

## Fruit Cultivation and Processing Improvement in Nigeria

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**Abstract:** This study reviews the problems of fruit wastage, seasonal glut, off season scarcity and how to ameliorate them in Nigeria. Tropical fruits which have high nutritional and medicinal values, are very seasonal and deteriorate speedily shortly after harvest. This situation needs to be arrested using suitable storage technologies. Known methods for extending the storage life of fruits particularly in the developed countries were reviewed to see how suitably they could be adopted to store tropical fruits in order to reduce their wastages. These methods include hypobaric storage, controlled atmosphere storage, modified atmosphere storage, irradiation, chemical treatment and refrigeration. Most of the aforementioned methods have been found to be either too sophisticated/expensive or injurious to most tropical fruits. Storage technologies particularly, hypobaric, controlled atmosphere and irradiation are reported to be either too technical or capital intensive for fruit storage and marketing business in the developing tropical countries. Hence the technology not being compatible with the poor market values of the fruits. Refrigeration which could have been a better alternative to preserve tropical fruits also suffers a set back of erratic power supplies and even when power is available, it imposes a physiological disorder known as chilling injury to the fruits at temperatures below 15°C. The film packaging and chemical treatments are reported to have little or no significant preservative effects on the fruits if not combined with refrigeration. The combinations of chemical treatment, film packaging and refrigeration has been found to be very effective in minimizing the effect of chilling injury and extending storage life, but the cost still remains an issue. This study has revealed that, there is scarcity of technologically suitable and economically feasible methods of preserving fruits in their fresh form in the tropics resulting in their seasonal glut. (i.e The fruits are readily available at rock bottom prices during their seasons with high attendant wastages and become terribly scarce and expensive shortly after their seasons). Hence, the feasible approach to solving this problem therefore, is processing the fruits into more stable products such as juices, drinks, jellies and jams etc. The focus of this study is therefore to encourage processing of the fruits into juices. The main aim being to make their nutritional and medicinal benefits available to consumers, particularly in the tropics all year round.

**Key words:** Fruit juice, policies, wastage, processing, nutrition, Nigeria

### INTRODUCTION

Most tropical fruits are seasonal and highly perishable. They include oranges, pineapple, mango, pawpaw (papaya), cashew fruit to mention few. Once harvested, they continue to respire rapidly and lose moisture through transpiration because of the tropical atmospheric conditions (High temperature and low relative humidity). This imposes physiological stress and accelerates biochemical reactions that speeds up deterioration in the fruits. Ability to naturally keep the fruits wholesome is limited to few days (i.e. 2-10 days) unless deliberate attempts are made to store them at controlled atmosphere or process them into more stable products such as juices, drinks, jellies and jam etc.

Postharvest losses of fruits and vegetables in Nigeria has been put at between 35-100%<sup>[1]</sup>.

Methods available for extending the storage life of fruits include refrigeration, regulation and modification of the storage atmosphere (Controlled Atmosphere Storage-CAS); hypobaric storage, packaging in plastic films, use of food surface coatings, chemical treatments (Ethylene absorber, Gibberellin infusion etc.) and irradiation<sup>[2-4]</sup>. The practicability and economic justification for the use of some of these methods particularly hypobaric, controlled atmosphere storage, irradiation and refrigeration in Nigeria as well as other developing countries could be doubtful, since the investment, maintenance and operating costs are perhaps not compatible with the market values of the fruits<sup>[4,5]</sup>.

A physiological disorder known as Chilling Injury is a major problem in postharvest storage of most tropical fruits, which are susceptible to it. This is because it precludes their storage at low temperatures (Below 15°C) that otherwise would prolong their storage life considerably<sup>[2]</sup>. It is therefore obvious from the reasons aforementioned that, besides packaging the fruits into plastic films and application of food surface coatings with some chemical impregnation, which can only extend storage for few weeks, the most feasible approach would be to process them to juices and other more stable products i.e jam and jellies<sup>[6,7]</sup>. For the purpose of this write up, emphasis would be laid on fruit juices.

