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**ORIGINAL RESEARCH PAPER**

# PHYSICOCHEMICAL PROPERTIES, CONSUMER ACCEPTABILITY AND MICROBIAL QUALITY OF SACCHARIFIED SWEET POTATO JUICE PRESERVED WITH LEMON

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**Abstract**

In this study, saccharified sweet potato juice preserved with lemon juice at different concentrations of 0.5, 1.0, 1.5, 2.0, 2.5 and 3.0%, was formulated. Physicochemical, sensory, and microbial quality of the juice stored for 48 hr were analyzed. The pH and brix values decreased, but the total titratable acidity increased as a result of added lemon juice. There was a significant amount of Vitamin-C, B6, and B9 in the samples, while the antinutritional component (phytate, saponin and tannin) of the juice was generally low compared with the generally acceptable limit. The sensory results showed that the sample with 2.5% lemon juice was the most accepted. The rate of microbial growth within a 48 hr storage period decreased with the addition of lemon and there was no record of fecal coliform bacteria growth. Lemon can be used as a source of natural preservatives and a substitute for artificial preservatives for sweet potato juice.

**Keywords:** lemon, physicochemical properties, saccharification, sweet potato juice

## Introduction

Sweet potato (*Ipomoea batatas* L. Lam.) is an important crop grown in many parts of the world (Rose and Vasanthakaalam, 2011). It is richer in starch, vitamins, minerals and protein than most other vegetables (Shigematsu *et al.*, 2017). Kolawole *et al.* (2020), reported that sweet potatoes may vary in physical attributes and chemical composition. For instance, orange fleshed sweet potato is reportedly richer in carotene, while the purple fleshed contains large amounts of anthocyanin (Kim *et al.*, 2007; Van Jaarsveld *et al.*, 2006). These variations in chemical

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composition reflect in their physical appearance and may dictate their various applications. Due to the perishability of most tuber crops including sweet potato, efforts have been made to increase shelf life by processing the tuber into different stable products such as chips (Bechoff *et al.*, 2010), flour (Cui and Zhu 2019; Julianti *et al.*, 2017; Van Hal, 2000), or starch (Ketnawa *et al.*, 2019; Zhu *et al.*, 2020).

Another important product from the sweet potato is the juice. The production of juice from sweet potatoes will certainly enhance the economic value of the crop (Wireko-Manu *et al.*, 2010). Potato juice is the liquid fraction of potato tubers and represents a side stream of the starch industry (Kowalczewski *et al.*, 2019). It is rich in antioxidants, which was found to prolong life span and delay aging in fruit fly (*Drosophila melanogaster*) (BiYing *et al.*, 2019). With the growing demand for food and beverages with novel functionality, sweet potato juice may be the next beverage that will hit the market. This is because the tuber is rich in vitamins, minerals, antioxidants (anthocyanins, tocopherol and β-carotene), dietary fiber, and minerals (Wireko-Manu *et al.*, 2010). However, the juice (100% sweet potato) was reported to be poorly rated in aroma, taste, and mouthfeel compared to when the juice was sweetened with 20% pineapple (Bocher *et al.*, 2019). Wireko-Manu *et al.* (2010), also reported better consumer acceptability for ginger and lime-flavored sweet potato juice compared to unflavored control juice, with the former being the most preferred. The above studies on flavored sweet potato juice suggest that acceptability may be enhanced using different flavoring agents. Another promising flavoring agent that could be used to enhance the acceptability of sweet potato juice is lemon (*Citrus limon*). Hence, the objective of this study was to investigate the physicochemical properties, consumer acceptability and microbial quality of saccharified sweet potato juice preserved with lemon.

## Materials and methods

### *Plant materials*

Fresh tubers of sweet potato (*Ipomoea batatas* L. Lam.), sorghum (*Sorghum bicolor* L. Moench) and ripe lemon (*Citrus limon* L. Osbeck) were purchased from Ipata market in Ilorin, Kwara state, Nigeria. The experiment was conducted at the Department of Home Economics and Food Science laboratory, University of Ilorin.

