African Journal of Food Science Vol. 6(22) pp. 524-528, 26 November, 2012
Available online http://www.academicjournals.org/AJFS
DOI: 10.5897/AJFS12.027
ISSN 1996-0794 ©2012 Academic Journals

Full Length Research Paper

Assessment of physico-chemical, micro-biological and sensory properties of seasoning developed from mushroom and locust bean

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Accepted 28 June, 2012

The study was conducted to develop a seasoning from a combination of mushrooms and fermented locust bean seeds. The milled samples were prepared in different concentrations. The chemical, functional, microbial properties and sensory acceptability of the samples were determined. Crude protein, ash content, water absorption capacity, oil absorption capacity ranged between 36.95 and 49.90%, 31.99 and 34.30%, 51.53 and 93.80% and 18.70 and 44.66%, respectively. The total viable count in the sample ranged from 11 to 16 cfu/g and the mold count 0 to 60 cfu/g. The sensory evaluation result showed that sample with higher concentration of locust bean (WF1) was the most acceptable for tasting nice and having appealing flavour.

Key words: Seasoning, mushroom, locust bean, evaluation.

INTRODUCTION

Seasoning which is also referred to as additive or condiment can be defined according to Food and Agriculture Organization (FAO, 1971) as non-nutritive substances added intentionally to food generally in small quantities to improve its appearance, flavour, texture, or storage properties. Spices and herbs have long been used as flavouring agents in food and are believed by many people to possess medicinal properties (Kaefer and Milner, 2008). The leaves used in food preparation contain aromatic oils, which releases flavours and scents when the leaves are crushed or chopped. Herbs can be used raw or processed depending on the variety or users (Anita, 1988). USA, Food and Drugs Administration describes a spice as an aromatic vegetable substance in whole, broken or ground form, whose function is for seasoning rather than nutritional purposes (Hulse, 1996). Also, spices have been used throughout history all over the world and for many centuries have been an important trading commodity (Joseph, 1977). Seasoning plays an important role in food production, like processing aids and flavour enhancer because of these, it importance cannot be underestimated. Mushrooms are saprophytes which are referred to as conspicuous umbrella shaped fruiting body (sporephore). They are produced by the fungi vegetable bodies, the mycelia growing in the soil, on wood, or sometimes hidden under the leaves or moss (Gray, 1975).

Mushrooms are popular delicacies in Nigeria especially in the Southern part, as these vegetables are usually loved for their flavours (Osho, 1975). Fresh cultivated mushrooms have a high rate of metabolic activity; based on this, it is advisable to be consumed or processed promptly after harvest (Komanowsky, 1970). *Termitomyces robustus* is the sweetest of all the mushrooms, is highly nutritive and has the highest metal contents of all edible plants. Fermented locust bean (*Iru*) is a fermented product of Africa locust bean. It is an important product but less known legume protein source in West Africa. Traditionally, 'Iru' is used as a food condiment. Food condiment is defined by the International Organisation for Standardization (ISO) as natural vegetable product or mixture without any extraneous matter that are without

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Table 1. Concentrations of seasoning formulation.

Ingredient	Amount of Ingredients (g)					
	WF1	WF2	WF3	WF4	WF5	WF6
Stockfish	50.0	50.0	50.0	50.0	50.0	50.0
Wheat flour	17.5	17.5	17.5	17.5	17.5	17.5
Table salt	16.5	16.5	16.5	16.5	16.5	16.5
Iru	13.5	Nil	6.75	9.45	4.05	8.1
Mushroom	Nil	13.5	6.75	4.05	9.45	5.4
Pepper	2.5	2.5	2.5	2.5	2.5	2.5
Total	100	100	100	100	100	100

any extraneous matter that are used for flavouring, seasoning and imparting aroma to foods; the term applies to the product either in the whole form or in the ground form (Pruthi, 1992). Fermented locust bean serves as a low cost animal protein substitute, as a result of its high protein content (Odunfa, 1981). Fermented locust bean is digestible and improves the availability of amino acids present through processing method (Achinewhu, 1996). It has been shown that the optimum temperature range for fermentation process is 35 to 37°C and it has about 20.3% fat which is made up of 54% unsaturated and 46% saturated fatty acid. The chemical composition as well as the nutritive values has been determined (Fetuga et al., 1973; Oke and Umoh, 1975). '*Iru*' had been known has one of the flavour enhancers that increases the attributes and palatability of a diet.

