DOI : 10.5958/0974-0112.2017.00092.5

Indian J. Hort. 74(3), September 2017: 471-474

Short communication

A process for preparation of ketchups from mango and guava fruits and their storage study

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ABSTRACT

A process for preparation of ketchups from ripe mango and guava fruits was developed, comprised extraction of pulp by conventional methods, homogenization and addition of sugar, salt, spices, acetic acid *etc.* The contents were heated to reduce the volume to one third, added with class II preservatives and bottled. Changes in TSS, acidity, non enzymatic browning, ascorbic acid, antioxidants along with microbial and sensory qualities were recorded at one month interval for a period of nine months under ambient storage conditions. The ascorbic acid content decreased from 98.3 to 81.8 and 60.0 to 49.9 mg/100 g in guava and mango ketchups, respectively, while the NEB increased from 0.089 to 0.174 and 0.373 to 0.577 after nine month storage. Slight increase in TSS and acidity were observed. The anti-oxidant value decreased from 32.8 to 18.8 mM/ ml in guava ketchup and 26.9 to 16.2 mM/ ml in mango ketchup after 9 month storage. No microbial population could be detected during the period of study. The overall acceptability score ranged from 7.0 to 7.8 and 7.2 to 8.5 in guava and mango, respectively.

Keywords: Fruits, guava, ketchup, mango, storage.

India is blessed with a variety of fruits having peculiar aroma and taste. Among these, mango and guava are the widely grown and commercially important fruit crops of India. The country produced 3.7 million tonnes of guava and 18.4 million tonnes of mango during year 2013-14 (NHB, 1). These are valuable sources of carbohydrates, minerals and vitamins, particularly vitamins A in mango and vitamin C in guava. Pickle, chutney, dried slices, amchoor, puree, squash, RTS drink, jam, canned slices, bar, etc. are the major traditional products prepared from mango, while guava products include squash, RTS drink, jam, jelly, cheese and toffee. However, in view of huge production of mango and guava in the country, there is a need to increase the level of processing as well as development of newer products from these crops.

Ketchup is often used as a supplement with various food preparations served either hot or fried. It is an integral part of fast food dishes like pizzas, burgers, noodles, etc. all over the world. Ketchup enhances taste and flavour of food stuffs and also serves as an appetizer. With changing food habits of modern generation and rapid growth of fast food industry in India, consumption of ketchup has also grown up fast. Mango and guava are also highly nutritional fruits. Mango is rich in beta-carotene (vitamin-A), a potential antioxidant compound like lycopene in tomato. Lupeol, a triterpene present in mango is known to exhibit a number of pharmacological properties including antioxidant, antilithiatic, and antidiabetic effects (Prasad *et al.*, 2). Guava fruit is considered as highly nutritious because it contains a high level of ascorbic acid and has several carotenoids such as phytofluene, β-carotene, β-cryptoxanthin, γ-carotene, lycopene, rubixanthin, cryptoflavin, lutein, and neochrome. Phenolic compounds such as myricetin, apigenin, ellagic acid, etc. are also at high levels in guava fruits (Verma *et al.*, 3). Apart from these chemical properties, mango and guava fruits bear pleasant aroma, an additional quality not found in tomato. Keeping in view, use of these fruits as alternate to tomato for production of ketchup from guava and mango pulps using spices and other additives was undertaken.

Disease-free, mature ripe fruits of mango and guava were washed thoroughly with tap water. Mangoes were peeled while guavas were cut into pieces using stainless steel knife. Smooth pulps were obtained by subjecting them to electric fruit pulper using 20 per cent water. Both the pulps were kept for heating separately in stainless steel vessels. Ingredients like onion, ginger and garlic along with coarsely ground spices (Table 1) were taken in a small piece of muslin cloth, tied and dipped in heating pulp in order to extract the aroma and taste of spices without adding turbidity to the product. Sugar and salt were added to the pulp and mixture was heated further till consistency of ketchup was achieved. The spice bag was removed after squeezing its extract

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in to pulp. Now, desired quantity of acetic acid (Table 1) was poured into it and pulp was heated for 5 minutes more. Finally, vessel was removed from flame and preservatives, *viz*. potassium metbisulphite and sodium benzoate (Table 1), dissolved in small quantities of water, were added. The prepared ketchup was filled hot in glass bottles and sealed with caps. The bottles were pasteurized in boiling water for 15 min. cooled to room temperature, labeled and stored in cool dry place.

