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Effect of Sweet Basil (*Ocimum Basilicum*) Leaf Extract as a Spice in Hamburger

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ABSTRACT

This study was conducted at the meat processing unit of the University for Development Studies (UDS), Nyankpala campus to determine the effect of sweet basil (*Ocimum basilicum)* leaf extract as a spice in hamburger. A total of 4 kg of meat (pork) was used. Two (2) g, 4 g and 6 g basil leaves were boiled separately in 0.5 liters of water for treatment 2, treatment 3 and treatment 4, respectively for 10 minutes. Thus each product contained the following: T1) control (without basil), T2) with 10 ml of basil extract per 1 kg of meat, T3) with 10 ml of basil extract per 1 kg of meat, T4) with 10 ml of basil extract per 1 kg of meat, Sensory analyses were conducted to examine the effect of basil on the sensory characteristics of the products. Sensory characteristics were not significantly different. There were significant differences in the protein contents of the products which cannot be solely attributed to the inclusion of basil leaf extract since the trend was not consistent. There were significant differences in the moisture, fat and pH content of the products.

Keywords: hamburger, basil extract, sensory characteristics, nutritional composition.

INTRODUCTION

Meat refers to the flesh of a slaughtered animal that is eaten as food and this may include skeletal muscle, fats and other tissues (Lawrie and Ledward, 2006). Meat contains high amount of essential amino acids that play a major role in the growth and development of our bodies (Warries, 2010). In Ghana, meat is mainly from both ruminants (cattle, goats, sheep), and the non-ruminants such as pigs and poultry (domestic fowl, guinea fowl and ducks) (Adzitey, 2013). Meat processing can be defined as the procedures that involve the addition of ingredients or mechanical actions that converts fresh meat into specific products (Teye, 2007). Meat processing is done to preserve or extend the shelf life and to improve upon the flavour and tenderness of meat and meat products (FAO, 2007). Meat processing can also help to add

value to PSE and DFD meats (Adzitey, 2011; Adzitey and Nurul, 2011; Adzitey and Huda, 2012).

Hamburger is a product consisting of a cooked patty of ground meat usually placed inside sliced bread (Kenda, 1990). There have been so many claims of the invention of hamburger, but one of the earliest claims come from Charlie Nagreen, who in 1885 sold a meatball between two slices of bread at the Seymour Fair now called Outagamie County Fair (Ozersky, 2009). Originally, burgers were made from beef but in recent years chicken, pork and mutton burgers have become more common. A common feature of burgers is that it consists of minced meat blended with salt and spices, mainly black and white pepper and in some instances also herbs, garlic or onions are added. Burgers are stored frozen and individually pan-fried or grilled before consumption. Burgers are often served on bread rolls or buns with slices of cheese, mayonnaise, mustard or green salad (FAO, 2007).

Spices are esoteric food adjuncts that are used as flavouring agents and as preservatives in meat products (Srinivasan, 2005). The leaves of sweet basil plant have been among the most important spice and herbs in India and other regions in Asia, having been planted over 5,000 years (Darrah, 1980). The sweet basil plant contains anti-microbial, anti-oxidant and other medicinal properties that play a major role in the health of humans (Brandi *et al.*, 2006). It is traditionally used for supplementary treatment of stress and asthma as a spice product in India (Srinivisan, 2005). It is also used as flavouring agents in chicken soups in Ghana hence the name ‘akokobesa’ and ‘koklogbe’ in Akan and Ewe, respectively (Dokosi, 1998). Recent study has been conducted on the use of basil leaf paste which gave promising result by increasing the crude protein content in meat products (Abu, 2012). Therefore this study seeks to determine the suitability of sweet basil leave extract as a spice in hamburger.

MATERIALS AND METHODS

Location of study

The experiment was conducted at the Meat Processing Unit of the University for Development Studies (UDS), Nyankpala Campus. Chemical analysis of meat products were carried out at the Spanish laboratory of UDS, Nyankpala Campus.

Preparation of basil leaf extract

Fresh basil leaves were obtained from potted plant and were washed thoroughly in water to get rid of dirt and germs. Two (2) g, 4 g and 6 g basil leaves were boiled separately in 0.5 litres of water for treatment 2, treatment 3 and treatment 4, respectively. It was boiled for 10 minutes and the extract collected using decantation method.

Preparation of burgers

A total of 4 kg pork was obtained from the Meat Processing Unit of UDS and was thawed overnight at a temperature of 4°C. The minced meat was divided into four equal parts (1kg/treatment). Each treatment contained 15 g of curing salt (sodium nitrite), 0.5 g red paper, 1.0 g black pepper, 1.0 g white pepper, and 2.0 g mixed spices (Adobo®) with or without basil leave extract. Thus, Treatment 1 contained no basil to serve as the control, Treatment 2, Treatment 3 and Treatment 4 each contained 2 g, 4 g and 6 g of 10 ml of basil leaves extract.

Products preparation and sensory evaluation

The hamburgers were grilled in an electric oven (Turbofan, Blue seal, UK) at 100°C for 30 minutes, sliced into uniform sizes of about 2 cm, and wrapped with coded aluminium foils to keep them warm and maintain the flavour. A total of fifteen (15) panelists, were randomly selected and trained according to the British Standard Institution (BSI, 1993) guidelines for panel selection and training, to form the sensory panel for evaluation of the products. The panelist used a five-point category scale to evaluate the four treatments based on the parameters in Table 1.

