

## QUALITY EVALUATION OF CHIN-CHIN PRODUCED FROM A BLEND OF WHEAT FLOUR AND AN UNDERUTILISED EDIBLE PLANT: *CISSUS POPULNEA* FLOUR

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### ABSTRACT

**Background:** Malnutrition in most developing countries like Nigeria can be reduced by promoting the use of geographically available underutilized edible plants.

**Objective:** This study was conducted to determine the proximate composition and sensory properties of chin-chin made from *Cissus populnea*-wheat composite flours

**Methods:** *Cissus populnea* stems were processed into flour (CPF) and used to substitute wheat flour at different portions of 0% (sample A), 10% (sample B), 20% (sample C), 30% (sample D), 40% (sample E), 50% (sample F) and 100% (sample G). The composite flours were processed into chin-chin. Proximate composition of the chin-chin was determined using AOAC methods while the acceptability was determined from sensory attributes of the chin-chin using 25 panellists. Data were subjected to analysis of variance (ANOVA), means were separated using Duncan New Multiple Range Test and considered significant at  $p \leq 0.05$ .

**Results:** The proximate values of the chin-chin ranged from 3.18-3.54%, 5.22-12.98%, 6.33-10.66%, 2.00-3.56%, 2.28-3.02% and 59.61-79.89% for moisture, protein, fat, ash, crude fibre and carbohydrate, respectively. Protein, ash and fat contents increased with increased substitution of wheat flour while moisture, fibre and carbohydrates decreased. All the samples were significantly ( $p \leq 0.05$ ) different from the control especially in the protein content. The most accepted sample was the 100% wheat flour (WH). There was no significant ( $p \leq 0.05$ ) difference in the overall acceptability of sample D and sample E.

**Conclusion:** Chin-chin made from *Cissus populnea*-wheat composite blend had good nutritional quality when compared with the 100% wheat flour chin-chin as the protein, ash and fat content increased. Although its acceptability needs to be improved.

**Keywords:** *Cissus populnea*, chin-chin, proximate analysis, sensory attributes.

### Introduction

Diets of many rural and urban dwellers in most developing countries like Nigeria are deficient in protein but higher in carbohydrate. The resultant effect is high incidence of malnutrition and an increase in diet related diseases, a situation in which children, pregnant and lactating women are most vulnerable (1). Nigeria is endowed with numerous varieties of useful plants whose fruits, seeds, stems, roots and leaves serve many important roles in medicine and nutrition. Among the numerous varieties of plants are *Cissus populnea* (2).

*Cissus populnea* (CP) belongs to the family of *Amplidanceae*, it is a dicotyledonous shrub and a climber which can reach a height of 3 meters or more based on its age and the height of the supporting tree.

*Cissus populnea* is known in different Nigerian languages as *Dafaraa* in Hausa, *Okoho* in Idoma (Middle belt) and *Ogbolo* in Yoruba. The plant is used in some states (Niger, Kogi, Plateau, Adamawa, Benue, Kwara and Ogun) in Nigeria, to make vegetable soup, stop postnatal bleeding and as food thickener (3). *Cissus populnea* are rich in essential nutrients and could serve as good source of dietary supplements for growth and body maintenance (4). The plant contains appreciable amount of nutrients (macro and micro nutrients) and low amounts of phytochemicals (2). The *Cissus populnea* stem bark contains relatively higher amount of glycine, arginine and alanine (8). The high gum yield makes the leaves of the plant potential source of industrial gum with promising applications in the food and pharmaceutical industries (5). *Cissus populnea* gum can be a very

useful additive to wheat cassava composite bread at 10% level of substitution as evidenced from its strengthening, increase in extensibility ratio of the dough all of which correlates with the increase in the volume of loaf (6). People who are allergic to egg due to the high content of cholesterol forming substances in egg or those who have chemical phobia can replace egg with *Cissus populnea* gum extract (7).

Snacks most often do not provide adequate quantities of nutrients needed by the body (9). This may be due to their composition or due to the production process they went through. Many people now work outside their homes and are becoming more dependent on snacks for the supply of part of their daily nutritional requirements. It is therefore necessary to produce a highly acceptable snack with high nutritional quality that could be useful in nutritional programmes to combat malnutrition and nutrient deficiencies (10). Chin-chin is a traditional Nigerian snack prepared by mixing wheat flour, butter or margarine, milk and eggs to form a stiff paste which is spread out on a flat surface with a wooden rolling pin, cut into small pieces and deep fried until golden brown and crispy (11). Chin-chin as a ready-to-eat snack is mostly enjoyed by children probably due to its crunchy nature but might

be nutritionally inadequately. Since *Cissus populnea* is a good source of protein and mineral, fortifying chin-chin with this plant can increase the nutritional content of the snack.

