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Research Article

Effects of frying temperature and time on the textural attributes and sensory acceptability of fried *Dioscorea alata* mash (*Ojojo*)

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Abstract *Ojojo* is a fried food made by grating *Dioscorea alata* tuber, adding salt and spices, and deep-frying in hot oil. However, the frying temperature and time have not been studied, as they affect the textural attributes and consumer acceptability. In this, *Dioscorea alata* tuber was processed into flour and then fried into *Ojojo* with different frying temperatures and times (180℃ for 4 min, 160℃ for 3 min, and 170℃ for 5 min) and fresh *Ojojo* was used as a control sample. The sensory and instrumental texture attributes were assessed using a well-structured questionnaire with 20 panelists and a texture analyzer, respectively. In contrast, consumer acceptability was assessed in three locations (Safari, Malete, and Ilorin) using 50 respondents per location. No significant differences were found in the textural attributes of *Ojojo* samples except for sensory gumminess. Consumer acceptability varied significantly between the other two locations and Ilorin, with instrumental adhesiveness and hardness being key factors. The consumer acceptability of the *Ojojo* produced from 160℃ for 3 min and 170℃ for 5 min was attributed to the instrumental adhesiveness and hardness. The study suggests that fresh *Dioscorea alata* tuber can be processed into flour and used for *Ojojo* production at frying temperatures and times of 160℃ for 3 min or 170℃ for 5 min, to reduce the drudgery involved in using fresh *Dioscorea alata* tuber.

Keywords *Dioscorea alata* tuber, *Dioscorea alata* flour, *Ojojo*, textural attributes, sensory acceptability

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1. Introduction

Numerous instant food products continue to emerge in food markets due to the growing demand for convenience foods and the reduced labour involved in food preparation. In some studies, the correlation between convenience and food choice or preference has been discussed (de Boer et al., 2004; Jaeger, 2006). Jaeger (2006) asserts that convenience in product handling, preparation, and consumption has increasingly influenced consumers' purchasing decisions. According to Aworh (2008), the development of various instant traditional root- and tuber-based food products is particularly attributable to the difficulties associated with processing root and tuber products. *Dioscorea alata* is one of such tuber crops.

One of the 11 commercially important yam species and a main crop in tropical and subtropical areas is water yam, often referred to as winged yam (Neina, 2021). Due to its favorable agronomic traits and quality properties, such as its high yield, improved tuber storability, and resistance to non-staking conditions, this yam species is widely farmed (Neina, 2021). Because of its low sugar

content, water yams have a low glycaemic index, which is beneficial for diabetics (Udensi et al., 2010). Moreover, it contains significant amounts of potent antioxidants such as diosgenin, alkaloids (dioscorine), and polyphenolic chemicals (tannins). In comparison to *D. cayensis*, *D. escunlenta*, *D. rotundata*, and *D. trifida*, it also has a greater protein content, more vitamin C, and fewer fats (Muzac-Tucker et al., 1993).

Additionally, water yams have anti-cancer, purgative, anti-inflammatory, anti-rheumatism, and anti-leprosy qualities. It has antioxidant properties and seems to reduce diabetes (Zhang et al., 2019). Even though water yam has many agronomic and nutritional benefits, it is still underutilized. This is mainly because consumers have historically believed that water yam is inferior to white yam in terms of food product quality, which has led to the neglect of the many health, nutritional, and economic advantages of this yam species. Traditionally, water yam is processed into boiled yam, yam flour for amala, fried yam, and fried yam balls known as *Ojojo* (Barde et al., 2021).

Ojojo is a deep-fat fried snack produced from *Dioscorea alata* tuber (Onwueme, 2006). According to Aminu et al. (2018), the freshly peeled *D. alata* tuber is traditionally grated into a viscous mass and mixed with other chopped vegetables like pepper and onion. The grating of the tuber takes the most energy and time, making it the most laborious process. To reduce the drudgery associated with traditional *Ojojo* preparation, a simpler method involving the conversion of *Dioscorea alata* tuber into flour has been proposed. This method could improve handling, storage, and year-round availability. However, optimizing the frying process remains crucial, as it significantly impacts the textural and sensory qualities of the final product (Ananey-Obiri et al., 2018; Giovanelli et al., 2017; Sobukola et al., 2008). Squeezing the tissue against the abrasive surface of grating utensils also causes hand injuries for processors. As a result, scientific research is required to lessen or eliminate the monotony of traditional *Ojojo* processing. A form of value addition would be the development of a simpler method for preparing the product (Aminu et al., 2018). This could be done by carefully grinding the *Dioscorea alata* tuber into flour, which will make it easier to handle, store, and keep for longer and can be used to make *Ojojo* all year. Nonetheless, the frying process of *Ojojo* should be controlled.

