OIL AND VITAMIN E SUPPLEMENTATION AND COLOUR STABILITY OF FRESH AND PROCESSED PORK

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BACKGROUND

Oxidation is a major cause of chemical deterioration of food due to its effects on organoleptic qualities such as taste, flavour and colour. Colour type and stability during prolonged exposure to light is a key element of shelf life. Oxidation of lipids and myoglobin are strictly related (Faustman *et al.*, 1992; Chan *et al.*, 1997; Sahoo e Anjaneyulu, 1997). On the one hand radicals produced from lipid oxidation appear to accelerate myoglobin oxidation directly, or indirectly by weakening muscle reducing systems. On the other hand metmyoglobin and oxymyoglobin appear to be able to catalyse lipid oxidation, the latter probably through hydrogen peroxide generated during oxidation. There seems to exist a direct relationship between malonhaldehyde formation and metamyoglobin increase.

The research which has been undertaken aimed at studying the effect of increasing muscular content of vitamin E on colour stability of fresh and processed pork.

METHODS

A group of 84 pigs was raised as described by Zanardi *et al.* (1998). Colour stability trials were carried out on fresh chops, on salame Milano and on the hams. Chops were packed in oxygen-permeable film and under vacuum, salame Milano and ham slices were packed in protective atmosphere and under vacuum. The packs were placed in a refrigerated display cabinet (4°C) exposed to illumination with fluorescent lamps (Philips TLD 18W/96: 6500 K, 97 chromatic index, 65 ratio lumen/watt) at a light intensity of about 1000 lux. The appearance of the brown colour of metamyoglobin was evaluated by a panel according to a 5 points scale for brown colour (1 = very light; 5 = very deep). The test lasted until average scores were higher than 3, considered to be the level above which consumers would not buy the packets.

RESULTS AND DISCUSSION

No significant differences were observed in the rate of brown appearance in oxygen permeable packed chops. Differences have emerged in the rate of brown formation in chops packed under protective atmosphere (Fig. 1). The group supplemented with 200 ppm vitamin E, in particular, was associated with a significantly lower rate of brown metamyoglobin formation. Protective atmosphere packaging allowed storage times of up to 20 days as opposed to about 1 week of oxygen permeable film and that could be the explanation of the phenomenon observed

Evaluations of colour stability of salame Milano (Fig. 2; 3), both for vacuum packaging and protective atmosphere, have shown a quicker rate of oxidation for the diets with oil supplementation compared with the control diet. No differences were observed on the basis of Vitamin E supplementation. The lower colour stability of salame from oil supplemented diets could be explained with technological problems. The fat of salami produced with the meat of oil supplemented pigs tended to smear during mincing and mixing and the salami presented frequent cracks on slicing.

Colour stability trials of ham slices lasted for nearly three months. In all cases, about 2 months were required before evaluation scores got near to a value of 3. Vacuum packaging appeared to be slightly more protective than modified atmosphere as a score of 3 points was reached about 10 days later. Control samples showed a modest tendency towards quicker oxidation rates. The difference with the other samples, though, was very limited and not significant. The oil and vitamin E supplemented samples showed equivalent evolutions with storage times.

Literature reports on the relationship between vitamin E content and meat colour stability are variable. For instance, colour measures (L*,a*,b*) of L. dorsi did not show significant changes over 10 days refrigerated storage in relation with vitamin E content (0.5, 2.6 and 4.7 ppm) (Asghar *et al.*, 1991). An improvement of the stability of a* values, as a consequence of vitamin E supplementation, was reported after 8 days refrigerated storage of chops which had been frozen for 4 months (Monahan *et al.*, 1992). Honikel (1997) reported a tendency, although not always significant, towards darker meat (higher a* values) with increasing vitamin E supplementation.

In conclusion, colour stability trials suggested that higher Vitamin E contents could be associated with slower myoglobin oxidation rates in fresh chops packed in protective atmosphere. Salame colour stability tests could not probably show any effect of vitamin E due to the presence of oil. Significant differences among dietary groups were not observed in Parma ham. Such results do not openly disagree with what had been observed with chops where vitamin E appeared to have some effect. The myoglobin chemical status in ham is not known yet and the exact compound responsible for Parma ham colour in the absence of nitrate/nitrite has not been identified. Such a molecule, therefore, has not been fully investigated and its oxidative stability and possible interactions with vitamin E are not known.