Seasonings are of little nutritive value, even if our diet is balanced nutritionally, it has to be flavourful, or otherwise enough pleasure might not be derived from it (Heath, 1977). The objectives of this study were to deve-lop a seasoning from combination of mushrooms and locust bean seeds, and to assess the physico-chemical, and microbiological properties, and sensory acceptability of the seasoning.

MATERIALS AND METHODS

The mushrooms, locust bean seeds, wheat flour and dried stockfish were obtained from Alekuwodo market in Osogbo, Osun State Nigeria.

Preparation of materials

Mushrooms (500 g) were cut into pieces and soaked in 0.05% of common salt solution for 30 min. This was boiled for 3 min, then cooled and drained. The drained mushrooms were oven-dried at 65°C for 24 h. The dried mushrooms were milled into powdered form using a hammer mill. Locust beans were fermented into '*Iru*' using the method of Amusu (1987). The fermented locust beans were dried at 65°C for 24 h. The dried '*Iru*' was milled into powdered form using a hammer mill.

Stockfish was re-dried in oven at 65°C for 30 min. The dried stockfish was milled into the powered form. All the milled samples were sieved with sieve aperture of 0.04 mm.

Seasoning formulation

The milled mushrooms, '*Iru*', and stockfish were weighed and mixed with wheat flour, pepper and table salt at different concentration as shown in Table 1. The mixed ingredients were sieved and packaged in polythene bag. Figure 1 shows the flow diagram for seasoning preparation.

Chemical composition

The crude protein, ash, and moisture contents of the samples were determined according to AOAC method (2000). The mineral constituents: calcium, phosphorus, sodium and potassium were determined also by AOAC method (2000).

Functional properties

Water absorption capacity of the samples was determined according to Ige et al. (1984). Oil absorption capacity was determined using the method described by Lin et al. (1974). Foam capacity and stability were determined by Lawhon and Cater (1971).

Microbial analysis

Total viable counts of the samples were carried out using nutrient agar. Samples were incubated at 27°C for 48 h (Collins et al., 1989).

Sensory evaluation

The seasoning samples were used in preparation of melon soup; this is because some people like using '*iru*' when cooking that soup. The samples were coded and presented to nine panellists. The quality attributes of the samples that were tested were appearance, taste, flavour and overall acceptability. Seven-point hedonic scale was used in scoring the sample (Ihekoronye and Ngoddy, 1985). Data obtained were analysed using analysis of variance and Turkey's test.

RESULTS AND DISCUSSION

The results of physicochemical determinations are as presented in Table 2. Sample WF1 has the highest protein content (49.9%) compared to other samples; this could be attributed to the presence of '*Iru*' as indicated by

