



PHYSICO-CHEMICAL EVALUATION OF GARLIC OIL ON THE NUTRITIVE AND SHELF-LIFE OF CHEESE

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ABSTRACT

A study was conducted to evaluate the efficacy of garlic oil in the preservation of West African soft cheese. The experiment consists of cheese samples treated with garlic oil (Treatment B) and cheese sample kept in the whey (Treatment A, control). The experiment which lasted for 28 days consists of twenty cheese samples each for Treatments A and B. The nutritional quality, sensory quality and microbial value were evaluated using Student's "T" test. The results revealed a significant ($p < 0.05$) increase in the crude protein, ether extract, dry matter and ash of the garlic oil treated cheese sample compared to the Control (cheese sample kept in the whey). The sensory properties of the cheese samples treated with garlic oil were described by positive attributes such as significant improvement ($p < 0.05$) of the overall acceptability, flavour, texture, colour and taste which were associated normally with cheese. The microbial evaluation showed high colony forming unit in the control (Treatment A) compared to Treatment B (Garlic oil treated cheese sample). It could be concluded that garlic oil has a great nutritional, microbial and therapeutic potentials as preservative for enhancing the shelf-life of cheese.

KEY WORDS: Garlic oil, cheese sample, proximate composition, microbial quality, sensory quality, shelf-life.

INTRODUCTION

Garlic which belongs to Alliaceae family originated from Central Asia and spread to other countries including Nigeria. Garlic is used for both culinary and medicinal purposes. Its medicinal uses include treatment of whooping cough, lung disease, stomach complaint and disorder resulting from child birth, cold, sore eyes and ear ache. It was noted to help in the prevention of heart disease (Jen, 2011). A czech study revealed that garlic oil, dehydrated powder could help in reducing accumulation of cholesterol in the vascular walls of animals (Sovova, 2004). While it's culinary uses include spicy flavor that mellows and sweetens considerably with cooking (Gernot, 2005). Additionally, garlic has been found to have anti-bacteria, anti-viral and anti-fungal activities. Garlic oil was reported to be the best due to the fact that extraction of garlic oil can increase the potency and eliminate unpleasant characteristics as well as the irritating, acidic and oxidizing compounds in raw garlic. Garlic oil exhibits anti-oxidative activities while raw garlic or dehydrated garlic stimulates oxidation (Yin and Cheng, 1998). Garlic may help to boost the birth weight of babies destined to be too small as well as cut the risk of pre-eclampsia (raise blood pressure and protein retained in the urine). Cheese is valuable for its portability and high nutrient contents such as protein, carbohydrate, lipids, vitamins, minerals like calcium, phosphorus (Hildreth, 1977). Nutrient in cheese are needed for body growth and development. It can be used in place of meat and fish as a source of protein in food (Belewu *et al.*, 2005). Excess calcium presents in cheese can help to prevent bones weakening which may results into serious condition like osteoporosis. Calcium can also help to prevent kidney stones, seizures and body

spasms (Belewu, 2012). It is noteworthy, that cheese can be attack by microbes if not preserve and deteriorate faster. In the absence of refrigeration, cheeses are traditional preserved in the whey. However, they may only preserve cheese for between 2 and 3 days (Belewu, 2006). Additionally, cheese may be preserved by frying, salting and smoking (O'Connor, 1999; Belewu, 2006). Hence, the thrust of this study was to evaluate the efficacy of garlic oil in extending the shelf-life, enhancing the nutritional quality as well as reducing the microbial count of West African soft cheese.

MATERIALS & METHODS

Site of the Study

The study was conducted at the Department of Animal Production and Department of Chemistry, University of Ilorin, Nigeria.

Collection of Garlic bulbs

The garlic used for the study was bought from a local market in Ilorin, Nigeria. Garlic bulbs with no signs of deformities /or physically damage were selected and kept before the starting of the experiment.

Cheese samples

Cheese samples used for the study was bought from a local market in Ilorin, Nigeria and kept in the whey for preservation.

Extraction of Garlic oil

Fresh garlic cloves were removed from the garlic bulb. The parchment skin was removed from the cloves and the cloves were chopped and later crushed with mortar and pestle. The garlic oil was obtained by steam distillation after crushing the fresh bulb (Hughes & larry, 1991).

