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PRODUCTION AND EVALUATION OF VELVET TAMARIND (*DIALIUM GUINEESE WILD)* CANDY

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ABSTRACT: *Velvet tamarind (Dialium guineese, wild) pulp flour was used to produce candies. Proximate composition, and vitamin composition of the pulp flour and candies were evaluated. The sensory properties and functional properties were also determined using chocolate candy as the control. The candies and the pulp flour had vitamin composition ranging from 0.7 mg/100 to 1.59mg/100 vitamin A and 38.71 mg/100 to 4.85 mg/100 vitamin C. The result of the functional properties of velvet tamarind pulp flour had emulsion capacity of 56%, bulk density of 0.44g/m, water absorption capacity of 2.5g/ml, oil absorption capacity of 1.76g/ml, foam capacity and stability of 30% and 111% respectively. The results of the sensory evaluation showed that the velvet tamarind chewable candy was most preferred by the panelists in terms of colour, flavour, taste and general acceptability. The control was most preferred in terms of mouth feel and appearance.*

KEYWORDS: Velvet Tamarind, Sensory evaluation, functional properties, candy.

INTRODUCTION

Velvet tamarind (*Dialium guineese*) is a woody plant that occurs in the rain forest region of West Africa. It grows up to 15m high with dark green glossy leaves, each measuring 6cm to 8cm long and 2.5cm wide at the widest part of the leaf (Okegbile and Taiwo, 1990). The young leaves are sometimes chewed for its tangy taste. The ripe fruits are available from January till May but the peak period for harvest is between March and April (Okafor, 1975). The velvet tamarind pulp is eaten in South Eastern Nigeria (where it is known as “Icheku” or “Nchichi”) because of its refreshing properties and pleasant scorching taste (Ubbaonu *et al.*, 2005).

However, it has been earlier shown that the fruit could be processed into beverages, soft drinks, alcoholic drinks, syrup / concentrate and jams (Okafor, 1975). The fruits contain fibre, sugars (namely, fructose, glucose, sucrose and maltose), acids, polysaccharides, small amounts of protein and lipid (Okegblie and Taiwo, 1990).Velvet tamarind fruit is most valued for its high ascorbic acid content, minerals and sugar. Ascorbic acid is one of the anti-scurvy vitamins and is one of the valued nutrients inadequately supplied in many Nigerian diets and which needs to be supplemented (Okegblie and Taiwo, 1990). Inadequate intake of vitamin C has been reported as one of the major problems people encounter with regards to the health and nutrition of their children. Since the fruit is high in ascorbic acid and children like eating candy, there is need to supplement it with the fruit.

The rate of post-harvest losses of the fruit is high and Nigeria is a velvet tamarind producing region. This fruit is seasonal and its taste is cherished by many children thus there is the need for its proper processing and utilization. This led to the objectives of this work, which are: To produce candy using velvet tamarind; To evaluate the functional properties of velvet tamarind pulp; To evaluate the proximate composition and sensory properties of the candy samples produced with velvet tamarind fruits; The work when properly executed, will help to supplement ascorbic acid (vitamin C) in Nigeria's sugar confectionaries. It will also help to reduce post harvest losses hence encourage farmers to produce more which also will go a long way to increase their income and standard of living.

METHODOLOGY

Production of Candy

The velvet tamarind (*Dialium guineense)* fruits, sugar, glucose syrup were purchased from new market in Aba, Abia State. The fresh fruits were first sorted, cleaned and the weight of the whole fresh fruit noted. The shells were removed manually by breaking them open with hands. The seeds were removed and the pulp was subjected to size reduction to obtain velvet tamarind pulp powder.To produce chewable Velvet Tamarind candy, a weighed quantity of Sugar (150g), 20g of glucose syrup, 20g of velvet tamarind pulp powder, and 50ml of water were combined in a saucepan over medium heat. The sugar was stirred until it dissolved. A thermometer was inserted in the mixture as it started boiling and the mixture was allowed to boil without stirring until the temperature of the candy reached 105 – 110^{0}C for one hour. The candy was removed from the heat when it reached 110^{0}C and was allowed to sit until it stopped bubbling completely. The candy was poured into greased mould cavities. Then it was allowed to cool completely and removed when hardened. The candies were individually wrapped in a foil and stored in an airtight container at room temperature. For the non-chewable Candy production, the same procedure was followed, but with the absence of glucose syrup.

