P-04-26

Addition of date by-products extract to improve oxidative stability of raw pork patties (#586)

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Introduction

Meat is an importan source of valuable nutrients, such as high quality proteins, all essential aminoacids, vitamins (B6 and B12), minerals (iron, zinc, selenium, phosphorus) and fat and fatty acids (mono and polyunsaturated). However, oxidative degration of proteins and fatty acids during storage are considered the main causes of meat quality loss, causing changes in nutritional value, texture and color (Faustman et al. 2010; Estévez, 2017). Synthetic antioxidants such butylated hydroxianisol (BHA), butylated hydroxytoluene (BHT), tert-butyl hydroquinone (TBHQ), and propyl gallate (PG) have been commonly used in foods to delay oxidation; however, this industrial practice has been questioned from a food safety standpoint (Faustman et al. 2010). It has been reported that use of natural extracts is a feasible option for the meat industry (Jiang & Xiong, 2016). Industrial byproducts are particularly rich in bioactive compounds with antioxidant activity, such as phenolic compounds which delay or inhibit oxidation of lipids (LOX) and protein (POX) (Rodríguez-Carpena et al. 2011). In addition, *in vitro* and *in vivo* evaluations of date extracts have shown an antioxidant potential attributed to their content of phenolic acids, so that date are recognized as a source of valuable functional ingredients (Sirisena et al. 2015). Thus, the objective was to assess the inhibition of LOX and POX of date byproducts extract in fresh pork patties during refrigerated storage.

Methods

The date by-products extracts were obtained using ultrasound assisted extraction during 1 h. Pork patties were elaborated (80:20 lean:fat ratio) and randomly allocated to the following treatments: Control (C), date seed extract (DSE), date fruit extract (DFE), and butylated hydroxytoluene (BHT). The color of raw pork patties was evaluated in the surface of each sample using a Minolta spectrophotometer; CIE L*a*b* color coordinates were determinate per tenfold (Rodríguez-Carpena et al. 2011). LOX was assessed using the thiobarbituric acid reactive substances (TBARS) method (Pfalzgraf et al. 1995). The POX was measured by the total content of carbonyls and evaluated for 2,4-Dinitrophenylhydrazine (DNPH) derivatization (Oliver et al. 1987). Data analysis was performed using a two-way linear model GLM-ANOVA. Significant differences among means were identified with the Tukey's test ($P<0.05$).

Results

The results obtained in our study showed that color of pork patties varied with treatment and storage time ($P<0.05$) (Table 1). At initial day of storage (day 0), date by-product extracts addition not affect L*, a*, and b* values ($P>0.05$), at last day (day 9), not significant differences were observed in L* and b* values for all treatments ($P>0.05$). Additonaly, the highest ($P<0.05$) redness (a*) values were observed in pork patties treated with DSE. DSE patties presented the lowest value at day 9 (0.71 mg MDA/Kg sample), followed by the BHT and DFE counterparts (1.37 and 2.03 mg MDA/Kg sample, respectively). In regard to POX (Figure 1b), there was a clear correspondence with LOX at day 9, DSE showing the lowest ($P<0.05$) value. However, no significant differences ($P>0.05$) were observed on the same day for DFE, BHT, and C.

Conclusion

In meat and meat products, color influences the acceptability and plays a great role in the purchase decision (Faustman et al. 2010). The a* value can be inversely associated with the LOX value because the latter promotes myoglobin oxidation; also, date extracts contains greenish-brownish pigment that may decreae partties' redness (Sirisena et al. 2015). Lipid hydroperoxides have been identified as primary products of LOX and its decomposition results in aldehydes, ketones, alcohols, volatile organic acids, among others compounds, known as secondary oxidation products. Respect to protein oxidation, reactive oxygen species on muscle proteins results in the loss of sulphydryl groups and the generation fo carbonyl compounds (Faustman et al. 2010; Estévez, 2017). In our study, results indicate that inhibition of LOX and POX of pork patties can be related with the phytochemical compounds present in the extracts, which may exert an antioxidant protective effect by inactivating the formation of free radicals (L•, LO•, and LOO•) (Pfalzgraf et al. 1995). Therefore, date by-products extracts has a good potential to improve shelf-life of pork patties, and they could be used as a natural preservative ingredient for meat and meat products.