**Tropical fruit juices:** Fruit juice as defined by Merriam Webster<sup>[8]</sup> is the extractable fluid contents of cell tissues. Codex Alimentarius also defines juice as “unfermented but fermentable fluid, intended for direct consumption, obtained by the mechanical process from sound, ripe fruits, preserved exclusively by physical means. The juice may be turbid or clear; concentrated and later reconstituted with water suitable for the purpose of maintaining the essential composition and quality factors of the juice. The addition of sugars or acids can be permitted but must be endorsed in individual standard<sup>[9]</sup>. Popular among the various tropical fruits from which juice can be extracted are pineapple, mango, papaya, guava, banana and citrus fruits such as orange, lime, tangerine and grape<sup>[10]</sup>. The cultivation of these fruits in Nigeria comes mainly from backyard or compound gardens with only few small to medium sized plantations. Moreover, cultivation of the fruits are limited mostly to the southern states of Nigeria, where adequate annual rainfall of about 1200 mm occurs<sup>[11]</sup>.

**Nutritional significance of fruit juices:** Fruit juices are valuable from the nutritional point of view. They are rich in minerals, vitamins and other nutritive factors as shown in Table 1 above. Besides, they are delicious, universally appealing and are best in taste, aroma and colour when freshly expressed<sup>[9]</sup>.

Fruits when consumed in good quantities could supply about 9% of the Calories in diet., provide about 92% of Vitamin C., 49% of Vitamin A and 30% of Vitamin B6.

The carbohydrate content of some fruits has been estimated at between 5.1 and 23 g 100 g dry matter. However, higher values have been reported for various fruits<sup>[9]</sup>. Fruits form about 4% of the world's food supply and are found to be rich in vitamins, especially vitamin C, minerals, fats and sugar<sup>[12]</sup>.

**Medicinal significance of fruit juices:** Fruits and their juices are generally taken for the treatment of certain diseases in Nigeria, when their consumption is not as snack. Many of the tropical fruits besides their sensory and nutritional qualities undoubtedly possess neutraceutical or phytochemicals and other desirable quality features as yet under exploited.

Phytochemicals such as carotenoids, flavonoids, polyphenols and vitamins in fruits are considered as health promoting compounds. These compounds are associated with the reduction in risk of degenerative diseases in humans. Their antioxidant activity being one of the possible mechanisms for this effect<sup>[13]</sup>.

Examples of medicinal applications of fruits and their Juices Include:

- Treatment of cough and liver cirrhosis with bitter cola (*Garcina cola*)
- Recommendation of consumption of pawpaw (*Carica papaya*) for the treatment of gastro intestinal disorder as a laxative.
- Use of coconut (*Cocos nucifera*) as universal antidote for nearly all studies of poisoning.
- Use of ripened fruit of Tetrapleura with other herbs for the treatment of convulsion, leprosy, inflammation and rheumatic pains
- Consumption of orange and orange juice as mild laxative.
- On account of low carbohydrate in fruits and consequently low calorific value, fruit and fruit juices are usually recommended for weight reducing formula and
- For providing energy for convalescing patients who most often lack appetite during the period of ill health.

In developed countries, fruit juices commonly form part of the breakfast and are produced in very large-quantities. The contrast is however the study in Nigeria.

Despite the enormous nutritional benefits of fruits and their juices, they have not been given a pride of place in the diets of the Nigerian peoples. The main reason for the neglect being ignorance of the nutritive values of most of the fruits, which abound in our environment. Other reasons include the rising cost of perishable commodities and that of distribution.

