Original Research Article

Characterisation of Eggplant (*Solanum melogena*) Sauerkraut Stored in Sugar-Salt Osmotic Solution

ABSTRACT

Eggplant (*Solanum melogena*), one of the most common food crops in the world, has been reported to be a source of nutritionally important phytochemicals that are of health benefits although there is dearth of its harness in diversity of diets. The eggplant sauerkraut was produced by fermentation in 2.5% brine for 2 weeks and storage studies (28±2 ˚C, 4 weeks) were conducted on the sauerkraut in 2.5% brine (sample A0), 1% sucrose in 2.5% brine (A1), 2% sucrose in 2.5% brine (A2) and 3% sucrose in 2.5% brine (A3). Selected parameters were monitored on the raw eggplant, freshly prepared and stored sauerkraut using standard methods in the literature. The pH, crude fibre, ash, protein and vitamin C contents of the raw eggplant were 6.50, 0.66%, 0.55%, 0.94% and 9.12 mg/100g, respectively. Storing the sauerkraut in osmotic solutions caused significant changes ($P = .05$) in the chemical properties. The highest fibre and protein contents of 2.41 and 2.63%, respectively were recorded for sample A3 after four weeks of storage. Although the osmotic solutions provided a good medium for product stability, all the sauerkraut samples experienced decrease in the vitamin C content with increase in storage time. Sauerkraut stored in medium containing 3% sucrose (Sample A3) had the highest sensory scores in appearance, aroma, taste and overall acceptability and the best judgment in terms of saltiness and firmness among samples stored in sucrose containing osmotic solutions. Storing eggplant sauerkraut in osmotic solutions can reduce postharvest loses, enhance dietary diversity, product stability, and availability of eggplant during off season thus, contributing to achieving SDGs 1 and 2 (zero hunger and no poverty).

Keywords: Eggplant; Fermentation; Osmotic solution; Sauerkraut

1. INTRODUCTION

Fruits and vegetables are increasingly being recognized for their value in human diet because of their immense contribution to human health. They are good sources of vitamins, essential minerals, dietary fiber, glucosinolates and antioxidants [1,2]. In addition, they supply considerable amounts of carbohydrates and calories Fruits and vegetables also contain phenolic compounds such as flavonoids, sulphur compounds, monoterpenes, phytoestrogens and bioactive peptides. Concentrations of these components in fruits and vegetables depends on varieties, maturity and agricultural practices such as irrigation and use of fertilizer [3]. These nutritional and health-promoting effects of fruits and vegetables improve the state of human health and reduce the risk of various diseases. After harvest, a large tonnage of fruits and vegetables is lost. In developing economies, post-harvest losses and wastage of fruits and vegetables amount to 40% of total production. Moreover, only a limited quantity of fruits and vegetables are produced for local markets or for exportation due to inadequate processing and storage facilities [4,5]. A wide variety of fruits and vegetables such as eggplant, mango, cashew, tomato, pawpaw, oranges, and others are available in many regions of the world and make significant contributions to human diets.

Eggplant (*Solanum melogena*) is one of the most common food plants consumed worldwide. China, with the production of 32 million tonnes, is the largest producer of eggplant accounting for about 64% of the world total production, and India producing 13 million tonnes is the second largest producer. Ninety percent of the world total production of eggplant comes from Asia while the remaining is produced by America, Europe and Africa [6,7]. Eggplant varies in colour, shape and size, and supplies reasonable amounts of nutritionally important nutrients such as fibre, mineral elements and vitamins [8]. Eggplant has been reported to contain a variety of phytochemicals such as phenolics and flavonoids that provide important health benefits [9]. Previous studies have confirmed that eggplant extract suppresses the formation of blood vessels required for tumor growth and metastasis and inhibits inflammation. Methanol leaf extract of African eggplant has been reported to tremendously lower the high blood glucose content of alloxan induced diabetic adult male albino rats [10]. Eggplant fruit possesses antioxidant activities and is ranked amongst the top ten vegetables in terms of antioxidant capacity [11,12,13,14]. Resistance to antibiotics is rising to dangerous levels in all parts of the world. In a recent study, eggplant calyx aqueous methanolic extract has been used for synthesis of nanoparticles of silver and zinc oxide for fighting antibiotic resistance [15].

