## ASSESSMENT OF PLANT EXTRACTS AND MISCELLANEOUS FOOD INGREDIENTS AS ANTIOXIDANTS IN RED (BEEF) AND WHITE (CHICKEN) MEAT SYSTEMS

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### Background

Lipid oxidation is a major cause of meat quality deterioration affecting colour, flavour, texture and nutritional value (Morrissey *et al.*, 1994). Antioxidants are one of the principal ingredients that protect food quality by preventing oxidative deterioration of lipids (Crackel *et al.*,1988). Supranutritional vitamin E supplementation has been shown to give increased lipid stability in various raw meat systems (Gray *et al.*, 1996). However, its ability to delay oxidation in cooked beef (Liu *et al.*, 1994) and poultry (Sheehy *et al.*, 1991) was observed to be substantially diminished. The objective of this study was to assess the effectiveness of natural food ingredients as antioxidants by measuring lipid oxidation (TBARS numbers) and compare their performance against control, dietary α-tocopheryl acetate supplemented and BHA/BHT treatments in raw and cooked beef and chicken patties.

### Methods

Cattle were fed a basal (20 IU) or supplemented (3000 IU) α-tocopheryl acetate/kg feed/head/day for 120 d prior to slaughter. The fore-quarters were removed, vacuum packed, and frozen (-20°C x 4 w). Day old broiler chicks (n=80) were divided into two groups (n=40) and were fed diets containing 30 (basal) and 200 (supplemented) mg α-tocopheryl acetate per kg feed for 42 d prior to slaughter. Breast and thigh muscles were removed from each carcass, vacuum packed, and frozen (-20°C x 4 w).

Meat was thawed and minced twice through 10 and 5 mm plates. The chosen antioxidants were added at a previously determined optimum concentration to basal meat. All meat was then formed into patties. The chicken meat was minced in a ratio of 1 thigh:1 breast. The patties for the cooked trials were heated on an electric frying pan at 175°C x 5 mins / side. All patties were stored under refrigerated (4°C) display conditions for 10 d. Oxidative deterioration was assessed using the 2-thiobarbituric acid distillation method of Tarladgis *et al.* (1964) as modified by Ke *et al.* (1977). A total of three analyses performed in duplicate was carried out per treatment and statistically assessed using the SPSS 8.0 for windows (SPSS, Chicago, IL, U.S.A).

### Results

All food ingredients exhibited antioxidant potential in both meat systems. In raw meat, significantly ($p<0.05$) lower TBARS numbers were observed using the optimum concentrations of tea-catechins, sage and rosemary in both beef and chicken during the 10 d display period when compared to the control patties. Mustard and WPC also significantly ($p<0.05$) lowered TBARS numbers in raw beef. However, in chicken, a significant ($p<0.05$) effect was only apparent on d 10. When compared to α-tocopheryl acetate supplemented and BHA/BHT treated beef, tea-catechins, mustard, WPC and rosemary produced comparable results. However, tea-catechins, rosemary, sage, WPC and mustard, compared favourably with only α-tocopheryl acetate supplemented chicken. BHA/BHT gave the lowest TBARS values in raw chicken.

In both cooked meat systems, all ingredients used produced lower TBARS values compared to control patties. Patties containing tea - catechins had significantly ($p<0.05$) lower TBARS numbers than either α-tocopheryl acetate supplemented or BHA/BHT treated meat. Similar results were observed for mustard and WPC in beef. TBARS values for rosemary and sage patties were comparable with patties formed from vitamin E supplemented beef and chicken. Many of the antioxidants used behaved differently in each meat systems. This was particularly observed for sage, mustard and WPC.

### Conclusion

All ingredients tested showed potential for use as antioxidants in meat systems. Mustard, tea-catechins and WPC were the most effective in beef, whereas, rosemary and tea-catechins were the most effective in chicken. Patties containing tea-catechins showed the greatest antioxidative capacity and reduced lipid oxidation levels below that of vitamin E in all cases and below BHA/BHT in all, but in the raw chicken meat. While ingredients used here showed antioxidative properties, their effects on other meat quality characteristics like colour and flavour is under study to define their acceptability in processed meat systems.

