

## Sensory Evaluation and Overall Acceptance of Processed Products of Underutilised Fruits of Sikkim Himalayas

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### Authors' contributions

All authors have equally contributed to this research study. All authors had read and approved the final manuscript.

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### ABSTRACT

Underutilised fruit crops of sikkim has a great potential to be made into processed products but is not explored much. Sensory evaluation is one technique through which one can release a product out of these potential fruit crops. *Diploknema butyraceae*, *Hippophae salicifolia*, *Elaeagnus latifolia*, *Docynia indica* and *Machilus edulis* are the potential fruits taken for the study. The present study focuses on the acceptability of different products made from these fruits. Sensory evaluation was done using the hedonic scale which ranged from 1 - 9. For the parameters like flavor, color, aroma and appearance, the best result were obtained in ketchup of (*Elaeagnus latifolia*) for flavor, jam (*Hippophae salicifolia*) and juice (*Hippophae salicifolia*) for color, ketchup (*Elaeagnus latifolia*) and juice (*Hippophae salicifolia*) for aroma, and ketchup (*Elaeagnus latifolia*) for appearance, jam (*Hippophae salicifolia*) and juice (*hippophae salicifolia*), ketchup (*Elaeagnus latifolia*) and juice (*Hippophae salicifolia*), and ketchup (*Elaeagnus latifolia*).

The overall acceptability was also assessed and the best product was obtained in juice (*Hippophae salicifolia*) with mean overall acceptability as 7.33 followed by juice (*Hippophae salicifolia*) having 7.00 as the mean overall acceptability. On the other hand, the products prepared from *Machilus edulis* had the lowest scoring among all. Thus, the results obtained from this study can be used for future works under the related topics.

**Keywords:** Underutilized fruit; sensory evaluation; overall acceptability; *Elaeagnus latifolia*.

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## 1. INTRODUCTION

Underutilized fruits are an important source of minerals and vitamins since time immemorial. Sikkim is endowed with a huge potential fruit crops which is still not exploited regarding processed products. The indigenous fruit crops of sikkim are lesser known to the outside world beside being rich source of fat, sugar, protein and antioxidants [1].

*Diploknema butyraceae*, *hippophae salicyfolia*, *elaegnus latifolia*, *docynia indica* and *machilus edulis* are some of the potential fruits grown in sikkim. These fruits are not well known among the other cultivated fruits but has a unique taste and flavor. Moreover, it is devoid of any synthetic chemicals which retains its originality regarding taste and flavor. These fruits are normally consumed fresh but when given a tinge of minimal processing, makes it more pleasing in appearance and taste. Processing of these fruits can be considered as a method to preserve the seasonal fruits for longer period of time as they are perishable.

The demand for processed products of these indigenous fruits of sikkim himalayas is high among the local people and can also be marketed outside the state. Consumers nowadays are more health conscious and are looking for products which is chemical free and healthy to eat. So, the product prepared from the wild fruits of sikkim will fulfill this purpose as the state is declared organic. Not only this but processing also adds value and market to the products prepared.

The attempt for sensory evaluation of the underutilized fruit crops has not been made till date to make the processed products of these fruits popular. Upgrading the quality attributes of these fruits through various processed products may diversify the market and can be a new experience for the consumers as well.

Sensory methods are useful in developing new products and determining product standards while instrumental methods are superior in measuring quality on a routine basis [2].

## 2. MATERIALS AND METHODS

The samples was collected from different parts of sikkim. The selected fruits were washed and cleaned with double distilled water (ddw). Diversified value added products from select

underutilized fruits (*diploknema butyraceae*, *hippophae salicifolia*, *docynia indica*, *elaegnus latifolia* and *machilus edulis*) of sikkim depending on their nutritional status (as per fpo specification, 1955). Product prepared was *diploknema butyraceae* candy, juice and jam, *hippophae salicifolia* juice, jam, jelly, *docynia indica* jam, jelly and pickle, *elaegnus latifolia* chutney, ketchup and jam and *machilus edulis* powder, puree and mayonnaise.

**Sensory evaluation:** about 30 semi-trained panelists was used to evaluate of the products on a 9-point hedonic scale (where 1 = dislike extremely, 2= dislike very much, 3= dislike moderately, 4=dislike slightly, 5= neither like nor dislike, 6= like slightly, 7= like moderately, 8= like very much, 9= like extremely. The samples were scored for color, flavor, aroma, taste, and overall acceptability. Each product was presented in a petriplate with a code name at room temperature (23 to 24 °c). Purified water was served and used for mouth-rinsing between samples. 15 products were put on a large table in a preparation room. Samples were orderly evaluated from left to right according to indication by a test conductor.