### *Sorghum malt preparation*

Sorghum malt was sprouted according to the modified method of (Wireko-Manu *et al.*, 2010). Briefly, the sorghum grains were cleaned, washed and steeped for 18 hrs. Steeped grains were drained and sprouted for 3 days on a jute sack. The sprouted grains were dried in an oven (D-37520, Thermo Fisher Scientific, Frankfurt, Germany) at 50$^{o}$C for 24 hr and milled to get sorghum malt. The sorghum malt was placed in Ziploc bags and stored at 4$^{o}$C for one week until needed.

### *Preparation of sweet potato and lemon juice*

Sweet potato juice was prepared as previously reported by Wireko-Manu *et al.* (2010). Briefly, the cleaned tubers were sliced and immersed in a 1.5% sodium

metabisulphite solution for 30 mins. Thereafter, they were rinsed with water and homogenized. The lemon juice was prepared by washing the lemon fruits, peeling and cutting them into two halves. Each half was squeezed and sieved using a muslin cloth to obtain the juice. Additional water (3 L $kg^{-1}$) and 5% of sorghum malt, as a source of exogenous α- and β-amylase enzymes were added and heated to a temperature of 60ºC for 1 hr. The resulting juice was filtered and varying amounts (0, 0.5, 1.0, 1.5, 2.0, 2.5 and 3.0%) of lemon (v/v) as natural preservative were added. Samples were labeled SL1 to SL7 for samples with 0% lemon and 3.0% lemon respectively.

***pH, titratable acidity and total soluble solids***

The pH of the samples was measured using a pH meter (Jenway 3505, Bibby Scientific, London, UK), and the titratable acidity (TTA) content was determined as previously reported (Oyewole and Afolami, 2001). The juice (5 ml) was mixed with distilled water and made up to the 50 ml mark. An aliquot of the mixture (5 ml) was titrated with 0.1 N NaOH using phenolphthalein solution as an indicator and TTA was calculated as percent citric acid. Also, total soluble solids were measured by evaporating 2 g of juice in a water bath and drying in an oven at 70ºC until a constant weight was obtained (Wireko-Manu *et al.* 2010). The insoluble solids content was calculated as a percentage of the sample.

Two grams (2 g) of the beverage was weighed into a dried and preweighed glass crucible. The crucible with its content was evaporated by putting it in a boiling water bath and dried to a constant weight in an oven at 70°C. The insoluble solids were calculated as a percentage of the sample.

***Vitamins and anti-nutritional factors***

Water-soluble vitamins including C, B6 and B9 of the samples were determined by reversed-phase HPLC using the pronto SIL C18 AQ column and smart line HPLC (Kolawole *et al.,* 2020). Tannin content was determined using a Vanillin-HCl assay, the absorbance read at 500 nm against a blank (1% HCL in methanol) using a UV spectrophotometer (Olagunju *et al.,* 2018). Phytate content was also determined as reported by Olagunju *et al.* (2018). Approximately 8 g of juice was mixed with 200 ml of 2% HCl and vortexed for 3 h. The solution was filtered and 10 ml of 0.3% $NH_4SCN$ was added to 50 ml of the filtrate. The solution was titrated against 0.00195 g/ml ferric chloride solution until a persistent brownish yellow color was observed, while the saponin content of the juice was determined by Abidoye *et al.* (2017). A gram of the sample was weighed into a beaker and 100 ml of isobutyl alcohol was added. The mixture was shaken for 2 h and filtered through a Whatman No. 1 filter paper. A 40% saturated solution of magnesium carbonate (20 ml) was added and used to make the mixture up to 250 ml. The solution obtained with saturated $MgCO_3$ was again filtered through a Whatman No. 1 filter paper to obtain a clear colorless solution. A milliliter of the colorless solution was pipetted into a 50 ml volumetric flask and 2 ml of 5% $FeCl_3$ solution was added and made up to mark with distilled water. It was allowed to stand for 30 min for blood red color to develop. Standard saponin solutions (0 to 10 ppm) were prepared from saponin stock solution. The standard solution was treated similarly

with 5% of $FeCl_3$ solution as done for the sample and the absorbance of the sample, as well as the standard solution, were read after color development using a Spectrophotometer at a wavelength of 380 nm.

