An Inhibition of TBA Formation in Cooked and Uncooked Lamb and Chicken Patties Using Alpha-Tocopherol.

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The level of alpha-tocopherol (0, 100 and 200 ppm) were added to cooked and/ or uncooked lamb and chicken patties as an antioxidant during storage at 4°C, after packaging the products either under vacuum or atmospheric pressure in polyethylene bags. Lipid oxidation was measured using the thiobarbituric acid TBA as well as organoleptic tests. Data revealed that the level of 200 ppm of alpha-tocopherol was recommendable. However,positive relation was observed between the level of alpha-tocopherol and reducing rancidity in both cooked and uncooked patties of lamb and chicken. TBA numbers increased during storage of cooked products at 4°C with increasing time of storage. The highest level of alpha-tocopherol (200 ppm) resulting the lowest TBA level of uncooked patties of both lamb and chicken which were packaged under vacuum and stored up to 270 days at -20°C. Organoleptic evaluation revealed that the level of alpha-tocopherol (200 ppm) slow rancidity in cooked lamb patties which were packaged under atmospheric pressure only comparing with the other treatments. While, paelists easily detected flavor difference due to 0 and 100 ppm alpha-tocopherol after 240 days of storage under -20°C either packaged under vacuum or atmospheric pressure.

AN INHIBITION OF TBA FORMATION IN COOKED AND UNCOOKED LAMB AND CHICKEN PATTIES USING ALPHA-TOCOPHEROL.

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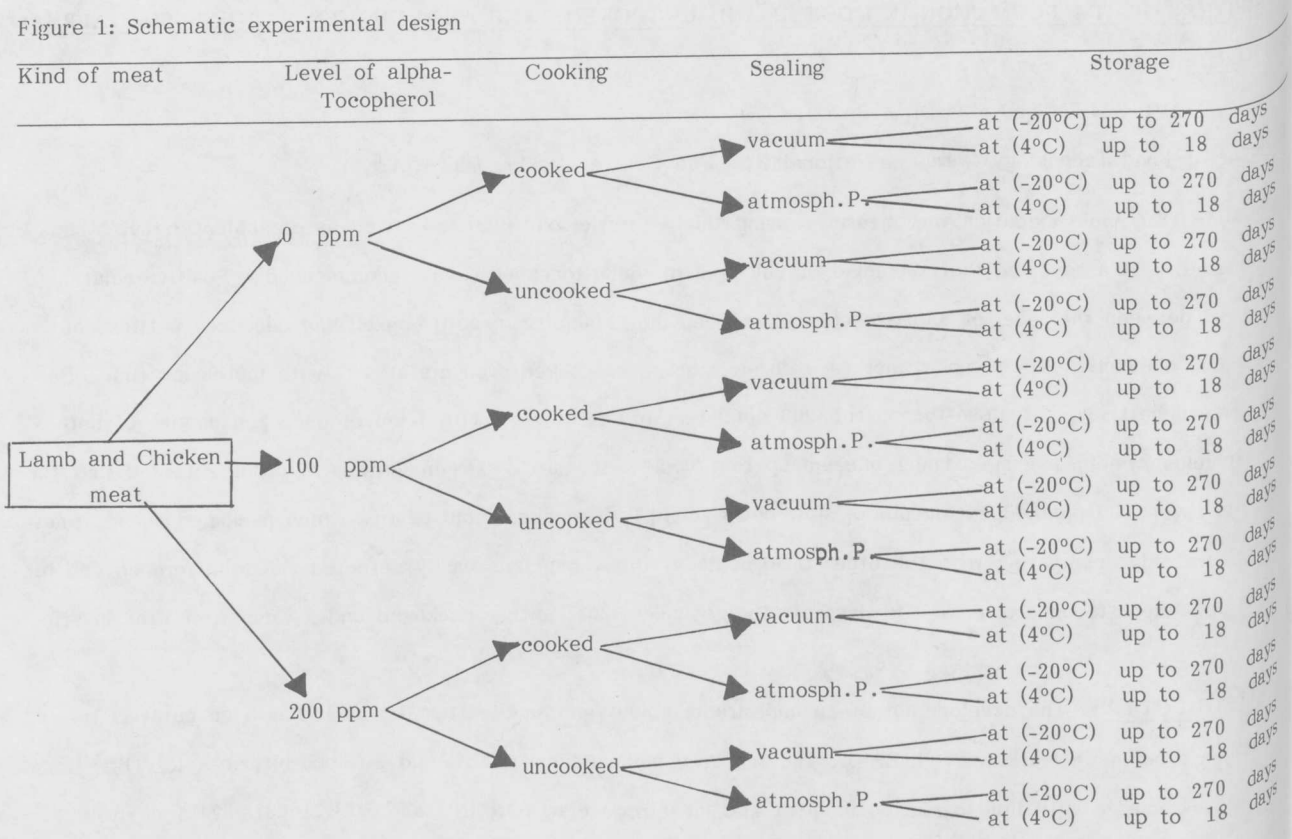
SUMMARY: Lipid oxidation was measured using thiobarbituric acid (TBA), as well as organoleptic tests had been evaluated. Data revealed that the level of 200 ppm of alpha-tocopherol was recommended. Positive relation was observed between the level of alpha-tocopherol and reducing rincidity in both cooked and uncooked patties of both lamb and chicken. TBA numbers increased during storage of cooked products at 4°C with increasing time of storage. The highest level of alpha-tocopherol (200 ppm) resulted the lowest TBA level of uncooked patties of both lamb and chicken which packaged under vaccum up to 270 days at -20°C. Organoleptic evaluation revealed that the approperiate level (200 ppm) alpha-tocopherol slow down rincidity in cooked lamb patties which packaged under atmospheric pressure only, comparing with the other treatments. While, panelists easily detected flavor difference due to 0 and 100 ppm alpha-tocopherol after 240 days of storage under -20°C either packaged under vacuum or atmospheric pressure.

