

RESEARCH PAPER

Development of *Ocimum sanctum* (Tulsi) incorporated mango leather to enhance the sensory quality and storage stability

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Mango fruit leather was prepared by incorporation of *Ocimum sanctum* (Tulsi) for better textural and sensory properties. The mango fruit leather was incorporated with the leaf extract of *O. sanctum* at different concentrations of 5, 10, 15 and 20 percentages. The natural antioxidants present in the *O. sanctum* leaf extracts that was incorporated in the fruit leather showed extended shelf-life over three months when compared with control, without any added preservatives at ambient temperature. Also the storage stability of the product was studied under two flexible packages of polypropylene and polyester out of that the products packed in polypropylene showed better storage stability.

Key words : Mango fruit leather, *O. sanctum*, Polyester, Polypropylene

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INTRODUCTION

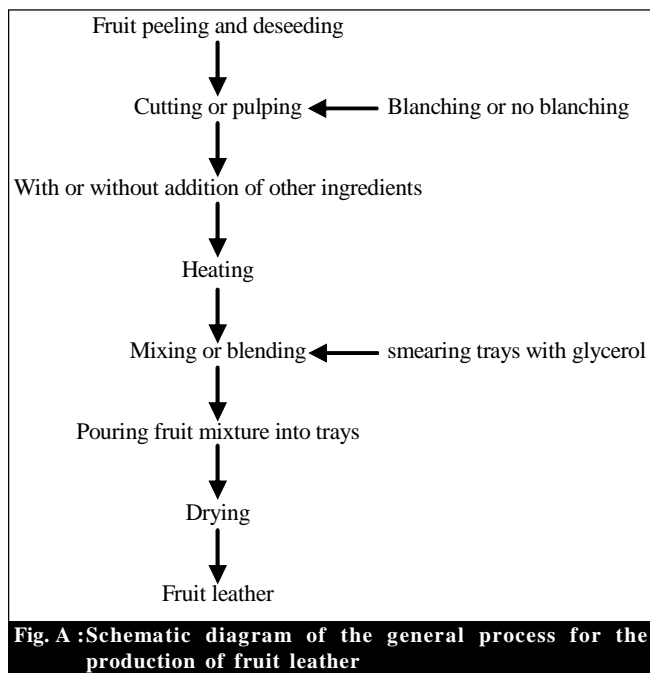
Mango (*Mangifera indica* L.) is a world-wide appreciated fruit and which is regarded as a tropical culture tree and it grows in varied climates. Processing is the term applicable to many products like dried mangoes, chutney and mango leathers. Fruit leather was made by drying a very thin layer of fruit puree to obtain a product with chewy texture similar to soft leather. Some of the studies have been conducted regarding the mango leather but most of them were prepared using preservatives and additives. The objective of incorporating the *O. sanctum* extract in the mango leather was to have an added natural flavour and to have better therapeutic qualities possessed by it such as

anticarcogenic, antidiabetic, antifungal, antimicrobial and antispasmodic properties. Eugenol (1-hydroxy-2-methoxy-4-allylbenzene), the active constituent present in *O. sanctum* L., has been found to be largely responsible for the therapeutic potentials. So the consumption of incorporated mango leather will yield the therapeutics of *O. sanctum* to some extent even after its processing.

RESEARCH METHODOLOGY

Banganapalli mango (*Mangifera indica*) variety was selected after being cleaned and sanitised (50-60 mg per lit. free active solution) after then peeled out and then mango pulp was obtained with the use of pulper device. Now the mango pulp was blanched at 90°C for 3

minutes to destroy enzymes. Total soluble solids of pulps were raised to 30 °Brix using powdered caster sugar and 0.6 percentage of citric acid was added. The textural preservation effects were due to the added sugar and corn flour. Bharambhe *et al.* (2009) mentioned that aspartame sweeteners cause loss of sweetness during drying. Accordingly crystallized caster sugar and corn flour were added at rate value of the mango pulp. Mix the pulp, corn flour and sugar in an equal range without any formed lumps to have a smooth textural property (Fig. A).