***Microbial quality***

The microbial load of the samples stored at 25±2°C including total bacterial, total fungal and fecal coliform counts stored for 48 hr was determined as previously reported by Balogun *et al.* (2016). Briefly, 1 g of sample was added to 10 ml sterile water and shaken. The mixture was serially diluted to $10^{-1}$, $10^{-2}$ up to $10^{-5}$ dilution with sterile water for both bacterial and fungal analysis. The pour plate method was employed and 1 ml of each $10^{-3}$ and $10^{-5}$ were dispensed into sterile petri dishes using sterile pipettes. Cooled, molten sterile Nutrient Agar (NA) and Potato Dextrose Agar (PDA) were poured separately to cover the mixture in the petri dishes and swirled. The petri dishes were left for some minutes to solidify. After solidifying, the plates for bacterial examination were inverted and incubated at a temperature of 36°C for 24 h while those for fungi were incubated at ambient temperature (27 ± 2°C) for 72 h. The colonies were counted after incubation using the colony counter.

***Sensory attributes***

Sensory evaluation of the samples was carried out by a 9- point hedonic preference scale and a multiple comparison test was used to assess the acceptability of the juice. Fifty (50) panel members, selected from students of the Department of Home Economics and Food Science, University of Ilorin, Nigeria were used for the evaluation. Prior to the sensory analysis, they were screened with respect to their interest and ability to differentiate food sensory properties. The samples were evaluated for color, aroma, taste, consistency and overall acceptability.

***Statistical analysis***

Duplicate samples were prepared and analyses were done in triplicate. Data was analyzed using one-way analysis of variance (ANOVA) and means were compared using the Fisher Least Significant Difference (LSD) test ($p \leq 0.05$) using the Statistical Package for the Social Sciences (SPSS) Version 16.0 for Windows (SPSS Inc., Chicago, USA).

## Results and discussion

***Physicochemical properties***

The pH of the sweet potato juice samples significantly ($p < 0.05$) decreased with the increasing level of lemon juice (Figure 1), which could be due to the high acidity of lemon juice. The pH of lemon juice may vary between 2.0 and 2.8 (Alfadul and Hassan, 2016; Maldonado *et al.*, 2008; Vandercook *et al.*, 1966). The decrease in pH was accompanied by a corresponding increase in the titratable acidity (TTA) of the juice from 1.2 to 4.5% (Figure 1). Saccharified sweet potato juice had a °Brix of 12, which decreased to 8.2 °Brix following the addition of 3% lemon juice. The values for Brix in this study are within the values (6.43–16.10 °Brix) previously reported for freshly harvested sweet potato (Panja *et al.*, 2016)

and its juice (Ray *et al.*, 2012; Wireko-Manu *et al.*, 2010). Wireko-Manu *et al.* (2010) reported a Brix between 12.00 and 13.30 for sweet potato juice preserved with lime juice, while a higher value of 16 $^{o}$Brix was reported for freshly prepared sweet potato must (Ray *et al.*, 2012). Obviously, the low values of the Brix could be linked to the use of lemon or lime as found in the current study and values reported previously by Wireko-Manu *et al.* (2010).

