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Coffee bagasse extract enhances antioxidant status of pork patties during chilled storage (#587)

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Introduction

Lipid oxidation (LOX) during storage may adversely affect meat quality and safety because it leads to meat discoloration, nutrient losses and formation of toxic compounds such as malondialdehyde (MDA) (Lee et al. 2005). Synthetic antioxidants like butylated hydroxyanisole (BHA), butylated hydroxytoluene (BHT) and tert-butylhydroquinone (TBHQ) and propyl gallate (PG) have been used to prevent LOX, but they might pose a health risk for consumers (Kahl & Kappus, 1993). Natural antioxidants like those found in waste from the preparation and processing of fruit (bearberry and grape), vegetables (avocado and broccoli), species (black currant, curry, oregano, rosemary an sage) and plants (Ginkgo biloba, green tea and olive oil), can be used as a strategy to reduce such risk (Jayathilakan et al., 2012; Falowo et al., 2014). Coffee bagasse extracts (CBE) are another natural source of bioactive compounds such as phenolic acids (chlorogenic, caffeine, caffeic, trigonelline and protocatechuic acid), which can improve antioxidant activity (Pérez-Hernández et al., 2013). In the present study, pork patties were formulated with two concentration levels of CBE, and compared to Control and BHT samples to assess their antioxidant status during chilled storage.

Methods

Firstly, phenolic compounds of coffee bagasse were extracted with water (1:10) assisted by a ultrasound method (42 KHz/ 25 °C/ 30 min). Thereafter, the mixture was centrifuged (4,200 x g, during 10 min) and the resulted solution was filtered (Whatman No. 4 filter paper), concentrated under reduced pressure, lyophilized and stored at -20 °C under dark, until analysis. Total phenolic compounds (TPC) and antioxidant activity of CBE were determined by the Folin-Ciocalteu and antiradical DPPH• activity (Pérez-Hernández et al., 2013; Ainsworth & Gillespie, 2007; Molyneux, 2004). Pork meat (M. *semimembranosus*, 24 h *postmortem*) was homogenized with fat (20% in final formulation, w/w), salt (1.5%, w/w), and water (5%, v/w) for patties elaboration (40 g each). In each replication (twice) pork patties were assesed in four treatment as follow: untreated pork (control), 0.05 or 1.0% of CBE, and BHT (0.01%). Patties were placed in polypropylene trays and wrapped with PVC film (17,400 cm^3 O_2/m^2/24 h at 23 °C) and stored (4 °C/ 9 days/ under darkness), and subjected to evaluation of pH, thiobarbituric acid reactive substances (TBARS, as a LOX indicator) and color (a* value) (Huang et al., 2011). Data were subjected to ANOVA and means were separated by the Tukey's test ($P<0.05$).

Results

The results showed that TPC level of CBE at 5 mg/mL was 508.1 mg gallic acid equivalents/g of dried extract, while the antiradical DPPH• inhibition at 100 µg/mL was 70%. As shown in Table 1, initial pH values (day 0) of pork patties ranged from 5.89-5.92 ($P>0.05$), and decreased gradually for all treatments during storage. At day 9, the highest pH values ($P<0.05$) were exhibited by patties treated with CBE1%. In this trial, CBE addition to pork patties did not affect ($P>0.05$) redness (a*) values or LOX levels. However, chilled storage caused a reduction in redness (a*) values (Figure 1) and a concomitant increase in LOX levels (Figure 2) for all samples under study ($P<0.05$). At last day of storage (day 9), patties treated with CBE1.0% showed the highest a* values and the lowest LOX levels ($P<0.05$).