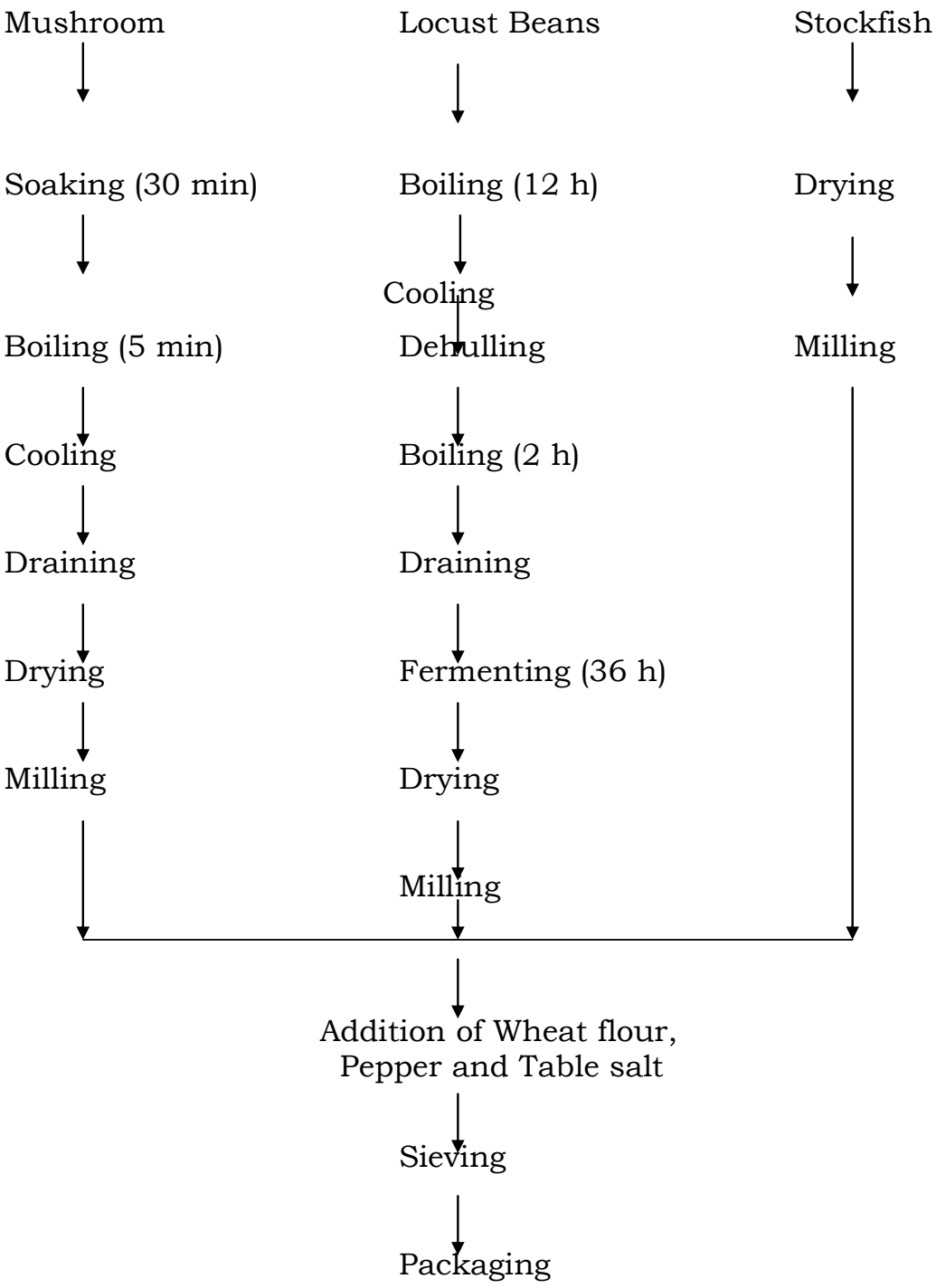

Figure 1. Flow diagram for preparation of seasoning.

Oyewole and Odunfa (1990). This was followed by sample WF5 with protein content of 46.5%. Campbell-Platt (1980) further indicated that its richness in protein and other nutritional components enables it to provide meaty flavour on addition to soups and stew. This is in agreement with the research findings of Odunfa and Oyewole (1997). Alabi et al. (2005) discovered from the researches carried out on fermented locust bean seasoning to be very nutritious because of its high protein content. The table further revealed reasonable amount of ash content (34 to 31%) suggesting that the samples are high in minerals: calcium (456 to 427 mg/100 g), phosphorus (624 to 564 mg/100 g), sodium (1548 to 1286 mg/100 g), potassium (750 to 439 mg/100 g), these could be helpful

Table 2. Chemical composition of the seasoning.

Sample	Protein (%)	Ash (%)	Moisture (%)	Calcium (mg/100 g)	Phosphorus (mg/100 g)	Sodium (mg/100 g)	Potassium (mg/100 g)
WF1	49.90 ± 0.015	31.99 ± 0.02	5 ±0.00	439.28 ± 0.012	564.11 ± 0.008	1286.59 ± 0.01	439.28 ± 0.004
WF2	36.95 ± 0.01	33.65 ± 0.02	4 ± 0.00	427 ± 1.500	582.63 ± 0.012	1507.21 ± 0.01	699.89 ± 0.012
WF3	36.84 ± 0.01	32.48 ± 0.02	4 ± 0.00	432.97 ± 0.008	591.86 ± 0.008	1390.11 ± 0.12	608.75 ± 0.014
WF4	41.47 ± 0.0 1	34.30 ± 0.02	4 ± 0.00	441.85 ± 0.012	624.35 ± 0.008	1465.92 ± 0.008	693.46 ± 0.008
WF5	46.55 ± 0.015	33.78 ± 0.02	4 ± 0.00	456.91 ± 0.012	621.15 ± 0.012	1530.84 ± 0.012	750.01 ± 0.450
WF6	43.86 ± 0.01	34.24 ± 0.02	5 ± 0.00	452.48 ± 0.015	592.32 ± 0.012	1548.02 ± 0.008	710.32 ± 0.008

Table 3. Functional properties of the seasoning.