According to Ananey-Obiri et al. (2018), deep-fat frying is a common method of cooking that uses oil or fat as the medium for the transfer of heat and comes into direct contact with the food at a temperature above the boiling point of water. It is a complicated process that involves the temperature of the heated oil, the amount of time it takes to fry, the method used, the ratios of food weight to frying fat volume and surface area to volume, some characteristics of the food, and the fat source (Sobukola et al., 2008). The food's physical, chemical, and sensory characteristics are altered. As a result, giving the products a better texture, improved appearance, and enhanced flavor (Giovanelli et al., 2017). According to reports, deep-fat frying increases the fat content of fried food because of the oil's absorption and retention. This means that the average calorie consumption of French fries and hamburgers is 42% and 53%, respectively, after frying (USDA, 2013). According to reports, interactions between the amino group of lysine and carbonyl compounds caused the available lysine in fish fillets to decrease by approximately 17% and by 25% when the fish oil was used for continuous deep-fat frying for 48 h (Oluwaniyi et al., 2010). Abebe et al. (2024) found that for fried sweet potato chips of different varieties (Kabode, Dilla, and Kulfo, respectively), the optimum frying temperatures were 154.8℃ for 3.82 min, 160.1℃ for 3.66 min and 162.65℃ for 3.04 min. According to Fikry et al. (2021), the optimum frying temperature and time for fried falafel—a typical Egyptian dish made with chickpeas, water, onion, garlic, spices, parsley, paprika, and sesame seeds—are 178.8℃ and 11 min. Fried yam chips were shown to have an optimal frying temperature of 175-180℃ while utilizing tubers with an initial dry matter of 0.18-0.21 kg/kg and frying for 4-5 min (Sobukola et al., 2008). However, as of the time this article was written, *Ojojo's* frying conditions had not been reported.

The *Ojojo's* texture and subsequent consumer acceptance are thought to be affected by variations in frying temperature and time. As a result, the purpose of this research is to ascertain the relationship between the textural characteristics and consumer acceptability of *Ojojo* made from *Dioscorea alata* flour at various frying temperatures and times. This study aims to explore these variables to establish optimal frying conditions for *Ojojo* made from *Dioscorea alata* flour, thereby ensuring consistent quality and broad accessibility throughout the year.

2. Materials and methods

2.1. Materials

The *Dioscorea alata* tubers (white-fleshed variety), groundnut

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oil, fresh pepper, and onions were purchased from the Oja Oba market in Nigeria's Kwara State Ilorin-west Local Government Area. The Food Science and Technology Laboratory at Kwara State University, Malete provided the knife, grater, trays, cabinet dryer, blender, deep fryer (Crown Star 3.5 L, MC-DF3139, Guangzhou FHT China Technology Co., Ltd., Shenzhen, China), weighing balance, plastic buckets, aluminum foil, and other utensils.

2.2. Methods

2.2.1. Instant *Dioscorea alata* flour preparation

Okoye et al.'s method (2018) was modified to make flour from the tubers of *Dioscorea alata*. Sorting was used to get rid of the mechanically damaged tubers of *Dioscorea alata* that had reached maturity. To get rid of dirt and soil, the tubers underwent a thorough washing. Before being blanched at 100℃ for 2 min and drained in a basket, the properly washed tuber was hand-peeled and sliced thinly with kitchen knives. Before hammer milling and sieving (500 mm mesh size), the blanched *Dioscorea alata* slices were spread out in a single layer inside a perforated tray and dried in an oven at 60℃ for 12 h. Before any further processing, the flour was packed in a bag made of polyethylene.

