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Impact of lime peel powder influences on lime tea powder (*Citrus Aurantifolia*)

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Abstract

A study was conducted on Lime peel tea powder from January to December 2021 at ICAR- Krishi Vigyan Kendra, Tirunelveli to establish a standard method of preparation, study the shelf-life and evaluate the results using sensory evaluation scores. The aim of the study is to semblance the influences on different lime peel powder concentration addition to lime tea dip drink quality, assess the neutraceutical properties of lime peel tea powder and study the different concentrations of the lime peel powder that accepted as best by sensory analysis. The treatment of present study is the addition of lime peel powder by 2%, 3%, 4% & 5%, respectively. The acceptability responses of the semi panelists for sensory evaluation encouraged for a period of 180 days at 30 and 60-days interval. Accordingly, by sensory evaluation it was perceived that the product lime tea was accepted till a storage period of 180 days at room temperature. The researcher standardized this Acid lime peel tea powder with natural colour, flavor and without adding any preservatives. This present study could uplift the farmers' income by introducing new innovation in acid lime production technology

Keywords: Lime tea powder, lime peel powder, shelf-life and sensory evaluations

Introduction

Lime (*Citrus aurantifolia*) is a rich source of flavonoids and limonoids that has been cultivated around the world with the world production of approximately 20,050,000 Metric tons/annum (Shahbandeh, 2021) [1]. Tirunelveli district ranks first among cultivation of Acid lime, an area of 2788 ha with the production of 2760 kg/ha. Tirunelveli and Tenkasi districts, of Tamil Nadu state, Acid lime is traditionally grown at Kadayam, Puliyangudi, Sivagiri, Vasudevanallur, Manur, Cheranmahadevi and Sankarankovil blocks for decades, and specially in Tenkasi district, Acid lime production considered as "One district, One product Crop" (ODOP). The production of processed and value-added products of Acid lime squash, tea powder, carbonated beverages, candy, bars, jam and jelly from lime-based yields considerable amount of lime peel. That became food waste which could be comprehensively exploited economically. The aim of the present study is to use lime peel effectively which has significant role of phenolic and flavonoid properties. As lime peel has bitter in taste which may not accepted by many people, but the peel alone serves as an excellent flavoring agent on basis of neutraceutical properties.

At presently, herbal tea in the form of ready to serve food is of the diversified products business that is being developed. Countries like Indonesia, herbal drinks increasingly in demand as a result of public awareness of the importance of health and high demand of traditional medicines. This is reinforced by the number's higher recovery from drug use herbs (Hartoyo, A. (2015) [2]. Lemon juice and lime juice are rich sources of citric acid, containing 1.44 and 1.38 g/oz, respectively. Lemon and lime juice concentrates contain 1.10 and 1.06 g/oz, respectively (Kristina L. Penniston *et al.* 2008) [3]. The *Citrus aurantifolia* naturally has more neutraceutical properties and contains citric acid as much as 7 to 7.6% that plays significant role as an antioxidant (Hariana, *et al.* 2015) [4]. As of now the studies related to lime peel powder incorporated lime tea powders are under reported in Tamil Nadu. This present study could uplift the farmers' income by introducing new innovation in acid lime production technology.

Materials and methods

Formulation, Standardization and acceptability study of lime peel tea powder was conducted at ICAR-Krishi Vigyan Kendra-Tirunelveli (Tamil Nadu). A brief description of methodology is presented below:

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The methodology includes materials required for preparation of lime peel tea powder by adding it in different concentration of lime peel powder to lime tea powder and to study the shelf life of the product.

Raw materials for making Lime Peel Tea powder

- Sugar-1000 g
- Lime juice-150 g
- Powdered lime peel-2%, 3%, 4% and 5%

The fresh Acid lime (12 nos.) was cleaned in running tap water and wiped with clean towel. Then take lime grater and gently grate the outer layer of lime and dry in shadow for 24 hours. Raw materials like sugar and Acid lime were procured from farmers of in and around Tenkasi and Tirunelveli districts of Tamil Nadu. Approximately 12 nos. of grated lime peels produced 10 gms of dried lime peel powder. The lime tea powder was made using an aqueous extract of lime juice.

