

## Short Communication

# Storage and consumer acceptability of fruit: Ginger based drinks for combating micronutrient deficiency

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Accepted 2 February, 2012

Fruits are good sources of micronutrients especially mineral and vitamin C. Ginger satisfies the function of color and flavour enhancers. Matured healthy pineapple, orange and paw-paw fruits were used to prepare pineapple-ginger, orange-ginger and paw-paw-ginger based drinks. The drinks were distributed into the same type of plastic container with lid (50-ml capacity filled up to about 45 ml). They were kept under ambient condition (shelves in the laboratory) at 30 to 32°C while some were kept in a refrigerator (24 to 26°C). Visual examinations of the drinks were carried out and they were evaluated for taste/flavour. By 96th-h of storage, all the drinks under ambient condition got spoilt. All the fruits-ginger drinks kept well under refrigeration as they remained acceptable to the panelists for 21 days with pawpaw-gingered drink more acceptable ( $P < 0.05$ ) to the panelists than orange-ginger and pineapple-ginger drinks. The pH of the drinks stored under ambient conditions decreased as storage progressed thus encourages proliferation of fermentation microorganisms while those in refrigeration did not fluctuate.

**Key words:** Spices, herbs, fruits, ginger drinks, consumer acceptability, preservative.

## INTRODUCTION

The high rate of micronutrient deficiencies in Nigeria has been attributed partly to poor dietary habits. Increased production and consumption of micronutrient rich foods would improve the micronutrient status of the Nigerian population. Fruits are good sources of micronutrients especially mineral and vitamin C (Egbekun and Akubor, 2006). High post harvest losses are usually recorded in most of our fruits. The use of chemical preservative such as sodium benzoate used to preserve fruit juices or drinks have been found to be toxic, hence the use of spices and herbs for this purpose. Many preservatives are readily available for many diverse uses. Some foods, however, because of their delicate balance of flavours require the utmost care in selecting preservatives (Giese, 1994).

Sweet orange (*Citrus sinensis*) is the most widely grown of all the citrus crops. The juice contains 86 to 91% water, 5 to 9% carbohydrate, 0.70% protein and 1 to 2% fiber; 1,200 J of energy is provided by 1 kg of the edible materials. Pineapple and paw-paw are available in

almost all parts of Nigeria. However, high post harvest losses are usually recorded coupled with problem of off-season. Proper handling of these fruits reduces the losses, thus making them also increase availability in off-season. Spice and herbs act as colour and flavour enhancers, ginger satisfies these functions. Products with pH less than 4.2 are considered to be safe from food poisoning (Ihekoronye, 1998).

Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (WHO, 1995). Food security is assumed to occur when all people at all times have access to enough food that is affordable, safe and healthy, culturally acceptable, meets specific dietary needs, obtained in a dignified manner, produced in ways that are environmentally sound and socially just (WHO, 1995). The prevention of hypovitaminosis A can be achieved through dietary diversification, food and beverage fortification, as well as periodic and specific supplementation.

The objectives of the study were to determine consumer acceptance and sensory changes occurring during storage of pineapple-ginger, orange-ginger and paw-paw

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**Table 1.** Sensory evaluation of fruit: ginger drinks stored at ambient temperature / refrigerated conditions.

Samples	Storage period	Acceptability scores*					
		Ambient temperature (h)			Refrigerated conditions (days)		
		0	48	96	7 days	14 days	21 days
Ginger-pineapple		5.27 <sup>b</sup>	5.04 <sup>b</sup>	Spoilt	5.52 <sup>b</sup>	5.25 <sup>b</sup>	5.25 <sup>b</sup>
Ginger-orange		5.72 <sup>b</sup>	5.12 <sup>b</sup>	Spoilt	5.70 <sup>b</sup>	5.69 <sup>b</sup>	5.71 <sup>b</sup>
Ginger-pawpaw		6.54 <sup>a</sup>	5.89 <sup>b</sup>	5.56	6.35 <sup>a</sup>	5.90 <sup>a</sup>	6.02 <sup>a</sup>
Bitter lemon (control)		5.27 <sup>b</sup>	5.25 <sup>b</sup>	5.26	5.23 <sup>b</sup>	5.25 <sup>b</sup>	5.24 <sup>b</sup>
<b>LSD</b>		<b>0.82</b>	<b>0.64</b>	<b>-</b>	<b>0.65</b>	<b>0.21</b>	<b>0.31</b>

\*7-point hedonic scale: 1 = dislike extremely, 4 = neither like nor dislike and 7 = like extremely.