Analytical Methods

The proximate compositions determined were the crude protein, crude fat, crude fat, total ash, moisture content and the carbohydrate contents using standard methods (James, 1995). Vitamin C content of the velvet tamarind pulp, chewable and non-chewable candies were determined using the method of (AOAC, 1990). Vitamin A was determined using method described by Mieko and Delia (2003). The fuctional properties of the Velvet Tarmarind Powder determined were the bulk densitiy, the water absorption capacity,the water absorption capacity, foam capacity and emulsification capacity using the method described by Onwuka (2005).

Sensory evaluation of the velvet tamarind candy.

Sensory evaluation was conducted to determine consumer preference and acceptability of the candies obtained from velvet tamarind. A candy sold in the market was used as a control. Using a 9-point hedonic scale, twenty four panelists drawn from the Michael Okpara University of Agriculture Umudike community were used to carry out the sensory evaluation. The attributes assessed were colour, flavour, taste, mouth feel, appearance and general acceptability.

Statistical analysis.
All data were subjected to analysis of variance (ANOVA) to ascertain if there were any differences at 5% level of significance. The means were separated by Duncan's multiple rang tests to establish if there were significant differences between the different samples of the candies.

RESULTS

The results of the proximate composition of the velvet tamarind pulp flour and the candies are shown in Table 1, while that of the vitamin contents are shown in Table 2. Table 3 has the functional properties of the velvet tarmarind pulp flour and Table 4, the sensory scores of the candy samples.

Table1: Proximate composition of velvet tamarind candies and the pulp flour

*Samples (%)	Moisture content	Ash content	Crude fibre	Crude protein	Fat content	Carbohydrate
Velvet tamarind pulp flour	$6.71^{b}\pm0.01$	$1.81^{a}\pm0.01$	$2.05^{a}\pm0.00$	$4.21^{b}\pm0.01$	$2.58^{a}\pm0.02$	$82.64^{a}\pm0.01$
Velvet tamarind chewable candy	$7.81^{a}\pm0.00$	$1.77^{b}\pm0.01$	$2.01^{a}\pm0.00$	$4.17^{b}\pm0.01$	$2.07^{b}\pm0.00$	$82.17^{b}\pm0.00$
Velvet tamarind non - chewable candy	$4.24^{c}\pm0.02$	$1.49^{c}\pm0.01$	$4.01^{b}\pm0.00$	$14.022^{a}\pm0.0$	$1.281^{c}\pm0.01$	$73.42^{c}\pm0.00$

* Means in the same column with different superscripts are significantly different (P<0.05)± standard deviation

Table 2: Vitamin contents of velvet tamarind candies and pulp flour samples

*Samples	Vitamin A (mg/100g)	Vitamin C (mg/100g)
Velvet tamarind chewable candy	0.73 [b] ±0.00	38.71 [b] ±0.01
Velvet tamarind non-chewable candy	0.07 [c] ±0.00	38.73 [b] ±0.01
Velvet tamarind pulp flour	1.88 [a] ±0.00	41.85 [a] ±0.07

* Means in the same column with different superscript are significantly different ($P<0.05$) ± standard deviation.

Table 3: Functional Properties of Velvet Tamarind Pulp Flour

*Sample	WAC (g/ml)	OAC (g/ml)	FC (%)	FS (%)	EC (%)	BD (g/cm^3)
Velvet tamarind pulp flour	2.5	1.76	30	111	56	0.44

*BD-Bulk density, FC-Foam capacity, FS-Foam stability, WAC-Water absorption capacity, OAC-Oil absorption capacity, EC- Emulsion capacity

Table 4: Sensory Quality score of the candies samples

Sample	Flavour	Appearance	Taste	Mouthfeel	General acceptability
Velvet tamarind chewable candy	7.70[a]±1.04	6.54[c]±1.02	8.25[a]±0.67	6.75[b]±1.13	8.41[a]±0.78
Velvet tamarind non-chewable candy	8.08[a]±0.77	8.00[b]±0.58	7.87[a]±0.90	7.45[a]±7.97	7.50[b]±0.88
Chocolate candy	6.83[b]±1.04	8.50[a]±0.72	6.83[b]±1.00	6.95[ab]±1.16	6.37[c]±0.15

Means in the same column with different superscripts are significantly different ($p<0.05$), $\pm$ means standard deviation.