### Materials and methods

*Cissus populnea* plant was collected from a farm in Imala town, Ogun State, Nigeria. It was identified and authenticated at the herbarium, Department of Botany, University of Ibadan, Nigeria. Commercial wheat flour and other ingredients for making chin-chin namely margarine, sugar, salt, baking powder, milk, egg, water, nutmeg, and vegetable oil were purchased from New Market in Ijebu-Ode town, Ogun state, Nigeria. *Cissus populnea* plant separated into different parts (stem, leaves & root), the stem was washed with water and air dried for 2 weeks, pounded manually with ceramic mortar and pestle and sieved with 250µm mesh sieve into flour (12). The *Cissus populnea* flour (CPF) was used to substitute wheat flour at different portions of 0% (sample A), 10% (sample B), 20% (sample C), 30% (sample D), 40% (sample E), 50% (sample F) and 100% (sample G) in wheat flour chin chin.

### Recipe for making the experimental chin-chin

Table 1: Ingredients and weight(s) for the production of the chin-chin

S/N	Ingredients	Weight
1	Composite flour	200g
2	Milk	10g
3	Butter	4g
4	Sugar	40g
5	Salt	2g
6	Baking powder	2g
7	Nutmeg	2g
8	Egg	50g
9	Water	20ml

Each composite flour (varying proportions of wheat flour substitution: A, B, C, D, E, F and G), was mixed with sugar, butter (fat), salt, egg, baking powder, water, and milk in a large bowl using the method of Akubor (13). The dough was placed on a floured surface and kneaded until smooth and elastic. The kneaded dough was rolled out to approximately 2cm thickness and then cut into small squares 2cm by 2cm in size. Vegetable oil was put inside a deep fryer (MC 1800 model) and heated to 180°C, the dough cubes

were placed in the hot oil for 8 minutes (until golden brown). The fried chin-chin was then removed from the oil into a sieve while excess oil was drained off. The chin-chin produced were cooled and then made ready for analyses.

### Proximate composition

The moisture, protein, total fat, ash and dietary fibre in the samples were determined by the recommended methods of the Association of Official Analytical Chemists (14).

### Sensory evaluation:

The sensory attributes of the chin-chin were obtained by using simple hedonic tests as described by Larmond (15). This was done using a 25-member panel comprising students and staff of the Department of Home Economics and Hotel Management, College of Vocational and Technical Education, Tai Solarin University of Education, Ogun state, Nigeria who were familiar with the sensory attributes of chin-chin. The panellists were asked to score each attribute on a 9-point hedonic scale where 1-9 represented dislike extremely - like extremely respectively. The attributes that were evaluated included taste, flavour, texture, appearance and overall acceptability.

### Data analysis

Data were subjected to analysis of variance (ANOVA). The means were separated using Duncan New Multiple Range Test. Statistical significance was considered at  $p \leq 0.05$ .

### Results

The proximate composition of chin-chin enriched with *Cissus populnea* stem flour is presented in Table 2. The moisture content ranged from 3.18-3.54% with sample A having the highest value and sample G the lowest value. The ash content values increased significantly ( $p < 0.05$ ) from 2.00 (sample A) to 3.56% (sample G), the highest value. Result on fat content revealed significant ( $p < 0.05$ ) increase from 6.33 - 10.66% as the proportion of CPF increased. The result of the

crude fibre of the samples indicated a significant ( $p < 0.05$ ) decrease in all samples when compared with control (sample A) which occur as the proportion of CPF increased, ranging from 3.02 - 2.28%. There were significant differences ( $p \leq 0.05$ ) in protein content of the chin-chin as the proportion of CPF increased, highest value was observed in sample G and the lowest in sample A. Carbohydrate content showed a significant decrease as the proportion of the *Cissus populnea* flour increases, ranging from 59.61 - 77.97 (sample G and B, respectively). The control had 79.89% carbohydrate.

