



EFFECT OF THYME AND OREGANO AQUEOUS TEA INFUSIONS ON THE LIPID OXIDATION AND SENSORY CHARACTERISTICS OF FRANKFURKTERS SAUSAGES

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ABSTRACT

Lipid oxidation is one of the main limiting factors for the quality and acceptability of frankfurkter type of sausages. The antioxidant activity has been measured using a TBA assay. Dried oregano (*Origanum vulgare*) and thyme (*Thymus vulgare*) were purchased from a local store and kept in dark until the use. Aqueous extracts were prepared by one-step extraction with 3 g of each pulverized plant. Samples of freshly cooked sausages were evaluated by a 6 member semi-trained panel of laboratory co-workers. Panelists evaluate appearance overall texture, flavour, aroma and overall acceptability on a 6 point hedonic scale. In this work the antimicrobial and antioxidant effect of *Thymus vulgare* and *Origanum vulgare* significantly reduced ($p < 0.05$) lipid oxidation in frankfurkters sausages on 10th day of aerobic storage. The organoleptic changes in sausages had no negative effect on the sensory value of cooked sausages. Results obtained in this work indicated the technical viability of using the oregano and thyme aqueous tea infusions in relative low concentration, which is possible to enlarge the shelf-life of fresh sausages with the desired slight alteration of the original taste parameters. Results indicate that thyme and oregano aqueous tea infusions compare to essential oils can be cheaper alternative incorporate into pork frankfurkters as natural antioxidants.

Keywords: Frankfurkters; thyme; oregano; lipid oxidation; sensory quality

INTRODUCTION

The main advantage of essential oils with antibacterial and antioxidant activity is that they can be used in any food and are generally recognized as safe (GRAS) (USFDA, 2006), as long as their maximum effects are attained with minimal change in the organoleptic properties of the food (Viuda-Martos et al., 2009). It is well known that potency of essential oil in food system is generally reduced when compared to *in vitro* work, as the presence of fats, carbohydrates, proteins, salts and pH strongly influence the effectiveness of these agents (Burt, 2004). The food matrix can represent a physical hurdle and an essential oil dissolved in the fat of the food will be less available to act on bacteria present in aqueous phase. However, increased doses of essential oils required for food preservation, can also negatively influence taste or odor (Tserennadmid et al., 2010). On the other hand the water dispersible antioxidants most likely partitioned with the lipid phase, resulting in less protection of the more polar sarcoplasm to oxidation (Hayes et al., 2009). Extracts of oregano leaves contain flavanones, dihydroflavonols, favonols and flavones. Aqueous tea infusions from thyme and oregano represent a good source of the compounds with significant antioxidant activity.

Kulišić et al. (2006) found that oregano and thyme aqueous tea infusions have high amount of total phenols (12,500 mg.L⁻¹ gallic acid equivalent, GAE) and flavonoids (9,000 mg.L⁻¹ GAE). The rosmarinic acid was dominant in both oregano (123.11 mg.g⁻¹) and wild thyme (93.13 mg.g⁻¹). According to Matsuura et al. (2003) water soluble and antioxidant active ingredients from the oregano leaves were 4'-O-beta-D-glucopyranosyl-3',4'-dihydroxybenzylprotocatechuate and 4'-O-beta-D-glucopyranosyl-3',4'-dihydroxybenzyl-4-Omethylprotocatechuate.

The objective of this study was to examine antioxidant activity of thyme and oregano aqueous tea infusions in pork sausages and to evaluate sensory properties of cooked sausages after storage at 4 °C.

MATERIAL AND METHODS

Preparation of spice extracts

Dried oregano (*Origanum vulgare*) and thyme (*Thymus vulgare*) were purchased from a local store and kept in dark until the use. Aqueous extracts were prepared by one-step extraction with 3 g of each pulverized plants, placed in a flask with added 100 cm³ distilled water. The suspensions were incubated at 70 °C in water bath for

2 hours. After filtration through Whatman No. 4 the 5, 10 and 15 cm³ of each aqueous extracts were used per 1 kg of meat (Heilerová et al., 2003; Kulišić et al., 2006).