The juice extract of *O. sanctum* was measured with the measuring cylinder and poured into the product mix at different concentrations in which the juice was extracted with no added water after then pulp blend was mixed using a electrical mixer for two minutes for a better consistency. Then spread into a clean steel trays coated with butter paper. Now load the mixed ingredients in a cross flow cabinet drier ($70 \pm 5^{\circ}\text{C}$) for about 6-7 hrs (Khanal *et al.*, 2010) until the moisture content of the mango leather reached 15-18 percentage.

Dried sheets were cut into rectangular ($3.5 \times 10 \text{ cm}^2$) bars and rolled with butter paper and packed in poly propylene (PP) or polyester pack at last. Sensory tests were conducted by untrained panellist. Azeredo *et al.* (2006) used a 7-point hedonic scale for colour, flavour and toughness attributes whereas Gujral and Khanna

(2002) used a 9-point hedonic scale to evaluate mango fruit leather samples for flavour, colour and texture of mango fruit leather. Acceptance test of the samples was carried out at nine point hedonic scale (1- 'extremely disliked' to 9- 'extremely liked') and the sensory data were subjected to analysis of variance. The finished products were stored under refrigerated temperature ($5 \pm 2^{\circ}\text{C}$) and were analysed at an interval of thirty days. Control sample was added with 0.2 per cent potassium meta-bi- sulphite for preservation. Proximate composition was analyzed using standard methods and the results obtained were used for comparison among various fruit leathers prepared (Ryland *et al.*, 2010). The statistical analysis of data recorded in all observations was computed by methods of analysis of variance and treatments were compared with help of critical difference as suggested by Chandel 1978); Karl (1978) and Panse and Sukhatme (1967).

RESEARCH FINDINGS AND ANALYSIS

Leaves of *Ocimum sanctum* are rich in essential oils. The presence of eugenol in it, in considerable amount has been shown to possess significant antioxidant property and to efficiently inhibit lipid peroxidation. Many studies have shown the importance of Tulsi in lowering the glucose levels in blood and antioxidant potentials that it possessed (Sethi *et al.*, 2004).

The ability of antioxidant potentials of Tulsi was utilised and tested for preservation in prepared mango leather. *O.sanctum* extracts included mango leather had very good organoleptic score and it was very much comparable with control. T_1, T_2, T_3, T_4 are the notations for *O.sanctum* incorporated amounts in 5 per cent, 10 per cent, 15 per cent, 20 per cent of the extracts, respectively. The objective of adding this *O.sanctum* extracts was to extend the shelf-life without any chemical preservatives and to also to have value addition through pharmaceutical property of Tulsi leaves. Proximate composition of different treatments and control sample are shown in Table 1.

In regard with four different concentration of incorporation of *O.sanctum* extracts treatment T_4 was liked by most of the untrained panel members. The sensory evaluation results showed that most of them extremely liked the sample T_4 and T_2 was liked very much in case of fine textural property. Finally sample T_4 was standardized for the mango leather preparation

process it was compared with the control sample during storage (Table 1).

No appreciable changes were recorded in the organoleptic features *viz.*, appearance, colour and texture over 90 days (Table 2). However, significant differences were observed for flavour and overall acceptability. On the basis of shelf-life studies the keeping quality of *O. sanctum* leaf extract incorporated sample could be 65 days at $5\pm 2^\circ\text{C}$. The control sample without incorporated with leaf extract had a shelf-life period of about 25 to 26 days and the standard plate count were about not more than 100 CFU g^{-1} and the yeast counts were more than 10 CFU g^{-1} whereas the samples incorporated with *O. sanctum* leaf extracts remained with lower than 10 CFU g^{-1} .

