P-05-18

Incorporation of gelled emulsions with α-tocopherol as fat replacer in heat-treated fermented sausages (#432)

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Introduction

As consumers are becoming more aware of healthy nutrition, researches related to reduction of toxic compounds resulting from oxidation in the meat industry have gained attention [1,2]. In this case, the use of gelled emulsions, which is a novel approach, may be an important solution for eliminating oxidative stress and the health risks caused by animal fats used in the formulation of meat products [3,4]. Some studies showed that using both GE and antioxidants had a better protective effect against oxidation in meat products [5,6]. Thus, in this study it was aimed to assess the effects of using gelled emulsion and tocopherol on the oxidative quality of heat-treated fermented sausages.

Methods

Cold set emulsion gels were prepared according to Pintado et al. [7] with some modifications. Beef and beef fat were minced, 20% of beef fat was totally replaced with GE with/without α-tocopherol addition. Production of heat-treated sausages were carried out according to Zungur-Bastıoğlu et al. [8]. Peroxide, p-anisidine and TBARS values were determined throughout storage [9,10,11]. Colour was measured with a portable colorimeter (Konica Minolta, Japan).

Results

Peroxide, p-Anisidine and TBARS values of fermented sausages are given in Table 1. GE added samples showed higher peroxide values than control groups ($p<0.05$). Addition of tocopherol to samples formulated with 20% fat did not affect peroxide values ($p>0.05$), while incorporation of it to GE increased peroxide value except 0th month ($p<0.05$). Using gelled emulsion (GE) caused an increment in p-Anisidine values ($p<0.05$). However, adding tocopherol to the gelled emulsion decreased p-Anisidine values throughout the storage ($p<0.05$), while direct addition of tocopherol did not have any decreasing effect except first month of storage. The lowest initial TBARS value was observed in CA1 samples ($p<0.05$), while other treatments were not significantly different from each other. At first month of storage, addition of tocopherol was unable to retard the oxidative changes and GE added samples showed highest TBARS values of all storage time values. At the end of the storage, the lowest TBARS values were found in CA1 samples and tocopherol decreased TBARS values both in direct addition and in GE formulation ($p<0.05$).

Colour changes of fermented sausages are presented in Figure 2. The highest initial L* value was seen in CA1 samples, while the lowest value was obtained in GEA1 samples ($p<0.05$). On 3rd month, all samples exhibited similar L* values. Since a* values are indicators of lipid oxidation, it was found that direct addition of tocopherol showed its antioxidant activity, but addition of tocopherol in gelled emulsion did not affect a* values positively. The highest initial b* value was found in GEA1 samples, at the end of the storage, b* values of CA1 and GEA0 samples increased ($p<0.05$).

Conclusion

In this study, it was shown that 100% replacement of beef fat with gelled emulsion containing healthier oils showed less oxidative stability than control groups, however using healthier oils without modifying by using emulsification methods may show higher TBARS values when it is incorporated into meat product formulations, thus it is recommended that since different oils or antioxidants may show different oxidative stability, researches related with GE and utilization of antioxidant in GE should be studied in detail.

Acknowlegment

The authors would like to thank to Scientific and Technological Research Council of Turkey (TUBITAK) under the project number 116-O-506.

References

1.
Kanner, J. (2007). Mol. Nutr. Food Res., 51: 1094-1101.
2.
Lorenzo, J. M., Trindade, M. A., Ahn, D. U., & Barba, F. J. (2019). Food Res. Int., 115: 377-378.
3.
Poyato, C., Astiasarán, I., Barriuso, B., & Ansorena, D. (2015). LWT-Food Sci Technol., 62: 1069-1075.
4.
de Souza Paglarini, C., de Figueiredo Furtado, G., Biachi, J. P., Vidal, V. A. S., Martini, S., Forte, M. B. S., ... & Pollonio, M. A. R. (2018). J of Food Eng., 222: 29-37.
5.
Freire, M., Cofrades, S., Pérez-Jiménez, J., Gómez-Estaca, J., Jiménez-Colmenero, F., & Bou, R. (2018). Food Res Int. 113: 465-473.
6.
Alejandre, M., Ansorena, D., Calvo, M. I., Cavero, R. Y., & Astiasarán, I. (2019). Meat Sci., 148:219-222.
7.