Preparation of meat products

The sausages were prepared from freshly boneless pork. Meat was purchased in local abattoir approximately 24 h after slaughter. Sausages were prepared using the following ingredients per 1 kg of meat: 18 g of mixture sodium nitrite and sodium chloride, 1.5 g powdered black pepper (*Piper nigrum*), 1 g sweet pulverized paprika (*Capsicum anum*), 0.2 g powdered nutmeg (*Myristica fragrans*), 0.2 g powdered allspice (*Pimenta officinalis*), 10 g cutter mix and 200 cm³ water. Following mincing, raw materials were assigned to one of six treatments. Control sausages (no added extracts); sausages with added 5, 10 and 15 mL.kg⁻¹ thyme; sausage with added 5, 10 and 15 mL.kg⁻¹ origanum. The sliced meat with ingredients was fine chopped by bowl vertical cutter PSP 500 (RM Gastro) for 5 minutes. Emulsified sausages were stuffed into polyamide casings (Ø 22 mm), cold smoked for 4 hours and heat treated in water bath until the temperature in the center of sausages reached the value 70 °C for 10 min. The sausages were stored in air conditions at 4 ± 1 °C and evaluated for antioxidant activity and sensory quality on 1st, 7th, and 10th days.

Determination of antioxidant activity

Lipid oxidation was assessed in triplicate by the 2-thiobarbituric acid (TBA) test following the recommendations of Grau et al. (2000) and measured by spectrophotometric method at 532 nm (Shimadzu UV/VIS – 1240). TBARS values were calculated from a standard curve of malondialdehyde (MDA) and expressed as mg MDA.kg⁻¹ sample. Antioxidant activity was analyzed on days 1st, 7th, and 10th in the raw sausages stored aerobically.

Sensory evaluation of cooked sausages

Samples of freshly cooked sausages were evaluated by a 6 member semi-trained panel of laboratory co-workers. Sausages were heat treated by boiling for 3 minutes. Samples were served within 1 min of cooking in random order to panelists. Panelists evaluate appearance overall texture, flavour, aroma and overall acceptability on a 6 point hedonic scale where 1 and 6 were the extremes of each characteristic.

Statistical analysis

The significance of differences among evaluations at each day of storage was determined by analysis of variance (ANOVA). Differences were considered significant at the *p* < 0.05 level. The geomean and standard deviation of the difference was also calculated. The entire experiment was replicated three times.

RESULTS AND DISCUSSION

Lipid oxidation is one of the main limiting factors for the quality and acceptability of this type of sausages. The antioxidant activity has been measured in the past using a TBA assay in model meat systems, showing a potential for protecting meat from oxidation (Ruberto, 1999).

Thyme and origanum aqueous tea infusions significantly reduced (*p* < 0.05) lipid oxidation in sausages on 10th day of aerobic storage. However, no significant differences (*p* > 0.05) on 7th day in sausages with added 5 mL/kg of thyme and 10 mL.kg⁻¹ of origanum, relative to control were observed (Figure 1).

Antioxidant potency of oregano essential oil for homogenized raw meat treatment was evaluated in work of Fasseas et al. (2007). In agreement with our results they found that essential oil significantly reduced the lipid oxidation of raw meat during twelve days of storage (4 °C). Salem et al. (2010) tested the addition of thyme,