Changes in TSS, acidity, non enzymatic browning, ascorbic acid, antioxidants along with microbial and sensory qualities were recorded at one month interval for a period of nine months under ambient storage conditions. The total soluble solids of ketchup were recorded by using hand refractometer (Erma, Japan). Titratable acidity, ascorbic acid and non-enzymatic browning were determined as per the methods described by Ranganna (4). Ascorbic acid content of beverage was measured by titrating samples against dye (2,6-dichloro phenol indophenol, sodium salt) solution. The amount of reducing sugars was determined by spectrophotometric method as per Folin and Wu (5). The anti-oxidant property of product in terms of FRAP values was determined as per Benzie and Strain (6). The microbial examination of mango and guava ketchups was carried out as per method detailed by Speck (7). The organoleptic evaluation of beverage was carried out by a panel of semi-skilled judges, using a 9-point Hedonic scale as prescribed by Amerine *et al.* (8). Sensory attributes like colour, flavour and taste were scored individually. The overall rating was obtained by calculating the average of the scores.

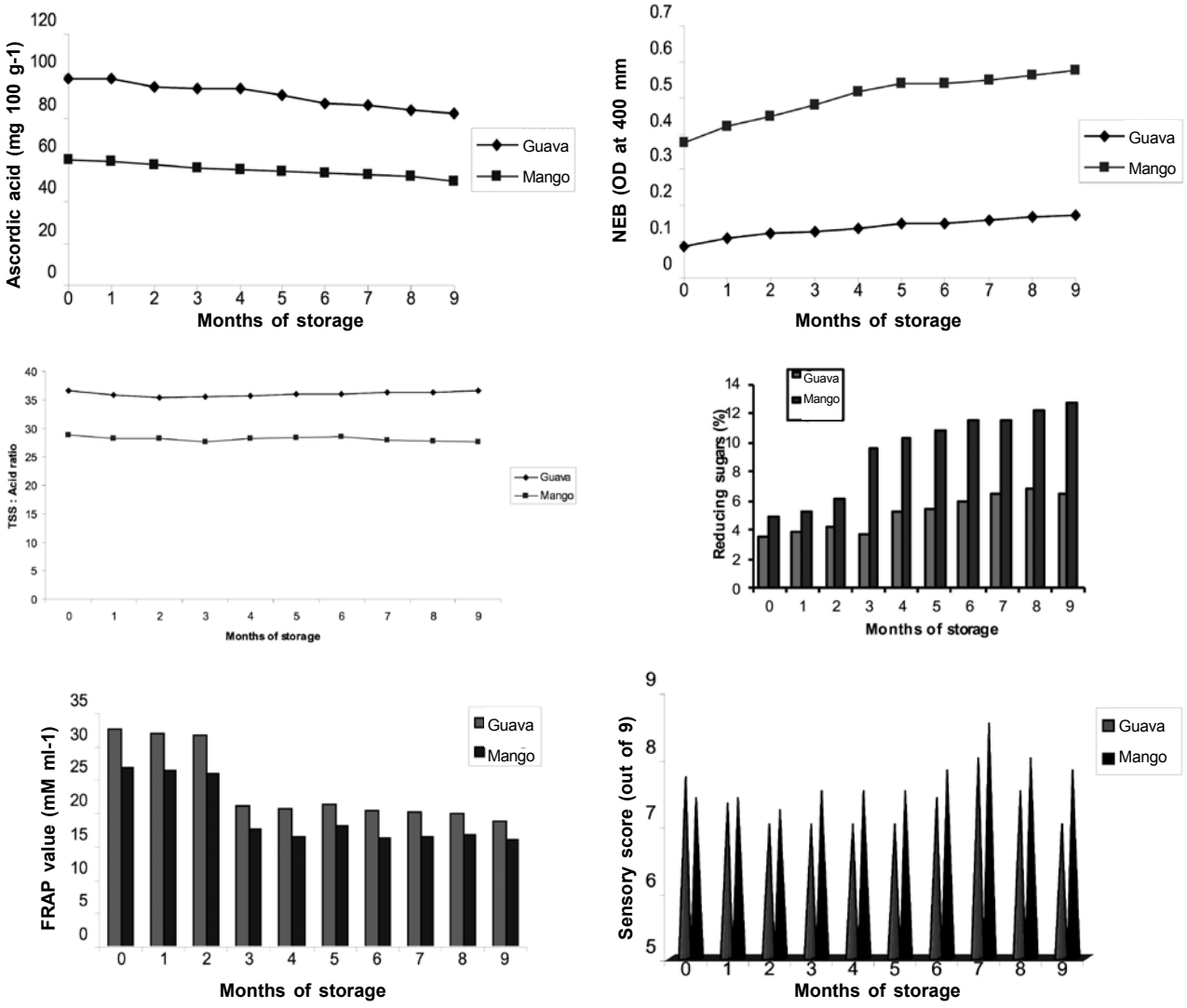

Fig. 1. Changes in bio-chemical and sensory parameters of guava and mango ketchups during storage.

Table 1. Ingredients used for preparation of guava and mango ketchups.

Ingredient	Quantity	
	Guava ketchup	Mango ketchup
Pulp	1000 g	1000 g
Sugar	110 g	67 g
Salt	26 g	15 g
Onion	37 g	50 g
Ginger	9.0 g	10 g
Garlic	5.0 g	5.0 g
Red chili powder	2.0 g	5.0 g
Spice mixture*	2.0 g	2.7 g
Acetic acid	5.0 ml	7.0 ml
Sodium benzoate	0.5 g	0.5 g
Potassium metabisulphite	0.25 g	0.25 g

*Spice mixture = 100 g contained 40 g cumin seeds, 12 g black pepper, 11 g cinnamon, 11 g mace, 4 g green cardamom, 2 g clove, 0.5 g big cardamom, 3.5 g nut meg and 16 g dried ginger

The microbial examination of the mango and guava ketchups revealed no microbial growth during storage. The total soluble solids (TSS) - acid ratio of guava and mango ketchups were 36.6 and 28.8 at zero time. Marginal changes in the TSS - acid were observed during storage of the product (Fig. 1). Initially, reducing sugar content of guava and mango ketchup were 3.50 and 4.93 per cent, respectively. It