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Effect of Storage Conditions on the Ascorbic acid content of Mango (*Mangifera indica*) fruit commonly grown in Kano state

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ABSTRACT

Mango fruit are consumed as part of refreshment and serves as source of nutrient in our diet. The problem is the way this mango is being handled during retailing, transporting and storage. Especially in Nigeria, fruits in general not only mango are being hawked which expose this fruits to certain poor handling and storage conditions in which include exposure to sunlight, room temperature closed, room temperature open and refrigeration at 4°C. these research is aimed at stimulating the effect of the storage conditions on the ascorbic acid content of mango fruit and was determined by titrimetric method using 2,6-dichlorophenolindophenol. Refrigeration exhibits the best storage condition of ascorbic acid content through mean differences and standard errors and also mango (*Mangifera indica* L.) Stores well under exposure to sunlight, under room temperature opened and room temperature closed (tied in polythene bag) stores least

Introduction

Mango fruits are rich luscious aromatic flavor and a delicious taste in which sweetness and acidity are delicately blended. Ripe mango are preserved by canning or used in the manufacture of juice, squash, jams and jellies and preserves (Manay and Shadaksharaswamy, 2003)

The fruit is a good source of fibres and vitamins (Tedjoet *al.*, 2002) and is described as the most favourite and valuable fruit in world market (Olli *et al.*, 1996). Besides, the fruit is rich in antioxidants and therefore, reduces the risk of cardiac disease, anti-cancer and anti-viral activities (Schieber *et al.*, 2003; Barretoet *al.*, 2008; Daudet *al.*, 2010).

Daudet *al.* (2010) indicated that the mangiferin present in mango extracts may have health promoting effects in diseases related to the impaired formation of new blood vessels.

Principally, the main aim of storing fruits is to control the rate of respiration and disease infection and to preserve the fruits and they are consumed fresh and perishable commodity. Fruits storage technology and transportation methods have developed so well that fresh fruits, grown not only in the country concerned, but also in widely scattered part of the world are available throughout the year (Ihekoronye and Ngoddy, 1985).

Majority of fruits must be picked close to their optimum maturity even before consumption.

But if prolonged storage is necessary (Davey *et. al.* 2000); this can be achieved to some extent by refrigeration, proper control of post-harvest diseases, regulation of the atmosphere, chemical treatments and irradiation. There may be difference among varieties of fruits with regards to their response to storage conditions (Ihekoronye and Ngoddy, 1985).

L-ascorbic acid is largely accepted as additive in human diets because of its antioxidative potential. The richest natural vitamin C sources are fruits and vegetables like pepper, rose hip, citrus fruit, and green vegetables. Fruits and vegetables supply more than 90% of vitamin C in human diets (Erentuket. *al.* 2005). A high recommendation of daily intake for humans has been suggested, since stress in modern life is known to increase the requirement for vitamin C (Olivier 2004). L-ascorbic acid is nutrient that besides its vitamin action is valuable for its antioxidant effect, stimulation of the immune system and other health benefits, such as prevention of scurvy and maintenance of healthy skin, gums and blood vessels. Vitamin C also reportedly reduces the risk of arteriosclerosis, cardiovascular diseases and some forms of cancer. At risk for ascorbic acid deficiency are smokers, women taking contraceptives containing the female sex hormone estrogen, and people who live in cities with high levels of carbon monoxide from traffic. There is conflicting evidence that taking large doses of ascorbic acid will either prevent the common cold or reduce the severity of its symptoms (Srilakshmi, 2006) Vitamin C functions in the carnitine synthesis, neurotransmitters synthesis, activation of hormones, drug intoxication, general antioxidant and iron metabolism. And the deficiencies include scurvy, tender bone, petechial hemorrhage, gingivitis, delayed wound

healing, cessation of bone growth. (Srilakshmi, 2006). This research is aimed to the simulation to the postharvest handling of the fruit to the field in order to discover of the storage conditions on the ascorbic acid of the fruit with time.

