PROXIMATE AND SENSORY PROPERTIES OF SOYA BEAN CHEESE COAGULATED WITH ALUM AND LIME

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ABSTRACT
This study was carried out at the Animal Health and Production Department, Oyo State College of Agriculture and Technology, Igboora, Oyo State. Alum and lime were used as coagulants for soya beans cheese. The sensory evaluation showed that (cheese processed with Sodom apple) T_1 and (soyabean cheese coagulated with alum) T_3 had the same value (8.00) and (soyabean cheese coagulated with lime)T_2 (3.00) had the lowest value of (3.00) for colour. T_1 and T_3 had the same value of 5.00 with T_1 having the highest value of 7.00 for flavour. T_1, T_2 and T_3, had the same values in texture. T_1 and T_3 had the same values (6.00) with the highest value of 8.00 in of T_2 for tenderness. The ether extract of T_1, T_2 and T_3 were significantly different ($p<0.05$) from each other with T_1 having the highest value of 37.04.The moisture content were also significantly different ($p<0.05$) from each other. It is recommended that lime can be used in coagulating cheese for commercial purpose. It could be concluded that alum and lime are good for coagulating soya beans cheese.
Keywords: Soya beans, coagulants, cheese, alum and lime.

INTRODUCTION
Meat analogues are food products that are made to have similar texture, colour, taste and form as meat (Hurley and Liebman, 2006). They are considered to be meat substitutes or meat alternatives because they provide good source of protein and can also be used as bulking agent to extend real meat products. Soya bean cheese (a meat analogue) is an unripe cheese consumed in several parts of West Africa. It is often referred to as poor man's cheese and also known as 'Soya bean cheese', 'beske', or 'wara' in Nigerian. Whole soybean contains 40% protein, 30% carbohydrate, 20% lipid and 10% mineral (Iwe, 2003). Soya bean cheese processing involves the use of rudimentary equipment and largely a home art method. Soybean is a cheap source of quality protein that balances the essential amino acids profile of cereal flour and it has a close protein content and amino acids to cow's milk (Belewu and Belewu, 2007). Due to the present economic situation many poor and middle income Nigerians cannot afford animal protein such as fish, meat, chicken and eggs in their diet because they are expensive. This study aimed at determining the proximate composition and evaluation of the sensory properties of soybean cheese coagulated with alum and lime.

MATERIALS AND METHODS
The experiment was carried out at the department of Animal Health and Production Technology, Oyo State college of Agriculture and Technology Igboora Oyo state. The soya bean and the alum used for the experiment were purchased from Towobowo market. The lime was harvested from the school premises. Soybean seeds were cleaned to remove contaminants. The seeds were soaked in clean water for 2 hours to soften them, washed and then milled into a paste. The paste was diluted with water and sieved through muslin cloth to extract the soy milk. Then the alum was also dissolved in water, the lime was squeezed and the juice was extracted in a bowl .10ml of both alum and lime juice were added 2 litres of soy milk respectively during cooking. The milk obtained was divided into two parts, heated at 100°C in different pots and placed on two different charcoal pots after which the coagulants (lime and alum) were added to the boiling soy milk. Coagulation of the alum was achieved within 7minutes and that of the lime coagulant was achieved within 10minutes. Coagulated cheese was then pressed in a muslin cloth to remove residual whey within 40min. The sensory evaluation of the cheese samples was carried out by 20 semi trained panelists. Samples were taken to the laboratory for proximate analysis.