increased regularly with the storage period and finally reached to 6.49 and 12.69 in guava and mango samples, respectively after 9 months of storage (Fig. 1). The increase in reducing sugars content may be attributed to break-down of sucrose into glucose and fructose units during storage period (Kalra and Tandon, 9). Gradual decline in ascorbic acid content during storage was observed in both ketchups. It decreased from 98.3 to 81.8 and 60.0 to 49.9 mg/100g in guava and mango ketchups, respectively (Fig. 1). Similar trend in ascorbic acid content was observed by Famurewa *et al.* (10) in tomato paste during storage. Loss in ascorbic acid content may be attributed to gradual oxidation of ascorbic acid during storage. The non-enzymatic browning (NEB) (Optical Density of methanol extracted colour at 440 nm wave length) increased from 0.089 to 0.174 and 0.373 to 0.577 in guava and mango ketchups, respectively, after nine months of storage (Fig. 1). Woolfe (11) attributed formation of aldehydes such as furfural and hydroxymethyl furfural for non-enzymatic browning of products during storage. The anti-oxidant value taken as FRAP values decreased from 32.8 to 18.8 mM/ml in guava ketchup and 26.9 to 16.2 mM/ml in mango ketchup after 9 months of storage (Fig. 1). Vallverdú-Queralt (12) also reported decrease in anti-oxidant values of tomato ketchup during storage. The decrease in anti-oxidant value might be due to decrease in ascorbic acid and other anti-oxidant compounds with the storage period. During sensory evaluation of products on the basis of colour, flavour and taste, guava and mango ketchups obtained high organoleptic scores of 7.7 and 7.4 scores (out of 9), respectively (Fig. 1) at zero time. Both products retained good acceptability even after 9 months of storage, scoring 7.0 and 7.8, respectively, for guava and mango ketchups. The study indicated that fruit ketchups from mango and guava had good stability over a long period of time in terms of nutritional and organoleptic qualities. It may suggest guava and mango ketchups as potential alternate/additional products to tomato ketchup due to the presence of fruity flavour.

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Received : December, 2016; Revised : June, 2017; Accepted : July, 2017