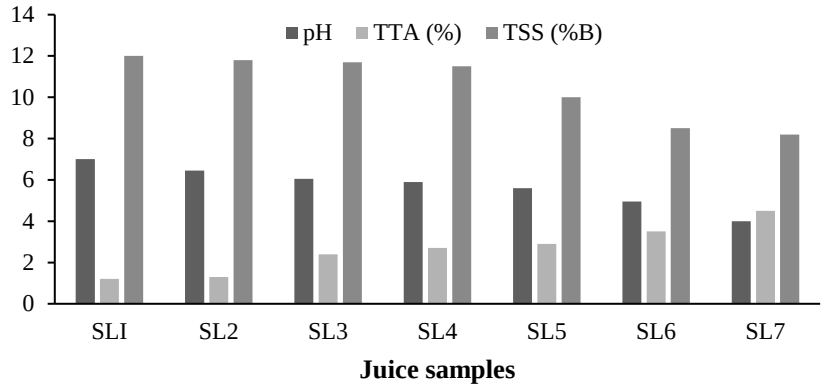


**Figure 1.** Physicochemical properties of the saccharified sweet potato juice.

SL1= 100.0MLs Sweet potato juice; SL2=99.5MLs Sweet potato juice + 0.5MLs Lemon juice; SL3=99.0MLs Sweet potato juice + 1.0MLs Lemon juice; SL4=98.5MLs Sweet potato juice + 1.5MLs Lemon juice; SL5=98.0MLs Sweet potato juice + 2.0MLs Lemon juice; SL6=97.5MLs Sweet potato juice + 2.5MLs Lemon juice; SL7=97.0MLs Sweet potato juice + 3.0MLs Lemon juice.

### *Vitamin content*

Pyridoxine (Vitamin $B_6$), followed by folate (Vitamin $B_9$) were the major vitamins in the sweet potato juice, while ascorbic acid (Vitamin C) was present in relatively small amounts (Table 1). The control sweet potato juice without lemon had significantly lower vitamin C (0.69 mg/100ml) and vitamin $B_9$ (6.02 µg/100ml) contents, but higher levels of vitamin $B_6$, (70.80 µg/100ml) compared to samples with added lemon. The vitamin C and vitamin $B_9$ contents of the juice increased together with the levels of lemon addition. Adding lemon juice up to 3% increased the vitamin C by tenfold, while the vitamin $B_9$ showed approximately a 3-fold increase. Lemon juice is rich in vitamin C with values ranging between 21.06 and 61.60 mg/100 g depending on the source of the fruit, variety and the degree of ripeness (Alfadul and Hassan 2016; Gironés-Vilaplana *et al.*, 2012; Kefi *et al.*, 2016; Okwu and Emenike, 2006). Wireko-Manu *et al.* (2010) reported much lower vitamin C contents for sweet potato juice flavored with lime and ginger. The variation could be due to the variety of sweet potato used and the measures put in place to minimize vitamin losses prior to analyses.

**Table 1.** Vitamin contents of the juice samples.

| Sample | Vitamin C (mg/100ml) | Vitamin B6 (µg/100ml) | Vitamin B9 (µg/100ml) |
|---|---|---|---|
| SL1 | $0.69^{g} \pm 0.08$ | $70.8^{c} \pm 0.00$ | $6.02^{i} \pm 0.02$ |
| SL2 | $1.19^{ef} \pm 0.07$ | $68.9^{c} \pm 0.56$ | $7.69^{h} \pm 0.33$ |
| SL3 | $1.59^{f} \pm 0.04$ | $46.7^{d} \pm 0.28$ | $11.85^{g} \pm 0.16$ |
| SL4 | $2.24^{e} \pm 0.08$ | $35.5^{e} \pm 0.49$ | $14.88^{f} \pm 0.11$ |
| SL5 | $3.05^{d} \pm 0.21$ | $31.2^{f} \pm 1.13$ | $15.74^{e} \pm 0.36$ |
| SL6 | $3.45^{cd} \pm 0.07$ | $21.9^{g} \pm 0.14$ | $17.69^{d} \pm 0.43$ |
| SL7 | $3.78^{c} \pm 0.25$ | $22.47^{h} \pm 0.60$ | $19.34^{c} \pm 0.36$ |

Mean ± SD Means with different letter of superscripts in each column are significantly different ($p<0.05$).
SL1= 100.0MLs Sweet potato juice; SL2=99.5MLs Sweet potato juice + 0.5MLs Lemon juice; SL3=99.0MLs Sweet potato juice + 1.0MLs Lemon juice; SL4=98.5MLs Sweet potato juice + 1.5MLs Lemon juice; SL5=98.0MLs Sweet potato juice + 2.0MLs Lemon juice; SL6=97.5MLs Sweet potato juice + 2.5MLs Lemon juice; SL7=97.0MLs Sweet potato juice + 3.0MLs Lemon juice.