### Sensory evaluation of *Cissus populnea* - wheat composite chin-chin

Table 3 described findings from the sensory evaluation of *Cissus populnea* chin-chin samples. The values of appearance and texture attributes ranged from 6.40-2.28 and 6.44-2.44 respectively. There were significant differences ( $p < 0.05$ ) in both flavour and taste attributes. The sample A (100% WF) had the highest likeness in terms of taste and flavour with values of 6.44 and 6.20, respectively, while sample G (100% CPF) had the lowest values of 2.28 and 2.32 for taste and flavour, respectively. Significant differences ( $p < 0.05$ ) were observed among samples of chin-chin in terms of overall acceptability. Chin-chin sample (A) with 100% wheat had the highest value of acceptability with a score of 6.80, while sample (G) with 100% *Cissus populnea* flour had the lowest score of 2.

Table 2: Proximate analysis of *Cissus populnea*- wheat composite chin-chin

Samples	Protein (%)	Moisture (%)	Ash (%)	Fat (%)	Fibre (%)	Carbohydrates (%)
A	5.22 <sup>f</sup>	3.54 <sup>a</sup>	2.00 <sup>g</sup>	6.33 <sup>g</sup>		
B	5.78 <sup>e</sup>	3.43 <sup>b</sup>	2.21 <sup>f</sup>	8.03 <sup>f</sup>	3.02 <sup>a</sup>	79.89 <sup>a</sup>
C	6.00 <sup>d</sup>	3.40 <sup>b</sup>	2.55 <sup>e</sup>	9.02 <sup>e</sup>	3.00 <sup>a</sup>	77.97 <sup>b</sup>
D	6.42 <sup>c</sup>	3.36 <sup>c</sup>	2.84 <sup>d</sup>	9.23 <sup>d</sup>	2.84 <sup>b</sup>	75.39 <sup>c</sup>
E	12.05 <sup>b</sup>	3.28 <sup>d</sup>	3.08 <sup>c</sup>	10.21 <sup>c</sup>	2.65 <sup>b</sup>	73.75 <sup>d</sup>
F	12.95 <sup>a</sup>	3.27 <sup>d</sup>	3.30 <sup>b</sup>	10.33 <sup>b</sup>	2.55 <sup>c</sup>	67.21 <sup>e</sup>
G	12.98 <sup>a</sup>	3.18 <sup>e</sup>	3.56 <sup>a</sup>	10.66 <sup>a</sup>	2.34 <sup>c</sup>	63.23 <sup>f</sup>
					2.28 <sup>d</sup>	59.61 <sup>g</sup>

Means in the same column with different superscript are significantly different ( $p < 0.05$ ) S = Samples, Wheat flour = WF, *Cissus populnea* flour = CPF; A = 100% WF, B = 90% WF and 10% CPF; C = 80% WF and 20% CPF; D = 70% WF and 30% CPF; E = 60% WF and 40% CPF; F = 50% WF and 50% CPF, G = 100% CPF

**Table 3: Sensory evaluation of *Cissus populnea*-wheat composite chin-chin**

Samples	Texture	Appearance	Taste	Flavour	Overall acceptability
A	6.44±0.77 <sup>a</sup>	6.40±0.58 <sup>a</sup>	6.44 ± 0.65 <sup>a</sup>	6.20 ± 1.04 <sup>a</sup>	6.80 ± 0.41 <sup>a</sup>
B	5.44 ± 0.96 <sup>b</sup>	5.56± 1.16 <sup>b</sup>	5.76 ± 0.78 <sup>b</sup>	5.84 ± 0.80 <sup>b</sup>	6.32 ± 0.48 <sup>b</sup>
C	4.52 ± 1.50 <sup>c</sup>	4.48±1.29 <sup>c</sup>	4.80 ± 1.12 <sup>c</sup>	5.00 ± 1.15 <sup>c</sup>	5.40 ± 0.87 <sup>c</sup>
D	4.12 ± 1.56 <sup>d</sup>	3.96 ± 1.12 <sup>e</sup>	3.88 ± 1.30 <sup>e</sup>	3.88 ± 1.23 <sup>e</sup>	4.44 ± 1.36 <sup>d</sup>
E	4.12 ± 1.24 <sup>d</sup>	4.04 ± 1.41 <sup>d</sup>	4.08 ± 1.29 <sup>d</sup>	3.92 ± 1.19 <sup>d</sup>	4.44 ± 1.23 <sup>d</sup>
F	3.88 ± 1.30 <sup>e</sup>	3.24 ± 1.40 <sup>f</sup>	3.68 ± 1.52 <sup>f</sup>	3.48 ± 1.48 <sup>f</sup>	3.64 ± 1.25 <sup>e</sup>
G	2.44 ± 1.69 <sup>f</sup>	2.28±1.31 <sup>g</sup>	2.28 ± 1.17 <sup>g</sup>	2.32 ± 1.31 <sup>g</sup>	2.80 ± 1.44 <sup>f</sup>

