VITAMIN E SUPPLEMENTATION AND SALT ADDITION AND THEIR EFFECTS ON THE OXIDATIVE STABILITY AND WARMED-OVER FLAVOUR (WOF) OF TURKEY PATTIES

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Background

Lipid oxidation in muscle foods is initiated in the membrane-bound phospholipids (Morrissey *et al.*, 1994), which are susceptible to peroxidation due to their high concentration of long chain Polyunsaturated Fatty Acids (PUFA). PUFA are very vulnerable to free-radical attack because of their double bond structure (MacPherson, 1994). It is generally accepted that the stability of muscle fats improves proportionally to the dietary vitamin E dose (Franchini *et al.*, 1989). Dietary α-tocopheryl acetate supplementation of poultry diets results in an increase in the stability of poultry meat (Sheehy *et al.*, 1993) while sodium chloride added during processing promotes lipid oxidation (King and Bosch, 1990). Turkey meat is highly unsaturated and is therefore prone to the development of Warmed-Over Flavor (WOF) (Bruun-Jensen *et al.*, 1996). Wilson *et al.* (1976) ranked the susceptability of several different types of meat to WOF as turkey > chicken > pork > beef > lamb.

The objective of the present study was to determine the effects of dietary α-tocopheryl acetate supplementation on the oxidative stability of raw and cooked turkey leg and breast patties. The development of Warmed-Over Flavour (WOF) was also investigated.

Materials and Methods

Turkey poults (n=14) were divided at random into two groups (n=7) and were fed diets containing 20 (basal) or 600 (supplemented) mg α-tocopheryl acetate/kg feed/day for 21 weeks prior to slaughter. Following slaughter, the leg and breast meat was removed. Four batches of patties (30 g) were produced from both leg and breast meat. Two batches were formed from control meat; control meat and control meat plus 1% salt. Two similar groups were formed from supplemented meat. All patties were overwrapped with oxygen permeable (6000-8000 $cm^3/m^2/24h$) polyvinyl-chloride film and held under refrigerated (4°C) display (fluorescent lighting, 616 lux) for 10 days. Lipid oxidation in meat samples was assessed by the 2-thiobarbituric acid method of Ke *et al.* (1977). The α-tocopherol content in the muscle tissues was determined using the extraction procedure of Bieri *et al.* (1975) with modification of Buttriss and Diplock (1984) and quantified by HPLC (Sheehy *et al.*, 1993). Taste panals to determine WOF were conducted using the method of Ang and Lyon (1990).

Results

Dietary supplementation with α-tocopheryl acetate significantly (p<0.001) increased α-tocopherol tissue levels. The mean vitamin E levels in the control (20 mg α-tocopheryl acetate/kg feed/day) leg and breast meat was 0.9 and 0.8 μg α-tocopherol/g tissue, respectively. Supplemented (600 mg α-tocopheryl acetate/kg feed/day) leg and breast meat contained 8.2 and 5.9 μg α-tocopherol/g tissue, respectively. Dietary α-tocopheryl acetate supplementation significantly (p<0.001) reduced TBARS numbers in raw and cooked patties during the display period. The TBARS values of patties from control (20 mg α-tocopheryl acetate/kg feed/day) and supplemented (600 mg α-tocopheryl acetate/kg feed/day) groups increased following cooking. In general, higher TBARS numbers were found in leg muscle patties (Figure 1a and 1c) as compared to breast patties (Figure 1b and 1d), despite higher α-tocopherol concentrations in leg muscle. The level of WOF was greater in the leg patties (Figure 2a) than in breast patties (Figure 2b). Higher levels of WOF were detected in control over treatment patties, the highest degree of WOF being found in control patties containing 1% salt. Salt significantly (p<0.001) increased the degree of WOF of the leg and breast patties, while vitamin E supplementation significantly (p<0.001) reduced WOF for leg patties only.

Conclusions

The dietary supplementation of turkeys with 600 mg α-tocopheryl acetate was effective in improving the oxidative stability of both raw and cooked turkey leg and breast patties. Supplementation also lead to a reduction in the degree of WOF detected in patties by taste panalists.