In spite of its many benefits, eggplant has a very limited shelf life, and loses water and quality when field heat is not removed quickly. Eggplant production is seasonal and its demand throughout the year has geared interest in products having qualities close to the fresh ones. Therefore, it is important to process this food crop into a shelf stable form that will be available all the year round. A number of processing methods have been employed to extend the shelf life of eggplant. These include refrigeration, freezing and modified atmosphere storage [16,17,18]. However, these methods may not be economical in many developing countries because of lack of and irregular supply of electricity as well as inadequate processing facilities. Combination of processing treatments such as fermentation and storage in osmotic solutions may therefore be a better alternative for preserving eggplant. Pretreatments such as fermentation, germination have been reported to impact desirable attributes to certain foods such as tubers and legumes [19]. Fermentation has been demonstrated to impact nutritional enhancement through bio-enrichment with microbial proteins, amino acids, lipids and vitamins [20]. Other processing methods such as blanching and osmotic pretreatment have been reported to improve product quality or drying rate [21].

In this study, eggplant sauerkraut was produced through fermentation and was stored for four weeks in various osmotic solutions to evaluate the suitability of the combined methods on the characteristics of the product. The product is hoped to serve as a ready-made vegetable or as a valuable condiment in the preparation of soups and premixed foods.

2. MATERIAL AND METHODS

2.1. Materials

Fruits of eggplant (*Solanum melogena*), food grade sodium chloride (NaCl) and sucrose ($C_{12}H_{22}O_{11}$) were purchased from a local market in Ogbomoso. Analytical grade reagents were obtained from Food Chemistry Laboratory of the Department of Food Science, Ladoke Akintola University of Technology, Ogbomoso, Nigeria.

2.2. Sample preparation and sterilization of glasswares

The eggplant fruits were sorted with immature, stalks and bad fruits as well as other extraneous materials removed. The fruits were washed in clean water and placed in a clean container prior to further processing. Glasswares --- petri dishes, conical flasks, pipettes, and test tubes were thoroughly washed with detergent and rinsed in clean water. They were then dried in a cabinet drier. All media were prepared and sterilized at 121 ˚C for 15 min prior to use according to the manufacturers' specifications [22].

2.3. Preparation of brine and eggplant sauerkraut

Brine having concentration of 2.5% was prepared into a clean stainless steel vat. The brine was poured on the sliced eggplant (10 mm thickness) at a ratio of 1:30 in a stainless steel bowl. A sterile wire basket was immersed in the container to keep the shredded eggplant fruits fully submerged in the brine according to the method of Ade-Omowaye (2002) [23]. The container was covered to allow fermentation at room temperature (28±2 ˚C) for the production of the sauerkraut. Fermentation was allowed to proceed for two weeks after which it was drained. The sauerkraut was divided into four portions out of which three portions were dipped in various concentrations of osmotic solutions containing both sucrose and salt while the fourth portion which served as control was dipped in only brine solution for the storage studies as described below.

2.4. Storage studies in various osmotic solutions

The fermented samples were weighed and loaded into different labeled previously sterilized glass jars containing various osmotic solutions: 2.5% brine solution (A0), 1% sucrose concentration in 2.5% brine solution (A1), 2% sucrose concentration in 2.5% brine solution (A2) and 3% sucrose concentration in 2.5% brine solution (A3) at ambient temperature (28±2 ˚C). The brine and the combined sucrose and salt solutions were prepared on w/v basis. The ratio of fruit/syrup was 1:3 by weight to prevent significant alteration of syrup concentration during storage. The processed eggplant sauerkraut packaged in labeled glass jars were stored at ambient temperature (28±2 ˚C) and observed for 4 weeks ---Figure 1.. Analyses were carried out on each of the samples every week.