INTRODUCTION: The development of an undesirable colour and smell after the meat has been cut was the most common problem in marketing (GREENE, 1969). Both malonaldehyde (MA) and 2-thiobarbituric acid (TBA) contents are associated with lipid oxidation in meat and meat products (KONSING and SILK,1963). TBA analysis demonstrated that turkey meat is most susceptible to warmed-over flavor development followed closely by chicken then by pork, beef and mutton in that order "WILSON et al.(1976)". The last authors added that, the most dramatic

changes occurred during storage of cooked meat at refrigerated temperature 4°C within 48 hours. A survey was m of the MA content of fresh and processed meat samples obtained from supermarkets showed that 92% of the proces or cured meats and 38% of the fresh meats contained less than 1 ppm MA. Meanwhile, cooking led to a slight inc ease in MA of most meat samples, but up to 10-fold increases in roasts cooked for 3 hours (SIU and DRAPER,197 Recently, alpha-tocopherol had been added to meat and meat products instead of traditional additives as ascorbic ac or modified gas atmosphere packaging after dip treatment (OKAYAMA, 1987 and OKAYAMA et al.,1987). So, this work aims to determine the effect of alpha-tocopherol as antioxidant either in cooked or uncooked lamb and chicke patties and to determine the effect of alpha-tocopherol level on lipid oxidation.

MATERIALS and METHODS: Lamb and chicken meat were obtained after slaughtering and cleaning, then stor in the refrigerator for 24 hours. A nested classification experimental design had been conducted to represent all the treatments and replicates of the study as shown in (Fig.1). Thiobarbituric acid (TBA) was determined according to (PEARSON, 1970) which expressed TBA numbers in terms of milligrams (mg) malonaldhyde (MDA) per 1000 gram sample. Also, off-flavor deterioration had been evaluated.

Figure 1: Schematic experimental design



RESULTS AND DISCUSSION: The effect of (0, 100, 200 ppm) alpha-tocopherol on TBA concentrations of cooked and/ or uncooked lamb and chicken patties during storage at -20°C were presented in Figure 2. Data showed that the highest concentrations of TBA were obtained from the treatment samples of 0 ppm alpha-tocopherol which sealed at atmospheric pressure at any of the studied intervals. Contrary, the lowest figure was obtained from the treatment of 200 ppm alpha-tocopherol which sealed under vacuum. An intermediate values of TBA values were obtained from the treatment of 100 ppm alpha-tocopherol. But the associated effect of alpha-tocopherol level and method of sealing was obviously noticed in the treatment samples of 200 ppm alpha-tocopherol sealed under vacuum. These findings were in accordance with those reported by "WILSON et al.(1976), SIU and DRAPER (1978), LOVE (1983) and WHANG et al. (1986)" . The last authors showed that the level of 200 ppm alpha-tocopherol slowed down the rate of oxidation in cooked and / or uncooked ground pork stored at -20°C. A gradual increase in TBA content of all treatments were obtained by advancing the period of storage at -20°C. After 270 days a neglible difference in TBA content was obtained between the treatments of 100 ppm alpha-tocopherol sealed under vacuum and sealed at atmospheric pressure.