2.2.2. Preparation of *Ojojo* for evaluation

According to Okoye et al.'s method (2018), which had been modified, was used to make the *Ojojo*. About 100 g of flour and 200 mL of water were combined to make the paste for *Ojojo* preparation. To 200 g of the paste, approximately 5 g of chopped fresh pepper, 4 g of chopped onions, 0.1 g of seasoning, and 0.1 g of salt were added. After thoroughly mixing the ingredients with a handheld food blender, 40 mL of the mixture was scooped into an electric deep fryer (Crown Star 3.5 L, MC-DF3139, Guangzhou FHT China Technology Co., Ltd.) with 3 L of hot vegetable oil to deep fried (Fig. 1) at various temperatures and times determined by the Central Composite Rotatable Design of Design Expert Software version 6.0 (Table 1).

2.2.3. Sensory evaluation

The sensory properties of the *Ojojo* were evaluated using a well-structured questionnaire with 20 panelists selected among the students of the Kwara State University Malete, Kwara state. Each panelist was presented with nine different

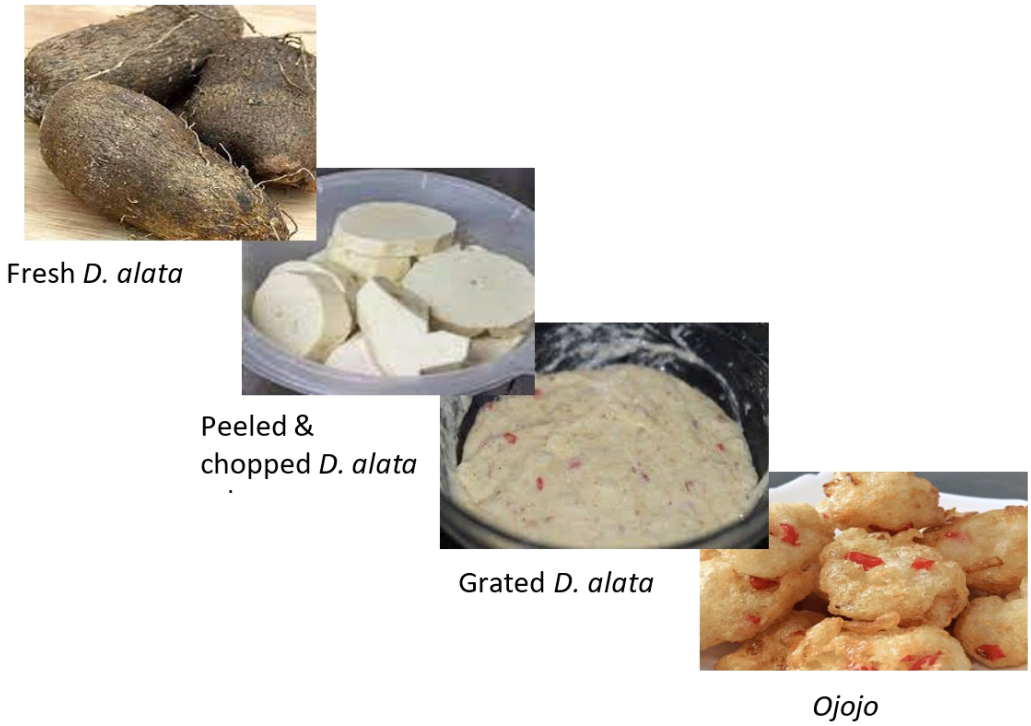

Fig. 1. Procedures of *Ojojo* preparation.

Table 1. Frying conditions for *Ojojo* preparation

S/No	Frying temperature (℃)	Frying time (min)
1	180.00	5.00
2	180.00	4.00
3	170.00	4.00
4	160.00	3.00
5	180.00	3.00
6	170.00	4.00
7	170.00	4.00
8	160.00	5.00
9	170.00	4.00
10	170.00	3.00
11	170.00	4.00
12	160.00	4.00
13	170.00	5.00

coded samples of *Ojojo* produced from different frying temperatures and times. Sensory evaluation was carried out by scoring each sample on a 9-point hedonic scale (where 9 = extremely liked and 1 = extremely disliked). The sensory attributes evaluated on the *Ojojo* are taste, texture, color, appearance, aroma, and overall acceptability. The sensory evaluation was done to pick the most liked, slightly liked, and least liked samples which were then used for texture analysis and consumer acceptability. The Kwara State University Ethical Committee in Malete, Kwara State, issued the ethical permission to conduct this study (Ref: KWASU/CR&D/REA/2023/0060) following the Helsinki Declaration of 1975 on human experimentation.

