American Journal of Food and Nutrition, 2020, Vol. 8, No. 2, 37-39
Available online at http://pubs.sciepub.com/ajfn/8/2/3
Published by Science and Education Publishing
DOI:10.12691/ajfn-8-2-3

Production and Evaluation of Pasta Using Two Varieties of Cassava Flour Enriched with African Yam Bean

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Received May 17, 2020; Revised June 20, 2020; Accepted June 27, 2020

Abstract Composite flour of two varieties of Cassava (TMS 419 and NR 8082) and African yam bean was used to produce pasta. Cassava was processed into flour using the processing methods: Peeling, washing, grading, dewatering, oven drying, fine milling and sieving. TMS 419 had higher emulsion capacity (15.56%), water absorption capacity (2.59%) and higher swelling index (1.54%) than NR 8082. Wettability and foaming capacity of NR8082 was however higher than that of TMS 419. TMS 419 had higher ash and fibre content than NR 8082. There was no significant difference between the two cassava varieties. NR 8082 contained more starch than 419, pasta produced from the flour were all acceptable to the panelist. Cassava has good potentials and would serve as a substitute to wheat flour in pasta production.

Keywords: *pasta, cassava, flour, African yam bean, composite flour*

Cite This Article: Agbaeze Theresa, Okoronkwo Christopher, Oganezi Nuria, and Iwuagwu Mary, "Production and Evaluation of Pasta Using Two Varieties of Cassava Flour Enriched with African Yam Bean." *American Journal of Food and Nutrition*, vol. 8, no. 2 (2020): 37-39. doi: 10.12691/ajfn-8-2-3.

1. Introduction

Pasta is a staple food of traditional Italian cuisine, now renowned worldwide. It takes the form of unleavened dough and comes in variety of different shapes that serve for both decoration and has carrier for sauces [1].

Pasta whether in the form of flat noodles, macaroni, or any of the myriads of shapes and sizes is consumed worldwide because it's economical, easy to prepare, shelf stable when dried and can serve in many ways [2].

Wheat flour is not a good source of fibre and protein even though its popular in the world [3].

It is an established fact that Nigeria cannot grow wheat in commercial quantities due to local climatic condition [4]. Cassava (*manihotesculenta*) belong to the family Euphobiaceac [5]. Cassava flour has a blend taste and is unlikely to alter the flavor of any product. Cassava plays a good security role in areas prone to draught, famine and in period of civil disturbances [6]. Cassava is the chief sources of dietary food energy for the majority of the people living in the lowland tropics and much of the sub humid tropics [7].

However, the utilization of cassava is limited by its extremely low protein content and so the consumption of its product has been implicated in malnutrition. The need to fortify cassava with African yam bean arises due to the protein content which ranges from 19.6% - 29% [8].

Therefore, there is the need to diversify cassava utilization of protein enriched form in order to effectively utilize the carbohydrate based staple. Hence the need to produce pasta from African yam bean and cassava and to evaluate the acceptability by consumers.

2. Materials and Methods

2.1. Production of Cassava Flour

The cassava roots were peeled, washed, and grated. The grated mash was bagged in labeled sacks and tied. Each sack was mounted on a hydraulic presser and dewatered. The dewatered cake was broken into pieces and sundried. It was later oven dried in an electric hot air at a temperature of 60°C for 8 hrs. The dried materials were milled in a disc mill and sieved with a 250um mesh sieve according to [9].

2.2. Production of African Yam Bean Flour

The African yam bean flour was prepared by sorting the bean followed by cleaning, dehulling, milling and sieving into flour.

2.3. Production of Instant Pasta

The cassava flour and African yam bean flour (Pasta) was blended together in a ratio of OA:100C, 100A:0C, 50A:50C, 40A:60C, 30A:70C, 20A:80C (Cassava vs African yam bean). All the samples were poured into a deep plate and mixed with water. The flour

was mixed until it formed dough. The dough was extruded and the extrudate was allowed to drop in a boiling water which transformed into pasta. It was cold in water for 10mins, cooked for 20min and then oven dried at 65°C [9].

2.4. Proximate Analysis

The moisture content, fat content, Ash, crude fibre was determined by the AOAC [10], the protein was determined by the Kjedhal method described by James [11]. The carbohydrate was determined by estimating the difference.

2.5. Functional Properties

Gelation capacity, water absorption capacity, oil absorption capacity, swelling index, emulsion capacity, bulk density, foam capacity and stability, wettability were all determined using the standard methods described by Okezie and Bello, [12] and Svanberg, [13].

2.6. Sensory Evaluation

Freshly cooked pasta was presented to a selected members of panelist as described by Ihekoronye and Ngoddy [14].

3. Results and Discussion

Table 1. Proximate Composition of the Cassava flour

Variables	TMS 419	NR8082	T-value	P- value
Ash(%)	1.933±0.011	1.860± 0.02	5.500	0.005^{a}
Fibre(%)	0.520±0.020	0.440±0.020	4.895	0.008^{b}
Carbohydrate(%)	86.116±0.254	85.666±0.214	2.340	0.079^{b}
Fat(%)	0.466±0.115	0.466±0.115	0.000	1.000^{b}
Protein(%)	2.003±0.219	2.233±0.178	-1.407	0.232^{b}
Moisture(%)	8.960±0.020	9.333±0.050	-11.939	0.000^{a}

a. differ significantly P < 0.05
b. do not differ significantly P>0.05.

From the Table 1 above, the ash content ranged from 1.860% to 1.933% with sample TMS 419 having a higher value than NR 8082. Significant difference exist from the two samples.