Preparation of lime tea powder mentioned below.

Lime Tea powder preparation

Ingredients: Lime juice and Sugar

Preparation of 100 g of Lime Tea powder

Take 150 g of lime juice in plate, add sugar to it and mix well. Keep these mixtures in shadow drying for 48 hours? Take the dried sugar content and grind it in mixer. Divide the powdered lime tea powder mix in four different plates' viz., add powdered lime peel-2%, 3%, 4% and 5%.

Table 1: Requirement of raw materials for 100g of Lime tea powder preparation (4 Replications)

S.No.	Ingredients	Quantities
1	Lime tea powder	20 g
2	Water	150 ml
3	Dried lime peel powder	2g, 3g, 4g and 5g respectively

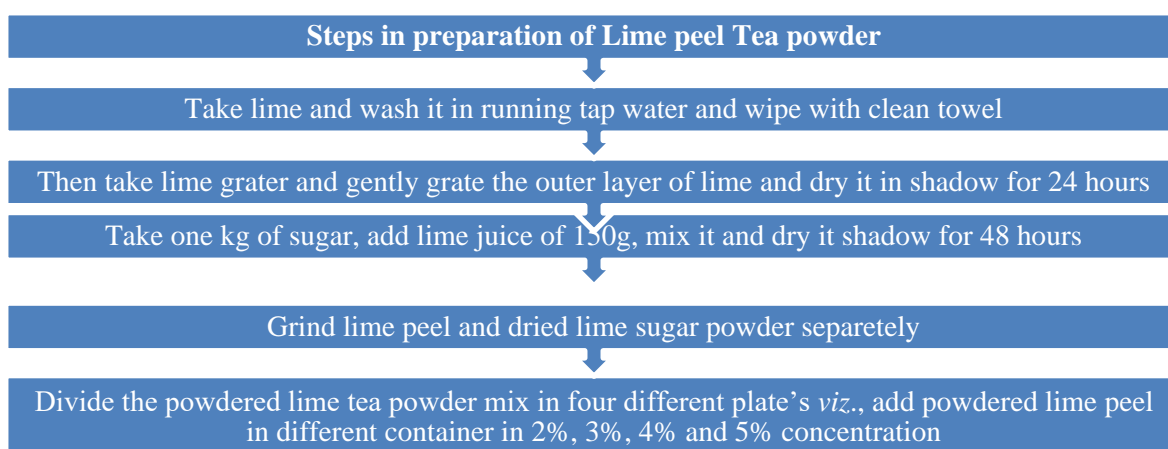


Fig 1: Steps in preparation of Lime peel Tea powder

Standardization of preparation method of Lime peel tea powder: In the second phase, take four separate containers and mark A, B, C and D. To each of the containers add 150 ml of water with 20 gm of lime tea powder and addition of lime peel powder in 2 g, 3 g, 4 g and 5 gms respectively. Heat the water up to 100 °C wait for 5 minutes then add 15 g of

lime tea powder with different lime peel concentrations. The purpose of four different containers is to study four different concentrations of adding dried lime peel and to arrive at the ideal concentration of lime peel powder required to produce an acceptable product with a good taste of 180 days.

Table 2: Treatment with different level of Concentration (lime peel tea powder)

Concentration of dried lime peel powder	7 days	30 days	90 days	180 days
2%	Taste and aroma is acceptable	Taste and aroma is acceptable	Taste and aroma is acceptable	Taste and aroma is acceptable
3%	Taste and aroma is good	Taste and aroma is good	Taste and aroma is good	Taste and aroma is good
4%	Aroma is good, Bitterness at last	Aroma is good, Bitterness at last	Aroma is good, Bitterness at last	Aroma is good, Bitterness at last
5%	Aroma is good, but Bitterness is there	Aroma is good, but Bitterness is there	Aroma is good, but Bitterness is there	Aroma is good, but Bitterness is there

Table 2. Explains about the different concentration of adding dried lime peel to arrive at the ideal concentration of lime peel powder required to produce an acceptable product using 2, 3, 4 and 5 percent concentration of lime peel tea powder as acceptable in four different concentrations. The ideal level of lime peel tea powder is found to be 3% of adding lime peel powder of 180 days.