2.5. Chemical analyses of the eggplant sauerkraut

Chemical analyses were carried out using conventional methods [24]. Determinations were made for the pH, titratable acidity, crude protein, crude fibre, moisture and ash. The vitamin C (ascorbic acid) was determined by titrating the sample with 2, 6 dichlorophenol indophenol after treating with metaphosphoric acid solution.

2.6. Microbiological analysis

<u>2.6.1. Sample preparation</u>

About 10 ml of the sample of eggplant sauerkraut was homogenized using Stuart scientific auto vortex mixer. About 0.2 ml of the mixture was serially diluted for estimating the number of microorganisms. Nutrient agar (NA) was used for total viable count, potato dextrose agar (PDA) was used for mould count and Eosin methylene blue agar was used for coliform count [25].

<u>2.6.2. Coliform count</u>

About 0.2 ml of each dilution was pipetted into the centre of appropriate plates containing Eosin methylene blue agar. The plates were allowed to set inverted and incubated at 37 ˚C for 24 h. All counts were done in triplicate and carried out at regular intervals during the storage period. Colonies were counted using an electronic counter ---- Fison Model CNW-330-010X [25].

<u>2.6.3. Mould count</u>

About 0.2 ml of each dilution was pipetted into the centre of the appropriate plate containing potato dextrose agar. The plates were allowed to set, inverted and incubated at room temperature for 48 h. All counts were carried out at regular intervals during storage period. Colonies were counted using an electronic colony counter --- Fison Model CNW-330-010 [25].

2.7. Sensory Evaluation

Sensory evaluation was carried out on the sauerkraut samples after the fourth week of storage by thirty-five panelists. Assessments were made for firmness, saltiness, taste, aroma, appearance and overall acceptability using the 9-point hedonic scale with 1 representing dislike extremely and 9 stands for like extremely.

2.8. Statistical Analysis

All analyses were carried out in triplicates and data obtained were subjected to one-way analysis of variance using the statistical package for social sciences software --IBM version 23 [26]. Duncan multiple range test was used to separate the means and the significant differences $(P = .05)$. were determined.

3. RESULTS AND DISCUSSION

3.1. Chemical properties of raw eggplant and its sauerkraut

Figure 1 shows samples of eggplant sauerkraut packaged in glass jars containing varying concentrations of osmotic solutions. The chemical properties of raw eggplant and its sauerkraut are presented in Table 1. As indicated in Table 1, the pH of the raw eggplant was 6.50 which was slightly acidic. The process of fermentation for 2 weeks to produce sauerkraut caused reduction of pH to 3.50. The decrease in pH during fermentation was probably due to the production of organic acids, mainly lactic acid [27,28]. The pH is a critical factor in developing the flavour and aroma of fermented fruits and vegetables. Low pH enhances the flavour of the product thereby giving it desirable organoleptic taste [29]. Most lactic acid bacteria favour conditions with a near-neutral pH [30,31]. The optimal pH of fermented vegetables like sauerkraut and *kimchi* was reported to be in the range of 3.5–4.5 [32]. A rapid decrease in pH at the beginning of fermentation is of importance for the quality of the end product [33,34]. In 2004, Maifreni *et al.* [35]. reported a decrease in the pH of turnip (*Brassica rapa*) from 6.4 to 3.7 in the first 24 h of fermentation with a mixed culture of lactobacilli (*Lactobacillus* spp., *Pediococcus* spp., etc.). Similar decrease was reported during fermentation of cabbage and cucumber [32]. Fermented foods with low pH has been reported to have antimicrobial properties [36]. Titratable acidity was recorded as percentage lactic acid and it increased from 0.09% in the raw eggplant to 0.15% for the sauerkraut after fermentation. Increase in titratable acidity could be attributed to the production of lactic acid bacteria. Increase in fermentation period make the product more acidic and thus create unfavourable environment for the growth of other microorganisms.

