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Preliminary Studies of the Chemical Composition and Sensory Properties of Sweet Potato Starch-Wheat Flour Blend Noodles

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ABSTRACT

Preliminary studies of chemical composition and sensory properties of instant noodles from blends of wheat flour and sweet potato starch were carried out. Sweet potato starch was used to replace wheat flour at 30, 40, 50, 60 and 70%. Proximate, vitamin A, mineral analysis and sensory evaluation were carried out by standard methods. Results showed that the formulated noodles had higher carbohydrate (63.34 – 70.53%), moisture (4.34 – 4.97%) and vitamin A (11.62 – 35.00 mg/100 g) but lower protein (3.36 – 7.89%), fat (16.91 – 25.09%), calcium (0.73 – 0.89%), phosphorus (0.24 – 0.32%), iron (0.10 – 0.27%) and ash content (1.17 – 3.17%) than the commercial noodles from wheat flour. The noodles containing 30% sweet potato starch showed no significant difference ($p > 0.05$) from commercial noodles (100% wheat flour) in terms of colour, crunchiness, taste and general acceptability, with improved nutrient composition. It is concluded that production and consumption of wheat flour/potato starch blend noodles should be encouraged to increase the calorie and vitamin A intake in the diet, especially for children who are the major consumers of noodles; apart from helping to promote and improve the utilization of sweet potato tubers.

Keywords: Wheat flour, sweet potato starch, noodles.

Introduction

Noodles are types of pastas made with flour and water or added with egg. The flour from various grains such as rice, wheat, buckwheat and mungbean starch are made into a vast range of shapes and sizes (Miskelly and Moss, 1985). They are strips or strands cut from a sheet of dough made from flour, water and either common salt or a mixture of alkaline salt. Noodles consumption represents about 40%of the total wheat flour consumption in East and South East Asia (Dexter, 1995). The number of servings was estimated to grow from 43 billion parks in 1998 to 100 billion by 2010 (Anon, 1999). In its natural state, wheat is a good source of vitamin B1 (thiamin), B2 (riboflavin), niacin, B6 (*pyridoxine*), E (*Tocopherol*) as well as Iron and Zinc (Shirao and Moss, 1978). Most of these nutrients are concentrated in the outer layers of the wheat grains and a significant proportion is lost during the process of milling (Lorenz and Dilsaver 1982). It is for this reason that some countries like Thailand have instituted the fortification of noodles with essential micro-nutrients such as iron, iodine, vitamin A, etc. (Hou, 1998). Wheat noodles can be fortified with nutrients from cheap plant foods such as sweet potatoes (*Ipoma batatas*). Sweet potato is a dicotyledonous plant belonging to the family of convolulaceae. It is a good source of carbohydrate, beta-carotene and fibre. It is a beneficial food for diabetics as preliminary studies on animal have revealed that it helps to stabilize blood sugar level and to lower insulin resistance. The objective of this study was to produce an acceptable instant noodle from a blend of sweet potato starch and wheat flour.

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Materials and Methods

Sweet potato tubers, wheat flour and commercial noodles were procured from a local market in Iwo, Osun State of Nigeria.

Extraction of sweet potato starch

The sweet potato tubers were washed in tap water and peeled manually with a sharp knife. The peeled tubers were washed and diced into cubes in another clean bucket of water prior to time of milling. Wet milling of the cubed tubers was carried out and a little amount of water was added to the slurry and sieved using a muslin cloth. It was allowed to settle for 6 h. The supernatant water was decanted and the starch was further washed twice using clean water to remove fibrous materials present and was left to settle. The starch was dried in clean transparent trays in the sun for 5 h. The dried starch was milled to a powdery form, sieved to pass through a 120 um mesh and packaged airtight using a high density polyethylene bag.

Production of instant noodles

The sweet potato starch at the rate of 30, 40, 50, 60 and 70% was blended with the wheat flour on replacement basis in a food mixer; distilled water was added to form a stiff dough. The dough was manually sheeted to about 2 mm thickness and was subsequently cut with a pastry cutter into 10 cm strips. The resulted noodles were dried at 60°C for 3 h and allowed to cool.

Chemical analysis

The noodles from the wheat flour, sweet potato blends and the commercial instant noodles were subjected to proximate and vitamin analysis using AOAC method (AOAC 2000). Carbohydrates were calculated by difference. Calcium (Ca), magnesium (Mg), Iron (Fe) and sodium (Na) content were determined from their ashes by atomic absorption spectrophotometry using a Perkin Elmer 300AA spectrophotometer (Perkin Elmer, USA). Phosphorus (p) content was determined using Vanadomolybdate method (Tahir and Sumati, 2009). All analyses were determined in triplicates.