The 170℃ for 5 min, best frying condition from the sensory acceptability test, was used to produce the control sample from fresh *Dioscorea alata* tuber. Before proceeding with subsequent analyses, the *Ojojo* was drained and allowed to cool. The overall acceptability of the *Ojojo* showed that 170℃ for 5 min (Fig. 2A) was the most liked, 160℃ for 3 min (Fig. 2B) was slightly liked, and 180℃ for 4 min (Fig. 2C) was the least liked. Then, the *Ojojo* (4 samples) produced under each of these frying conditions was evaluated for its texture attributes and sensory acceptability.

2.2.4. Texture profile analysis

2.2.4.1. Sensorial texture profile analysis of *Ojojo*

The Sensorial texture profile analysis (STPA) was done using the method that was reported by Otegbayo et al. (2007). This was done with a well-structured questionnaire using the same panelists (20 persons) who participated in the sensory evaluation following verbal agreement. To score for chewiness, gumminess, and hardness, four distinct coded samples of *Ojojo* were presented to each panelist. These samples had been fried at various temperatures and times.

2.2.4.2. Instrumental texture profile analysis of *Ojojo*

A TA-XTPlus-Stable Microsystems, United Kingdom, 50 kg load cell texture analyzer was utilized for the instrumental texture profile analysis of the *Ojojo*. The *Ojojo's* resilience, hardness, chewiness, and gumminess are the texture characteristics derived from the analyzer. During the evaluation, the *Ojojo* samples were kept in a cooler at 28-30℃ (Awoyale et al., 2021).

2.2.5. Sensory acceptability of *Ojojo*

A well-structured questionnaire with 50 respondents was

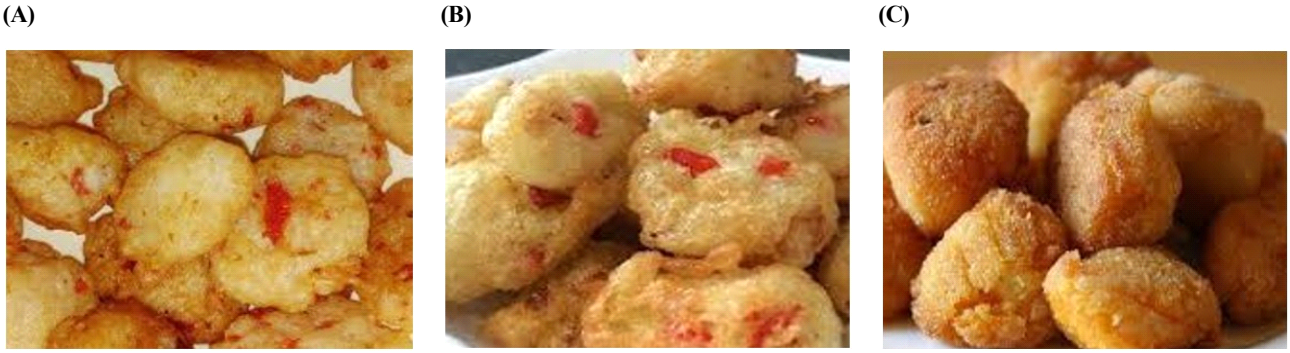

Fig. 2. *Ojojo* fried at 170℃ for 5 min (A), 160℃ for 3 min (B), and 180℃ for 4 min (C).

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used to assess *Ojojo's* sensory acceptability in three locations within Kwara State—Malete (longitude 8°43′23″N latitude 4°29′2″E), Ilorin (longitude 8°31′7″N latitude 4°28′58″E), and Safari (longitude 8°42′17″N latitude 4°28′1″E).