The crude fibre content increased from 0.66% in the raw eggplant to 1.64% in the sauerkraut. The apparent increase in the crude fibre content of the sauerkraut may be attributed to increase in the concentration of the dry matter due to water losses into the medium during fermentation. The ash content also increased after fermentation from 0.55% in the raw eggplant to 2.54% which could be due to the addition of salt into the medium during sauerkraut production.

There was a significant change in the protein content after fermentation. The protein content of raw eggplant was 0.94% while that of the sauerkraut was 1.05%. This increase may be attributed to microbial enhancement during fermentation. This agrees with the findings of Vadivel and Janavdhanan in 2005, [37]. who reported increase in protein content after fermentation. Vitamin C content of raw eggplant was 9.12 mg/100g. Fermentation reduced vitamin C content of the eggplant to 8.79 mg/100g in the sauerkraut. Loss or reduction of vitamin C in the sauerkraut may be due to the effects of processing operations employed in its preparation such as shredding, as well as leaching of the vitamin into the fermentation medium. Vitamin C (L- ascorbic acid) is a water soluble vitamin [38,39].

Figure 1. Eggplant sauerkraut stored in jars containing varying concentrations of osmotic solution

Table 1. Chemical properties of raw eggplant and its sauerkraut

Parameter	Raw Eggplant	Sauerkraut
pH	6.50±0.01	3.50±0.01
Total titratable acidity (%)	0.09±0.01	0.15±0.01
Moisture (%)	79.75±1.07	83.30±2.40
Ash (%)	0.55±0.01	2.54±0.01
Crude fibre (%)	0.66±0.04	1.64±0.01
Protein (%)	0.94±0.01	1.05±0.01
Vitamin C (mg/100g)	9.12±0.11	8.79±0.23

Values are means of three determinations ± standard deviation.

3.2. Effect of varying concentrations of osmotic solution on the chemical properties of the sauerkraut

The chemical properties of the sauerkraut dipped in varying concentrations of osmotic solution is presented in Table 2. The result shows that different concentrations of the osmotic solution had varying effects on the pH, titratable acidity, protein, vitamin C, crude fibre, moisture and ash contents of the sauerkraut samples after 24 h of storage. Addition of sucrose to the brine caused a change in the pH values of the sauerkraut. Sauerkraut dipped in 2.5% brine (Sample A0) had pH of 3.50 while the pH of samples A1, A2 and A3 dipped in brine and sugar solution at varying concentrations were 3.60, 3.60 and 3.60, respectively. There was slight increase in the titratable acidity on addition of sucrose at varying

Table 2. Effect of varying concentrations of osmotic solutions on the chemical properties of sauerkraut after 24 h of storage

Samples	pH	Titratable Acidity (%)	Moisture (%)	Ash (%)	Fibre (%)	Protein (%)	Vitamin C (mg/g)
A0	3.50 ± 0.00^{a}	0.15 ± 0.01^{b}	83.30 ± 2.40^{ab}	2.54 ± 0.02^{a}	1.64 ± 0.01^{a}	1.05 ± 0.01^{a}	8.79 ± 0.16^{d}
A1	3.60 ± 0.00^{b}	0.16 ± 0.01^{b}	85.10 ± 1.08^{a}	2.66 ± 0.01^{b}	1.64 ± 0.01^{a}	1.08 ± 0.01^{b}	8.15 ± 0.12^{c}
A2	3.60 ± 0.00^{b}	0.17 ± 0.01^{ab}	82.90 ± 1.00^{b}	2.74 ± 0.44^{c}	1.64 ± 0.01^{a}	1.08 ± 0.01^{b}	7.86 ± 0.44^{b}
A3	3.60 ± 0.00^{b}	0.18 ± 0.01^{b}	80.50 ± 1.01^{c}	2.92 ± 0.11^{d}	1.70 ± 0.01^{b}	1.08 ± 0.01^{b}	7.40 ± 0.33^{a}

Values are means of three determinations ± standard deviation. Means with different alphabets in the same column are significantly different (P=0.05). A0= sauerkraut in 2.5% brine; A1= sauerkraut in 2.5% brine and 1% sucrose solution; A2= sauerkraut in 2.5% brine and 2% sucrose solution; A3= sauerkraut in 2.5% brine and 3% sucrose solution.

concentrations to the brine. In an earlier study, addition of sucrose was reported to attenuate saltiness [23].