Materials and Methods

Fresh fruits were plucked from trees of the same species from Alheri farms Kano and were transported to the food Analysis laboratory of the Department of Food Science and Technology Kano University of Science and Technology Wudil; samples were used for the analysis

Experimental Design

The sample (mango) was analyzed for the content of ascorbic acid contents. Then the samples was subjected to their various storage conditions which are;

- Cold storage at 4°C
- Stored under room temperature closed (tied in polythene bag)
- Stored under room temperature opened
- Stored with exposure to sunlight at ambient temperature

The storage period was 18 days and analyses were conducted after 3,7,12 and 18 days of storage.

The fresh sample (2g) was macerated and 25 cm³ of juice extraction solution was added and the volume was made up to 100cm³ with distilled water and then filtered. The juice solution (50cm³) was taken and then 250cm³ of 0.5% oxalic acid was added and then the volume was made up to 100cm³ with distilled water,

Determination of ascorbic acid was carried out as described by (Krik and Sawyer, 1985, Ahmed and Ahmed 2012, Nagra, 2006 and Saleem *et. al.*, 2008). 10cm³ of the solution was pipetted and then titrated with 2, 6-dichlorophenolindophenol until faint pink color which will persist for 15 seconds.

TABLE 1; The Ascorbic Acid content (mg/100g) of the mango stored under room temperature closed (tied in polythene bag), room temperature open, refrigeration at 4° C and sunlight (at ambient temperature)

Storage Time (Days)	storage conditions (mg/100ml)			
	closed (In polythene bag)	sunlight	refrigeration	open
0	30.0±3.00	30.0±3.00	30.0±3.00	30.0±3.00
3	27.0 ± 0.40	28.0±2.00	30.0±3.00	24.0±0.06
7	13.0±0.22	25.0±2.00	27.0±2.00	10.0±0.01
12	9.0±2.00	20.0±2.00	18.0±1.00	5.0±5.00
18	2.2±0.50	15.4±3.00	17.0±2.00	2.2±1.00

Mean difference and standard error

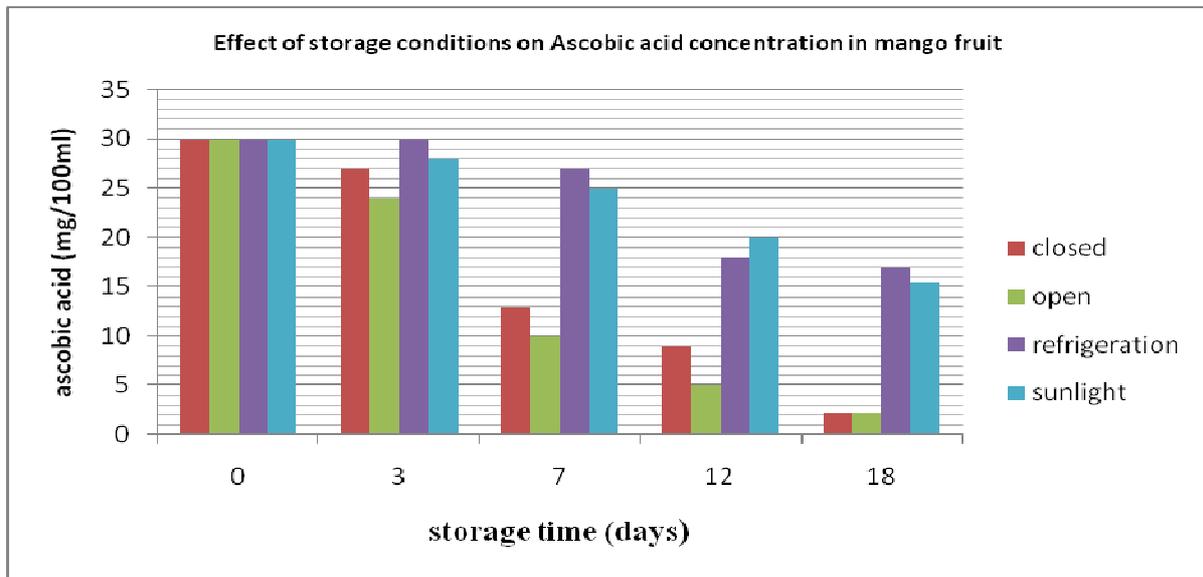


Fig1; A graphical presentation of Ascorbic Acid content (mg/100ml) of the mango stored under room temperature closed room temperature open refrigeration at 4° C and sunlight.

