ISSN:2321-1156
International Journal of Innovative Research in Technology & Science(IJIRTS)

COOKING PROPERTIES AND SENSORY EVALUATION OF ENRICHED CASSAVA/WHEAT NOODLES

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Abstract

The study investigated the possibility of producing noodles from blends of wheat, cassava and defatted protein rich flours. The cooking quality and acceptability of the noodles were also investigated. Four legume flours, soybean, groundnut, bambara nut and melon seeds were processed into flour and defatted using N-Hexane. The defatted flour samples were blended with wheat and cassava flours in the ratios of (80:10:10) wheat/cassava/defatted flour. The blends were used to produce noodles. The cooking quality and sensory properties were evaluated. The results obtained revealed that the cooking time of the noodle samples ranged from 10 to 16 minutes and there were significant difference ($p<0.05$) between the samples in terms of their cooking loss and cooking weight. There were also significant difference ($p<0.05$) in terms of texture, aroma and mouth feel of the products. An overall assessment of the results showed that 20% substitution of wheat flour with cassava flour 10% and defatted soybean flour 10% produced a protein rich and acceptable noodles.
Keywords: cooking quality, noodle, wheat, cassava, soybean, melon

Introduction

Replacement or substitution of wheat flour with flours from other sources as a possibility to increase the utilization of indigenous crops as well as contributing to lowering the cost of baked products has being on the increase [1]. Several research work had been reported on the use of composite flour in bread, biscuit and noodle production[2,3]. Addition of cassava flour that has low protein content to wheat flour will reduce the percentage of protein in the composite flour.

Production of flours from other sources that have higher protein content than cassava and using them in combination with wheat/cassava flour. Nutritionally, wheat grain is a good source of vitamins, minerals, protein, carbohydrate and dietary fibre. Inclusion of 10% cassava flour has been used for producing acceptable noodles. Acceptable noodles had been reported with inclusion of about 70% cassava flour[4]. Hence the investigation on the cooking quality of noodles produced from blends of wheat/cassava/defatted oil seeds and the acceptability of the noodles.

Materials and methods

Raw Materials : The food materials used include, wheat flour, melon seeds, soybeans, bambara groundnut and peanut obtained from Owerri main market, cassava tubers (TMS 1368 and 1371 yellow root variety) were obtained from Agricultural Development programme (ADP) Owerri all in Imo State Nigeria.

Sample Preparation. The oil seeds were all processed into fine flour separately and defatted using N-hexane in cold extraction method. The cassava tubers were processed into high quality cassava flour (HQCF) using standard method[5]. The flours produced were then blended into composite flours using 10% of each defatted flour separately in 80:10 wheat/cassava flour ratio. A total of five samples were formulated.

Noodle Production: Noodles were produced by mixing flour samples 100g with 87g of egg to form dough. The dough was allowed to rest for 20 minutes. After resting, it was rolled severally and pulled through a manually operated extruder (Eurosonic, globe 150). Noodle strands were extruded and put in clean aluminum trays then oven dried at 60^{o}C.

Cooking Time

In a 500ml beaker 300ml of water was heated until boiling. Twenty five ± 0.1g of noodles were put into the boiling water (no salt addition) without stopping the water from boiling. Every 30 seconds, one noodle was taken out and pressed between two Perspex plates. The

cooking time was calculated as the time when a white core could no longer be seen.

Cooking Loss: During the cooking, some parts of the noodles dissolve in water. The cooking loss was determined gravimetrically by weighing the residue after evaporating the cooking water.

Cooking Weight: Cooking weight was defined as the weight gain of the noodles during the cooking and indicated the amount of water that was absorbed and was therefore an index for the swelling ability of the noodles. Each noodle sample was cooked according to the determined cooking time and then the cooking weight was calculated and given in percentage.

Noodle production: Edible noodles were prepared with each sample using the recipes outlined in table 1.

