

ASSESSMENT OF NATURAL FOOD INGREDIENTS AS ANTIOXIDANTS IN FRESH AND PREVIOUSLY FROZEN PORK

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Lipid oxidation is the primary cause of loss of quality in meat and meat products during frozen storage (Buckley *et al.*, 1995). It results in the production of off-flavours, odours, reduction of fat soluble vitamins, pigments and lower consumer acceptability (Morrissey *et al.*, 1994). Many studies have indicated that lipid oxidation in meat products can be effectively controlled, or at least, minimized by the use of antioxidants (Gray *et al.*, 1996). Although synthetic antioxidants (BHA, BHT) are effective, concern about possible adverse health risks exists (Kikuzaki *et al.*, 1993). These observations have led to a demand for antioxidants derived from naturally occurring sources (Madsen and Bertelsen, 1995). The objective of the present study was to screen a number of naturally occurring food ingredients to assess their potential as antioxidants in fresh and frozen pork patties, thereby, determining the meat system most suitable for screening purposes.

Methods

Pork *M. semimembranosus* was minced (Mainca mincer, Barcelona, Spain) through a plate diameter of 10 mm. The meat was divided into two equal amounts: one part used for fresh studies and one part frozen (vacuum packed at -20°C for 4 w). Tea-catechins, ginseng, mustard and rosemary were added to both the fresh and previously frozen meat, mixed and reminced. Patties were formed (125 g) using a meat former (Deighton Engineering Ltd., England). The patties were overwrapped in oxygen permeable (6000-8000 cm³/m²/24 hr) clingfilm and held under refrigerated (4°C) display conditions for 10 d. Lipid oxidation was evaluated by the 2-thiobarbituric acid (TBARS) test of Ke *et al.* (1977).

Results

Pork patties containing tea-catechins (Fig. 1a), ginseng (Fig. 1b), mustard (Fig. 1c) and rosemary (Fig. 1d) showed markedly different results in terms of lipid oxidation when assessed in both fresh and previously frozen pork. In general, TBARS values for the controls of the fresh and previously frozen pork increased over time. In fresh patties, no significant differences in TBARS values were observed for ginseng and rosemary when compared to control patties, while significant ($p < 0.05$) differences for mustard and tea-catechins were only observed after 8 and 10 d of retail display. All ingredients showed significant ($p < 0.05$) antioxidant potential from d 2 of refrigerated display to d 10 in patties formed from previously frozen meat. With tea-catechins, there was a 1.5-fold difference between control and treated patties on d 2 which increased to a 2.5-fold difference by d 10. When using ginseng, the difference was 5.0-fold on d 2 compared to a 10.0-fold difference on d 10. With mustard, there was little difference between control and treated patties on d 2, however, by d 10 there was a 2.5-fold difference. With rosemary, there was a 4.0-fold difference between the control and treated patties on d 2 which had increased to an 11.0-fold difference by d 10. For treated patties from previously frozen meat and with the exception of mustard, TBARS values never increased above the initial level at which they started over the 10 d display period. Rosemary was the strongest antioxidant, followed by ginseng, tea-catechins and mustard in order of decreasing effectiveness.

Conclusions

All food ingredients screened showed strong antioxidant potential, however, this effect was dependant on the condition of the meat used to assess the potential. In fresh chilled meat, the food ingredients used failed, or showed limited antioxidant potential, when compared to the control. However, in previously frozen meat, all food ingredients demonstrated strong antioxidant activity and clearer differences were seen between food ingredients in relation to their antioxidant activity. The greater differences observed in antioxidant activity for food ingredients used in previously frozen meat is possibly a reflection of the oxidatively stressed nature of this meat and probably represents a more practical model for antioxidant screening purposes.