The moisture content of the sauerkraut samples ranged from 80.50% in sample A3 containing 3% sucrose to 85.10% for sample A1 containing 1% sucrose. There was decrease in the moisture content of the sauerkraut sample with increase in the concentration of sucrose in the brine. The reduction in the moisture content with increasing sugar concentration in the brine solution may be attributed to increasing osmotic pressure of the osmotic media [40].

There was a significant difference ($P = .05$) in the total ash content between the raw eggplant and the sauerkraut samples in osmotic solutions. All the sauerkraut samples in the osmotic media had higher ash content than raw eggplant. A progressive increase in the ash content was observed with increase in sugar concentration in the brine solution. Enhancement in the ash content of sauerkraut products accentuates the advantage of converting fresh eggplant into a shelf-stable product. For protein, an improvement over the fresh eggplant was recorded which might be attributed to microbial enhancement as reported in the literature [37]. Addition of sucrose to the brine caused about 3% improvement in the protein content irrespective of the concentration of the sucrose added. The apparent increase might be attributed to concentration of the solid matter with concurrent reduction in the moisture content. Decrease in vitamin C (ascorbic acid) was observed after fermentation. The lowest concentration of vitamin C, 7.40 mg/100g was recorded for sample A3 containing 3% sucrose while sample A0 containing only brine had the highest concentration of 8.79 mg/100g after fermentation. A gradual decrease was observed in the samples with increase in sucrose addition. The decrease might be attributed to leaching into the osmotic solution as ascorbic acid has been documented to be water soluble [41].

3.3. Effect of storage period on the chemical properties of the sauerkraut in osmotic solution

The effect of storage on the chemical properties of sauerkraut samples is presented in Table 3. There was little variation in the pH values during the period of storage. The pH of the samples gradually increased till the 4th week of storage. This observation suggests that the samples became less acidic with storage time, indicating diffusion of sugar into the samples. This result agrees with a previous study which reported that osmotic solution reduces acid/sugar ratio [42].

Generally, the storage caused a gradual reduction in the moisture content of the samples. The reduction in the moisture content of samples might be attributed to osmotic dehydration occurring within the cellular structures of the samples immersed in osmotic solutions of varying osmotic pressures. For each of the sauerkraut samples, the apparent increase in the

Table 3. Effect of storage on the chemical compositions of the sauerkraut samples