The fruit juice industry is therefore still in its infancy stage in Nigeria, resulting in importation of different brands of fruit juices. However, the recent ban by the Federal Government on importation of fruit juices and drinks to Nigeria in the year 2003, has led to increased

Table 1: Nutritional composition of some common Nigerian fruits

Fruits	Nutritional components										
	Water (%)	Protein (%)	Carbohydrate (%)	Fat (%)	Vit. C (mg/100 g)	Thiamine (mg/100 g)	Riboflavin (mg/100 g)	Niacin (mg/100 g)	Vit.A (iu)	Calcium (mg/100 g)	Iron (mg/100 g)
Citrus (Orange)	86.00	0.60	-	0.10	36.0	0.06	0.02	0.10	120.00	24.00	0.30
Pineapple	84.00	0.30	15.00 (As sugars)	0.30	2.60	0.08	0.02	0.10	50.00	12.00	0.30
Mango	83.00	-	-	-	30.00	-	-	-	1000-8000	-	-
Papaya(Pawpaw)	89.00	0.50	9.00	-	80.00	-	-	-	2,500.0	0.01	4.00
Banana	70.00	1.00	20.00	-	10.00	-	-	0.60	-	-	0.40

Source: Ihekoronye and ngoddy

production of these products locally both by the Nigerians and the foreign investors. At present, juice processing technology in Nigeria ranges from individuals preparing juice at home for the family consumption, to multinational conglomerates with several inter-connected high capacity plants and juice product lines serving global demands. Most fruit juices which appear on the retail market in cans, bottles, tetra-pak are derived from citrus fruits such as orange, lime, lemon, tangerine and grapefruit. Others include mango, pineapple, guava and a blend from two or more of the fruits usually called mixed fruit juices<sup>[14,15]</sup>.

#### Policies/actions to encourage fruit juice production:

Considering the enormous nutritional and health benefits derivable from the consumption of sufficient quantities of fruits and their juices against the backdrop of their colossal annual losses of over 30%<sup>[1]</sup>, there is urgent need for the following policies/actions to be taken to encourage fruit cultivation and processing into juices in Nigeria.

#### Public enlightenment:

- Improving public enlightenment of the nutritional and health benefits of adequate daily consumption of fruits and fruit juices through the Ministries of Health, Education and Information.
- Mandatory daily fruit juice consumption programme (at least 33cl/head) being introduced to our primary and secondary schools.

**Standards and regulations:** There are some general principles that should be understood by any one contemplating entering the fruit processing business. Many aspects of production, postharvest handling, food safety, quality, unit operation, processing and packaging procedures as well as regulatory, control and standards are common to practically all juice products. The essential requirements and quality factors as stipulated in the NAFDAC Fruit Juice and Nectar Regulations 2003<sup>[16]</sup> and Standard Organisation of Nigeria (SON) Industrial

Standard document (NIS 235: 1987)<sup>[17]</sup> should be readily made available to intended processors by these regulatory agencies.

#### Agricultural policies:

- Government should formulate agricultural policies that would encourage farmers, especially the young agricultural graduates and big time farmers to cultivate fruits on large scale. Areas of favourable policies could include availability of credit facility for agriculture as is being pursued by the present administration in Nigeria; provision of extensive agricultural land and inputs (seedlings, fertilizer and pest / disease control chemicals).
- Farmers should be encouraged to form association e.g. fruit farmers association through which access to loan and credit facilities could be made easier. Moreover, as an association, an integrated approach to fruit cultivation, storage, processing and marketing of the product would become much easier. Establishment of big farm pack houses, storage facilities, fruit juice processing plants in strategic locations as well as developing a sound marketing channel for the product would be more feasible.

#### Industrial policies:

- Government should encourage the establishment of small scale/cottage fruit juice processing plants in the country. This besides reducing wastages in fruits would create more jobs; improve the nutrient intake of the people and the economy of the country.
- Incorporating Entrepreneurship in the Curricula of Tertiary Institutions. This will encourage agricultural graduates particularly the food technologists to go into small -scale fruit juice processing on graduating.

#### CONCLUSION

Implementation of the above indicated policies/actions would encouraged fruit cultivation in

Nigeria, drastically reduce their seasonal gluts, its associated wastages and subsequent shortages. There would also be development of adequate storage and low cost processing technologies to produce, preserve and store fruit juices. More importantly, the nutritional and health benefits of our fruits would be fully harnessed.

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