Means in the same column with different superscript are significantly different ( $p < 0.05$ ); Wheat flour = WF, *Cissus populnea* flour = CPF; A = 100% WF, B = 90% WF and 10% CPF, C = 80% WF and 20% CPF, D = 70% WF and 30% CPF, E = 60% WF and 40% CPF, F = 50% WF and 50% CPF, G = 100% CPF

## Discussion

### Proximate composition of the *Cissus populnea*-wheat composite chin-chin

The moisture content of the chin-chin produced significantly ( $p < 0.05$ ) decreased in respect to increased proportion of *Cissus populnea* when compared with control (sample A). This is in support of the work of Sanni *et al.* (16), who observed that the lower the moisture content of a product to be stored the better the shelf stability of such products. Low moisture ensures higher shelf stability of dried product. Significant ( $p < 0.05$ ) increases in ash content were observed as the proportion of *Cissus populnea* flour increased. This invariably meant increase in the mineral content of the chin-chin produced. There was a general significant ( $p < 0.05$ ) increase in the fat content of the chin-chin samples when compared with the control sample. This indicated that *Cissus populnea* flour is high in fat content. Lipids are necessary in food because they increase palatability and retain the flavour of food (17).

However, Fasasi (18) reported that low fat content of any stored product would help in increasing the shelf life of the product by decreasing the chances of rancidity and contribute to low energy value of the food product while high fat content product would have high energy value and promotes lipid oxidation. Significant ( $p < 0.05$ ) decrease in the fibre content occurred in all sample compared to control sample A, as the proportion of *Cissus populnea* increased. This is contrary to the findings of Falola *et al.* (19), who reported an increase in fibre content of chin-chin from modified cocoyam starch ranging from 0.77 – 2.15%. As the proportion of the *Cissus populnea* flour

increased, the protein content of the chin-chin produced increased. This might be due to the high protein content (37% - 21%) of the *Cissus populnea* flour reported by Onoja (2). The result of this study also supports the work of Kiin-Kabari and Ogbonda (20) who reported that fillers enriched with *Rhynchophorusphoenics* paste for pies and sandwich had higher protein contents of 16.4 and 12.4% compared to the common meat pie and sandwich fillers which had protein contents of 11.2 and 9.9%, respectively. The result revealed that, increasing the proportion of *Cissus populnea* led to a significant ( $p < 0.05$ ) decreases in the carbohydrate content of the samples of chin-chin produced. The low content of carbohydrate of *Cissus populnea* plant could be responsible for this (2).

### Sensory evaluation of *Cissus populnea*-wheat composite chin-chin

The likeness for appearance and texture of the chin-chin reduced as *Cissus populnea* flour proportions increased. The sample A (100%WF) had the highest value while sample G (100%CPF) had the lowest values. These low values of likeness and appearance observed in sample G (100% CPF) might be due to the brownish colour of *Cissus populnea* flour when compared with whitish colour of wheat flour. The decrease in the taste of the chin-chin produced as the proportion of *Cissus populnea* increased supports the findings of Falola *et al.* (19), who reported similar decrease in the taste of chin-chin produced from modified cocoyam starch. It was observed that likeness of chin-chin sample decreases with increase in *Cissus populnea* substitution. However, there were no significant difference in the overall acceptability among samples D (70% WF: 30% CPF) and E (60%

WF: 40% CPF). This showed that the panellists still consumed chin-chin produced with up to 40% *Cissus populnea* composite flour.

### Conclusion

There were significant increases in the nutrient contents of the wheat substituted chin-chin, especially in the protein, ash and fat contents. Although the chin-chin from composite flours were generally accepted, but a decrease in these were observed. Results of this study would promote the utilisation of *Cissus populnea* stem and could lead to the reduction in wheat importation. Meanwhile, the acceptability of flour from CP should be researched on as well as other nutritional uses.

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