2.2.6. Statistical analysis

The Statistical Package for the Social Sciences (SPSS version 21) was utilized for the analysis of the variance of the generated data. Response Surface Central Composite Rotatable Design from Design-Expert (version 6.0) was utilized for the optimization. Using XLSTAT free version 2022, the principal component analysis (PCA) was used to summarize the relationships between *Ojojo's* textural attributes and sensory acceptability.

3. Results and discussion

3.1. Sensorial properties of Ojojo from different frying conditions

There was a significant difference in all the sensory properties of the *Ojojo* samples. However, there were no significant differences ($p>0.05$) in the *Ojojo* fried at 170°C for 4 min, and 170°C for 3 min in terms in terms of all the sensory properties (Table 2). *Ojojo* fried at 170°C for 5 min was the most preferred, and *Ojojo* fried at 180°C for 4 min was the least liked in terms of the overall acceptability. The variations in the overall acceptability of the *Ojojo* samples may be attributed to the different processing conditions.

3.2. Sensorial texture attributes of Ojojo from different frying conditions

Awoyale et al. (2021) reported that texture is an important characteristic that influences consumer acceptability of starchy products. The sensory texture characteristics of *Ojojo* produced at various frying temperatures and times are shown in Table 3. All the samples were, on average, chewable, moderately hard, and gummy. The hardness and chewiness of the *Ojojo* samples did not differ significantly ($p>0.05$), but the gumminess was significantly different from the control sample (Table 3).

Hardness is one of the most important texture parameters in determining whether a product is acceptable to consumers (Akissoe et al., 2009; Otegbayo et al., 2007). The findings indicate that *Ojojo* consumers may prefer moderately hard products. Even though both samples were fried at 170°C for 5 min, the *Ojojo's* hardness from the frying condition of 170°C for 5 min was significantly different from the control sample

Table 2. Sensorial attributes of *Ojojo* prepared from different frying conditions

Frying temperature (°C)	Frying time (min)	Taste	Texture	Color	Appearance	Aroma	Overall acceptability
180.00	5.00	5.20[1)]±1.20[2)a-c3)]	4.35±1.60^{bc}	3.50±1.76^{d}	4.60±1.76^{bc}	5.85±1.56^{a-c}	5.40±1.73^{a-c}
180.00	4.00	4.50±1.84^{b-d}	4.15±1.79^{c}	4.70±1.92^{b-d}	4.20±1.67^{c}	5.30±1.56^{b-c}	4.20±1.79^{c}
170.00	4.00	6.24±2.2.38^{a}	5.67±2.13^{ab}	5.55±2.14^{ab}	5.56±2.17^{ab}	6.27±1.93^{ab}	6.33±2.24^{ab}
160.00	3.00	3.40±1.73^{d}	3.75±2.20^{c}	3.95±1.88^{d}	5.10±1.80^{a-c}	4.60±1.60^{cd}	4.90±2.53^{bc}
180.00	3.00	5.45±2.37^{ab}	4.75±1.86^{a-c}	4.20±1.47^{cd}	4.05±1.93^{c}	5.35±2.03^{bc}	5.90±1.97^{ab}
160.00	5.00	3.75±1.92^{cd}	4.10±1.83^{c}	4.15±2.25^{cd}	3.90±1.62^{c}	5.40±1.79^{bc}	5.75±1.74^{ab}
170.00	3.00	6.15±2.56^{a}	5.70±2.41^{ab}	5.35±2.30^{a-c}	6.35±2.21^{a}	5.90±2.22^{ab}	5.80±2.75^{ab}
160.00	4.00	4.95±2.42^{a-c}	4.30±2.20^{c}	3.70±1.78^{d}	4.60±2.28^{bc}	4.10±2.34^{d}	4.90±1.89^{bc}
170.00	5.00	6.20±2.82^{a}	6.05±2.44^{a}	6.40±2.18^{a}	6.40±2.19^{a}	6.80±2.02^{a}	6.85±2.62^{a}
Mean		5.45	5.04	4.90	5.20	5.74	5.80
p-level		***	**	***	***	***	**

***p<0.001, **p<0.01.
[1)]1=Dislike extremely, 2=dislike very much, 3=dislike moderately, 4=dislike slightly, 5=neither like nor dislike, 6=like slightly, 7=like moderately, 8=like very much, 9= like extremely.
[2)]All values are mean±SD (n=20).
[3)]Means with the same superscripts ($^{a-d}$) within the same column are not significantly different ($p>0.05$).