Sample	Water absorption capacity (%)	Oil absorption capacity (%)	Foam capacity (%)	Foam stability (%)
WF1	82.33 ± 0.012	38.00 ± 1.24	0.21 ± 0.008	0.40 ± 0.008
WF2	62.4 ± 0.008	18.70 ± 0.008	0.40 ± 0.008	0.53 ± 0.012
WF3	80.53 ± 0.012	44.66 ± 0.012	0.40 ± 0.016	0.28 ± 0.008
WF4	93.80 ± 0.008	42.00 ± 1.69	0.58 ± 0.008	0.63 ± 0. 012
WF5	91.06 ± 0.016	26.66 ± 0.024	0.50 ± 0.012	0.60 ± 0.016
WF6	51.53 ± 0.012	42.00 ± 1.41	0.53 ± 0.008	0.62 ± 0.008

Means of triplicate determinations

Table 4. Microbial quality of the seasoning.

Sample	Total faecal *E. coli* form Count cfu/g (18 h)	Total viable count cfu/g × 10^2 (48 h)	Total lactic acid bacteria cfu/g (48 h)	Total yeast count cfu/g (48 h)	Total mould count cfu/g (48 h)	Total *E. coli* form count cfu/g (24 h)
WF1	0	14	0	20	25	0
WF2	0	12	0	0	0	0
WF3	0	16	0	20	15	0
WF4	0	15	0	25	20	0
WF5	0	11	0	65	60	0
WF6	0	13	0	40	35	0

nutritionally. Moisture content reduction (5 to 4%) shows long shelf life. The reductions could be indicative that the product would not be susceptible to spoilage during storage.

Data on the selected functional properties of the seasoning samples are given in Table 3. Water absorption capacity ranged from 51 to 93%, this low amount suggests that the samples would have prolonged shelf life as buttressed by Osundahunsi and Aworh (2002). Oil absorption capacity ranged from 18 to 44%, which shows that the samples may be good seasoning. Foam capacity ranged from 0.2 to 0.5% and foam stability ranged from 0.2 to 0.6%, respectively. Hence, it is a native protein crop and it is expected to have lower stability.

Table 4 shows the microbial quality of the samples; the total viable count at 48 h did not exceed the limit for microbiological contamination in food, this means the samples are good for consumption. Ockerman and Stec (1980) buttressed the point by reporting that coliforms, particularly the faecal types have been used as indicator organisms for assessing the phytosanitary quality of foods. Total yeasts were seen in high amounts in all samples as seen in Table 4, the least total yeast count of 0 cfu/g was obtained for WF2, while the highest value of 65 cfu/g was observed for WF5 in the investigated samples. And, they probably influenced the aroma of the final product as suggested by Akinrele (1968). Also, absence of anti-nutritional factors and pathogens, due to non-detection of any coliform bacteria in all the samples show that the product could be acceptable.

Sensory evaluation conducted showed that the samples WF1, WF5, WF6 rated high and not significantly different in terms of taste, flavour and overall acceptability (Table 5). Samples WF5 and WF6 are promising products because of the combination of mushroom and '*Iru*' that complement each other. Above all, sample WF1 with

Table 5. Sensory quality of the seasoning.

Sample	Appearance	Taste	Flavour	Overall acceptability
WF1	6.33[a]	6.33[a]	5.56[c]	6.33[a]
WF2	5.33[f]	5.22[e]	5.11[f]	5.22[e]
WF3	6.11[b]	5.44[d]	5.44[d]	5.44[d]
WF4	5.56[d]	4.67[f]	5.33[e]	4.77[f]
WF5	4.89[g]	5.76[b]	5.67[b]	5.76[b]
WF6	5.44[e]	5.56[c]	5.56[c]	5.56[c]
WF7	5.67[c]	6.33[a]	5.78[a]	6.33[a]

Letter a, b, c, d, e, f, g indicates that any sample that is not followed by the same letter in the column is significantly different and vice versa.

only fermented locust bean ('*Iru*') is the most preferred sample.

Conclusion

The development is considered worthwhile in view of the nutritional benefits to be derived. Such benefits include: higher protein content, absence of anti-nutritional factor and pathogen due to non-detection of any coliform bacteria as a result of good manufacturing practice. Therefore, there is need for its popularization at both local and international levels. The utilization of locust beans and mushrooms has led to the production of novel seasoning which in turn would minimize postharvest losses of these raw materials when properly exploited.

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