Regarding the effect of cooking, data showed that the treatments of both cooked patties had higher values of TBA comparing with those of uncooked ones. It is noticable that the effect of cooking was markedly observed up to 90 days of storage at -20°C, then slight,if any difference in TBA contents were obtained between cooked and uncooked patties either sealed under vacuum or atmospheric pressure. These findings were confirmed by "NEWBURG andCONCON (1987) and DAWSON & SCHIERHOLZ (1976). They hypothesized that the rate of chemical reaction is directly related to temperature. So, the formation as well as the degradation of this aldehyde would be affected by time temperature, time of cooking, mode of heat transfer as well as the acidity of the meat.

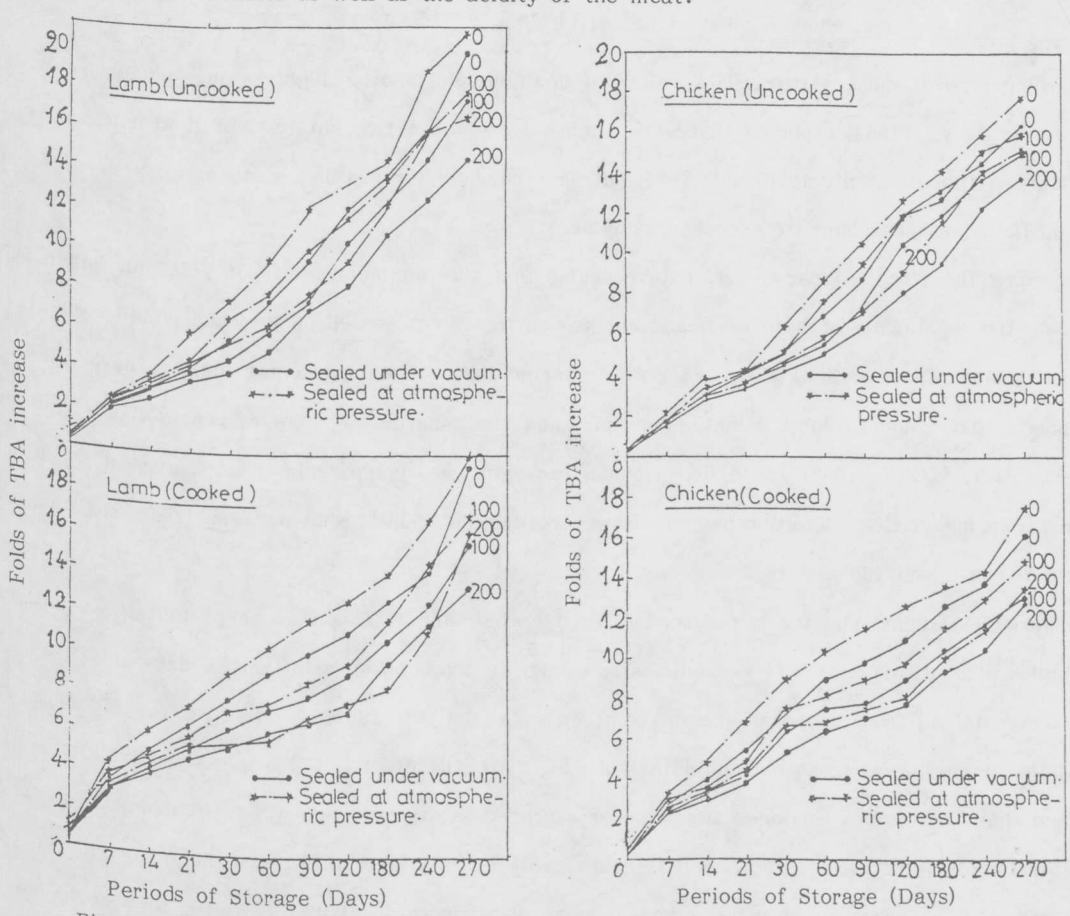


Fig.2. The relationship between the level of alpha-tocopherol and TBA values of both lamb and chicken meat stored at (-20°C) up to 270 days.