### *Antinutrients*

Raw sweet potato juice had significantly ($p < 0.05$) higher phytate (1.05 mg/100 ml), saponin (1.05 mg/100 ml) and tannin (0.45 mg/100 ml) contents in comparison to samples with added lemon juice (Figure 2).

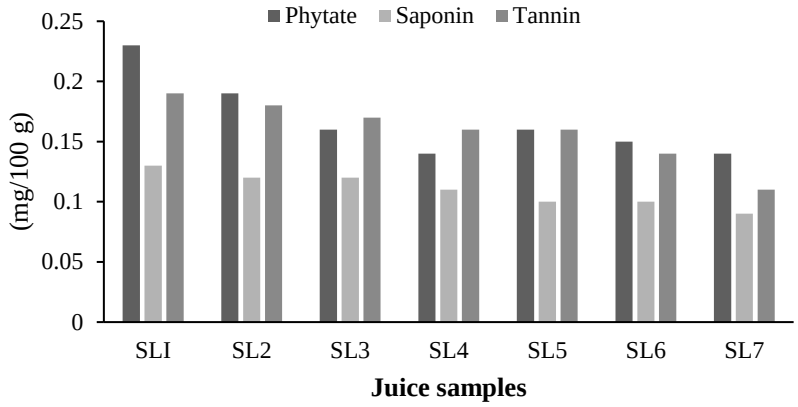


**Figure 2.** Antinutrient content of the saccharified sweet potato juice.

SL1= 100.0MLs Sweet potato juice; SL2=99.5MLs Sweet potato juice + 0.5MLs Lemon juice; SL3=99.0MLs Sweet potato juice + 1.0MLs Lemon juice; SL4=98.5MLs Sweet potato juice + 1.5MLs Lemon juice; SL5=98.0MLs Sweet potato juice + 2.0MLs Lemon juice; SL6=97.5MLs Sweet potato juice + 2.5MLs Lemon juice; SL7=97.0MLs Sweet potato juice + 3.0MLs Lemon juice.

The values of the antinutrients decreased significantly after pasteurization. Phytate was the most abundant antinutrient in the juice (0.14-0.23 mg/100 ml), while

saponin which was the lowest in the juice varied between 0.13 and 0.45 mg/100ml. Previous studies similarly found that phytate (49.35-78.38) was the dominant antinutrient in different varieties of peeled sweet potato (Dako *et al.*, 2016). Processing of foods including frying, boiling and pasteurization has been found to substantially reduce the antinutrients in foods. For example, Abubakar *et al.* (2010) reported low amounts of phytate in boiled (0.88 mg/100 g) and fried (0.72 mg/100 g) sweet potatoes. Phytate is a potent inhibitor of minerals such as iron, zinc, and calcium and can interfere seriously with their absorption (Gibson *et al.*, 2010). However, phytates and other antinutrients such as tannin and saponins in foods can be sufficiently reduced using processing methods such as pasteurization as reported in this study and those described by other authors (Abubakar *et al.*, 2010; Oyeyinka *et al.*, 2019; Oyeyinka *et al.*, 2017). The phytate, tannin and saponin contents of the juice are within the acceptable dietary intake of 10 mg/100g, 560 mg/day and 3 mg/kg BW per day respectively (Mehrjardi *et al*., 2014; Dako *et al*., 2016; Aquilina *et al*., 2019).

***Sensory properties***

The mean sensory scores for the sweet potato juice samples flavored with lemon is presented in Table 2. Sweet potato juice flavored with lemon (SL2-SL7) all had higher sensory scores than the control juice without lemon (SL1), indicating that the addition of lemon influenced the sensory properties of the juice samples.

