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Standardization of Preservation Technique and Evaluation Test of Citrus Pseudo Limon (Hill Lemon) Juice.

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Abstract

This study aimed to evaluate the preservation techniques and quality of hill lemon (Citrus pseudo Limón Tan.) juice. Various preservation methods including organic preservatives were compared and the juice was subjected to physico-chemical and organoleptic tests. Results showed that boiling the juice with salt and mustard oil yielded the longest shelf life (10 months) while maintaining sensory qualities. Additionally the study assessed the pH, organoleptic properties, titrable acidity, and ascorbic acid content of the juice over a storage period of 180 days. Recommendations for further improvement in preservation techniques were provided based on the findings. The hardy hill lemon (Citrus pseudo Limón Tan.) grows successfully In the low and mid slopes Of Himachal Pradesh. Its juice is stored and utilized as a souring agent in pickles, chutneys, and Other food preparations. Using organic preservatives the shelf life of Hill Lemon juice was evaluated. Juice is boiled until foam or leather forms at which point an organic Preservative (salt) is added. 20g/L of juice plus a 20ml/L mustard oil top dressing) was deemed To be the best and got the highest rating.Evaluation tests, including pH measurement, organoleptic assessments, titratable acidity, and ascorbic acid content, ensured the juice met quality and safety standards. Despite variations in TSS and ascorbic acid content over the storage period, the preservation techniques effectively maintained the juice's overall quality. However, a significant decline in ascorbic acid content was observed, indicating a need for further research to mitigate nutrient loss during preservation. Overall, the study highlights the importance of standardized preservation techniques for hill lemon juice to meet consumer expectations for high-quality, shelf-stable products. Recommendations include exploring alternative preservation methods to minimize nutrient loss and enhance the juice's shelf life while maintaining its nutritional and sensory properties.

Keywords: ***Citrus , juice preservation, organic preservatives, physico-chemical analysis***.

Introduction –

Hill lemon (Citrus pseudo Limón Tan.) is grown extensively in plains and sub-mountainous region of northwestern Himalayan ranges of country. Hill lemon is a hardy plant and a prolific bearer once a year with an average yield of 30-40 tonnes per acre. It is good source of vitamin C, minerals and salts . Hill lemon fruits are processed into lemonade and essential oils, besides juice concentrate, juice powder and appetizer have also been prepared experimentally.. Its juice is an excellent and economical acidulants to enhance taste and flavour of dierent fruit products. Standardizing preservation techniques and conducting evaluation tests for hill lemon juice are important for ensuring the quality and safety of the final product. Standardizing preservation techniques means using specific methods to preserve hill lemon juice in a way that minimizes deterioration and maintains its quality. This may involve techniques like pasteurization, sterilization, freezing, or adding natural preservatives. The goal is to extend the shelf life of hill lemon juice while preserving its taste and nutritional value. When evaluating the quality of hill lemon juice, various tests can be conducted. Some common tests include:These tests are conducted to ensure that hill lemon juice meets established quality and safety standards, ensuring consumer satisfaction and protection.The hardy hill lemon (Citrus pseudo Limón Tan.) grows successfully in the low and mid slopes of Himachal Pradesh. Its juice is stored and utilized as a souring agent in pickles, chutneys, and other food preparations. Using organic preservatives, the shelf life of Hill lemon juice was evaluated. Juice is boiled until foam or leather forms, at which point an organic preservative (salt) is added. 20g/L of juice plus a 20ml/L mustard oil top dressing) was deemed to be the best and got the highest rating. on several sensory qualities, particularly flavor and color, using a nine point hedonic scale.