Sensory evaluation

The cooked sweet potato starch-wheat flour blends and commercial noodles were evaluated for colour, crunchiness, taste and general acceptability by fifteen (15) untrained judges. The samples were evaluated on a 9-point hedonic scale (1 = dislike extremely and 9 = like extremely). The panel members consisted of staff and students randomly selected from the university community. Samples were randomly presented in three-digit-coded white plastic basins.

Statistical analysis

Analysis of variance was used to ascertain the significant difference between means. Least significant difference (LSD) test was used to determine if there was a significant difference between means. Significance was accepted at $p < 0.05$.

Results and Discussion

Table 1 shows the result of the chemical composition of commercial noodles and those of the blends of potato starch (ps) and wheat flour (wf). Noodles from ps/ wf blends had higher carbohydrate (63.34 – 70.53%), moisture (4.34 – 4.97%) and vitamin A (11.635.00 mg/100 g) but lower protein (3.36 – 7.89%), phosphorus (0.24 – 0.32%), iron (16.92 – 25.09%) and ash contents (1.17 – 3.17%) than the commercial noodles. The level of carbohydrates and vitamin A in the ps/wf noodles increased with the increase in proportion of potato starch in the blend. This was in agreement with literature report on high contents of starch and beta-carotene in sweet potato (FAO, 2001; Woofle, 1992). The mean sensory scores of ps/wf blends and commercial noodles are presented in Table 2; the mean sensory scores of ps/wf blends noodles for all the attributes increased with an increase in the level of wheat flour in the blend with the commercial noodles (100% wheat flour) being the most preferred by the panel. The blend containing 70% potato starch was not acceptable to the panel. However, the noodles containing 30% potato starch showed no significant difference ($p > 0.05$) with the commercial noodle in terms of overall acceptability.

Table 1: Chemical composition of noodles produced from wheat flour (wf) and potato starch (ps) blends

Sample	Moisture (%)	Fat (%)	Protein (%)	Ash (%)	CHO (%)	Ca (%)	Mg (%)	Fe (%)	Na (%)	P (%)	Vit A mg/100 g
Commercial (100%) wheat noodles	4.05^{f}	26.2^{a}	9.99^{a}	3.5^{a}	56.44^{f}	0.9^{a}	1.71^{a}	0.28^{a}	0.29^{a}	0.33^{a}	18.00^{f}
Blends:wf/ps 70:30	4.67^{a}	16.91^{f}	7.89^{b}	3.17^{b}	63.3^{cd}	0.84^{d}	1.61^{b}	0.27^{b}	0.28^{b}	0.32^{ab}	21.62^{ef}
60:40	4.34^{e}	21.14^{d}	4.62^{e}	1.30^{e}	68.40^{b}	0.73^{f}	1.50^{d}	0.10^{f}	0.21^{ef}	0.28e	25.05^{d}
50:50	4.40^{d}	25.09^{b}	6.00^{d}	1.17^{f}	67.34^{c}	0.89^{b}	1.27^{f}	0.25^{c}	0.23^{cd}	0.30^{c}	28.04^{bc}
40:60	4.97^{a}	21.18^{c}	7.28^{c}	1.67^{c}	66.90^{bc}	0.78^{e}	1.52^{c}	0.20^{e}	0.24^{c}	0.29^{d}	30.20^{b}
30:70	4.51^{c}	20.27^{e}	3.36^{f}	1.33^{d}	70.53^{a}	0.85^{c}	1.42^{e}	0.22^{d}	0.22^{e}	0.24^{f}	35.05^{a}

Values represent the mean of triplicate samples
Mean values carrying the same letters along the column are not significantly different ($p > 0.05$).

Table 2: Means sensory scores of cooked noodles produced from wheat flour (wf)-potato starch (ps) blends

Samples	Colour	Crunchiness	Taste	General acceptability
Commercial noodles (100% wheat flour)	8.8a	8.5^{a}	8.7^{a}	8.8^{a}
Blends of WF/ PS WF: PS				
70:30	7.8^{a,b}	7.7^{a,b}	7.8^{a,b}	8.0^{a,b}
60:40	7.6^{a,b}	7.0^{a,b}	6.4^{a,b}	7.6^{a,b}
50:50	7.5^{b}	6.9^{b}	7.3^{a,b}	7.1^{b}
40:60	7.2^{b}	7.2^{b}	6.8^{a,b}	5.3^{d}
30:70	4.4^{c}	6.8^{b}	4.6^{c}	4.9^{c}

Mean values carrying the same letters along the same column are not significantly different ($p > 0.05$).

Conclusion

The combination of wheat flour and potato starch in making noodles resulted in a product with improved nutrients composition and the wheat flour/potato starch blend at a ratio of 70:30 was the most acceptable among the blends. The production and the consumption of the wf/ps blend noodles should be encouraged to increase the calorie and vitamin A intake in the diet, especially in children who are the major consumers of noodles; and also to improve the utilization of sweet potato tubers.

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