**Table 2.** The pH of the fruit: ginger drinks during storage.

Sample	Code	Storage period (days)						
		0	2	4	6	7	14	21
Ginger-pineapple	A <sub>A</sub>	3.40	2.94	2.93	ND*	ND	ND	ND
Ginger-pineapple	A <sub>R</sub>	3.40	3.35	3.33	3.32	3.05	2.98	2.96
Ginger-orange	B <sub>A</sub>	3.98	2.80	2.77	ND	ND	ND	ND
Ginger-orange	B <sub>R</sub>	3.98	3.76	3.70	3.17	3.69	3.62	3.59
Ginger-pawpaw	C <sub>A</sub>	5.10	3.18	3.16	ND	ND	ND	ND
Ginger-pawpaw	C <sub>R</sub>	5.10	5.24	5.23	4.27	4.17	4.10	3.98
Ginger drink	D <sub>A</sub>	3.90	3.90	3.92	3.95	3.95	3.96	3.95
Ginger drink	D <sub>R</sub>	3.90	3.90	3.90	3.91	3.19	3.90	3.90

\*ND-not determine.

-ginger drinks towards increasing micronutrient intake of the populace especially the low income earners.

## MATERIALS AND METHODS

Matured and healthy pineapple, orange and paw-paw fruits were purchased from the Umudike central market while the ginger was obtained from the ginger programme of the National Root Crops Research Institute (NRCRI) Umudike. Pineapple-ginger; orange-ginger and paw-paw-ginger drinks were prepared using standard method described by Omodamiro et al. (2008).

The drinks were distributed into the same type of plastic kegs with cover (50-ml container filled up to about 45 ml). Four kegs kept under ambient condition (on shelves in the laboratory) at a temperature of 30 to 32°C and the other 4 were kept in the refrigerator (24 to 26°C). Kegs under ambient conditions were coded as A<sub>A</sub>, B<sub>A</sub>, C<sub>A</sub>, C<sub>A</sub> and D<sub>A</sub> and those under refrigerated coded as A<sub>R</sub>, B<sub>R</sub>, C<sub>R</sub>, D<sub>R</sub>. and D<sub>A</sub> represent the control. Sensory evaluation was done for the drinks using 7-point Hedonic scale where 7 = like extremely; 4 = neither like nor dislike; 1 = dislike extremely (Iwe, 2002).

The pH of the stored drinks was monitored for 3 weeks using methods of AOAC (1990). Visual examination of the drinks was carried out and they were evaluated for their taste/flavour.

## RESULTS AND DISCUSSION

Table 1 shows that all the fruit: ginger drinks were

acceptable to the panelists up to 48 h after preparation and storage under ambient conditions there was significant difference ( $P < 0.05$ ) between the pawpaw; ginger drink and the other fruit; ginger drinks in acceptance before storage and after 48 h storage; the paw-paw; ginger drink was found most acceptable by the panelists (Table 1).

By the 96th-h of storage all the drinks got spoilt. Table 1 show that all the fruit-ginger kept well under refrigeration as they remained acceptable to the panelists for 21 days. The pawpaw: ginger based drink was more acceptable ( $P < 0.05$ ) to the panelists than either the orange: ginger of pineapple: ginger drink.

The pH (Table 2) of the drinks stored under ambient conditions decreased as storage progressed thus encouraged proliferation of fermentative micro-organisms. The pH of the refrigerated drinks did not fluctuate and they remained acceptable to the panelists for as long as 21 days after preparation.

The results obtained from this work suggest that consumers accepts the gingered based drinks-pineapple-ginger, orange-ginger and paw-paw-ginger drinks. Changes observed during the storage shows that it could be produced and kept up to 48 h without the use of refrigerator, which the poor populace may not be able to afford. The adoption of this processing method in the production of micronutrient drinks will not only bring about

increasing micronutrient intake of the populace especially the low income earners but will also serve as income generation for the rural women and the unemployed youth with little capital.

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