DISCUSSION

Proximate composition of the samples

The proximate composition of the samples is presented in Table 1. The moisture content of the samples ranged between 4.24% and 7.81% and were significantly different ($p<0.05$). Velvet tamarind chewable candy had the highest moisture content (7.81%) and velvet tamarind non -chewable candy had the lowest moisture content (4.24%). The moisture content of any food material is of significance to shelf life, packaging and general acceptability (sefa-Dedeh and Saalia, 1997; Okaka and Okaka, 2001). Velvet tamarind non-chewable candy had the highest ash content (2.49%) which was significantly different ($p<0.05$) from other samples. The ash content (1.81%) of the velvet tamarind pulp flour was similar to ash content of *Tamarind indica* pulp (1.69%) reported by Isiaku (2012). The ash content represents the total mineral contents in foods and thus, serves as a viable tool for nutritional evaluation (Lienel, 2002). The crude fibre (2.01%) of the velvet tamarind chewable candy and crude fibre (2.05%) of velvet tamarind pulp flour were significantly different ($p<0.05$). Velvet tamarind non -chewable candy had the highest content of crude fibre (4.01%).The crude fibre content of the candies are higher than those of gelatin based candy reported by Onwuka *et al*.(2010). The crude protein (14.02%), of velvet tamarind non -chewable candy was significantly ($p>0.05$) higher than those of the velvet tamarind pulp flour and velvet tamarind chewable candy. The crude protein (4.17%) of velvet tamarind chewable candy is lower than corn starch based candy reported by Onwuka *et al.* (2010). The protein content of the pulp flour was low. Low protein content is characteristic of plant foods especially fruits (Kuhnlein, 1989 and Ishola *et al*., 1990). The fat content (2.58%) of the velvet tamarind pulp flour was highest and Velvet tamarind non -chewable candy had the lowest fat content (1.81%). There were significant differences ($p<0.05$) among the fat contents of the samples. The fat content of the pulp (2.58%) was similar to the result of (2.6%) reported by Achoba (1993). The samples had very high carbohydrate content. Velvet tamarind pulp flour had the highest level of carbohydrate (82.64%). This result is similar with velvet tamarind fruit pulp (86.6%) reported by Achoba (1993). There was significant difference ($p<0.05$) between the carbohydrate contents of velvet tamarind chewable candy and the velvet tamarind non-chewable. The result shows that the velvet tamarind pulp flour is a good source of carbohydrate.

Vitamin composition of the velvet tamarind candies and the pulp flour.

Vitamin A

There was a significant difference ($p<0.05$) between Vitamin A content of the velvet tamarind chewable candy (0.73mg/100g) and velvet tamarind non-chewable candy (0.70mg/100). The vitamin A content of velvet tamarind pulp flour (1.88mg/100g) was significantly different ($p<0.05$) from vitamin A content of the candies.

Vitamin C

The vitamin C content (41.8 mg/100) of the velvet tamarind pulp flour was significantly different ($p<0.05$) from the vitamin C content of the candies. This vitamin C content of the velvet pulp flour was higher than the result (35.7 mg/100) reported by Achoba (1993). There was no significant differences ($p>0.05$) between the velvet tamarind chewable candy (38.71mg/100) and velvet tamarind non-chewable candy (38.73mg/100) with regards Vit C. This result is in line with the report of Ubbaonu *et al*. (2005) which stated that the ascorbic acid content of velvet tamarind fruit pulp was high enough to serve as a food supplement to man. The result indicated that the level of vitamin C in the fruit pulp means it is relevant in preventing scurvy and other degenerative diseases. The evidence of vitamin C playing a key role in decreasing the incidence of degenerative diseases might be strong (Haliwell, 1996).