Notes

Pintado, T., Ruiz-Capillas, C., Jiménez-Colmenero, F., Carmona, P., & Herrero, A. M. (2015). Food Chem., 185:470-478.
8.
Zungur-Bastıoğlu, A., Serdaroğlu, M., Öztürk, B., & Nacak, B. (2018, September).. In IDS 2018. 21st International Drying Symposium Proceedings(pp. 1179-7). Editorial Universitat Politècnica de València.
9.
AOAC. 2007. "Official methods of analysis", 18th Ed., Gaithersburg, MD, USA.
10.
IUPAC. 1992. Standard methods for the analysis of oils, fats and derivatives. Oxford: Pergamon Press.
11.
Witte, V. C., Krause, G. F., & BAILEY, M. E. (1970). J Food Sci., 35(5): 582-585.

	Peroxide value (meqO_2/kg sample)				p-Anisidine (p-Av)				TBARS (mgmalonaldehyde/kg sample)			
Samples	Month 0	Month 1	Month 2	Month 3	Month 0	Month 1	Month 2	Month 3	Month 0	Month 1	Month 2	Month 3
CA0	$0.82^{b,Y}$ ±0.28	$3.09^{c,X}$ ±0.17	$0.43^{c,Z}$ ±0.15	$0.43^{c,Z}$ ±0.06	$12.17^{c,T}$ ±0.83	$18.07^{c,Z}$ ±0.20	$22.89^{b,Y}$ ±0.25	$32.66^{c,X}$ ±3.29	$1.36^{A,XY}$ ±0.55	$1.03^{b,Y}$ ±0.06	$1.72^{a,X}$ ±0.03	$1.24^{c,XY}$ ±0.03
CA1	$0.82^{b,Y}$ ±0.28	$2.95^{c,X}$ ±0.36	$0.76^{c,Y}$ ±0.15	$0.20^{c,Z}$ ±0.10	$10.93^{c,T}$ ±1.99	$15.98^{d,Z}$ ±0.16	$20.88^{b,Y}$ ±0.08	$31.31^{c,X}$ ±2.53	$0.73^{b,Z}$ ±0.14	$0.82^{b,YZ}$ ±0.08	$1.38^{b,X}$ ±0.04	$0.95^{d,Y}$ ±0.02
GEA0	$21.88^{a,X}$ ±0.06	$11.95^{b,c}$ ±1.00	$19.26^{b,Y}$ ±0.57	$8.99^{b,T}$ ±0.99	$19.58^{a,Y}$ ±0.71	$24.57^{a,c}$ ±1.54	$31.89^{a,Y}$ ±3.31	$52.97^{a,X}$ ±1.52	$1.59^{A,Y}$ ±0.07	$2.51^{a,X}$ ±0.40	$1.42^{b,Y}$ ±0.04	$2.51^{a,X}$ ±0.19
GEA1	$21.88^{a,Y}$ ±0.09	$16.65^{a,Z}$ ±0.57	$50.59^{a,X}$ ±1.19	$13.31^{a,T}$ ±1.16	$16.75^{b,Z}$ ±1.65	$20.86^{b,Z}$ ±1.19	$28.28^{a,Y}$ ±3.67	$44.39^{b,X}$ ±1.81	$1.38^{a,T}$ ±0.09	$2.55^{a,X}$ ±0.10	$1.69^{a,Z}$ ±0.02	$2.22^{b,Y}$ ±0.12

Figure 1. Peroxide, p-Anisidine and TBARS values of fermented sausages

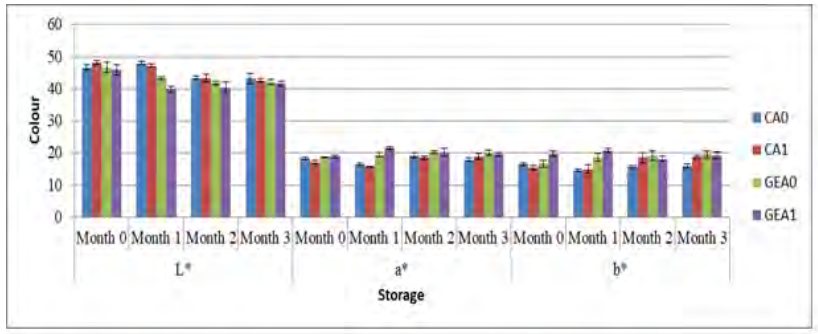

Figure 2. Colour parameters of fermented sausages

Notes