Table 1: Recipe for noodle preparation

Ingredients	Quantities
Noodle sample	100g
Commercial instant noodle	100g
Commercial noodle spices	5g
Pepper	2g
Water	400ml

Sensory Evaluation: Different noodle samples were cooked according to their cooking time and served hot in a plate to the panelist. A 9-point hedonic scale was used. The scores were 9 – like extremely, 8 – like very much, 7 – like moderately, 6 – like slightly, 5 – neither like nor dislike, 4 – dislike slightly, 3 – dislike moderately, 2 – dislike very much, 1 – dislike extremely. The cooked noodles were evaluated for colour, taste, aroma, texture, mouth feel and over all acceptability. The evaluation was done by 20 semi trained panelist.

Statistical Analysis: The statistical differences between the products were determined by analysis of variance (ANOVA) and their means separation using the Fishers least significant difference (LSD) procedure**.**

Results and Discussion

Cooking quality of cassava noodles:

The results of the cooking quality of the cassava noodles are presented in Table 2. The cooking time of the different noodle samples ranged from 10 – 16 minutes, with samples 205 (10% CF and 90% WF) and 202 (10% PDBGF, 10% CF and 80% WF) having the lowest and highest values respectively. Cooking time of the noodle samples increased with the incorporation of the partially defatted flour samples to the wheat-cassava composite flour which was used for their production; therefore the difference in the cooking time of the noodle samples may be attributed to their compositional differences. The cooking time generally were higher than that of wheat pasta which was reported to be 8 minutes [6], the difference may be attributed to the use of composite flour in their production.

Cooking loss: The result shows that there were significant differences ($p<0.05$) in the cooking loss among all the noodle samples. The cooking loss ranged from 3.44 – 22.32g with samples 204 and 205 having the lowest and highest values respectively. The high cooking loose of sample 205 (10% CF and 90% WF) may be due to the poor formation of protein complex which might have resulted from the poor protein content and lack of gluten forming proteins (glutenin and gliadine).

Cooking weight: The cooking weight of the noodle samples were significantly different ($p<0.05$), ranging from 115.60 – 213.56g with samples 202 (10% PDBGF, 10% CF and 80% WF) and 204 (10% PDSF, 10% CF and 80% WF) having the lowest and highest values respectively. The high cooking weight would be attributed to the high starch and protein content of the noodle samples.

Table 2: Cooking quality of cassava noodles

Noodle samples	Cooking time (min)	Cooking loss (%)	Cooking weight (%)
201	13.00	4.45[d]	155.24[c]
202	16.00	15.76[b]	115.60[e]
203	14.00	7.00[c]	118.64[d]
204	12.00	3.44[e]	213.56[a]
205	10.00	22.32[a]	212.44[b]

Means with different superscripts within the same column are significantly different (P < 0.05)

Key:
201 = 80% WF: 10% CF: 10% GF
202 = 80% WF: 10% CF: 10% BGF
203 = 80% WF: 10% CF: 10% WMF
204 = 80% WF: 10% CF: 10% SF
205 = 90% WF: 10% CF
SF = Soybean flour

Sensory Evaluation of the Cooked Noodle Samples

Colour: The average sensory scores for colour of the prepared cassava noodles ranged from 5.25 to 8.70 (Table 3). The control (sample 206) was the best (8.70) and was not significantly different (p>0.05) from sample 205 (10% CF and 90% WF) but was significantly different from the other samples. Samples 202 (10% PDBGF, 10% CF and 80% WF) and sample 203 (10% PDWMF, 10% CF and 80% WF) were the least preferred (probably because of their unattractive cooked colour which was attributed to the colur of the bambara and melon flours. Colour is one of the major response variables governing food acceptance [7]. Since colour relies on the sense of sight, the colour of the noodles was one of the outstanding parameters in the decision of the panelists.

Texture: The values for the texture of the prepared cassava noodles as seen in table 3 ranged between 6.25 and 8.50. The result shows that sample 206 which was the control also had the highest value in terms of texture and was significantly different (p<0.05) from the other samples.There were also significant differences (p<0.05) between Samples 201 (10% PDGF, 10% CF, 80% WF), sample 203 (10% PDWMF, 10% CF and 80% WF) and the other samples 204, 205 and 202 which may be as a result of the defatted flour samples incorporated.