Table 3. Sensorial texture attributes of *Ojojo* prepared from different frying conditions, compared to the control sample

Frying temperature (℃)	Frying time (min)	Hardness	Chewiness	Gumminess
170.00	5.00	2.20±1.00[1)a2)]	2.40±1.00[b]	1.40±0.50[b]
160.00	3.00	1.80±1.00[ab]	3.00±1.00[a]	1.40±0.50[b]
180.00	4.00	2.10±1.00[ab]	3.00±1.00[a]	1.50±1.00[b]
Control		1.70±1.00[b]	2.80±0.41[ab]	2.00±1.00[a]
Mean		2.00	3.00	1.54
p-level (sample)		NS	NS	**

**p<0.01, NS, not significant.
1)All values are mean±SD (n=20).
2)Means with the same superscripts ([a,b]) within the same column are not significantly different (p>0.05).
Hardness: 1=soft, 2=moderately hard, 3=hard.
Gumminess: 1=Not gummy, 2=moderately gummy, 3=gummy.
Chewiness: 1=Not chewable, 2=moderately chewable, 3=chewable.

(p<0.05). This could have something to do with the *Ojojo* being made before the yam tuber was processed into flour. However, frying at 160℃ for 3 min and 180℃ for 4 min yielded *Ojojo* of comparable hardness to the control sample. This is because the hardness of these samples and the control sample did not differ in a statistically significant way (p>0.05).

Gumminess is one of the changes that take place in cell separation during the frying of snacks. It is the degree to which samples stick to the hand, mouth surface, or teeth (Otegbayo et al., 2007). A moderately sticky *Ojojo* might be liked by buyers. All the *Ojojo* samples had significantly different gumminess from the control sample (p<0.05). This variation may be attributed to the flouring of the fresh *Dioscorea alata* tuber before the production of the *Ojojo* samples. Additionally, the increased frying time of the fresh paste may have reduced the exudation of gelatinized starch, resulting in the control sample's high gumminess. The release of amylose or gelatinized starch from the ruptured cells of the control sample may also cause the separation of the cells (Abong et al., 2009).

According to Karaolu and Kotancilar (2008), chewiness is the mouthfeel that results from prolonged elastic resistance from the food. It is interesting to note that the chewiness of the *Ojojo* produced at 170℃ for 5 min was not significantly different from that of the control sample (p>0.05). This suggested that the product's chewiness, in comparison to other sensory texture characteristics like hardness and gumminess, is unaffected by the fresh *Dioscorea alata* tuber's transformation into flour prior to the production of *Ojojo*.

3.3. Instrumental texture attributes of Ojojo prepared from different frying conditions

Table 4 displays the instrumental texture characteristics of the *Ojojo* produced at various frying temperatures and times. The force required to compress the sample is its hardness (Otegbayo et al., 2007). The *Ojojo* that was produced under each of the frying conditions did not significantly differ in hardness from the control sample (p>0.05). This indicates that the instrumental hardness of the product is unaffected by the fresh *Dioscorea alata* tuber being turned into flour before the production of *Ojojo*.

If the surface of the sample is sticky, a negative force will be generated after the sample has been subjected to pressure deformation. It can be interpreted as having a sticky texture in the food industry (Goddard et al., 2015). The degree to which the fried food adheres to the hand, mouth surface, or teeth is known as adhesiveness (Awoyale et al., 2021). The *Ojojo's* adhesiveness ranged from -15.40 to -1.84 N/m^2, with the control sample having the highest adhesiveness and the *Ojojo* fried at 180℃ for 4 min having the lowest adhesiveness. As a result, the *Ojojo* prepared from the control sample may not be as tasty for consumers as the *Ojojo* prepared from the frying condition of 180℃ for 4 min.