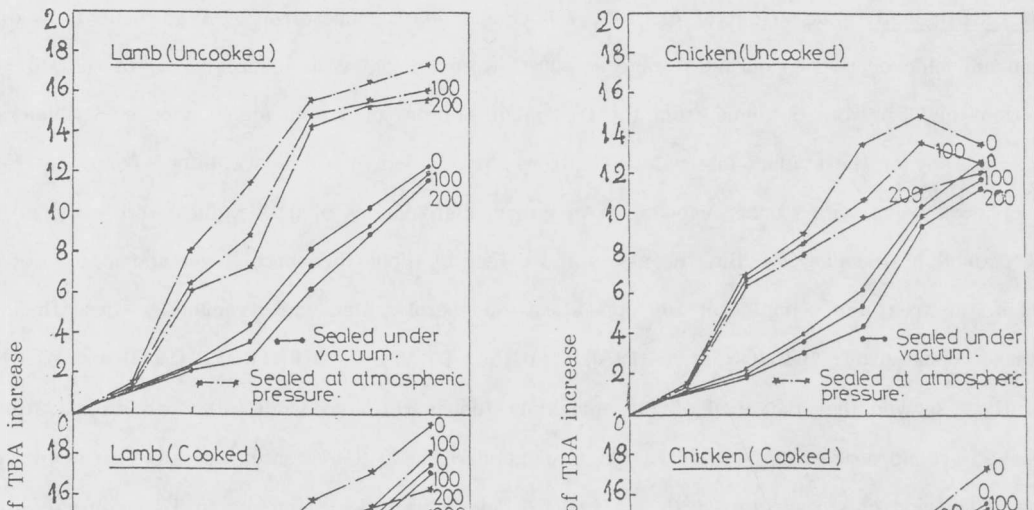


Fig.3. The relationship between the level of alpha-tocopherol and TBA values of both lamb and chicken meat stored at (4°C) up to 18 days.

Regarding type of meat patties, TBA values of lamb samples showed higher values comparing with chicken samples. Also, (LOVE, 1983) reported that, Fe^{3+} hemes were the active catalysts of lipid oxidation in muscles. the other hand, (WILSON et al.,1976) exhibited that TBA numbers for red and white muscles were of about the magnitude in both fresh eaw and fresh cooked samples.

Concerning the effect of packaging, data revealed that the minimum values of TBA and rancid flavor were obtained from the treatments of both lamb and chicken patties which sealed under vacuum and kept at -20°C. findings are in accordance with (LOVE, 1983) who reported that vacuum packaging limitate oxygen availability packaged meat. This should inhibit oxidation of lipids and minimize development of rancid flavor and accompanying TBA values. Also, (LOVE, 1983) added that vacuum packaging was comparable to packaging in N_2 atmosphere, superior to packaging in CO_2 gas atmosphere. However, a direct relationship between treatment level and TBA was found between 0 and 760 mm Hg.

The variables studied had the same trend in refrigerated samples (Fig.3), except that the values of TBA cooked samples after 18 days at 4°C were almostly similar to those obtained after 270 days at -20°C. While, values of TBA obtained from uncooked samples kept either at 4°C for 180 days or -20°C for 270 days were similar. These findings were in agreement with those of "WILSON et al.(1976) and DAWSON & SCHIERHOLZ who reported that TBA values remained the same or degraded as storage time at -18°C advanced up to 12 when no antioxidants were used. The panelists could easily detect flavor difference due to 0 and 100 ppm alpha-tocopherol after 12 - 15 days of both cooked meat samples refrigerated at 4°C. While, they could not detect flavor difference up to 180 days in samples kept at -20°C. However, the level of 200 ppm showed no flavor

difference till 12 days of refrigerating and 270 days of freezing in both meat patties. Moreover, 200 ppm alpha-tocopherol resulted no flavor difference in uncooked patties at 18 and 270 days of refrigerated and freezed chicken samples, respectively.

CONCLUSION: The most dramatic effect was obtained from the treatments of 0 ppm alpha-tocopherol, cooked lamb patties, sealed at atmospheric pressure and refrigerated for 18 days. While, 200 ppm alpha-tocopherol added to uncooked chicken patties sealed under vacuum and freezed (-20°C) for 270 days resulted in minimizing TBA values. However, the level of 200 ppm alpha-tocopherol was recommended in all treatments. Such observation was obviously obtained from the treatments of uncooked chicken patties. In other words, an obvious associated effect was due to the combined treatment of 200 ppm alpha-tocopherol and uncooked chicken patties.

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