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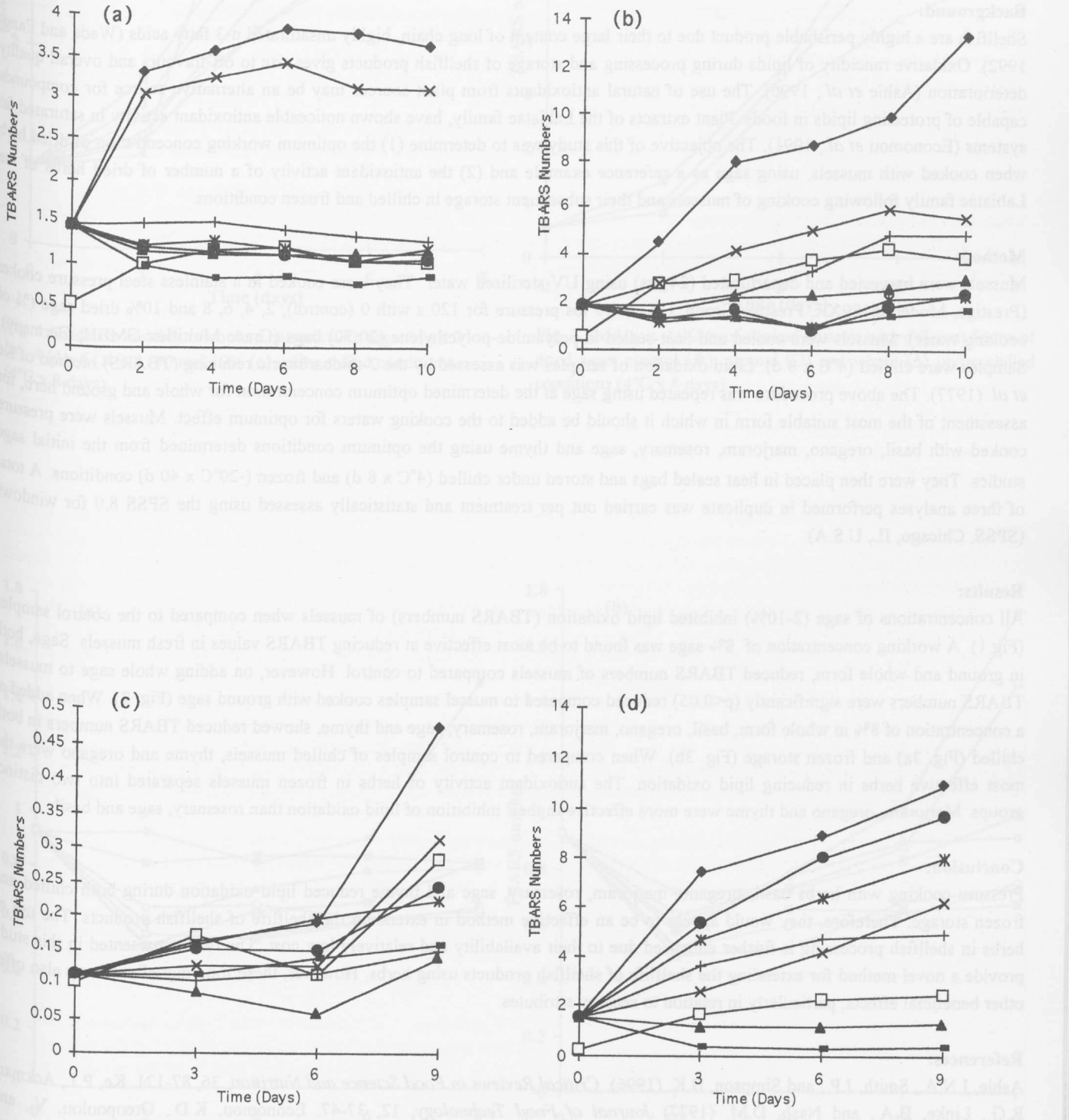


Fig. 1 Effect of a range of antioxidants on TBARS numbers for (**a**) raw and (**b**) cooked beef, and (**c**) raw and (**d**) cooked chicken, during refrigerated display at 4°C for 10 d. ( ◆ ) control meat, ( □ ) α-tocopheryl acetate supplemented meat, ( ▲ ) BHA/BHT, ( ✱ ) whey protein concentrate, ( × ) sage, ( + ) rosemary, ( ● ) mustard, ( – ) tea-catechins.