fresh mango has relatively low Ascorbic Acid content of 30mg/100ml compared to citric fruits (which ranges from 36mg/100ml-34mg/100ml), which is in conformity to the Ascorbic Acid content in the fruit (Ihekoronye and Ngoddy, 1985) other changes could be explained by the different locations, seasons and climatic conditions under which the mangoes were grown (Lee and Kader, 2000).

All mango samples showed significant loss of ascorbic acid the one stored under room temperature open showed a significant loss of ascorbic acid with time of storage from 30mg/100ml-

2.2mg/100ml there was a significant decrease of the ascorbic acid after seven days of storage after which the loss reduced with time of storage. This corroborates with the finding of Hussein *et al*;(2006) that the Ascorbic Acid of mango squash which was stored at room temperature for three months was discovered to decrease significantly and according to Ahmad and Ahmad; (2012) mangoes exhibited reduction in the ascorbic acid during storage for the period of six months and Chaudry *et.al*; (1993) also reported loss of ascorbic acid in this condition.

The ascorbic acid content of mango stored under room temperature closed (tied in polythene bag) showed that the decrease from 30mg/100ml to 2.2mg/100ml after 18 days of storage the decrease went drastic after 7 days of storage and continued decreasing to threefold. This conformed to the findings of Ahmad and Ahmad (2012) and Njoku et. al; 2011 who reported that there is reduction of ascorbic acid under this condition that the polythene bag provides no protection against light, oxygen or heat. Falade et. al; (2004), also reported that the percentage loss of ascorbic acid loss increased with storage time and as well as temperature in all packaging material. In addition, the percentage ascorbic acid loss and enzymatic browning increases in polyethylene film

Mango fruits stored under cold condition at a temperature of 4°C had minimal or less loss of its Ascorbic Acid contents, which decreased from 30mg/100ml-17mg/100ml with time of storage of 18 days even mango shows chilling injury, although refrigeration of food was reported to be the best storage condition of fruits (Torregrosa et al., 2004) also the loss of ascorbic acid could be due to the chilling injury as backed by Lee and Kader (2000). Chilling injury causes accelerated losses in ascorbic acid content of chilling sensitive crops. Destruction of ascorbic acid can occur before any visible symptoms of chilling. It is better to maintain or store Vitamin C in a place below the room

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temperature. (Njoku et. al; 2011 and Mudambi 1977).

Mango stored under sunlight also showed decrease in its ascorbic acid ranges from 30mg/100ml- 15.4mg/100ml and also, browning reaction and drying was observed during storage with time. The loss of ascorbic acid under this condition was minimal compared to other storage conditions this is backed by Ahmad and Ahmad, (2012) who found out that mango sliced dried under sunlight showed minimal loss/ high retention of ascorbic acid. This could be as result of quick evaporation of water from the slice and concentration of soluble solids which inhibit the reaction of polyphenolase enzymes (Desrosier and Desrosier, 1977). The percentage Ascorbic Acid loss of this fruit was reported to be about 34-85% with time of storage (Achinewhu, 1983). Also other factors of ascorbic acid loss could be attributed by light, temperature and oxidation at high temperature. (Rai and Chauhan, 2008 and Njoku et. al. 2011).

Conclusion

From the result it showed that refrigeration of mango fruits preserved the ascorbic acid content best and exposure to sunlight also helps in the retention of ascorbic acid compare to that under room temperature closed and open. Storage at room temperature closed leads to maximum loss of ascorbic acid and the package material (polythene bag) provides no protection to the fruit.

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