Taste: Sample 206 (commercial noodles) ranked highest (8.30) in terms of taste and was significantly different (p>0.05) from other samples . Samples 201, 202 and 203 were the least preferred having no significant differences (p<0.05) among themselves. Samples 204 (10% PDSF, 10% CF and 80% WF) and 205 (10% CF and 80% WF) were not significantly different (p<0.05) in terms of their taste. The difference in preference among the samples resulted from the taste of the partially defatted flour samples added to the wheat-cassava composite flour used in the noodle production. The panelists preferred the taste of the noodle produced with the flour blend containing soybean flour (204) and wheat-cassava composite flour (205) to the noodle samples produced with the other flour blends.

Aroma: The average sensory scores for aroma of the prepared cassava noodles in terms of aroma ranged between 5.95 and 8.85. The result followed the same suit with the result of other parameters. Sample 206 (commercial noodles) ranked the highest in terms of aroma and was significantly different (p>0.05) from the other samples. Sample 202 (10% PDBGF, 10% CF and 80% WF) was the least preferred and was significantly different (p>0.05) from other samples. This result may be attributed to the aroma of bambara groundnut which made up 10% of sample 202. The

panelists may not used to consuming bambara groundnut, and it has very strong aroma that is difficult to reduce during processing.

Mouth feel: The average sensory score for mouth feel of the prepared cassava noodles ranged between 6.75 and 8.25. Sample 206 (commercial noodles) still ranked the highest in terms of the mouth feel and was significantly different ($p>0.05$) from the other samples. Sample 204 followed in ranking, and had no significant difference ($p<0.05$) with samples 201, 203 and 205. Sample 202 was least preferred maybe because it was not as soft as the other noodle samples after cooking.

General acceptability: The control (Sample 206) was the best accepted and was significantly different ($p>0.05$) from the other samples in terms of general acceptability. Sample 202 (10% PDBGF, 10% CF and 80% WF) was the least preferred and was not significantly different ($p<0.05$) from sample 203 but was significantly different ($p>0.05$) from the other samples. Sample 202 (10% PDBGF, 10% CF and 80% WF) was least preferred by the panelist in terms of both colour and aroma which are very important in the acceptability of any food sample; therefore this may have contributed to the least preference of the sample.

Table 3: The results of the sensory evaluation of the cooked cassava noodle samples

Noodle samples	Colour	Texture	Aroma	Mouth feel	Taste	General acceptability
201	7.25^{b}	6.25^{c}	7.55^{b}	7.10^{bc}	6.25^{c}	7.05^{b}
202	5.25^{d}	7.25^{b}	5.95^{d}	6.75^{c}	6.55^{c}	6.50^{c}
203	6.40^{c}	6.50^{c}	6.65^{c}	7.30^{b}	6.30^{c}	6.55^{c}
204	7.30^{b}	7.20^{b}	7.45^{b}	7.40^{b}	7.45^{b}	7.45^{b}
205	7.95^{ab}	7.40^{b}	7.30^{b}	7.25^{b}	7.05^{b}	7.45^{b}
206	8.70^{a}	8.50^{a}	8.85^{a}	8.25^{a}	8.30^{a}	8.70^{a}

Means with different superscripts within the same column are significantly different ($P < 0.05$)
Key
Where;
201 = 80% WF: 10% CF: 10% GF
202 = 80% WF: 10% CF: 10% BGF
203 = 80% WF: 10% CF: 10% WMF
204 = 80% WF: 10% CF: 10% SF
205 = 90% WF: 10% CF
206= Commercial noodles (control)

Conclusion

The study indicated that noodles produced from 10% substitution of wheat flour with cassava flour and substitution of wheat flour with 10% cassava flour and 10% partially defatted soybean flour were preferred to others. The preference of these two samples (205 and 204) indicates that they can be used to produce acceptable noodles.

The overall results showed that substitution of wheat flour with cassava flour (10%) and partially defatted soybean flour (10%) can be used in the production of noodles with

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