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## Consumer acceptance for blended marmalade of mandarin and lime

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### Abstract

Marmalade is the product which is prepared from citrus fruits, where the peel of fruit is being suspended, which is having nutritional importance as it is rich source of ascorbic acid and other minerals. Marmalade made from single citrus fruits are quite popular among the consumers however, these are made from some specific fruits only. Other citrus fruits are not being used solely for preparation of marmalade due to their specific taste like lime. Blending of two different citrus fruits for preparation of marmalade can be a good opportunity for improving the nutritional quality of a value-added product by providing the basic nutrients of various fruits in a single product, hence giving better quality in respect to nutritional as well as sensorial aspect. Thus, keeping this objective in mind, the present investigation was done for finding the response of consumers towards the blended marmalade and standardizing the proportion the mandarin and lime fruits were used in different proportions for marmalade preparation and evaluated organoleptically. Among the blended marmalade the combination of 40% mandarin and 5% lime was most acceptable.

**Keywords:** Blended, consumer acceptance, marmalade, mandarin and lime

### Introduction

Marmalade is a fruit preserve made from the properly prepared juice and peel of citrus fruits. It is concentrated to achieve its gel structure, similar to jelly, with approximately the same standards (Dauthy, 1995) [3]. It is mainly prepared from citrus fruits with or without peel from same fruits (James & Kuipers, 2004) [5]. Peel supplies extra nutrition to the marmalade and reduce the wastage of citrus fruits, moreover requires no jellying agent though citrus peel is a rich source of pectin (Baghde *et al.* 2017) [2].

Citrus belongs to family Rutaceae having chromosome no. of  $2n=18$ . The most important commercial citrus species in India are Mandarin (*Citrus reticulata* Blanco), Sweet orange (*Citrus sinensis* Osbeak) and Acid lime (*Citrus aurantifolia* Swingle). Citrus fruits are not only rich source of ascorbic acid, but also contains several phytochemicals and flavonoids (Shukla *et al.* 2009) [6]. Other nutrients in citrus fruits include vitamin B complex, flavonoids, carotenoids, limonoids and relate nutrients (Economos *et al.* 1999) [4]. Mandarin and lime are having vitamin C 13-54 mg/100 and 27-37 mg/100g respectively, while they contain some amount of minerals like calcium, phosphorous and iron. The citrus peel contains a high concentration of antioxidant substances, it is also having different bioactive compounds mainly hesperidin, vitamin, naringin which shows anti-microbial activity. (Tiwari 2009) [7].

The blending of pulp could be an economic requisite to utilize some of fruits for processing, which may not otherwise have favourable characters such as colour, aroma, mouth feel including overall cost for the preparation of the processed products. It may also enhance the appearance, nutrition, flavour of the product and lead to new product development.

The aim and objective of this work is therefore to produce blended marmalade using mandarin and lime using sensory evaluation to determine different sensory attributes.

### Material and methods

The experiment was laid out in Factorized Complete Randomized Design with nine treatment combinations comprising three different mandarin juicy vesicles concentrations (Factor A) viz., M<sub>1</sub>(40% mandarin juicy vesicles), M<sub>2</sub> (45% mandarin juicy vesicles) and M<sub>3</sub>(55% mandarin juicy vesicles) and three different lime juicy vesicles concentrations (Factor B) viz., L<sub>1</sub> (0% lime juicy vesicles), L<sub>2</sub> (5 % lime juicy vesicles) and L<sub>3</sub> (10% lime juicy vesicles) which were replicated four times, to standardize the procedure of blended marmalade. The varieties used were Nagpur mandarin and PDKV Lime.

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**Preparation of blended marmalade**

The juicy vesicles and peel of the fruits were used in preparation of blended marmalade. The fruits of mandarin and lime were peeled, the rag from inside the mandarin peel was removed and the peel was cut in fine shreds. The shredded peel of mandarin was boiled for 10 to 15 minutes for softening and removing bitterness. The segments of mandarin and lime were separated and the juicy vesicles of mandarin and lime were collected. The water was added as per the treatment combinations. The boiling of prepared mixture was done on medium flame for about 30 to 40 minutes then sugar was added by dissolving it in boiling water and after that, the prepared shreds were added in the mixture. The preservative KMS (Potassium Meta bisulphite) was added at the rate of 90 ppm/ kg of marmalade.

The heating was stopped when the TSS reached 65<sup>0</sup>-67<sup>0</sup> Brix and at desired consistency when the boiling point reached 105 °C. After reaching the end point, blended marmalade was poured in sterile glass bottles and followed by cooling at room temperature.

**Sensory evaluation**

Marmalade prepared from mandarin and lime fruits were evaluated for sensory parameters viz., colour, flavour, taste, texture and overall acceptability. Each attribute was given separate score of 9 points scale according to the method reported by Amerine *et al.* (1965)<sup>[1]</sup>. Sensory panel consisted of 5 trained panelists evaluated the experimental samples as per the hedonic scale. The score for organoleptic evaluation was reported. They were also provided with potable water to rinse their mouth after evaluating each sample to check taste

interference.