Functional properties of velvet tamarind pulp flour

The bulk density of velvet tamarind pulp flour (0.44g/ml) was lower than the *Tamarindus indica* pulp flour (56.95g/cm^3) as reported by (Isiaku *et al*., 2012). Bulk density is a measure of heaviness of flour (Adejuitan *et al*., 2009) and an important parameter that determines the suitability of flours for the ease of packaging and transportation of particulate foods (Shittu *et al.*, 2005) as well as for infant formulations. According to Nelson- Quartey *et al*.(2007), low bulk density flours are desirable in infant food preparation. The bulk density of the velvet tamarind pulp flour was found to be low, therefore it could be useful in infant formulation. The emulsion capacity of the velvet tamarind pulp flour was found to be (56%), while Isiaku *et al*.(2012) reported that the emulsion capacity of *Tamarindus indica* pulp flour (9.31%) . High emulsion capacity is an indication that the flours samples could be an excellent emulsifier in various foods (Akobundu *et al*., 1982). The water absorption capacity of velvet tamarind pulp flour (2.5g/ml) suggests that velvet tamarind flour may find application in baked products. The velvet tamarind pulp flour had oil absorption of 1.76g/ml. The result shows that velvet tamarind may be a higher flavour retainer than raw winged bean (1.2g/ml) flours (Narayana and Narasinga-Rao,1982). The low oil absorption capacity of velvet tamarind flour might be due to low hydrophobic proteins which show superior binding of lipids (Kinsella, 1976). The foam capacity of velvet tamarind pulp flour of 1.30% was higher than the *Tamarind indica* pulp flour (11.67%) reported by Isiaku, (2012). The foam capacity of the flours was higher than cassava pulp flour 13.70% (Ubbor and Akobundu, 2009). Giami and Bekebain (1992) reported that foams are used to improve the texture, consistency and appearance of foods. According to (Yasumatsu *et al*., 1972) foam formation and stability are dependent on pH, viscosity, surface tension and processing methods. The foam stability (80%) of velvet tamarind pulp flour is higher than the *Tamarind indica* pulp flour (3.60%) reported by Isaku (2012). Foam stability is important since the usefulness of whipping agents depends on their ability to maintain the whip as long as possible (Lin *et al*., 1974). The flour have poor foaming capacity and stability and so they might be poor foaming agents in foods requiring foamability.

The sensory quality scores of the candies

In terms of appearance, Chocolate candy (control) ranked highest (8.50) and was significantly different ($p<0.05$) from other samples. Velvet tamarind chewable candy had the lowest mean score (6.54) which indicates that the sample was liked slightly by the panelists. There was significant difference ($p<0.05$) between the velvet tamarind candies and the chocolate candy (control). Velvet tamarind candies were better than the control. The mouth feel of velvet tamarind non-chewable candy had the highest mean score (7.46). There was no significant difference ($p>0.05$) between velvet tamarind chewable candy and the chocolate candy (control) in mouth feel. From the result (Table 4), velvet tamarind chewable candy had the highest mean score (8.42) for general acceptability, which indicated that the sample was accepted by the panelists followed by velvet tamarind non-chewable candy while the least accepted was chocolate candy (control).

IMPLICATION TO RESEARCH AND PRACTICE

Once this flour is incorporated in infant foods, the problem of scurvy and micro nutrient deficiencies will be a forgotten issue. Since procurement of the raw material is easy, this will make it to be readily available to the food manufacturers.

CONCLUSION

Velvet tamarind pulp could be processed into flour. Velvet tamarind pulp flour was found to have desirable physicochemical and sensory properties which may predispose it as a useful raw material to food industries. Hence, it has been successfully applied in the formulation of candy which was acceptable to the panelist.

FUTURE RESEARCH

The mineral profile of the fruit is recommended to be determined along side with the optimized process procedure for its utilization as a food supplement. The effect of its incorporation to production of confectioneries is recommended to be determined.