SAMPLE	WEEK	pH	TITRATABLE ACIDITY (%)	MOISTURE (%)	ASH (%)	FIBRE (%)	PROTEIN (%)	VITAMIN C (mg/100g)
A0	1	3.50 ± 0.00^{a}	0.15 ± 0.01^{d}	81.50 ± 1.04^{c}	2.56 ± 0.01^{c}	1.64 ± 0.04	1.05 ± 0.00	8.79 ± 0.32
	2	3.50 ± 0.00^{a}	0.16 ± 0.01^{d}	76.50 ± 0.48^{g}	0.31 ± 0.01^{r}	1.72 ± 0.02	1.20 ± 0.01	8.50 ± 0.21
	3	3.50 ± 0.00^{a}	0.16 ± 0.01^{cd}	75.40 ± 0.21^{a}	0.77 ± 0.01^{i}	1.72 ± 0.02	1.20 ± 0.00	8.50 ± 0.21
	4	4.40 ± 0.00^{b}	0.16 ± 0.01^{cd}	62.25 ± 0.22^{f}	0.96 ± 0.00^{p}	2.04 ± 0.03	1.51 ± 0.02	$7.09\ \pm0.05$
A1	1	3.60 ± 0.00^{a}	0.16 ± 0.01^{a}	82.95 ± 0.71^{d}	2.62 ± 0.01^{d}	1.64 ± 0.04^{a}	1.24 ± 0.02^{a}	8.00 ± 0.01^{d}
	2	3.60 ± 0.00^{a}	0.17 ± 0.01^{ab}	82.35 ± 0.28^{c}	0.60 ± 0.01^{a}	1.81 ± 0.01^{b}	1.24 ± 0.02^{a}	7.32 ± 0.11^{bc}
	3	3.70 ± 0.00^{a}	0.17 ± 0.01^{ab}	81.90 ± 0.67^{b}	0.64 ± 0.01^{b}	1.99 ± 0.03^{c}	1.43 ± 0.01^{b}	7.00 ± 0.00^{b}
	4	4.70 ± 0.00^{a}	0.16 ± 0.01^{a}	74.20 ± 0.42^{a}	0.86 ± 0.01^{c}	2.03 ± 0.04^{d}	1.76 ± 0.04^{c}	6.41 ± 0.20^{a}
A2	1	3.60 ± 0.00^{a}	0.16 ± 0.00^{c}	85.50 ± 0.35^{c}	1.18 ± 0.03^{a}	1.74 ± 0.01^{a}	1.52 ± 0.02^{a}	7.61 ± 0.41^{d}
	2	3.71 ± 0.00^{b}	0.15 ± 0.01^{b}	78.65 ± 0.32^{b}	2.06 ± 0.00^{c}	1.82 ± 0.02^{b}	1.52 ± 0.02^{a}	5.70 ± 0.30^{c}
	3	3.80 ± 0.00^{c}	0.15 ± 0.01^{b}	76.60 ± 0.33^{a}	1.83 ± 0.01^{b}	1.81 ± 0.03^{b}	1.90 ± 0.01^{b}	5.01 ± 0.00^{b}
	4	4.60 ± 0.00^{d}	0.13 ± 0.00^{a}	78.60 ± 0.28^{b}	1.87 ± 0.01^{b}	2.16 ± 0.05^{c}	1.92 ± 0.02^{b}	4.67 ± 0.23^{a}
A3	1	3.50 ± 0.00^{a}	0.16 ± 0.01^{d}	77.00 ± 0.41^{d}	0.42 ± 0.01^{a}	1.82 ± 0.01^{a}	1.72 ± 0.01^{a}	5.67 ± 0.31^{c}
	2	3.70 ± 0.00^{b}	0.15 ± 0.01^{c}	74.75 ± 1.00^{c}	1.52 ± 0.01^{c}	1.82 ± 0.01^{a}	1.83 ± 0.04^{b}	4.31 ± 0.03^{b}
	3	4.00 ± 0.00^{c}	0.14 ± 0.03^{b}	73.40 ± 0.25^{b}	2.49 ± 0.00^{d}	2.34 ± 0.01^{b}	2.35 ± 0.00^{c}	4.33 ± 0.01^{b}
	4	4.80 ± 0.00^{d}	0.13 ± 0.01^{a}	72.50 ± 0.48^{a}	0.86 ± 0.01^{b}	2.41 ± 0.01^{c}	2.63 ± 0.01^{d}	4.05 ± 0.01^{a}

Values are means of three determinations ± standard deviation. Means with different alphabets in the same column are significantly different (*P*=0.05). A0= sauerkraut in 2.5% brine; A1= sauerkraut in 2.5% brine and 1% sucrose solution; A2= sauerkraut in 2.5% brine and 2% sucrose solution; A3= sauerkraut in 2.5% brine and 3% sucrose solution.

crude fibre and ash contents during storage could be related to increase in the concentration of dry matter occasioned by the reduction in moisture content. The trend observed with protein content was similar to those recorded for the crude fibre and ash contents. A significant reduction in vitamin C content was observed in all the samples after the fourth week of storage. This is not unexpected because vitamin C is a water soluble vitamin [39,40].