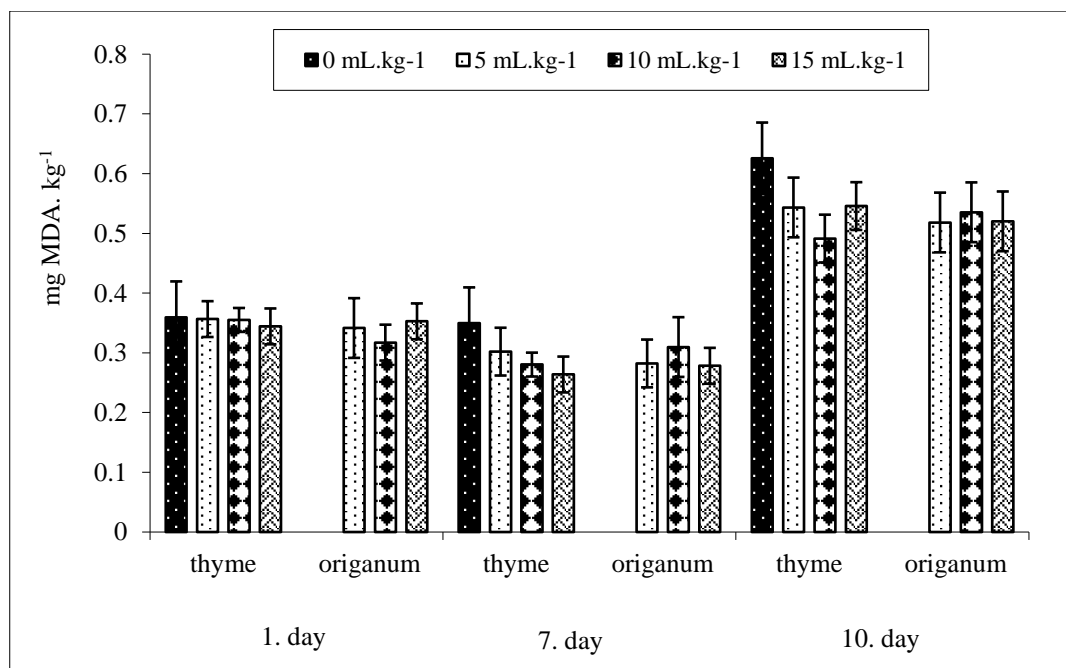


Figure 1 Effect of different amount thyme and origanum aqueous extracts on MDA production in sausages during 10 days storage.

Table 1 Sensory analysis of pork sausages after 24 hours of chilling storage.

Treatment	Appearance	Overall texture	Aroma	Flavour	Overall acceptability
5 mL thyme	4.18	4.18	4.05	4.09	4.12
10 mL thyme	4.21	4.18	4.05	4.10	4.14
15 mL thyme	4.20	4.19	4.20	4.28	4.21
5 mL origanum	4.23	4.23	4.09	4.03	4.14
10 mL origanum	4.22	4.17	4.08	4.01	4.12
15 mL origanum	4.23	4.18	4.05	4.05	4.13
Control	4.24	4.18	4.05	4.02	4.12

garlic and lemongrass essential oils as antioxidants and antimicrobials in minced beef. The obtained results of these authors indicated significantly lower value of TBA in tested groups relative to control. This is generally in agreement with other research studies that have investigated the effects of oregano essential oil in meat protection from oxidation through feeding (Botsoglou et al., 2002; Botsoglou et al., 2003).

In the past few years, a variety of plant materials containing phenolic compounds have been to be effective antioxidants in model systems. Since ancient times, herbs and spices have been added to food to improve sensory properties and prolong shelf life. Among the main objections against the use of spices as antioxidants, is the characteristic flavor which they give to the meat products. However, this could be turned towards a positive new exciting sensory sensation. The acceptability of the taste of highly spiced food is transmitted both culturally and genetically, and the countries with hotter climate use spices more frequently and at much higher levels than countries with cooler climates (Salem et al., 2010).

Appearance and overall texture were not affected by the addition of thyme and origanum (Table 1). The positive effect and significantly ($p < 0.05$) higher values for aroma, flavour and overall acceptability were recorded for the sausages with 15 mL.kg⁻¹ of thyme addition, which could be associated with the presence of thyme odor. The organoleptic changes in sausages with origanum addition were not significant ($p > 0.05$) and had no negative effect on the sensory value of cooked sausages. The results are in agreement with Viuda-Martos et al. (2008). They found that use of citrus waste water and oregano or thyme essential oil as ingredients of the fine meat paste used to produce bologna-type sausage had no negative effect on any of the chemical or physical properties assessed. Their addition to cooked meat products is a viable alternative for increasing the oxidative stability of the samples, while reducing nitrite levels. Solomakos et al. (2008) tested the antimicrobial effect of thyme essential oil against *Listeria monocytogenes* in minced beef. They found that 0.3% essential oil possessed weak antimicrobial activity, whereas at 0.9% showed unacceptable organoleptic properties in minced meat. The level of 0.6% thyme essential oil showed positive organoleptic effect and stronger inhibitory activity at 10 °C than at 4 °C.

CONCLUSION

The MDA assay data showed that the addition of the antioxidants can offer sufficient protection, which can be seen from the higher MDA values in the control compared to the oregano and thyme sausages. Results obtained in this work indicated the technical viability of using the

oregano and thyme aqueous tea infusions in relative low concentration, which is possible to enlarge the shelf-life of fresh sausages with the desired slight alteration of the original taste parameters. Results indicate that thyme and oregano aqueous tea infusions compare to essential oils can be cheaper alternative incorporate into pork frankfurters as natural antioxidants.

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