The phyto-chemicals enriched in the mango leather by incorporating the extract of the leaf juices of *O. sanctum* are a good choice for stabilizing the body cells with antioxidants. Since the mango fruit leather is liked

by everyone, the nutrient and medicinal values present in the *O. sanctum* added to the fruit leather, it contributes to general health and wellness. As per food standards and FDA (USA) fruit bars should not have odd flavours or off flavours but must possess flavour typical of its kind. Fruit bars should have typical colour of the fruit. All the fruit bars prepared in the study were having natural flavours and colours Singh *et al.*, 2012 and Chavan, 2012 also worked on the related topic.

Conclusion :

Fruit leathers provide attractive, colour and flavour of some products for people. A variety of researches have been carried out to study the effects on fruit leathers of different methods of preparation, different drying conditions, and packaging and storage conditions. Tulsi is most sacred plant in India. No plant in the world commands such universal respect, adoration and worship from the people as does Tulsi. It is the plant par

Parameters	Control	Treatments				P-value
		T ₁	T ₂	T ₃	T ₄	
Carbohydrate (g)	77.97 ± 0.036 (77.87-78.06)	77.29 ± 0.284 (76.56-78.02)	77.29 ± 0.275 (76.58-78.0)	78 ± 0.001	79 ± 0.001	0.0001**
Protein (%)	1.983 ± 0.248 (1.343-2.62)	1.33 ± 0.21 (0.791-1.88)	2.0 ± 0	2.0 ± 0	1.83 ± 0.17 (1.404-2.26)	0.035*
Fat (g)	7.03 ± 0.057 (6.89-7.18)	7.0 ± 0	7.0 ± 0	7.006 ± 0.11 (6.98-7.02)	7.0 ± 0	0.853 ^{NS}
Ash (g)	2.46 ± 0.144 (2.09-2.83)	2.66 ± 0.21 (2.12-3.21)	3.0 ± 0	3.0 ± 0	2.17 ± 0.17 (1.738-2.595)	0.001**
Moisture (%)	15.66 ± 0.22 (15.11-16.22)	16.17 ± 0.31 (15.38-16.96)	17.0 ± 0.258 (16.34-17.66)	17.0 ± 0	16.17 ± 0.17 (15.82-16.51)	0.000**
Titre acidity	3.67 ± 0.07 (3.48-3.85)	3.83 ± 0.17 (3.405-4.26)	4.0 ± 0	3.83 ± 0.16 (3.40-4.26)	3.67 ± 0.21 (3.13-4.21)	0.035**

Values are in the parenthesis are min – max values

* and ** indicate significance of values at P=0.05 and 0.01, respectively

Data are Mean ± Standard deviation

NS=Non-significant

Parameters	Time of storage study								T –test
	Control				T ₄ – 20% of <i>O. sanctum</i>				
	0 th Day	30 th Day	60 th Day	90 th Day	0 th Day	30 th Day	60 th Day	90 th Day	
Carbohydrate(g)	77.96	77.94	77.8	77.7	78.14	78.19	78.22	78.28	0.028**
Protein (%)	24.09	24.05	24.01	24	25.29	25.2	25.17	25.1	0.000**
Fat(g)	6.96	6.6	6.37	5.5	6.88	6.77	6.33	6	0.376 ^{NS}
Ash (g)	31.59	31.5	31.33	31.27	32.77	32.5	32.41	32.09	0.001**
Moisture (%)	15.55	15.5	15.49	15.45	14.64	15.61	15.58	15.5	0.554 ^{NS}
Titre acidity	6.9	6.1	5.8	4	6.8	6.3	5.7	5.5	0.001**

Data are Mean ± Standard deviation,

NS=Non-significant,

* and ** indicate significance of values at P=0.05 and 0.01, respectively

excellence. Utilizing the incorporation of 20 per cent *O. sanctum* leaf extracts in the mango leather, the storage stability of the product was improved without any added chemical preservative at refrigerated temperature for more than two months. The sensory property was also

very much liked by the evaluation conducted by the untrained panellists. These types of value addition by way of therapeutic enrichment do certainly help in income generation of the entrepreneurs at large and promote good health.

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