3.4. Microbial characteristics of the sauerkraut samples

The results of the microbial characteristics of the sauerkraut samples stored in varying concentrations of osmotic solution are presented in Table 4. There was no mould count in all the samples during the four weeks of storage. Coliform was not detected in any of the stored samples. Presence of coliform is an indication of feacal contamination. In general, the microbial characteristics of the sauerkraut samples fall within the limit set by International Commission on Microbiological Specification for Food [43]. Therefore, the product can be considered safe for consumption.

Table 4. Microbial characteristics of the sauerkraut samples

Week	Sample Raw Eggplant	Total Coliform Count (CFU/ml)	Mould Count (CFU/ml)
0	A0	ND	NIL
	A1	ND	NIL
	A2	ND	NIL
	A3	ND	NIL
1	A0	ND	NIL
	A1	ND	NIL
	A2	ND	NIL
	A3	ND	NIL
2	A0	ND	NIL
	A1	ND	NIL
	A2	ND	NIL
	A3	ND	NIL
3	A0	ND	NIL
	A1	ND	NIL
	A2	ND	NIL
	A3	ND	NIL

ND = Not detected. A0= sauerkraut in 2.5% brine; A1= sauerkraut in 2.5% brine and 1% sucrose solution; A2= sauerkraut in 2.5% brine and 2% sucrose solution; A3= sauerkraut in 2.5% brine and 3% sucrose solution.

3.5. Sensory attributes of the sauerkraut samples

The sensory attributes of sauerkraut samples are presented in Table 5. There was significant difference $(P = .05)$ in the sensory attributes evaluated among the sauerkraut samples. Sample A0 (with 2.5% brine) was scored highest for saltiness followed by samples A1, A2 and A3 with 1%, 2% and 3% sucrose respectively. Also, in terms of firmness and appearance, sample A0 (with 2.5% brine) was preferred to other sauerkraut samples. The score for appearance of sample A1 was not significantly different from that of sample A2. However, significant difference $(P = .05)$ existed among the samples in terms of taste with sample A3 (with 3% sucrose) being the most preferred. This observation corroborates previous report that sucrose attenuates saltiness which contributed to the overall acceptability of the product [23]. Assessment of the overall acceptability showed sample A3 had the highest score indicating the feasibility of producing acceptable sauerkraut from eggplant.

Table 5. Mean sensory scores of sauerkraut samples dipped in varying concentrations of brine and sugar solutions

Sample	Saltiness	Firmness	Appearance	Aroma	Taste	Overall Acceptability
A0	4.03[a]	5.83[a]	5.57[a]	4.70[b]	5.10[b]	4.92[b]
A1	3.77[b]	5.17[b]	4.80[b]	4.80[b]	4.83[c]	4.87[b]
A2	3.23[b]	4.87[c]	4.80[b]	4.30[c]	4.73[d]	4.80[b]
A3	2.33[c]	5.40[ab]	5.63[a]	5.63[a]	6.10[a]	6.27[a]

Values are means of three determinations. Means with different alphabets in the same column are significantly different (P=.05). A0= sauerkraut in 2.5% brine; A1= sauerkraut in 2.5% brine and 1% sucrose solution; A2= sauerkraut in 2.5% brine and 2% sucrose solution; A3= sauerkraut in 2.5% brine and 3% sucrose solution.

4. CONCLUSION

Preparation of sauerkraut from eggplant ((*Solanum melogena*) yield product of good and acceptable quality. Sauerkraut stored in osmotic solution is shelf stable at ambient temperature (28±2 °C). The use of eggplant in the production of sauerkraut will not only widen the scope of its consumption but could also increase its economic utility and strengthen dietary diversity in Nigeria and beyond.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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