This therapy not only extended the juice's shelf life by up to 10 months, but also kept the juice's natural flavor and color. fruit juice. Therefore, in many food processing firms, using an organic method of juice preservation can be a better option than using organic preservatives. The versatility of hill lemon extends beyond its raw form, with its fruits being processed into various products such as lemonade, essential oils, juice concentrate, and juice powder. Its juice, in particular, is prized for its role as an acidulant in enhancing the taste and flavor of diverse fruit products. However, to ensure the quality and safety of hill lemon juice, it is imperative to standardize preservation techniques and conduct rigorous evaluation tests.Standardization of preservation techniques involves the utilization of specific methods to prolong the shelf life of hill lemon juice while retaining its nutritional content and sensory attributes. These techniques may encompass processes like pasteurization, sterilization, freezing, or the addition of natural and organic preservatives. The aim is to minimize deterioration and microbial spoilage, thereby ensuring the longevity of the product without compromising its quality.Furthermore, evaluation tests play a crucial role in assessing the quality and safety of hill lemon juice. These tests encompass a range of parameters, including pH measurement, organoleptic assessments (such as color, taste, odor), titratable acidity, and determination of ascorbic acid content. By conducting thorough evaluation tests, any deviations from established quality standards can be identified and addressed promptly, thus safeguarding consumer satisfaction and health.In this context, this study aims to delve into the standardization of preservation techniques and evaluation tests for hill lemon juice. By systematically evaluating different preservation methods and conducting comprehensive quality assessments, the study seeks to optimize the preservation process while ensuring the retention of hill lemon juice’s nutritional value and sensory properties. Ultimately, the findings of this research endeavor hold significance for both the food processing industry and consumers, as they contribute to the production of high-quality, safe, and shelf-stable hill lemon juice products.

Fig : Pseudo Limon Citrus

Synonym: Citrus reticulata
Kingdom: Plantae
Clade: Trichophytes
Order: Sapindales
Family: Rutaceae
Subfamily: Aurantioideae
Genus: Citrus L.
Chem.constituent: phenolic compound,
Phenolic Acid,
Coumarins ,
Terpenoid,
Carotenoids,

History

Citrus plants are native to subtropical and tropical regions of Asia, Island Southeast Asia, Near Oceania, and northeastern and central Australia. Domestication of citrus species involved much hybridization and introgression, leaving much uncertainty about when and where domestication first happened. A genomic, phylogenic, and biogeographical analysis. In Nepal, citron is regarded as an indigenous crop. When Chinese travelers first noticed the yellow hue of Mandarin around 2000 years ago, they referred to Nepal as "the country of golden fruits." Ripening fruits (Lohar and Lama, 1997). Mandarin is called "Suntala" in Nepali, which translates to "golden story," a meaning that Chinese tourists have also expressed. Mandarin is referred to as "narangi" in Sanskrit, which also highlights how old the crop is in Nepal. Mandarin has been regarded as an indigenous fruit of Nepal by Bonavia (1890), as cited by Shrestha and Verma (1998). Tanaka (1954) believed that Citrus medica and C. native to the subtropical range from the eastern corner of Burma, Assam, and Sikkim to Punjab were found in the foothills of the Himalayas.

The majority of fruits In Nepal's mid-hill region are citrus species. The mid-hills of Nepal, which range in elevation from 800 to 1500 meters, have ideal agroclimatic conditions for the production of high-quality citrus fruits. Nevertheless, Numerous citrus species are cultivated in Nepal; on a commercial scale, mandarin (Citrus reticulata Blancco), sweet orange (Citrus sinensis Osbeck), and acid lime (Citrus aurantiflora Swingle) are among them. In Nepal, the hill lemon (Citrus pseudolimon), also referred to as Nibuwa in Nepali, is a widely used species for making juice and pickles. The native citrus species known as Citrus pseudolimon, or Hill lemon, is only found in the foothills of the Himalayan States that make up India. While lemon has antibacterial,

antifungal, antiviral, anti-diabetic, and anti-cancer properties (Duthie and Crozier, 2000, Kawaii et al., 2000, Burt, 2004; Ortuno et al., 2006, Kurutas et al., 2016), lime has many medicinal properties such as astringent, tonic, antiscorbutic, antiseptic, diuretic, and also used for curing rheumatism and arthritis (Wealth of India, 1992).

Evaluation

The large citrus fruit of today evolved originally from small edible berries over millions of years. Citrus species began to diverge from a common ancestor about 15 million years ago at about the same time that Severinia (such as the Chinese box orange) diverged from the same ancestor. About 7 million years ago the ancestors of Citrus split into the main genus, Citrus, and the genus Procerus (such as the trifoliate orange) which is closely enough related that it can still be hybridized with all other citrus and used as rootstock. These estimates are made using genetic mapping of plant chloroplasts. A DNA study published in Nature in 2018 concludes that the genus Citrus first evolved in the foothills of the Himalayas, in the area of Assam (India), western Yunnan (China), and northern Myanmar.