References

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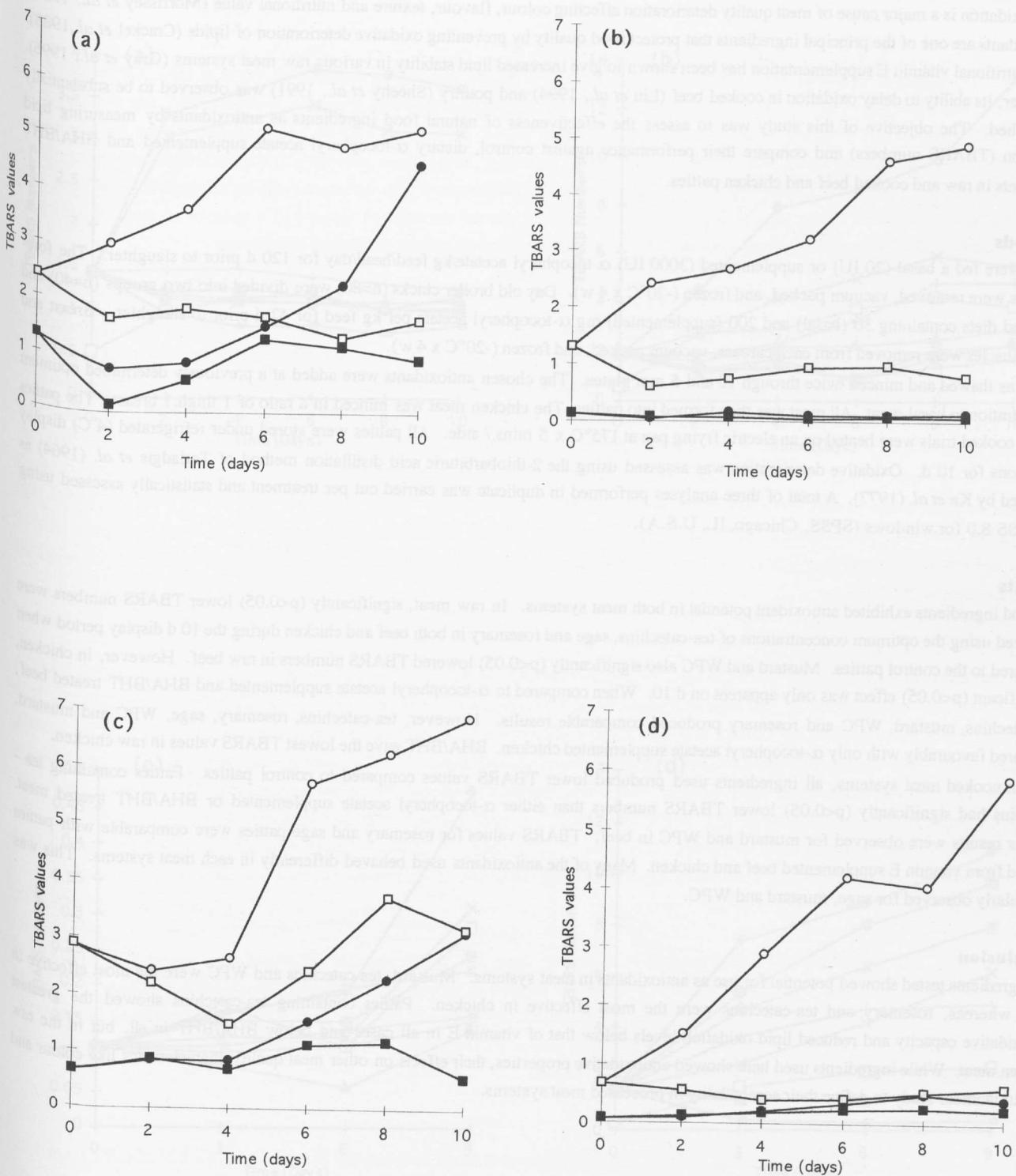


Fig 1 The effect of (a) tea-catechins (b) ginseng, (c) mustard and (d) rosemary on the oxidative stability of fresh and frozen pork patties during refrigerated display at 4°C for 10 days. (●) control of fresh pork patties, (■) antioxidant treated fresh pork patties, (○) control of frozen pork patties and (□) antioxidant treated frozen pork patties.