RESULTS AND DISCUSSION

Table 1: Proximate analysis of soya bean cheese coagulated with alum and lime

Parameters	T1	T2	T3	SEM	P. value
ASH	1.94[b]	3.35[a]	2.29[b]	0.23	0.00
CP	14.37[b]	17.56[a]	15.04[b]	0.51	0.00
CF	3.24[b]	5.49[a]	5.05[a]	0.37	0.00
EE	37.04[a]	21.69[c]	28.8[b]	2.25	0.00
MC	36.01[c]	45.66[a]	41.35[b]	1.41	0.00
CHO	7.42	6.19	7.41	0.30	0.15

a,b Means in the same row with different superscripts differ significantly ($p<0.05$)

T1 –Cheese processed with (Sodom Apple), T2- Cheese processed with Alum, T3- Cheese processed with Lime, CP - Crude Protein, CF - Crude Fibre, EE- Ether Extract, MC- Moisture Content ,CHO- Carbohydrate

Table 1 shows the proximate analysis of cheese prepared from soya milk coagulated with Sodom apple, alum and lime. Treatment 2 (T2) had the highest value of ash (3.35%) while Treatments 1 and 2 had lower ash contents 1.94% and 2.29% respectively. Highest value of 14.37% and 37.04% were recorded for crude protein and ether extract of T1 respectively. T2 had (5.49) as the highest value and 5.05% as the lowest was recorded in T3 for crude fibre. The Carbohydrate content of cheese from the treatments did not differ significantly from each other. The ether extract of T_1, T_2 and T_3 were significantly different ($p<0.05$) from each other with T_1 having the highest value of 37.04%. The moisture content were also significantly different ($p<0.05$) from each other.

Sensory evaluation of cheese

Table 2 shows the sensory evaluation of cheese produced from soya beans coagulated with alum and lime. T_1 and T_3 had the same value of (8.00, very light) in colour while that of T_2 was (3.00, moderately dark), T_2 and T_3 had the same value of the flavour of (5.00, intermediate) while that of T_1 is (7.00, moderately light). The tenderness of T_1 and T_3 had the same value of (6.00, slightly tender) with the T_2 8.00(very tender). The juiciness of T_1 and T_2 had the same value of (6.00, slightly juicy) while T_3 is 5.00(intermediate). The texture of T_1 T_2 and T_3 had the same value of (7.00, moderately fine).The overall acceptability of T_3 was the highest value which is (7.00, like moderately).

Table 2: Sensory properties of soya bean cheese coagulated with alum and lime

SENSORY	T1	T2	T3	SEM	P-VALUE
Colour	8.00[a]	3.00[b]	8.00[a]	0.83	0.00
Flavour	7.00[a]	5.00[b]	5.00[b]	0.73	0.49
Tenderness	6.00[b]	8.00[a]	6.00[b]	0.44	0.07
Juiciness	6.00[a]	6.00[a]	5.00[b]	0.33	0.42
Texture	7.00	7.00	7.00	0.65	1.00
Overall acceptability	6.00[b]	4.00[b]	7.00[a]	0.78	0.31

a,b Means in the same row with different superscripts differ significantly ($p<0.05$)

Discussion

This is an indication that the selected coagulant under consideration differ substantially in their coagulating ability, the difference could be as a result of their chemical components (Johnson *et al.,* 2001; Ghebremichael *et al*., 2005). The results obtained in this study was in line with the proximate composition of the different soy cheese samples obtained by Ndife *et al.* (2019). The reduction of the moisture contents of the cheese samples could lead to increased protein concentration. Furthermore, the protein content of the soy cheeses produced, was higher than those of the commercial soy cheese (12%) reported by Rinaldoni et al., (2014). This variation could be as a result of the difference in the variety of soybean, coagulants used and the condition under which the coagulation was carried out (Moller *et al*., 2008; Amadou *et al*., 2009).

The results for the sensory evaluation were slightly similar to the values obtained by Ndife *et al.* (2019). Cai and Chang (1999) reported that acid coagulants tend to affect the taste and texture of tofu more than tofu coagulated by alkaline coagulants. The alum coagulant had no strong perceivable smell and taste in the soy cheese (AC). Salt coagulants have been reported to produce tofu that is tender but slightly brittle in texture (Gopalakrishnan *et al*., 2016).

CONCLUSION AND RECOMMENDATION

The study showed that lime can also be used in coagulating cheese on a commercial scale as it has the highest content of crude protein with relatively higher ether extract and moisture content. From the result obtained in this study, it is shown that lime can be used in coagulating soymilk to produce cheese for commercial purpose.

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