**Table 2.** Mean scores of the sensory evaluation of the juice samples.

| Samples | Colour | Aroma | Taste | Consistency | Overall acceptability | Total score |
|---|---|---|---|---|---|---|
| SL1 | $5.80^{c}\pm1.58$ | $5.87^{b}\pm1.10$ | $6.00^{a}\pm1.31$ | $6.00^{a}\pm1.71$ | $6.13^{c}\pm1.16$ | 29.80 |
| SL2 | $6.03^{bc}\pm1.21$ | $5.90^{b}\pm1.39$ | $6.43^{a}\pm1.13$ | $6.37^{a}\pm1.32$ | $6.37^{bc}\pm0.96$ | 31.10 |
| SL3 | $6.60^{ab}\pm1.13$ | $6.17^{ab}\pm1.44$ | $6.30^{a}\pm1.46$ | $6.70^{a}\pm1.10$ | $6.70^{abc}\pm0.98$ | 32.47 |
| SL4 | $6.37^{abc}\pm1.18$ | $6.27^{ab}\pm1.33$ | $6.40^{a}\pm1.47$ | $6.73^{a}\pm1.50$ | $6.93^{ab}\pm0.86$ | 32.70 |
| SL5 | $6.50^{ab}\pm1.13$ | $6.50^{ab}\pm1.22$ | $6.63^{a}\pm1.21$ | $6.63^{a}\pm1.35$ | $7.20^{a}\pm0.92$ | 33.46 |
| SL6 | $7.07^{a}\pm1.11$ | $6.73^{a}\pm1.31$ | $6.70^{a}\pm1.70$ | $6.77^{a}\pm1.56$ | $7.13^{a}\pm1.38$ | 34.40 |
| SL7 | $7.00^{a}\pm1.23$ | $6.80^{a}\pm1.31$ | $6.73^{a}\pm1.23$ | $6.43^{a}\pm1.73$ | $7.03^{a}\pm1.18$ | 33.99 |

Mean ± SD Means with different letter of superscripts in each column are significantly different ($p<0.05$).

SL1= 100.0MLs Sweet potato juice; SL2=99.5MLs Sweet potato juice + 0.5MLs Lemon juice; SL3=99.0MLs Sweet potato juice + 1.0MLs Lemon juice; SL4=98.5MLs Sweet potato juice + 1.5MLs Lemon juice; SL5=98.0MLs Sweet potato juice + 2.0MLs Lemon juice; SL6=97.5MLs Sweet potato juice + 2.5MLs Lemon juice; SL7=97.0MLs Sweet potato juice + 3.0MLs Lemon juice.

The improvement in flavor (aroma and taste) of the juice samples may be associated with the presence of organic compounds and volatile aroma components. Cserhalmi *et al.* (2006) reported the presence of malic, citric, ascorbic and fumaric acids as well as significant amounts of neral and geranial as flavor compounds in lemon juice. Other authors reported that the volatile compounds in lemon consist of mono- and sesquiterpene hydrocarbons and oxygenated molecules such as aldehydes, monoterpene alcohols, and monoterpene esters (Allegrone *et al.*,

2006). The panel ratings for taste and consistency were very similar with no significant differences ($p>0.05$). In terms of overall acceptability, sweet potato juice with 2% lemon had the best rating among the sample, though the rating was not significantly different from the juice samples flavored with 2.5 and 3% lemon juice. Using the total score of the ratings altogether, sweet potato juice with 2.5% lemon (SL6) appears to be the best sample with a total score of 34.40, which was higher than the other samples (29.80-33.99). Furthermore, this sample had the highest rating in more sensory properties (color, consistency, and overall acceptability) than other samples.

***Microbial quality***

The microbial quality of the sweet potato juice preserved with lemon juice is presented in Table 3. After storage for 24 hr, the control sweet potato juice without lemon had the highest total bacterial count (TBC) and total fungal count (TFC), but there was no fecal coliform in any of the samples. The same trend was observed for the juice samples after 48 hr storage period. In general, the TFC was significantly ($p<0.05$) higher than the TBC. This is expected since fungi are of concern in juices because of the acid and sugar contents of the juice, while only acidophilic bacteria can tolerate the acidic condition of juice samples.

