Some biochemical and nutritional changes during the fermentation of fluted pumpkin (*Telferia occidentalis*)

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**Abstract.** The pH, soluble nitrogen, soluble solids and titratable acidity increased during a 6 day fermentation of fluted pumpkin seeds. Gas liquid chromatographic analysis of trimethylsilyl (TMS) derivatives of carbohydrates extracted from the seeds showed that the unfermented seeds contained mostly sucrose with a low content of flatus-oligosaccharides, raffinose and stachyose. There were also high contents of fructose and galactose. Fermentation increased the total monosaccharides with high content of glucose and some unidentified monosaccharides. Fermentation decreased the total oligosaccharide, eliminated raffinose and stachyose and increased the content of maltose. Except for a slight decrease in total saturated and increase in total unsaturated fatty acids, fermentation had no effect on fatty acid composition.

**Introduction**

Fermented foods have contributed considerably to human nutrition throughout the world [6,9]. During fermentation, indigenous or introduced microorganisms produce enzymes which contribute to various changes which may lead to a superior end product in terms of nutritional and organoleptic qualities. Very little is known about some of these changes during the fermentation of some Nigerian indigenous plant foods. The nutritive quality of some of these indigenous fermented plant foods is being investigated for their possible use as weaning food supplement. The present study is aimed at investigating some of the biochemical and nutritional changes that occur during the fermentation of fluted pumpkin especially of carbohydrates and fats, the two most important energy given nutrients. The fluted pumpkins are fruits from very common and widely grown garden green vegetables. The seeds are boiled and eaten as such or sometimes fermented and used as flavouring agents for soups. The seeds are high in essential amino acids [1].

**Materials and methods**

**Materials**

The fluted pumpkin seeds are oval in shape with smooth, soft, dark-green seed coat. The edible portion is white in colour. The fruit was harvested from the garden and immediately transported to the laboratory.
Methods

Preparation and fermentation of sample

The seeds were boiled with the seed coats wrapped in aluminium foil for 1 hour, the seed coats removed by hand pressure and edible portion ground in a mortar. NaCl was added to the sample (lg/kg sample) and the sample was inoculated with a previously oven-dried (vacuum oven at 60°C for 24 hours) fermented sample (3g/kg sample). The dried sample was mixed with 5 ml distilled water and was thoroughly mixed with the sample, wrapped in aluminium foil and incubated for 6 days at 31°C. The sample was freeze dried for analysis. Measurement of N, solids, pH, titratable acidity.

Total and soluble nitrogen, soluble solids, and titratable acidity, were measured according to the method of AOAC [2]. The pH was measured with a Jenway digital pH meter by mixing lg sample with 10 ml distilled water.

Analysis of carbohydrates

The extraction of sugar, the preparation of the stock solution and the hexamethyldisilazane derivative of sugars were the same as described by Li and Schuhmann [10] with minor modifications.

Preparation of stock solution

The pyridine reagent was prepared in a 50 ml quantity with 25 mg/ml hydroxylamine hydrochloride and 2 mg/ml β-phenyl-D-glucopyranoside as the internal standard. Standard sugar was prepared with 20 mg of each sugar in 10 ml water and 1 ml was derivatised after drying along with the samples.

Extraction of sugar from sample

Fat was removed from 5 g of freeze dried sample with n-hexane and the sample was extracted with 20 ml 80% methanol for 24 hours with constant shaking (600 cycles/min) at room temperature. The sample was centrifuged (2000 rpm for 6 min) and the extracts concentrated to 1 ml with vacuum evaporator at 30°C, then dried under N₂ in a water bath at 50°C. The last trace of water was removed in a vacuum desiccator.

Derivatisation

The dried extract was heated with 1 ml of pyridine reagent for 30 min, the tubes were cooled, 0.5 ml of hexamethyldisilazane and 4 drops of trifluoroacetic acid added and vigorously mixed for 30 seconds. After 30 min at room temperature, the mixture was injected into the GLC and 1 μL of the sample and standard was injected.

Gas chromatography

A pye-104 gas-liquid chromatography equipped with flame ionisation detector was used. The glass column (2,1 m x 6.4 mm id) was packed with 3% W/W OV-101 on 80/100 mesh chromasorb W and preconditioned for 48 hours.