References

1. Faustman, C. et al. (2010). Myoglobin and lipid oxidation interactions: Mechanistic bases and control. *Meat science*, *86*(1), 86-94.
2. Estévez, M. (2017). "What's new in meat oxidation?."*New aspects of meat quality*. Woodhead Publishing, 91-109.
3. Jiang, J., & Xiong, Y. L. (2016). Natural antioxidants as food and feed additives to promote health benefits and quality of meat products: A review. *Meat science*, *120*, 107-117.

Notes

4. Rodríguez-Carpena, J.G. et al. (2011). Avocado by-products as inhibitors of color deterioration and lipid and protein oxidation in raw porcine patties subjected to chilled storage. *Meat Science*, *89*(2), 166-173.
5. Sirisena, S. et al. (2015). The emerging australian date palm industry: date fruit nutritional and bioactive compounds and valuable processing by-products. Compr Rev Food Sci and Food Saf 14: 813-823.
6. Pfalzgraf, A. et al. (1995). Alpha-tocopherol contents and lipid oxidation in pork muscle and adipose tissue during storage. J Agric Food Chem 43: 1339-1342.
7. Oliver, C.N. et al. (1987). Age-related changes in oxidized proteins. J Biol Chem 262(12): 5488-5491.

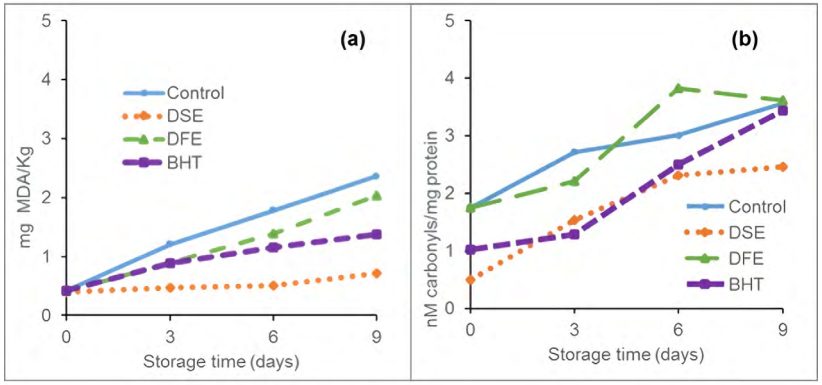

Figure 1 Figure 1. LOX (a) and POX (b) during refrigerated storage of pork patties added with extracts of date by-products.

Table 1. Color changes during storage time in pork patties added with extracts of dates by-products.

Day	C	DSE	DFE	BHT
		L*		
0	60.11 ± 2.31^{ax}	59.81 ± 3.95^{ax}	57.68 ± 2.66^{ax}	65.03 ± 2.73^{ax}
9	60.83 ± 2.03^{ax}	59.39 ± 2.31^{ax}	57.56 ± 1.89^{ax}	61.68 ± 2.54^{ax}
		a*		
0	4.65 ± 0.33^{bx}	5.44 ± 0.31^{ax}	5.44 ± 0.48^{ax}	4.39 ± 0.14^{bx}
9	1.64 ± 0.31^{cy}	3.37 ± 0.30^{ay}	2.75 ± 0.30^{by}	2.68 ± 0.26^{by}
		b*		
0	15.92 ± 1.30^{ax}	16.33 ± 1.34^{ax}	17.06 ± 1.61^{ax}	16.63 ± 1.46^{ax}
9	14.75 ± 1.21^{ax}	15.34 ± 1.43^{ax}	16.56 ± 0.90^{ax}	16.41 ± 0.82^{ax}

C; control, DSE; date seed extract (0.2%), DFE; date fruit extract (0.2%), BHT; butyl hydroxy toluene (0.2%). Different letters (a-c) in the same row indicate differences (P<0.05) between treatments. Different letters (x,y) between columns indicate differences between days of storage (P<0.05).

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