Sensory Analysis: Sensory analysis is a process of

identification, measurement, scientific analysis and interpretation of product attributes through the five human senses: sense of sight, smell, tasting, touch and hearing. Election of trained panellists is an important factor of planning sensory analysis (Setyaningsih, 2010) [5]. Sensory Analysis were performed using five-point hedonic scale, 1 = Very Poor, 2 = Poor, 3 = Average, 4 = Good, 5 = Excellent. Results of the assessment panel expressed on acceptance of panellists who expressed high value that obtained through

Sensory Analysis to color, taste and flavor of tea powder shows with the addition of powdered lime peel was presented in the following discussion.

Table 3: Sensory evaluation score

I. Scale used		II. Sensory evaluation
5-point Hedonic scale		
Points	Attributes	Evaluate each of these
5	Excellent	1-Colour & Appearance
4	Good	2-Aroma
3	Average	3-Taste
2	Poor	4-Texture
1	Very Poor	5-Overall acceptability

Table 3 describes the Sensory evaluation score of lime peel tea by using 5 points Hedonic scale and its attributes.

Results

Sensory Evaluation was done using five-point hedonic scale

by semi trained panel members from the product (lime peel tea) developed. The ideal concentration of lime peel powder required to produce an acceptable lime tea product was using 3 percent concentration of lime peel tea powder. The ideal level of lime peel tea powder is found to be 3% of adding lime peel powder of 180 days. The sensory evaluation study was carried with the acceptable lime peel tea powder.

Table 4: Mean Sensory Evaluation results for 3% lime peel tea powder

Mean Sensory Evaluation results					
Evaluation Intervals	Colour & Appearance	Aroma	Taste	Texture	Overall acceptability
0 Day	5	5	5	5	5
30 Days	4.9	4.9	5	5	4.95
90 Days	4.8	4.8	4.9	5.0	4.8
180 Days	4.8	4.7	4.8	4.8	4.8