### 2.1 Statistical Analysis

The data were subjected to analysis of variance using the statistical package for social sciences version 20.0. Duncan's multiple range test was used to compare the treatment mean. Statistical significance was accepted at ( $p < 0.05$ ).

## 3. RESULTS AND DISCUSSION

### 3.1 Descriptive Sensory Analysis

Descriptive Sensory Analysis is the most sophisticated sensory method. It is used to identify and quantify the sensory characteristics of products, usually in the order of their occurrence, through the objective descriptions of assessors who possess extraordinary sensory perception [3]. Studies regarding the underutilised processed fruit products are recent, and no such scientific publications and sensory evaluation are found which restricts the comparisons between the present results and those of other studies.

A total of 30 panellists were chosen for the evaluation of various products prepared from the indigenous fruits of Sikkim Himalaya. The ratio of male and female were equal among the chosen panellist. The age group of the panellist ranged

between 18 to 28 years old where most of them were students pursuing their B.Sc. Degree in Horticulture and some of them were M.Sc. and PhD scholars as well from Department of Horticulture, Sikkim University. The products prepared were Juice, Powder and Candy from *Diploknema butyraceae*, Jam, Jelly and Juice from *Hippophae salicifolia*, Jam, Jelly and Pickle from *Docynia indica*, Ketchup, Chutney and Jam from *Elaeagnus latifolia* and Powder, Puree and Mayonnaise from *Machilus edulis*. The products made from different fruits were judged according to its flavour, colour, aroma and appearance and an overall acceptance was measured using Hedonic Scale.

**Table 1. Overall acceptance of wild fruits according to flavour, colour, aroma and appearance**

Fruit products	Overall acceptance
<i>Diploknema butyraceae</i> jam	5.40±1.003
<i>Diploknema butyraceae</i> juice	5.87±1.196
<i>Diploknema butyraceae</i> candy	6.50±1.106
<i>Hippophae salicifolia</i> jelly	6.60±1.003
<i>Hippophae salicifolia</i> juice	7.00±1.438
<i>Hippophae salicifolia</i> jam	6.40±1.653
<i>Elaeagnus latifolia</i> ketchup	7.33±1.295
<i>Elaeagnus latifolia</i> chutney	6.60±1.133
<i>Elaeagnus latifolia</i> jam	6.20±1.349
<i>Docynia indica</i> pickle	6.23±1.455
<i>Docynia indica</i> jelly	5.53±1.408
<i>Docynia indica</i> jam	5.87±1.042
<i>Machilus edulis</i> puree	3.90±0.960
<i>Machilus edulis</i> mayonnaise	3.77±1.382
<i>Machilus edulis</i> powder	3.77±1.382

Mean (±), significance difference at ( $p < 0.05$ )

The scoring was given according to the preference of all the individuals in the panellist. The scoring ranged from 3-7 in general. Before the evaluation of the overall acceptability, parameters like flavour, colour, aroma and appearance were taken into consideration. The best result could be seen in Ketchup (*Elaeagnus latifolia*) for flavour, Jam (*Hippophae salicifolia*) and Juice (*Hippophae salicifolia*) for colour, Ketchup (*Elaeagnus latifolia*) and Juice (*Hippophae salicifolia*) for aroma, and Ketchup (*Elaeagnus latifolia*) for appearance. Thereafter, the overall acceptability was evaluated where the best product was obtained in Ketchup (*Elaeagnus*

*latifolia*) with mean overall acceptability as 7.33 followed by Juice (*Hippophae salicifolia*) having 7.00 as the mean overall acceptability. Similar work was conducted by Ihediohanma et al. [4] where they reported that Pineapple Jam is most acceptable followed by Orange Jam.

On the other hand, the least acceptability was observed in the products made out of *Machilus edulis* having the mean overall acceptability as 3.9, 3.7 and 3.7 for Puree, Mayonnaise and Powder respectively as shown in Table 1. The reason for its less acceptability may be because *Machilus edulis* is barely sweet in taste due to which the panellist gave less scoring for its product. Moreover, Puree and Powder are liked by people when it is sweeter.

#### 4. CONCLUSION

The research work in regard to the topic "Sensory evaluation and Overall acceptability" of processed products of underutilised fruits of Sikkim Himalayas will be useful for future research work. From the results obtained through Sensory evaluation, it can be inferred that the overall acceptance of Ketchup and Juice prepared from *Elaeagnus latifolia* and *Hippophae salicifolia* respectively was observed to be the best among all the other products. Further, these two products can be recommended for fortification and subsequently release the same as a value-added product in the market. This would reduce the seasonal glut in the local market.

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#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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