Hill lemon fruit typically refers to lemons grown in hilly or mountainous regions. These lemons may have slightly different characteristics compared to lemons grown in other environments, such as flavor profile, acidity level, and size. However, without specific details about this particular variety, it's challenging to provide a detailed evaluation. If you can provide more information about the characteristics or specific attributes of hill lemon fruit, I'd be happy to provide a more thorough evaluation.

Taxonomy

The taxonomy and systematics of the genus are complex and the precise number of natural species is unclear as many of the named species are hybrids clonally propagated through seeds (by apomixis) and genetic evidence indicates that even some wild truebreeding species are of hybrid origin. Most cultivated Citrus spp. seem to be natural or artificial hybrids of a small number of core ancestral species, including the citron, pomelo, mandarin, and papeda. Natural and cultivated citrus hybrids include commercially important fruit such as oranges, grapefruit, lemons, limes, and some tangerines. Apart from these core citrus species, Australian limes and the recently discovered mangshanyegan are grown. Kumquats and Clymenia spp. are now generally considered to belong within the genus Citrus. Trifoliate orange which is often used as commercial rootstock, is an outgroup and may or may not be categorized as a citrus.

The hill lemon, scientifically known as Citrus limonimedica, Is a variety of lemon belonging to the Rutaceae family and the Citrus genus. It is often considered a subspecies or a variant of the common lemon (Citrus limon)

Uses

Many citrus fruits, such as oranges, tangerines, grapefruits, and clementines, are generally eaten fresh. They are typically peeled and can be easily split into segments. Grapefruit is more commonly halved and eaten out of the skin with a spoon. Special spoons (grapefruit spoons) with serrated tips are designed for this purpose. Orange and grapefruit juices are also popular breakfast beverages. More acidic citrus, such as lemons and limes, are generally not eaten on their own. Meyer lemons can be eaten out of hand with the fragrant skin; they are both sweet and sour. Lemonade or limeade are popular beverages prepared by diluting the juices of these fruits and adding sugar. Lemons and limes are also used in cooked dishes, or sliced and used as garnishes. Their juice is used as an ingredient in a variety of dishes; it can commonly be found in salad dressings and squeezed over cooked fish, meat, or vegetables.

Avoid kidney stones Small lumps called kidney stones develop in your kidneys as a result of waste products crystallizing and accumulating. They are fairly common, and those who experience them frequently do so again.By raising the pH and volume of urine, as well as by making the environment less conducive to kidney stone formation, citric acid may help prevent kidney stones. For those who have already had stones, just a half-cup (4 ounces or 125 ml) of lemon juice daily may be sufficient to help prevent them from forming. Though the results have been conflicting, some studies have also found that drinking lemonade can effectively prevent kidney stones. Other research has not found any impact. Thus, more thorough research is required to determine whether drinking lemon juice prevents kidney stones from forming.

Material And Method –

Fruits were gathered at Fruit Processing Research in January from an orchard in the Nalagarh area of the district Sloan (HP) at the proper maturity. the Department's laboratory. Fruits were cleaned and sorted. completely in water to get rid of foreign objects.Hill Lemon Juice's shelf life was evaluated by three years of

successive on-farm trials (OFTs) carried out by KVK, Mandai. (2015-2018) The fruit's juice was removed and heated to the process of making leather. Once the juice had cooled, it was preserved with top dressing and 20g of salt per liter of juice.
The juice receiving therapy one was kept intact after boiling without the need of anyconservant After undergoing four treatments, the juice was put into sterile bottles with a 2-cm headspace, sealed, and kept at room temperature for a year.
Fruit Procurement: Hill lemon fruits were collected from an orchard in the Nalagarh area of Sloan district, Himachal Pradesh, during January at the peak of maturity.
Fruit Preparation: The collected fruits were thoroughly cleaned and sorted to remove any foreign objects or impurities
Juice Extraction: Various extraction methods were employed, including a screw-type extractor, hydraulic press, pulper, and burr machine, to obtain hill lemon juice from the fruits.
Preservation Techniques: a. Organic Preservation: The juice was boiled until foam or leather formed, then preserved with 20g of salt per liter of juice and a top dressing of 20ml mustard oil per liter.