Gumminess is the amount of energy required to break down a semi-solid food so that it can be taken in. It is calculated by multiplying the cohesiveness by the hardness (Awoyale et al., 2021; Goddard et al., 2015). The gumminess of the *Ojojo* samples went between 1.40 N/m^2 and 2.00 N/m^2. *Ojojo* of comparable gumminess to that of the control

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Table 4. Instrumental texture attributes of *Ojojo* prepared from different frying conditions, compared to the control sample

Frying temperature (℃)	Frying time (min)	Hardness (N/m^2)	Adhesiveness (N/m^2)	Chewiness	Gumminess
170.00	5.00	1,341.00±82.60[1)a2)]	-6.60±2.30[a]	3.00±0.00[a]	1.40±0.00[a]
160.00	3.00	1,367.70±7.37[a]	-4.69±1.57[a]	3.00±0.00[a]	1.40±0.00[a]
180.00	4.00	1,100.90±46.00[ab]	-1.84±2.53[a]	3.00±0.00[a]	2.00±0.00[a]
Control		1,146.60±0.43[ab]	-15.40±14.40[a]	3.00±0.00[a]	2.00±0.00[a]
Mean		1,239	-7.14	0.30	0.30
p-level		NS[3)]	NS	NS	NS

[1)]All values are mean±SD (n=6).
[2)]Means with the same superscripts([a,b]) within the same column are not significantly different (p>0.05).
[3)]NS, not significant.

sample was produced from the frying condition of 180℃ for 4 min, even though there was no significant difference (p>0.05) in the gumminess of the *Ojojo* samples. However, the texture of fried starchy foods suffers from gumminess (Otegbayo et al., 2007). This suggested that, due to their lack of gumminess, the *Ojojo* produced under frying conditions of 170℃ for 5 min and 160℃ for 3 min might be more popular with consumers.

The energy required to masticate solid food to a ready-for-swallow state is chewiness (Chandra et al., 2015). It is essential to note that the chewiness of the *Ojojo* produced under all frying conditions was not significantly different from that of the control sample (p>0.05). This suggested that the chewiness of *Ojojo* is unaffected by the fresh *Dioscorea alata* tuber being ground into flour prior to production.

3.4. Sensory acceptability of Ojojo prepared from different frying conditions, as well as the correlation loading of the textural attributes and sensory acceptability of Ojojo

According to Yusuf et al. (2017), products may not be accepted by consumers if they are perceived to have poor textural quality. The results of sensory acceptability test revealed that the samples, location, and interaction between the samples and locations significantly influenced *Ojojo's* consumer acceptability. In all three locations (Malete, Ilorin, and Safari Town), the control sample performed the best (p<0.05) (Table 5). This could be because the *Ojojo* has a significant (p<0.05) negative correlation with sensory gumminess (r=-0.94) and a positive correlation (r=0.96) with consumer acceptability (Supplementary Table S1).

The principal component analysis biplot also showed that the control sample, a fresh *Ojojo* from *Dioscorea alata tuber*, was in the same quadrant as the *Ojojo's* sensory gumminess (Fig. 3). Compared to the control sample, the *Ojojo* produced under the frying conditions of 180℃ for 4 min, 160℃ for 3 min, and 170℃ for 5 min was slightly acceptable (Table 5). The positive correlation that exists between the instrumental adhesiveness (r=0.85), and the consumer acceptability of the

Table 5. Sensory acceptability of *Ojojo* prepared from different frying conditions

Frying temperature (℃)	Frying time (min)	Sensory acceptability
180.00	4.00	2.37±1.14[1)a2)]
160.00	3.00	2.20±1.10[a]
170.00	5.00	2.30±1.0[a]
Control		1.34±1.0[b]
Location		
Malete		2.23±1.20[a]
Ilorin		1.70±1.0[b]
Safari		2.23±1.20[a]
Mean		2.05
p-level (sample)		***
p-level (location)		***
p-level (sample × location)		**

**p<0.01, ***p<0.001.
Sensory acceptability: 1=liked very much, 2=liked slightly, 3=disliked very much.
[1)]All values are mean±SD (n=50).
[2)]Means with the same superscripts ([a,b]) within the same column are not significantly different (p>0.05).

