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Formulation and acceptability studies of squash prepared from indigenous *Assam lemon*

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Abstract: *Assam lemon (Citrus Limon L. Burmf) fruits are acidic fruits of family Rutaceae and contain healthy nutritional content that are important for the body. Squash was formulated and prepared using Assam lemon. The acceptability responses of the panelists were encouraging for an initial period of 15 days. The product scored better than the commercial ones, mainly due to the freshness of the product. Beyond a period of one and half months, most of the panellists found both the products to be alike. Accordingly, it was found that the product was accepted by the consumers.*
Key words: *Assam lemon, firmness, squash, sensory, sugar syrup*

I. Introduction

Assam lemon (*Citrus Limon L. Burmf*) is one of the most important crops of Assam and other parts of N.E. region of India. Fruit is widely used for beverages, industrial and medicinal uses. The moisture content affects its susceptibility to mechanical injury with resistance being lower in those fruits which have to higher moisture content. Also, the fruits are sensitive to the environment, their rate of metabolic activities is temperature dependent and may get damaged by heat or cold. Further, they are affected by the levels of O_2 and CO_2 and volatiles in the atmosphere.

Citrus flavonoids have a large spectrum of biological activity including antibacterial, antifungal, antidiabetic, anticancer and antiviral activities[1]. Flavonoids can function as direct antioxidants and free radical scavengers, and have the capacity to modulate enzymatic activities and inhibit cell proliferation[2]. In plants, they appear to play a defensive role against invading pathogens, including bacteria, fungi and viruses[3]. Flavonoids are generally present in glycosylated forms in plants, and the sugar moiety is an important factor determining their bioavailability. Though different types of antibiotics are produced by pharmacological industries, resistant to antibiotics by micro organisms has been increased now a days. In general, bacteria have the genetic ability to transmit and acquire resistance to drugs, which are utilized as therapeutic agent[4]. It is cultivated mainly for its alkaloids, which are having anticancer activities and the antibacterial potential in crude extracts of different parts (viz., leaves, stem, root and flower) of Lemon against clinically significant bacterial strains has been reported[5]. Preparation from peel, flowers and leaves of bitter orange (*Citrus aurantium L.*) are popularly used in order to minimize central nervous system disorders[6]. In addition, the fiber of citrus fruit also contains bioactive compounds, such as polyphenols, the most important being vitamin C (ascorbic acid) and they certainly prevent and cure vitamin C deficiency-the cause of scurvy[7]. Juice pineapple (Ananas comosus), carrot (*Drocus carota*), and orange(*Citrus sinensis*) were optimised to a blended beverage which was stored for 21 days in pet bottles (400 ml capacity) at refrigerated temperature. Physic-chemical and sensory analysis were evaluated[8]. The degree of esterification and methoxyl contents were varying depending upon the maturity stages. Therefore, the premature lemon pomace can be considered as rich source of pectin in terms of yield, methoxyl content, degree of esterification and anhydrouronic acid content[9]. Results of in-vitro antioxidant assays using the dosage model indicated that free-radical scavenging activity and reducing ability were higher in the flavedo of small fruit[10]. In Sri Lanka potential for cultivating fruits for the domestic and export markets is high. Despite there being a demand for Sri Lankan fruits in abroad, the country faces a serious problem in finding exportable quality fruits in sufficient quantities. The most of fruits in Sri Lanka still remain as underutilized stage and growing in unexploited areas without proper marketing strategies[11]. This investigation is involved a systematic study on the production of *Assam lemon* squash and a formulation for its use in the making of ready-to-use squash.

II. Materials and Methods

It presents the methodology of unit operations including various materials required for preparation of *Assam lemon* squash, based on the experiments were conducted in the Department of Agricultural Engineering, NERIST, Nirjuli (Arunchal Pradesh). A brief description of methodology is presented below:

2.1 Raw materials

The whole *Assam lemon* fruits were procured from the local market of Nirjuli, Arunchal Pradesh and fresh and firm fruits were selected. The fruits were washed and stored in refrigerated temperature and used as and when required.

Table-1: Formulated Ingredients of *Assam lemon* squash

Sr. No.	Ingredients	Quantities
1	Juice	1 L
2	Sugar	2 kg
3	Water	1 L
4	Essence	10ml (2 tsp)
5	Potassium Metabisulphite (KMS)	4g (4/5 tsp)

2.2 Cleaning and washing

The selected fruits were washed thoroughly in water, preferably in running water to removed dust, pesticide spray residues etc. Handling them carefully to avoid brushing. Some time gentle rubbing may be necessary to remove dust.