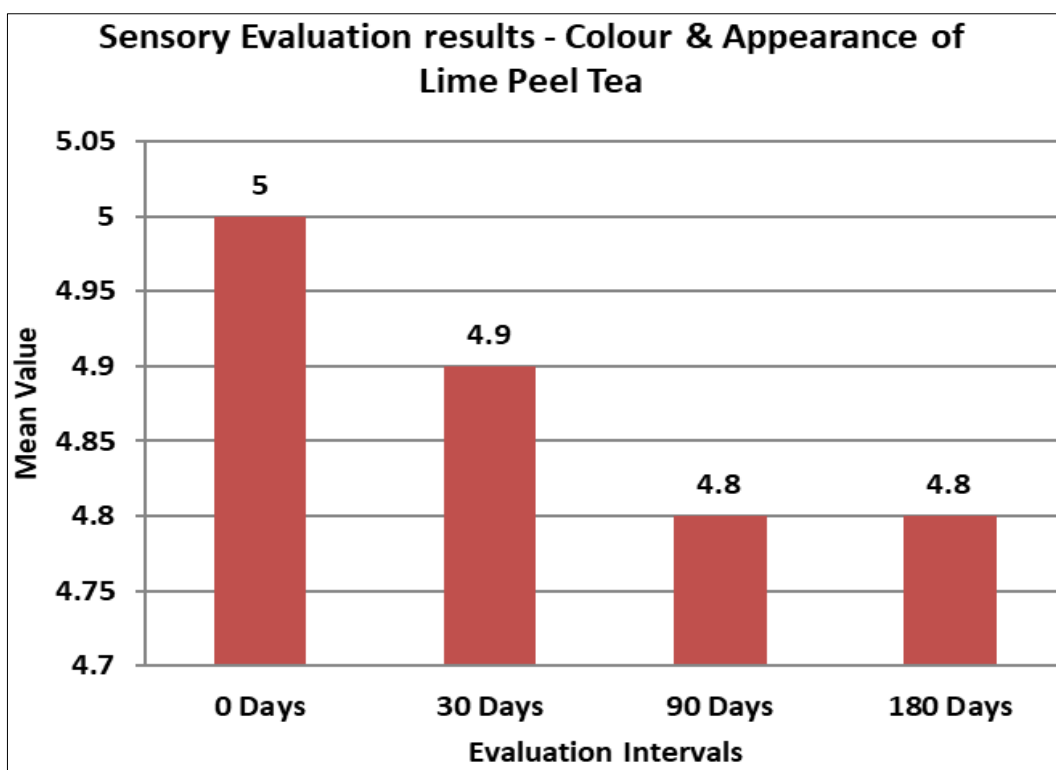


Fig 2: Mean Sensory Evaluation results - Colour & Appearance Lime Peel Tea.

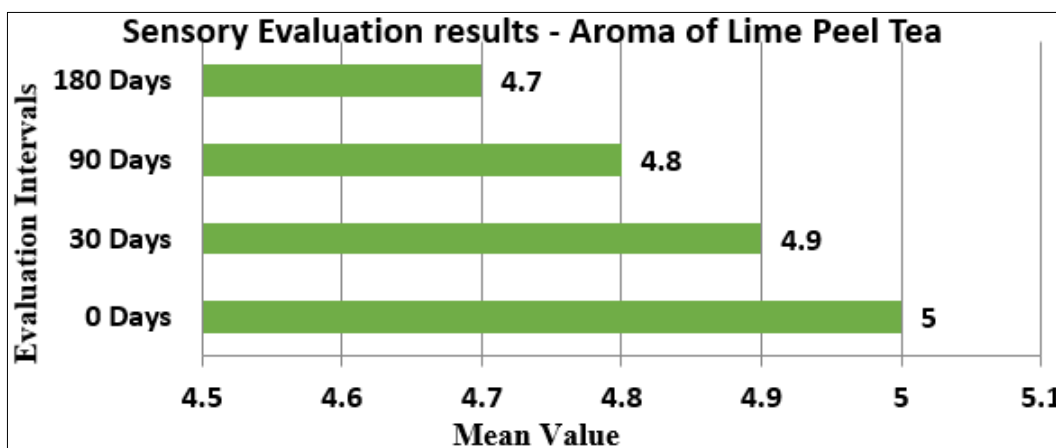


Fig 3: Mean Sensory Evaluation results - Aroma of Lime Peel Tea.