REFERENCES

Adejuyitan, J.A., Otunola, E.T., Akande,E.A.B., Olarinwa, I.F. and Oladokun, F.M. (2009) *Some Physicochemical Properties of flour Obtained from Fermentation of Tiger nut (Cyperus esculentus) Source from a Market in Ogbomoso, Nigeria*, African Journal of Food Science, 3, 51-55.

Akobundu, E.N.T., Cherry,J.P. and Sommons,J.G. (1982) *Chemical, functional and Nutritional properties of Egusi* (C*olocynthis citrullus L*), Seed protein products, Journal of Food Science, 47, 829-835.

AOAC (1990) *Official methods of analysis*, In Association of official analytical chemists, 15th edition, Washington D.C.

Achoba, M. (1993) *Nutrients composition of fruits*, In Nutritional quality of plant foods. Ambik press, p. 258.

Giami, S.Y. and Bekebain, D.A. (1992) *Proximate Composition and functional Properties of Raw and Proceeded full fat Fluted Pumpkin (Telfaria occidentalis) Seed Flour*, Journal of the Science of Food and Agriculture 59, 321-325.

Haliwell, B. (1996) Antioxidants and human diseases: A general introduction. Nutritional Review, 55, 44 – 52.

Ishola, M.M., Agbaji, E.B., Agbaji, A.S. (1990) *A Chemical Study of Tamarindus indica (Tsamiya) fruits grown in Nigeria*, Journal of the Science of Food and Agriculture, 51, 141-143.

Isiaka, A.A. and Atasie, V.N. (2012) *Nutritional and functional Properties of Tamarindus indica Pulp and zizphus spina Christi Fruit and Seed*, Journal of Food, Agriculture and Environment, 10,16-19; 621-630.

James, C.S. (1995) The analytical chemistry of foods, Chapman and Hall, New York, p.5

Jayawerra, D.M (1981.) Medicinal plants. Indigenous and exotic used in Ceylum Part II *Flacouticeae lytharoceae*, Published by the National council of Srilanka, p. 254.

Kinsella, J.E. (1976) *Functional properties of protein foods*, critical Review, of Journal of Science and Nutrition, 1, 219-299.

Kuhnlein, H.V. (1989) *Nutrient Values in Indigenous wild berries used by the Nuxalk people of Bella Colla, British Columbia.* Journal of Food composition Analysis, 2, 28-36.

Lienel, H.H. (2002). *Ash analysis*, In Introduction to chemical analysis of foods. (Ed. Nielsen, S.S), CBS publishers New Delhi, pp. 123-133.

Maga, J.A. and Kim, C.H. (1989) *Co-extrusion of rice flour and dried fruits and fruit juice concentrates*, *lebensm*, Wiss U- Technology, 2:182 – 187.

McWillams, M. (2007) Nutrition and Dietetics, 2001 Edition, Rex Bookstore, Inc., pp. 177 – 154.

Narayana, K. and Narasinga -Rao, M.S. (1982) *Functional properties of raw and heat processed winged bean flour*, Journal of Food Science, 47, 1534-1538.

Okafor, J.C. (1975) *The place of the wild (Uncultivated) fruit and vegetable in Nigeria diet,* In Proceedings of national seminar on fruits and vegetables Ibadan Nigeria, pp. 262 – 299.

Okaka, J.C, and Okaka, A.N.C. (2001) Foods: composition, spoilage and shelf life extension, O C Janco Academic Publishers, Independence layout, Enugu, Nigeria.

Onwuka, G. I. (2005) Food Analysis and Instrumentation (Theory and Practice), Naphthali prints, Lagos, Nigeria.

Onwuka, G.I., Atuonwu, A.C. and Ibeawuchi, G.I. (2010) *Comparative study on the role of food gums in the production of Cocoa- enriched candies*, Nigerian food Journal, 1, 96-198.

Sefa- Dedeh, S. and Saalia, F.K. (1998) *Extension of maize-cowpea blends in modified oil expeller.*Journal of the Science of Food and Agriculture,73, 160-168.