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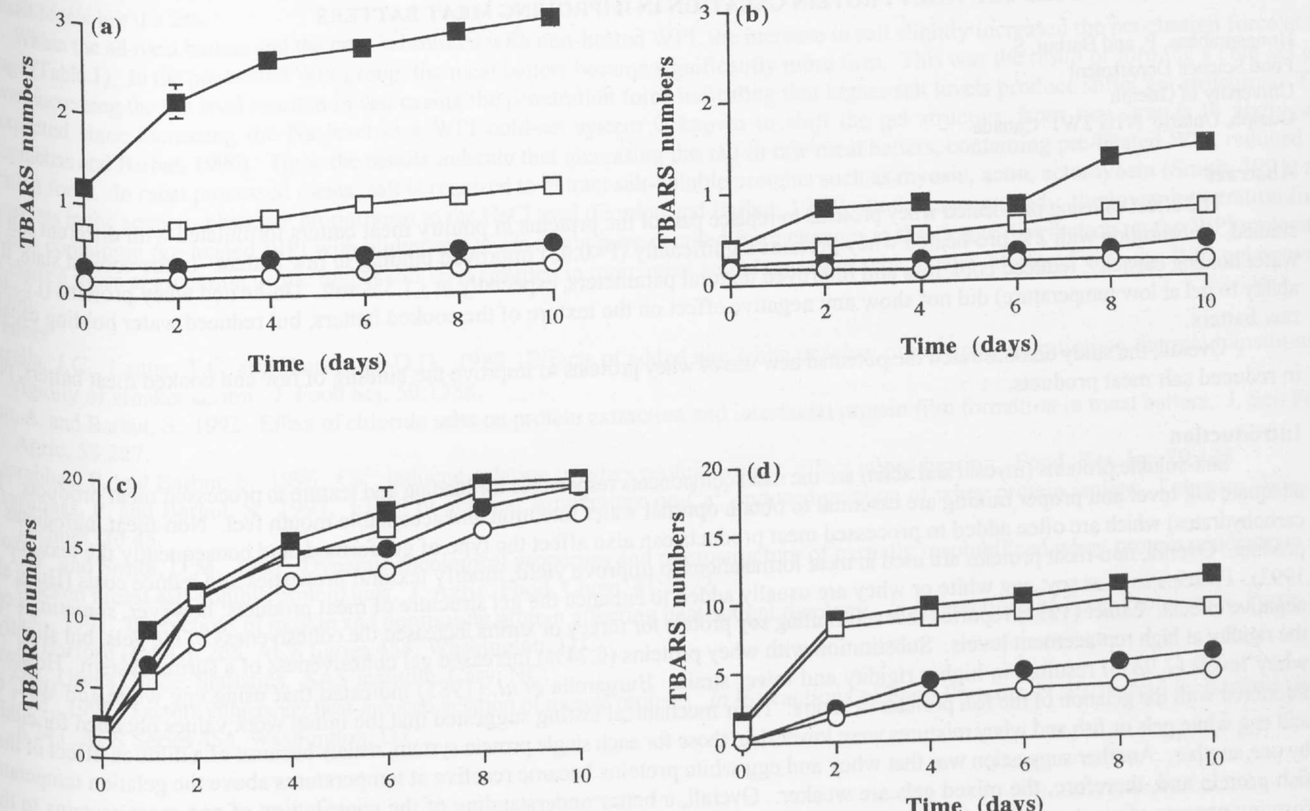

Figure 1 Effect of dietary α-tocopheryl acetate supplementation and the addition of 1% salt on the oxidative stability of overwrapped **(a)** raw leg patties, **(b)** raw breast patties, **(c)** cooked leg patties and **(d)** cooked breast patties during refrigerated display at 4°C for 10 days. (□) Control patties (■) Control patties plus 1% added salt (○) Supplemented patties and (●) Supplemented patties plus 1% added salt. Control and supplemented turkey groups fed 20 and 600 mg α-tocopheryl acetate/kg feed, respectively, for 21 weeks prior to slaughter.

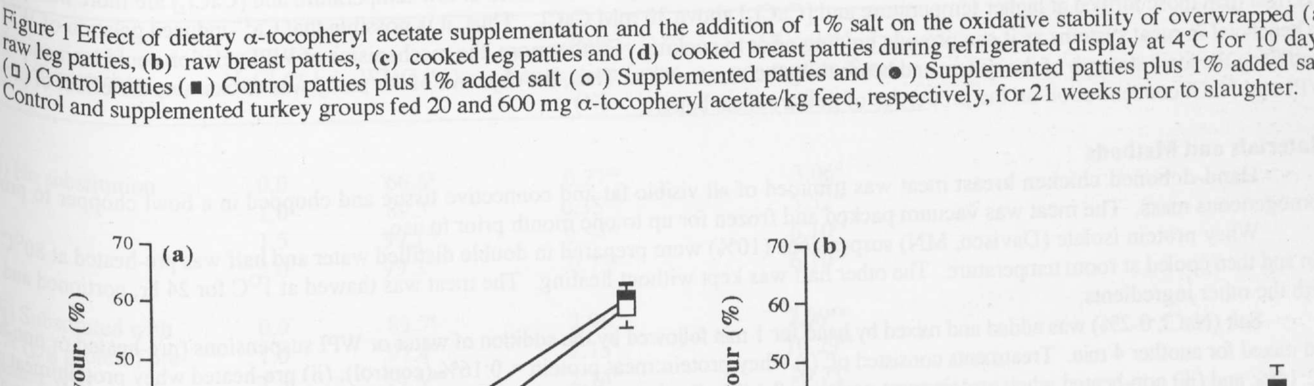

Figure 2 Effect of dietary α-tocopheryl acetate supplementation and the addition of 1% salt on the Warmed-Over Flavour (WOF) of overwrapped **(a)** cooked leg patties and **(b)** cooked breast patties during refrigerated display at 4°C for 4 days. (□) Control patties, (■) Control patties plus 1% added salt, (○) Supplemented patties and (●) Supplemented patties plus 1% added salt. Control and supplemented turkey groups fed 20 and 600 mg α-tocopheryl acetate/kg feed, respectively, for 21 weeks prior to slaughter.