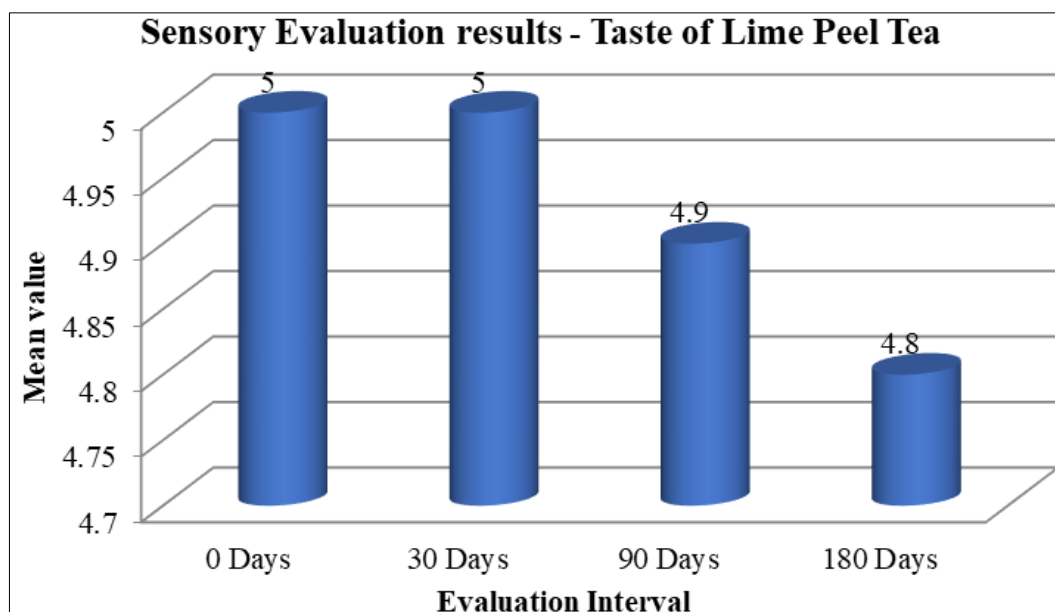


Fig 4: Mean Sensory Evaluation results - Taste of Lime Peel Tea.

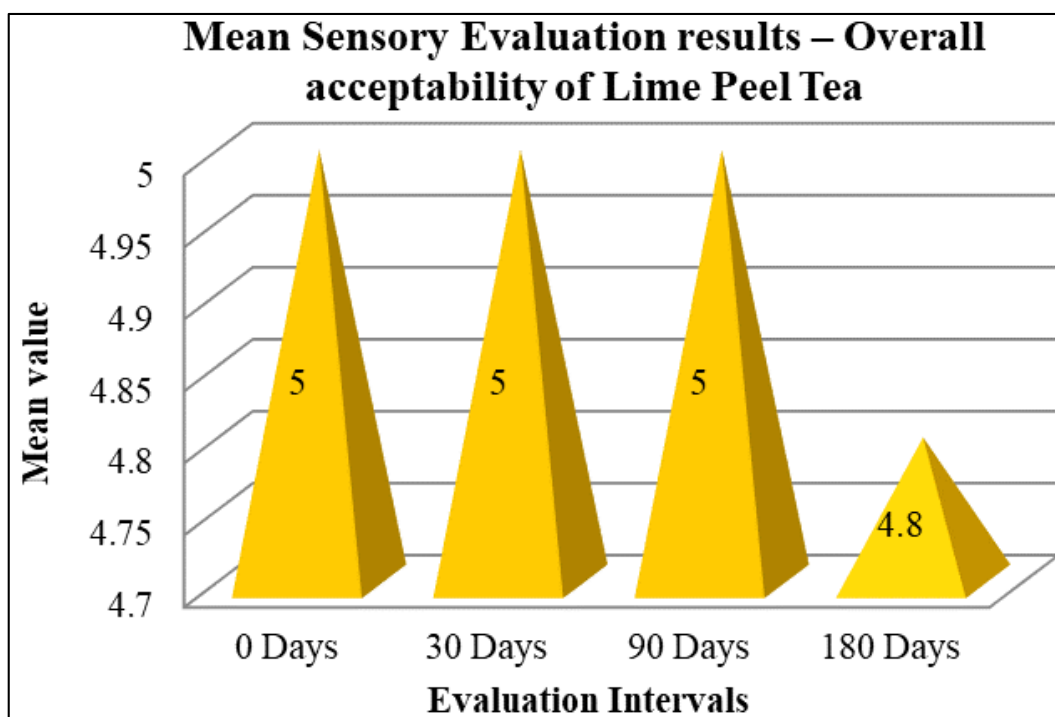


Fig 5: Mean Sensory Evaluation results – Overall acceptability of Lime Peel Tea.