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Figure 1 - Fresh chops packed in protective atmosphere : rate of brown colour appearance

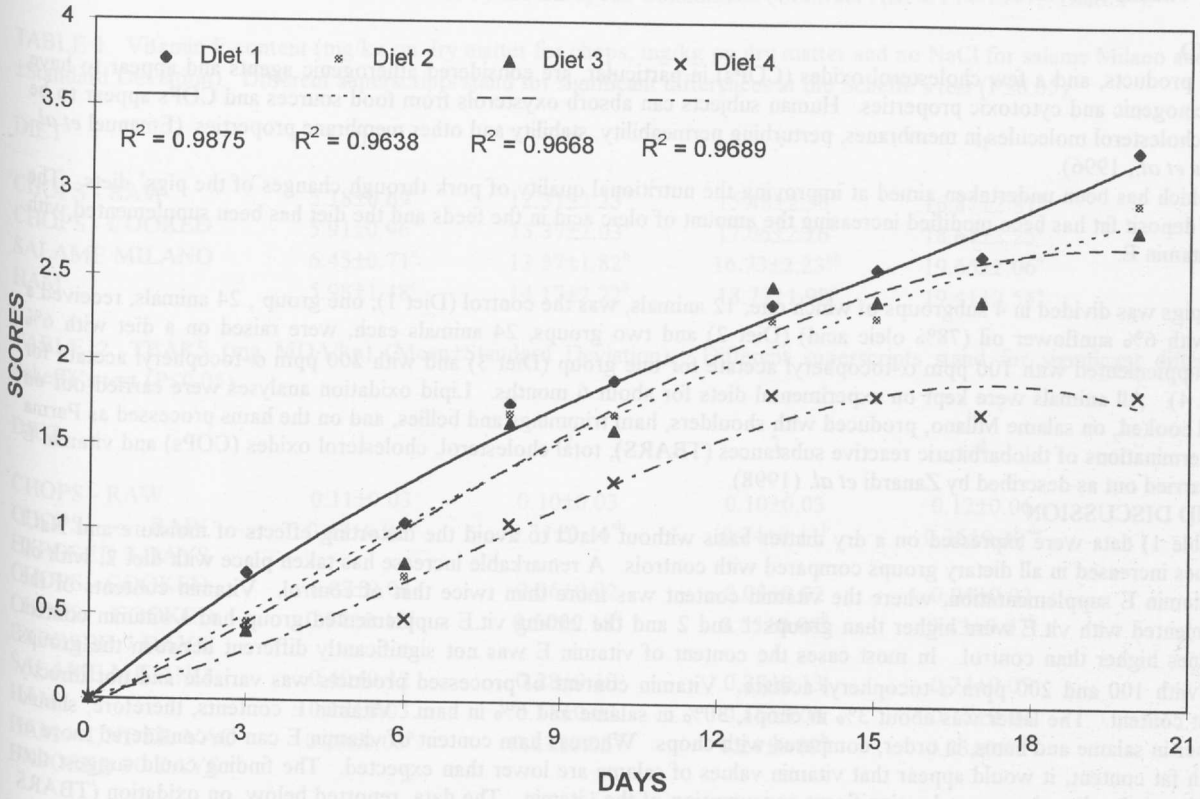

Figure 2 - Salame Milano packed under vacuum : rate of brown colour appearance

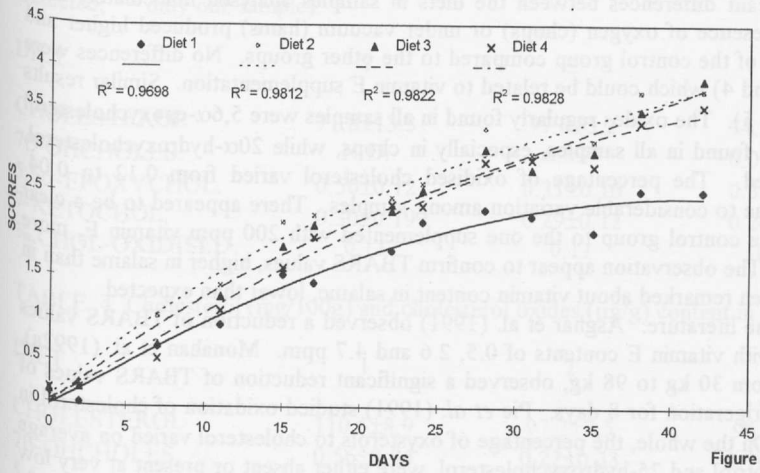

Figure 3 - Salame Milano packed in protective atmosphere : rate of brown colour appearance