Table 1: Five (5) -point scale used for the sensory evaluation

Attribute	Scale				
	1	2	3	4	5
Colour	Very Pale Red	Pale Red	Intermediate	Dark Red	Very Dark Red
Aroma	Very Offensive	Offensive	Intermediate	Pleasant	Very Pleasant
Basil Flavour	Very Weak	Weak	Intermediate	Pleasant	Very Pleasant
Flavour Liking	Dislike Very Much	Dislike	Intermediate	Like	Like Very Much
Acceptability	Dislike Very Much	Dislike	Intermediate	Like	Like Very Much

The products were presented to each of the panelists, under conditions of controlled lighting and examination so that a panelist would not be influenced by another panelist. Each panelist was provided with water and pieces of bread to serve as neutralizer between the products.

Laboratory analyses of the products

The burgers were analyzed for moisture, crude protein, pH and fat (ether extract) contents according to the methods of the International Association of Official Analytical Chemists (AOAC, 1999). Analyses were conducted in triplicates; all reagents were of analytical grade.

Data analysis

The data was analyzed using the General Linear Model (GLM) of the Analysis of Variance (ANOVA) of the Minitab Statistical Package, Version 15.

RESULTS AND DISCUSSION

The result from the sensory evaluation is presented in Table 2 and it shows no significant difference ($P > 0.05$) among the four treatments. This may be due to the level of inclusion of the basil leave extract in the four treatments. These levels were probably too low to cause any change in terms of colour, aroma, flavour liking, “akokobesa” (sweat basil) flavour and overall liking (acceptability) of the products.

Colour is a major indicator of meat quality, as the appearance of a product influences consumer acceptance. It was expected that the green colouration of basil would be transferred to the products, but that did not occurred. The insignificant difference in colour ($P > 0.05$) indicates that burgers prepared with basil leaf extract would be equally liked as the control products. This is in agreement with Abu (2012), who reported that there were no significant differences among the products in terms of colour prepared with basil leaf paste up to the inclusion level of 6 g/kg meat.

Table 2: Sensory characteristics of hamburger

Parameter	T1	T2	T3	T4	Sed	Sig.
Colour	2.5	2.8	2.6	2.2	0.395	N.S
Aroma	4	3.2	3.9	3.7	0.303	N.S
Flavour liking	2.1	3.3	2	2	0.288	N.S
Basil flavour	2.2	2.6	3.1	2.5	0.407	N.S
Acceptability	1.6	2.2	2.1	2.1	0.296	N.S

Sed = Standard error of difference. N.S = not significant

Similarly, there was no significant difference ($P > 0.05$) in the aroma of the products. Aroma refers to the smell of substances perceived by people using the nose (Adu-Adjei *et al.*, 2014). Aroma causes an attraction or repulsion of people to food substances. The insignificant difference in the aroma of the products means that burgers prepared with sweet basil leaf extract up to 10 ml/kg meat would be equally accepted as the traditional meat products on the market. This result agrees with Abu (2012), who stated that there were no significant differences among the hamburgers prepared with basil leaf paste in terms of aroma up to the inclusion level of 6 g/kg of meat.

Table 3: Nutritional qualities of hamburgers

Parameter	T1	T2	T3	T4	Sed	Sig
Moisture	53.40a	52.83a	52.72a	49.78b	1.693	*
Fat	56.87b	49.32c	27.25d	58.07a	0.13	**
Protein	15.14b	16.66a	14.65c	14.31d	0.143	**
pH	6.09a	6.07b	6.05c	6.07b	0.009	**

Sed = Standard error of difference. Sig = significance. Means on the same row with the same superscript are not significantly different. * = $P < 0.05$. ** = $P < 0.01$

Table 3 shows the nutritional qualities of the burgers. There were significant differences ($P < 0.05$) in the moisture, fat, protein and pH of the products. Moisture refers to the level of water contained in products. Juiciness of a meat is greatly influenced by the moisture present. High moisture makes meat more juicy and less moisture makes meat less juicy. The storability of meat is also influenced by the amount of moisture present. Since the moisture content of T4 was significantly lower it could store better than the rest of the products. More so, T2 and T3 suggests that the microbial quality of the test products would not be affected by the inclusion of basil leaf extract up to 10 ml of 6 g of basil leaves/kg. This result agrees with Abu (2012), who reported that there were no significant differences in moisture of the hamburgers prepared with sweet basil leaf paste up to the inclusion level of 6 g/kg of meat.

According to FAO (2007), fats are added to processed meat products to make it softer and also for taste and flavour enhancement. The results obtained from the study showed that there were significant differences in the fat content of the products ($P < 0.05$). However, there was drastic reduction in treatment 3 which could be due to sampling error, since this result disagrees with findings of Abu (2012), who reported insignificant differences in fat content of hamburgers prepared with basil leaves paste included up to 6 g/kg meat.

There were significant differences in the protein contents of the products which cannot be solely attributed to the inclusion of basil leaf extract since the trend was not consistent. This results again disagrees with the findings of Abu (2012), who reported that there were consistent increased in protein content of the product as the inclusion level of basil leaf paste increases.

pH is a measure of the acidity or alkalinity of water containing substances. This result recorded a significant difference in pH of the control and test products. The control product

was significantly higher ($P < 0.01$) than the test products. FAO (2007) indicated that the pH of meat products are important for their storage, the lower the pH, the lesser favorable condition for microbial growth and therefore storability is enhanced for longer time. It can be suggested that that the test products will store better than the control product.

CONCLUSIONS

This study showed that the addition of sweet basil leaf extract (10 ml/kg) to hamburger up to level of 6 g/kg in meat had no effect on appearance of the products. Sweet basil has no effect on the flavour liking, aroma and overall acceptability of the products. However, the moisture, fat, protein and pH were significantly affected.

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