2.3 Peeling

Peeling is a necessary operation in the processing of fruits to remove unwanted or inedible materials and to improve the appearance of final products. In case of *Assam lemon*, hand peeling method is particularly suitable. In this method peeler is pressed against the surface of fruits to remove the skin. The skin can be easily removed and causes little damage or loss of fruits. In case of *Assam lemon* pulp was treated after peeling of fruits for removal of astringency from juice. The whole pulp was dipping in 2%NaOH solution for 2-3 minuts and again dipping in 0.5% citric acid solution for neutralization of alkalinity of juice.

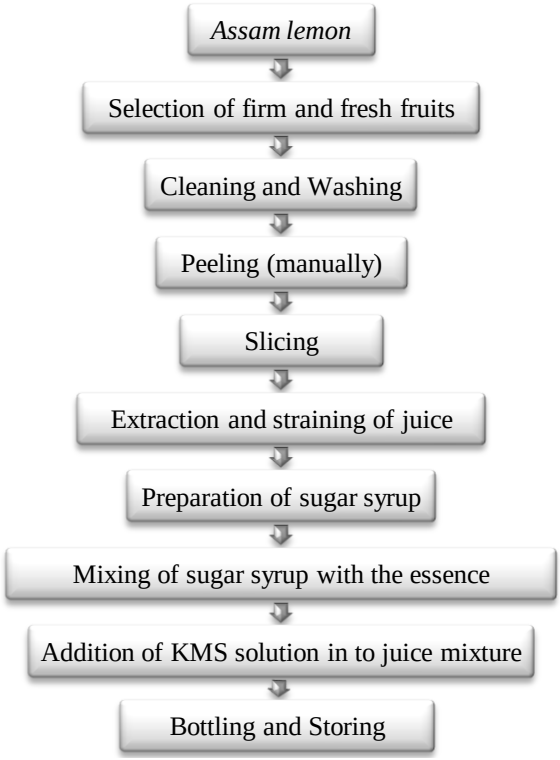

Fig. 1 Process flow chart for the preparation of *Assam lemon* squash

2.4 Slicing

Slicing is an important unit operation before extraction of juice otherwise juice extractor could be choked. Slicing was done by whole pulp cut in to halves with a stainless steel knife.

2.5 Extraction and straining of juice

Most of the fruits are first crushed to help in the extraction of juice before pressing. In case of *Assam lemon* fruits, the fruits were cut in to halves and the juice was extracted with a juice extractor. Care should be taken that all the skin operations of lemon fruits should be removed completely; otherwise it makes the juice

bitter. Finally the juice was strained through a thick muslin cloth or a strainer to remove the course portion of seeds.

2.6 Preparation of sugar syrup

Generally all the juice is sweetened by adding sugar. Sugar work as a type of preservatives for flavour and colour and prolongs the keeping quality. In case of lemon squash generally use the ratio of water and sugar are 1:2 for preparation of sugar syrup. Mixed the sugar and water and then heated for proper mixing. Adding small quantity of citric acid or some drops of lemon juice for clarification of undesired substance during heating time and to make cleared and transparent sugar syrup. The clarified juice was filtered through a muslin cloth.

2.7 Mixing of the sugar syrup with the juice and essence

Prepared sugar was cooled up to slightly warm and then adds the juice as well as essence.

2.8 Adding of KMS solution to the juice mixture

Potassium metabisulphite was dissolved in a small quantity of water and mix it with the rest of the product.

2.9 Bottling and storage

Cool the bottle quickly after pasteurization, preferably in running cold water and take them out while they are still warm. This helps them to dry quickly in the air and placed glass bottles separately on wooden planks or asbestos sheet for cooling in air, taking care not to expose the hot bottles to a cool surface, water or air draft. After cooling store them in a cool and dry place.

2.10 Sensory test

The acceptability of prepared *Assam lemon* squash was evaluated based on paired comparison questionnaire described by[12].

III. Results and Discussion

The product obtained is compared with commercially available lemon squash from Kissan brand. Following questionnaire was used for the organoleptic evaluation and a panel of twenty five untrained panellists, picked randomly, were asked to evaluate the product.

A. Scale used

5-point Hedonic scale

Points	Attributes
5	Excellent
4	Good
3	Regular
2	Bad
1	Very bad

B. Sensory evaluation

Paired comparison questionnaire

Evaluate each of these two samples	
S. No.	**Attributes**
1	Are they alike
2	A is better than B
3	B is better than A
Comments	

The responses of the panelists were encouraging in the sense that, for initial period of 15 days the product scored better than the commercial one, mainly due to the freshness of the product. Beyond this, up to a period of one and half month, the most of the panellists found both the products to be alike. Accordingly it can be concluded that the product would be the acceptable to the consumers.

IV. Conclusion

The value added product, squash was prepared from *Assam lemon* fruits. Hence, it may be concluded from the above findings that the product can be utilized commercially during the period of availability of the fruit. The sensory quality of *Assam lemon* squash was acceptable up to15 days at room temperature. The *Assam lemon* fruit can be very well utilized for preparation of squash.

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