Experimental Treatment

The garlic oil was used for preserving Cheese samples (Treatment B) while cheese samples kept in the whey was the Control (Treatment A).

Parameters evaluated

Parameters evaluated include dry matter, crude protein, fat, ash, microbiological value as well as sensory quality.

Sensory Quality

Thirty panelists who were used to the sensory quality were invited to sample the cheese by tasting the cheese treated with garlic oil and untreated cheese samples (Control) kept in the whey. The evaluation was based on hedonic scale of 1-9 while taste, flavor, texture, colour and general acceptability were determined.

Analyses

TABLE 1: Proximate Composition of garlic Treated and Untreated Cheese Samples

Parameters	Treatment A (Control)	Treatment B	Significant different
Crude protein	15.22 ^a	30.03 ^b	P<0.05
Total solids	36.63 ^a	80.05 ^b	P<0.05
Fat	28.75 ^a	29.63 ^b	P<0.05
Ash	43.88 ^a	93.50 ^b	P<0.05

Means along the row with similar superscripts are not significant different from each other (p>0.05)

This shows that fresh cheese could not be preserved in whey for long period. The non reduction in the protein content of the garlic oil treated cheese sample may be as a result of the antioxidant properties of garlic oil (Yang *et al.* 1993 and Yin and cheng, 1998). Additionally, the high protein content could be due to the richness of protein content in garlic (USDA, Nutrient Database 2005). There was increased fat content of Treatment B. This could be attributed to the anti-oxidative activities of garlic oil (Yin and cheng, 1998; Jen, 2011). The ash content of Treatment B (93.50%) was significantly higher (p<0.05) than the ash content of Treatment A (43.88%). This observation was confirmed by high concentration of mineral content of garlic (USDA, Nutrient Database

The chemical composition of treated and untreated cheese sample was determined using the method of A.O.A.C (1995). The microbial quality was determined by using the methods of Murugkar *et al.* (1993). All collected data was subjected to a Student "T" test.

RESULTS & DISCUSSION

The proximate composition of garlic oil treated and untreated cheese samples are shown in Table 1. The dry matter content was higher in cheese treated with garlic oil (80.50%) (Treatment B) than cheese sample kept in whey (36.63%) (Treatment A). The crude protein was 30.03% in Treatment B and 15.22% (Treatment A). The poor crude protein in Treatment A could be due probably to the breakdown of protein by proteolytic organism (Aworth and Egouley 1985).

2005). The significant sensory quality of Treatment B (Table 2) (taste, colour (flavor, texture and overall acceptability) was similar to the reports of Belewu *et al.* (2005); Belewu *et al.* (2008) and Belewu *et al.* (2011) who used pure honey, garlic extract and recorded similar improvement in the sensory parameters. The least colony forming unit (cfu) (Table 2) of Treatment B could be accounted for due to the antimicrobial properties of garlic oil. Allicin which is the active ingredient in garlic oil is responsible for the antimicrobial properties (Mercola, 2003). The antimicrobial benefits of garlic oil was also reported by Ankri *et al.* (1999); Sallam *et al.* (2004) and Song (2004).

TABLE 2. Sensory evaluation and Colony forming Unit of Garlic Treated and Untreated Cheese Sample

Parameters	Treatment A	Treatment B	Significant different
General acceptability	26.50 ^a	64.13 ^b	P<0.05
Flavor	24.50 ^a	65.38 ^b	P<0.05
Texture	22.75 ^a	68.38 ^b	P<0.05
Colour	22.13 ^a	74.63 ^b	P<0.05
Taste	22.13 ^a	61.88 ^b	P<0.05
Colony forming unit	8.0x10 ⁶	6x10 ⁶	

Means along the row with similar superscripts are not significant different from each other (p>0.05)

CONCLUSION & IMPLICATION

It could be concluded from this study that garlic oil proved effective in preserving and enhancing the nutritional quality, shelf-life, microbial and therapeutical values of West African soft cheese. In addition, the new method will help traders, farmers and those who are concerned in the business to regulate supply and transport the product to markets where prices are more favorable.

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