Discussions

Approximately grated 12 nos. of lime peels produced 10 g of dried lime peel powder. The lime tea powder was made using an aqueous extract of lime juice. Lemon and lemon-based products are rich sources of Flavonoids which postponed the aging in human. Citrus based unique innovation technologies on value addition kept on increasing among the youngsters on healthiest diet. According to Shafeeqa Irfan *et al.* 2019 [6], illustrated about the health benefits of Lemon peel, which has the high presence of phytochemicals, antimicrobial and antioxidant activity with an astringent property. Author also explained that lemon peel has anti-dermatophytic activity and anti-impact on LDL-Cholesterol, status, source of pectic-oligosaccharides Analysis of lemon peel extract.

In present the mean value of sensory evaluation results from

the responses of the 25-semi trained panellist for a period of 180 day with respect to the colour, appearance, aroma, taste and overall acceptability is illustrated as graph is depicted in figure 1, 2, 3 and 4. On sensory evaluation of panellist the overall acceptability revealed well as per evaluation also the results of the final product were very encouraging. The shelf life of the products was of 180 days. These results accepted by Kanmani *et al.* 2014 [7], who used lemon in a wide range of foods as a gelling agent, included in the production of jams, jellies, as thickener, texturizer, emulsifier and stabilizer in many products. Author also mentioned that the importance of its jellifying properties, used in pharmaceutical, dental and cosmetic formulations. There are less value-added products reported from lime peel, the upcoming researchers may bring more value-added products from acid lime, which have to be

used effectively by the mankind.

Value added products from Acid lime should be prepared during season and may be utilized during shortage of production/off seasons. Citrate present in lime is the most clinically significant, as it may be manipulated by either diet or pharmacologic therapy or a combination thereof (Pak CYC 1994) [8]. The districts like Tirunelveli and Tenkasi farmers mostly depend on Acid lime cultivation throughout the year. The seasonal calamities and water scarcity put more pressure on farmers' side which naturally yields low production. By utilizing all the components of Acid lime one can meet out the loss also this uplift the economic status of farmers. This may lead to the products availability for the consumers throughout the year. Lime peel is getting wasted during processing, which has more nutraceutical properties, the upcoming researchers keep more research work on peel in order to convert waste out of wealth. Lime juice is an excellent natural preservative to store the processed food in safe. The mean value of sensory evaluation from the respondents of the 25 semi trained panellists with respect to the colour and appearance accepted the product as per sensory evaluations. The storage study also done to check the storage quality that also found satisfactory. The sensory evaluation conducted 0 days, 7 days, 30 days, 90 days and 180 days with the selected panellists and accepted by them. And also, no deteriorated effects reported on storage under room temperature.

According to Sahadi 2015 [9], elucidated about the influences of lime Powder on Hibiscus leaf tea quality the result showed that influences of different lime powder concentration level addition to hibiscus leaf dip drink's quality through sensory evaluation. Authors also studies on the qualities of the products on storage. Present results agreement with the above who also reported no quality on storage under room temperature. This study conducted continuously for 180 days (6 months) no significant seasonal impact of the product noticed. The taste and aroma of the product were also accepted by panellist without any disagreement. On the health point of view the selected lemon peel has vital role on the individuals; the accepted products can be marketed in organic manner. Present study also found the ratio above the accepted level considered non palatable that could be overcome by using different technologies like blanching, streaming and soaking in brine solutions.

Conclusion

The Lime peel Tea preparations rich in anthocyanins which could be successfully applied in the food industry as a good source of natural pigments due to their beneficial health effects and antioxidant activities. Tea dip was prepared from lime juice and peel applied for sensory evaluation study. The best combination selected for lime tea was subjected to different peel treatments of 2, 3, 4 and 5 gms of lime peel powder. Amongst four treatments, 3 gm of lime peel powder was reported to be ideal. Our study results concluded that the lime tea using lime peel as functional and Nutraceutical compounds, it can be consumed safely for up to 6 months from the date of preparation. The acceptability rating of the semi trained panelists has conclusively showed that the product retains its original properties without any deterioration for a period of at least 180 days.

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