Evaluation Tests: A. Physico-chemical Characteristics: The pH of the juice was measured using a pH meter. Total soluble solids (TSS) were determined using an Erma hand refractometer.
B. Organoleptic Tests: Color, taste, odor, and texture of the juice were evaluated using sensory evaluation methods.
C. Titratable Acidity: Titratable acidity was determined by direct titration using 0.1M sodium hydroxide (NaOH) titrant with phenolphthalein indicator.
D. Ascorbic Acid Content: The ascorbic acid content was measured using iodine solution and starch solution titration method.

Extraction of hill lemon juice-
distinct tools and techniques [Screw type (fruits were sliced into eight pieces without peeling), hydraulic press (fruits were cut), and pulper (juice extracted after peeling)without peeling, into 16 pieces), and a burr machine (fruitswere divided into two equal parts horizontally withoutpeeling)] were employed to extract the hill lemon's juice. fruit (each apparatus used 12 kilogram). Best approach obtained was used to further extraction
Extraction of hill lemon juice involves separating the liquid content from the fruit pulp, seeds, and other solid components. Various extraction methods can be employed, depending on factors such as equipment availability, scale of production, and desired quality of the juice. Here are some common extraction methods for hill lemon juice.
1.Screw Type Extractor: This method involves using a screw-type extractor, where the fruits are sliced into pieces without peeling and then fed into the machine. The screw mechanism crushes and presses the fruit, extracting the juice while leaving behind the pulp and seeds
2.Hydraulic Press: In this method, the fruits are first cut or sliced, and then the juice is extracted using a hydraulic press. The sliced fruits are placed between layers of pressing material, and hydraulic pressure is applied to squeeze out the juice.

Juice preservation and analysis –
Three portions of the extracted juice were separated and pasteurized using potassium metabisulphite (KMS) at 700 parts per million of SO2.and 0.05 percent sodium benzoate] which were three times over. Handled juice was poured intosterilised bottles with a 2 cm head space, sealed, and kept at room temperature for half a year. Made-ahead juice wasexamined for physico-chemical characteristics at variousTotal soluble solids (TSS) were stored at intervals of 6, 7, anddetermined using an Erma hand refractometer. Information wasexamined using a fully randomized design.
Preservation of hill lemon juice is crucial to maintain its quality, flavor, and nutritional content over time. Several preservation techniques can be employed, including organic methods, to extend the shelf life of the juice. Additionally, analysis of various parameters ensures the quality and safety of the preserved juice. Here's an overview of juice preservation and analysis methods:
Preservation Techniques:Organic Preservation: Boiling the juice and adding organic preservatives such as salt and mustard oil. This method helps to inhibit microbial growth and enzymatic activity, thereby extending the shelf life of the juice.These preservatives act as antimicrobial agents, preventing spoilage and maintaining the quality of the juice.

Formula

Sr.No	Ingredients	Quantity
1	Lemon juice	1 Lit
2	Salt	20 gm/L
3	Mustard oil	20 ml/L

Procedure
Boiling the juice
⬇
Adding organic preservatives
⬇
Salt (20gm/L)
⬇
Mustard oil (20ml/L)

- Shelf life of juice is 10 months .

Table1. Effect of organic Preservatives on shelf life of hill lemon Juice.

Sr.No	Treatment	Average Shelf life of Juice(Months)
1	T2: Boiling the Juice with 20 g of Salt per Liquor and 20 ml of Oil per Liquor.	10
3	T4: Boiling Juice + 0.7 g/L of Potassium Metabisulphite.	6

Evaluation Test :-
1. PH- pH is a measure of the acidity or alkalinity of a solution. It ranges from 0 to 14, with 7 being neutral. Solutions with a pH less than 7 are acidic, while those with a pH greater than 7 are basic or alkaline. The lower the pH, the more acidic the substance; the higher the pH, the more alkaline. The pH scale is logarithmic, meaning each whole pH value represents a tenfold di erence in acidity or alkalinity. PH of pseudolimon citrus (Hill lemon) juice is ' 2'
2. Organoleptic Tests :- Organoleptic tests are sensory evaluations that assess the qualities of a substance based on human perception.Organoleptic tests involve assessing the sensory properties of a substance, such as flavor, aroma, color, and texture. For juice, these tests can include:

a) Colour -
The color of pseudo Limón citrus fruits' juice can vary, but it's generally yellow to yellowish-green. The specific shade may depend on factors like ripeness and the particular variety of pseudolimon citrus. Keep in mind that individual fruits within the pseudolimon citrus category may exhibit slightly different colors.
b) Taste –
Evaluate the overall taste of a substance, considering factors like sweetness, sourness, bitterness, saltness.
c) Odour –
Smell the substance to identify and evaluate its aroma or fragrance. This is crucial for products like perfumes, food, and beverages.