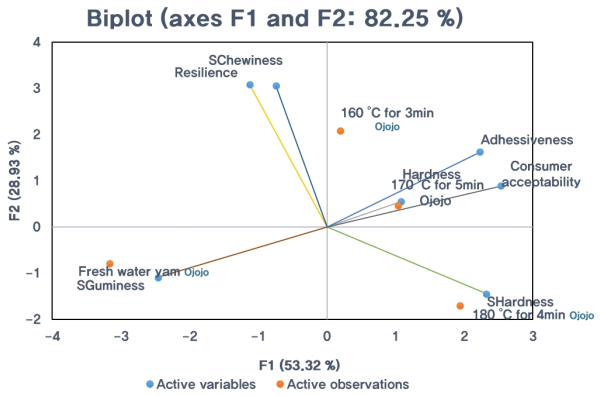

Fig. 3. Principal component biplot of the textural attributes and consumer acceptability of *Ojojo* prepared from different frying conditions. SHardness, sensory hardness; SChewiness, sensory chewiness; SGumminess, sensory gumminess.

Ojojo may be the reason for the slight acceptability of the *Ojojo* produced from 170℃ for 5 min (Fig. 3, Supplementary Table S1). Additionally, as depicted in Fig. 3, the 108℃ for 4 min fried *Ojojo's* slight acceptability may be attributable to its sensory hardness.

We were able to separate the *Ojojo* samples based on the textural characteristics and consumer acceptability of the *Ojojo* using the Principal Component Analysis (PCA) biplot in Fig. 3. Principal Component (PC)1 was responsible for 53.32 percent of the variance in the data, while PC2 was responsible for 28.93 percent. The *Ojojo's* instrumental adhesiveness, instrumental hardness, and consumer acceptability were all in the same quadrant with *Ojojo* produced at 160℃ for 3 min and 170℃ for 5 min. In a similar vein, the control sample was in the same quadrant as the *Ojojo's* sensorial gumminess, while the *Ojojo* from 180℃ for 4 min was in the same quadrant with the sensorial hardness. This indicated that the instrumental hardness and instrumental adhesiveness may have contributed to the consumer preference for the *Ojojo* prepared from the frying temperatures of 160℃ for 3 min and 170℃ for 5 min in all locations.

4. Conclusions

The acceptability of the *Ojojo* prepared at 160℃ for 3 min and 170℃ for 5 min by the consumer was linked to instrumental adhesiveness and instrumental hardness. Similarly, the primary characteristic of the *Ojojo* made at 180℃ for 4 min is the sensory hardness, while that of the control sample exhibited sensory gumminess. Therefore, fresh *Dioscorea alata* tuber can be processed into flour and utilized for *Ojojo* production at frying temperatures and times of 160℃ for 3 min or 170℃ for 5 min to reduce the drudgery involved in the use of fresh *Dioscorea alata* tuber and obtain preserved *Ojojo*.

Supplementary materials

Supplementary materials are only available online from: https://doi.org/10.11002/fsp.2024.31.5.763.

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Conflict of interests

The authors declare no potential conflicts of interest.

Author contributions

Conceptualization: Awoyale W, Saliu LO, Sanni LO. Methodology: Awoyale W, Saliu LO. Formal analysis: Awoyale W, Saliu LO. Validation: Awoyale W, Sanni LO. Writing - original draft: Awoyale W, Saliu LO. Writing - review & editing: Awoyale W, Saliu LO, Sanni LO.

Ethics approval

This research was approved by the ethical committee of the Kwara State University, Malete, Kwara State (Ethical approval number KWASU/CR&D/REA/2023/0060 dated 20/05/2024).

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Supplementary materials

Table S1. Correlation loading of the textural attributes and consumer acceptability of *Ojojo* produced from different frying temperatures and times

Attributes	F1	F2	F3
I Hardness	0.41	0.16	0.90
I Adhesiveness	0.85	0.45	-0.28
S Hardness	0.88	-0.41	-0.24
S Chewiness	-0.28	0.86	-0.43
S Gumminess	-0.94	-0.31	-0.18
Consumer acceptability	0.96	0.25	-0.11

I, instrumental; S, sensory.