Conclusion

Coffee residues are rich in phenolic compounds (ArOH) which have shown antioxidant activity (Pérez-Hernández et al., 2013). ArOH are excellent oxygen radical scavengers because the electron reduction potential of the phenolic radical (OH-group) is lower than the electron reduction potential of oxygen radical (Ainsworth & Gillespie, 2007). Furthermore, the antiradical DPPH• activity of ArOH from natural extracts is associated with their hydrogen donating ability, and the reaction is based on the reduction of the purple-colored radical to its reduced form 1,1-diphenyl-2-picryl hydrazine, residual pale yellow-colored (i.e. DPPH• + ArOH → DPPH-H + ArO•) (Molyneux, 2004). The results of the meat quality parameters pH, color (a* value) and LOX showed that CBE x storage time effect was significant ($P<0.05$). pH and LOX are parameters related with the quality of fresh meat and meat products, and changes in any of them can affect the chemical, technological and sensory properties (Huang et al., 2011). The highest pH value observed in patties treated with CBE1.0% can be explained by the CBE phenols content. CBE1.0% preserved 51.3% of the red color of fresh pork meat and reduced 93.7% of LOX when compared to the control samples during the 9-day storage period. The present results highlight the potential usage of CBE as efficient inhibitors of LOX and color deterioration during chilled storage or raw pork patties. Using these extracts as natural antioxidant could be an effective strategy to enhance the quality of meat and meat products.

References

Notes

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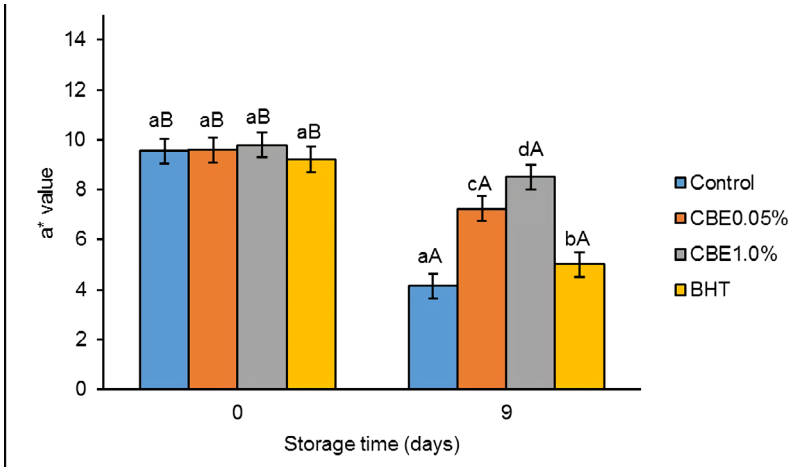

Figure 1

Figure 1. Effect of CBE on a* value of pork patties during storage time. Different literals within the same storage day (a-d) and across

Table 1. Effect of CBE on pH of pork patties during storage time.

Treatment	Day	
	0	9
Control	5.90^{aB}	5.68^{aA}
CBE0.05%	5.89^{aB}	5.74^{bA}
CBE1.0%	5.92^{aA}	5.91^{cA}
BHT	5.89^{aB}	5.72^{bA}

CBE: coffe bagasse extract, BHT: butylhidroxytoluene. Means in the same row (A-B) or column (a-c) with different literal differ (P<0.05).

Table 1

Table 1. Effect of CBE on pH of pork patties during storage time.

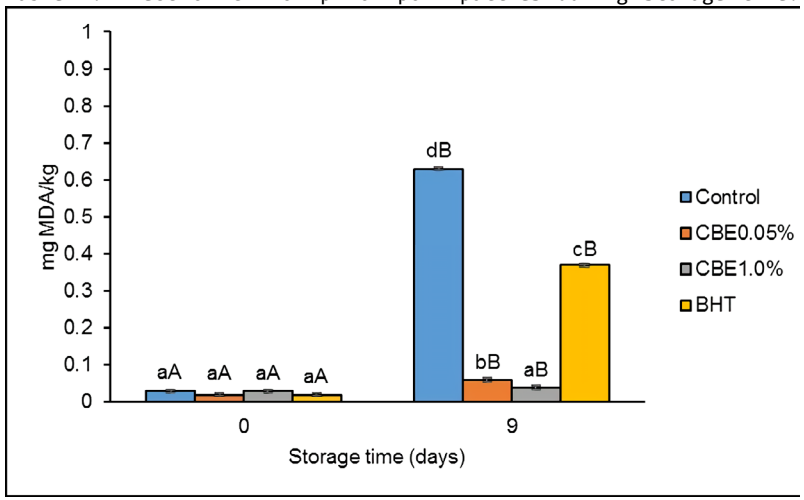

Figure 2

Figure 2. Effect of CBE on LOX of pork patties during storage time. Different literals within the same storage day (a-d) and across storage days (A-B) indicate differences (P<0.05).

Notes