considerable impact on protein carbonylation. On the contrary, Fuentes *et al.* [6] stated that proteins seemed not be particularly affected by the fatty acid composition of fermented sausages. In all samples, carbonyl content tend to rise significantly during production (P<0.05), due to formation of proteolysis reaction products. Similar results observed in TBARS and carbonyl values might be an indicator of the interactions between lipid and protein oxidation mechanisms.



(a) (b)

Figure 1. (a) TBARS values and (b) total carbonyl content of sucuk samples during production (abc: means with the different letter in the different columns are significantly different (P<0.05), XYZ: means with the different letter in the columns with same pattern are significantly different (P<0.05), standard deviation of the means varies between 0.01-0.08 and 0.01-0.22)

IV. CONCLUSION

The results of our study indicated that modification of lipid composition had strong impacts on both of the lipid and protein oxidation products in fermentation and ripening of sucuk. Further research would lighten the interactions and relationships between oxidation mechanisms in different macromolecules of meat products related to lipid alteration and processing variables.

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