**Table 3:** Microbial count of the juice samples after storage for 24 and 48 hr ($\times 10^3$ cfu/ml).

| Sample code | 24 hr | | | 48 hr | | |
|---|---|---|---|---|---|---|
| | **TBC** | **TFC** | **FCC** | **TBC** | **TFC** | **FCC** |
| SL1 | $4.23^{a}$ | $5.96^{a}$ | ND | $6.03^{a}$ | $6.62^{a}$ | ND |
| SL2 | $1.67^{b}$ | $3.36^{b}$ | ND | $4.57^{b}$ | $5.23^{ab}$ | ND |
| SL3 | $1.63^{b}$ | $2.50^{c}$ | ND | $4.03^{b}$ | $5.35^{ab}$ | ND |
| SL4 | $1.47^{bc}$ | $1.90^{cd}$ | ND | $3.27^{bc}$ | $4.50^{b}$ | ND |
| SL5 | $1.30^{c}$ | $1.80^{d}$ | ND | $2.40^{c}$ | $4.52^{b}$ | ND |
| SL6 | $1.30^{c}$ | $1.70^{cd}$ | ND | $3.20^{c}$ | $3.50^{c}$ | ND |
| SL7 | $1.27^{d}$ | $1.46^{cd}$ | ND | $2.04^{d}$ | $2.46^{d}$ | ND |

Means with different letter of superscripts in each column are significantly different ($p<0.05$).

TBC: Total bacterial count; TFC: Total fungal count; Fecal coliform count; ND: Not detected SL1= 100.0MLs Sweet potato juice; SL2=99.5MLs Sweet potato juice + 0.5MLs Lemon juice; SL3=99.0MLs Sweet potato juice + 1.0MLs Lemon juice; SL4=98.5MLs Sweet potato juice + 1.5MLs Lemon juice; SL5=98.0MLs Sweet potato juice + 2.0MLs Lemon juice; SL6=97.5MLs Sweet potato juice + 2.5MLs Lemon juice; SL7=97.0MLs Sweet potato juice + 3.0MLs Lemon juice.

Fungi are the major causes of spoilage of fruits and vegetables and have been isolated in fruit juices (Ogodo *et al.* 2016). The low pH of the juice samples (Figure 1) due to the addition of the lemon may have favored the growth of fungi (yeast and mold) (Ogodo *et al.*, 2016; Oranusi *et al.*, 2012; Tournas, 2005). Lemon addition resulted in a progressive but significant reduction in the TFC and TBC of the juice samples during storage. The progressive decrease in microbial load could be due to the reduced pH (Figure 1), and the significant amount of organic acids such as citric acid in lemon juice (Penniston *et al.*, 2008). Earlier studies have documented the antimicrobial activity of lemon juice (Tassou *et al.*, 1996; De

Castillo *et al.*, 2000; Hashemi *et al.*, 2017), which in turn leads to the extension of the shelf life of food products.

This is an indication that lemon can be used as a natural preservative to extend the shelf life of food and beverages in the Food Industry. The non-detection of fecal coliforms, TFC and TBC within safe limits shows the sweet potato juice is safe for consumption for the period of storage.

## Conclusions

Acceptable flavored juice was prepared from saccharified sweet potato juice and lemon juice. Lemon addition improved the vitamin C content of the juice and also enhanced the shelf life. This is an indication that lemon can be used as a natural preservative to extend the shelf life of food and beverages in the Food Industry. Phytate, saponin and tannin of the juice samples were reduced significantly indicating that the juice is safe for consumption and that they are within the acceptable safe limit of antinutrients for juice. Consumer acceptability results revealed that sweet potato juice can be prepared using 97.5% sweet potato juice and 2.5% lemon since the juice had the highest total score of 34.40 and showed the highest rating in more sensory properties (color, consistency and overall acceptability) than other samples. The non-detection of fecal coliforms, TFC and TBC within safe limits shows the sweet potato juice is safe for consumption for the period of storage.

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