TMS 419 has higher fibre content than NR8082, significant difference (P<0.05) also exist. TMS 419 had high carbohydrate content than NR 8082 which supported the high carbohydrate content of cassava [6]. They were no significant different between the fat and protein content of the two samples at 5% level of freedom.

Significant difference exist in the moisture content of TMS 419 (8.960%) and 9.333%. NR8082 respectively.

Table 2. Sensory Scores of the Pasta Samples

Varieties	Ratios	Taste	Texture	Colour	General Acceptability
Tms419	$0A:100^{c}$	4.48^{cd}	5.24^{de}	4.76^{bc}	5.05^{cd}
	$20A:80^{c}$	6.71^{a}	7.57^{a}	7.14^{a}	7.62^{a}
	$30A:70^{c}$	6.51^{a}	7.01^{a}	6.88^{a}	7.12^{a}
	$40A:60^{c}$	5.76^{ab}	6.79^{ab}	5.81^{b}	6.52^{ab}
	$50A:50^{c}$	5.29^{bc}	6.29^{bc}	4.81^{bc}	6.10^{bc}
NR8082	$0A:100^{c}$	3.10^{e}	4.43^{e}	3.29^{d}	4.10^{d}
	$20A:80^{c}$	5.48^{cd}	6.43^{bc}	5.76^{b}	6.19^{bc}
	$30A:70^{c}$	5.01^{cd}	6.22^{bc}	5.66^{b}	5.88^{bc}
	$40A:60^{c}$	4.10^{de}	5.57^{cd}	4.86^{bc}	5.10^{cd}
	$50A:50^{c}$	3.43^{de}	4.81^{de}	4.24^{cd}	4.76^{d}

Key: A = African yam bean, C = Cassava, a, b, c - superscript shows that there is a significant difference (P<0.05) which means with superscript on the same column are not significant different (P>0.05).

In Table 2, Pasta made from 20:80% AYB/CF was most acceptable, while pasta made from 0:100AYB/CF of both varieties were least accepted in taste. TMS 419 were most acceptable in taste than NR 8082.

Significant difference do not exist in texture of 20:80%, 30:70% and 40:60% AYB /CF, TMS 419 samples, this may be implicated to increase in African yam bean which gave the cassava flour a soft texture [15].

The colour of the samples was significantly higher (P<0.05) in the blends of 20:80% AYB/CF of TMS 419 and 30:80% AYB/CF of NR 8082. The colour darkens with the increase in African yam bean. The general acceptability do not show any significant difference (P>0.05) between 20:80% AYB/CF of TMS 419 and 20: 80% AYB/CF of NR8082. The result revealed that TMS419 samples were most acceptable than NR 8082 due to its does not break easily in the mouth.

Table 3. Functional Properties of Cassava Flour

Variables	TMS419	NR8082	T-Value	T-Value
Emulsion capacity (mg/g)	15.563±0.075	14.78±0.069	13.961	0.00^{a}
Foam capacity (mg/g)	10.850±0.684	12.450±0.588	-3.069	0.0337^{a}
Gelation capacity	71.500±0.020	71.500±1.000	0.000	1.000^{b}
PH	6.030±0.02	5.020±0.010	78.234	0.000^{a}
WAC	2.233±0.051	1.133±0.057	23.335	0.000^{a}
OAC	2.590±0.051	2.340±0.051	5.893	0.004^{a}
Swelling index	1.543±0.023	1.463±0.035	3.297	0.030^{a}
Bulk density	0.695±0.002	0.694±0.004	0.431	0.688^{b}
Wettability	20.000±1.000	35.000±1.000	-18.371	0.000

P < 0.05 Differ significantly (a)
P > 0.05 Do not differ significantly (b)

Data on the water absorption capacity of the flour from cassava varieties (Table 3) ranged from 1.133 - 2.233mg/g, TMS419 had higher water absorption capacity than the NR.8082 while NR8082 had the lower oil absorption capacity than the TMS 419 (2.340 - 2.590mg/g). There was significant difference ($P<0.05$) in the water and oil absorption capacity of the flour samples, this agreed with [13] which stated that water absorption capacity is a useful indication of whether flour can be incorporated into aqueous food formulations.

The flour samples have bulk density values of 0.0694 to 0.695 with TMS 419 which is little higher than NR 8082. There was no significant difference ($P>0.05$). Low bulk densities of flour is good physical attribute when determining transportation and storability [16]. Swelling index and wettability as shown in Table 3 ranged from 1.463 - 1.543 and 20.000 - 35,000 sec. respectively. TMS 419 have the lower wettability than the NR8082. Significant difference exist ($P<0.05$) in the swelling index and wettability of the flour samples. Wettability is a function of the ease of dispersion, the sample with lowest time of wettability would perform better in texture [17].

The Emulsion capacity of the flour samples (Table 3) were 14.748 - 15.363%, variety TMS 419 has a higher emulsion capacity than NR8082. Significant difference exist ($P<0.05$) in the flour samples. High emulsion capacity is an indication that the flour samples can act as an excellent emulsifier in various food system [18].

PH and gelation temperature of flour samples for both TMS 419 and NR8082 was 71.50^{o}C and there was no significant difference ($P>0.05$). The results are in accordance with the result shown for commonly used complementary foods in North Western Nigeria [19].

4. Conclusion and Recommendation

The blend of cassava and African yam bean were good raw materials for pasta production and could be used to replace wheat if the technology is adopted and developed. 20%. African yam bean and 80% cassava flour gave good pasta and also 20% African yam bean and 80% cassava flour had higher cooking time. The blends were good because they were nutritionally upgraded. Further research should be geared toward improving the use of composite flour so as to harness their potentials. Therefore, the use of composite flour would reduce over dependence on wheat for production of pasta.

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