**Hedonic scale**

Like extremely-9	like slightly-6	dislike moderately-3
Like very much-8	neither like nor dislike-5	dislike very much-2
Like moderately-7	dislike slightly-4	dislike extremely-1

**Results and Discussion**

From the table given below, it shows the mean organoleptic score of blended marmalade of mandarin and lime fruits. The scores were analysed in terms of colour, flavour, taste, texture and overall acceptability. The result gotten from the analysis revealed that treatment M<sub>1</sub>L<sub>1</sub> scored highest 8.4 followed by the treatment M<sub>1</sub>L<sub>2</sub> having score 8.3 while treatment M<sub>3</sub>L<sub>3</sub> was having the lowest score which was 7.7 with respect to colour.

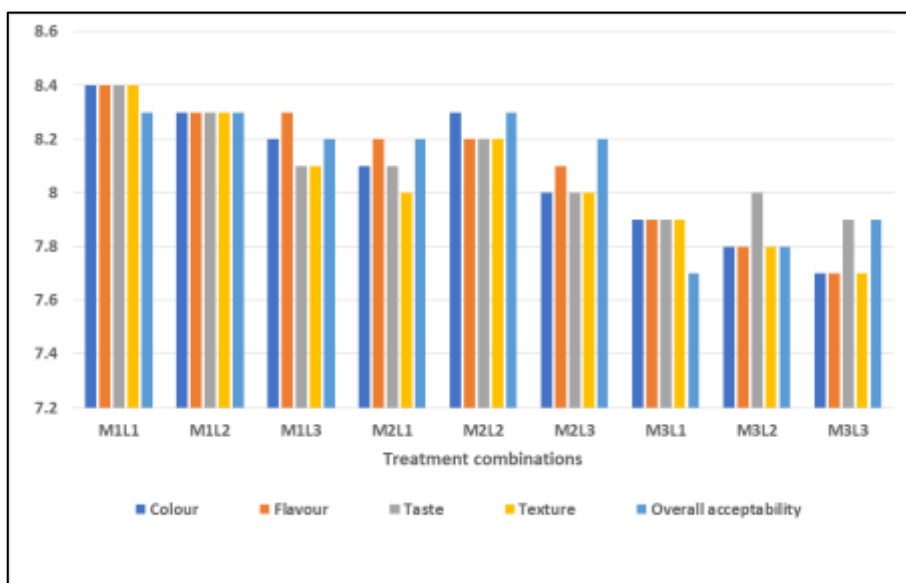
For flavour, treatment M<sub>1</sub>L<sub>1</sub>, the highest score of 8.4 while treatment M<sub>3</sub>L<sub>3</sub> has lowest score. In taste, the treatment M<sub>1</sub>L<sub>1</sub> has the highest value which was 8.4, followed by the treatment M<sub>1</sub>L<sub>2</sub> and the lowest score was found in treatment M<sub>3</sub>L<sub>3</sub> having score of 7.9.

In texture and overall acceptability, the treatment combination M<sub>1</sub>L<sub>1</sub> was found to have highest score which was followed by M<sub>1</sub>L<sub>2</sub> whereas, the lowest score was found for the treatment combination M<sub>3</sub>L<sub>3</sub> which was 7.7 and 7.9 respectively.

The result of organoleptic evaluation shows that. The treatment combination M<sub>1</sub>L<sub>1</sub> (40% mandarin juicy vesicles) whereas, the treatment M<sub>3</sub>L<sub>3</sub> (55% mandarin and 10% lime juicy vesicles) was having the lowest score.

**Table 1:** Organoleptic scoring of different proportion of marmalade

Treatment combinations	Colour	Flavour	Taste	Texture	Overall acceptability
M <sub>1</sub> L <sub>1</sub>	8.4	8.4	8.4	8.4	8.3
M <sub>1</sub> L <sub>2</sub>	8.3	8.3	8.3	8.3	8.3
M <sub>1</sub> L <sub>3</sub>	8.2	8.3	8.1	8.1	8.2
M <sub>2</sub> L <sub>1</sub>	8.1	8.2	8.1	8.0	8.2
M <sub>2</sub> L <sub>2</sub>	8.3	8.2	8.2	8.2	8.3
M <sub>2</sub> L <sub>3</sub>	8.0	8.1	8.0	8.0	8.2
M <sub>3</sub> L <sub>1</sub>	7.9	7.9	7.9	7.9	7.7
M <sub>3</sub> L <sub>2</sub>	7.8	7.8	8.0	7.8	7.8
M <sub>3</sub> L <sub>3</sub>	7.7	7.7	7.9	7.7	7.9



**Fig 1:** Organoleptic scoring of different proportion of marmalade

## Conclusions

As per the results obtained from the study, although the maximum acceptance among the all samples of marmalade, the marmalade made solely from mandarin got the highest score but, the second most acceptable marmalade among the sensory evaluators was the marmalade made from the combination of 40% mandarin and 5% lime juicy vesicles which clearly shows the potential of blended marmalade for exploiting the different fruits of citrus family which are still not use for the preparation of marmalade.

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