3.Titrable Acidity -
Titratable acidity refers to the amount of acid present in a solution, often expressed as a percentage of a specific acid, such as citric acid in the case of citrus fruits. It's determined by titrating the solution with a base until the acidity is neutralized. The titratable acidity can vary among citrus varieties and is influenced by factors like ripeness and growing conditions. The preprogrammed method is used in titrable Acidity In this method direct titration using 0.1M sodium hydroxide titrant

Materials:
1) Citrus juice sample
2) Sodium hydroxide (NaOH) solution of known concentration
3) Phenolphthalein indicator

4) BuretteErlenmeyer flask
5) Pipette
6) Distilled water

Procedure
Measure the volume of juice and dilute with conc. Sodium hydroxide solution .
⬇
Add few drops of Phenolphthalein indicator to the citrus juice in the flask.
⬇
Prepare burette with the sodium hydroxide solution.
⬇
Titrate slowly with sodium hydroxide solution. The Phenolphthalein indicator change the colour. when acid neutralize pink colour formed.

- The end point at pH is 8.3.
- The titrable acidity of the sample is 8.3.

4.Ascorbic Acid -
Ascorbic acid, commonly known as Vitamin C, is present in lemon juice, including hill lemon juice. Hill lemon juice refers to lemon juice obtained from lemons grown in hilly or mountainous regions. Lemon juice, regardless of its origin, contains varying amounts of ascorbic acid, which is known for its antioxidant properties and its role in supporting the immune system.

Equipment-
1. Iodine solution
2. Starch solution
3. Sample
4. Distilled water

procedure -
Take 5 ml of sample in the flask.
⬇
Dilute 150 ml of juice with water.
⬇
Add 4.5 ml of starch in sample juice.
⬇
Fill 50 ml of burette with iodine solution.
⬇
Titrate sample with iodine.
- The Blue colour is the end point of titration.Ascorbic Acid test is suitable for measuring. level of natural ascorbic Acid (vitamin c) Present in food or juice.

Impact of Preservation Techniques on Juice Quality Highlights.
Total Soluble Solids(TSS)
Over 180 days, the TSS contents of hill lemon juice ranged from 7.41 to 7.56°B.Regardless of treatment, the mean ascorbic acid content in hill lemon juice dropped dramatically over the 180-day storage period, from 34.16 to 18.66 mg/100ml.These results are consistent with research conducted in aonla juice11 over an eight-month storage period.
Optimal TSS levels in hill lemon juice are essential for consumer acceptance and satisfaction. Preservation techniques that effectively control microbial growth and enzymatic activity while preserving TSS contribute to prolonging the shelf life of the juice without compromising its quality.Continuous monitoring and optimization of preservation techniques are necessary to ensure consistent TSS levels in hill lemon juice, thus meeting consumer expectations for a high-quality and flavorful product. Additionally, research and development efforts focused on enhancing preservation methods can further improve juice quality and extend its shelf life while maintaining optimal TSS levels.
Result

Discuss the results obtained from the evaluation tests and their implications for the preservation of citrus hill lemon juice. Highlight the strengths and limitations of the preservation techniques employed and suggest recommendations for further improvement. Overall, the standardization of preservation techniques and evaluation tests for citrus hill lemon juice aims to ensure the availability of high-quality, shelf-stable juice with retained nutritional value and sensory attributes.

Conclusion

The study aimed to assess preservation techniques and quality parameters of hill lemon (Citrus pseudo Limón Tan.) . Boiling the juice with salt and mustard oil emerged as the most effective method, extending the shelf life to 10 months while maintaining sensory qualities. Organic preservation methods proved superior to ones in maintaining juice quality. Evaluation tests over a storage period of 180 days revealed consistent pH levels, organoleptic properties, and titrable acidity, while the ascorbic acid content declined significantly over time. These findings underscore the importance of regular evaluation to ensure product quality over extended storage periods.

Despite the success of the preservation method, limitations such as the decline in ascorbic acid content suggest room for improvement. Recommendations include further research into alternative organic preservatives to mitigate nutrient loss and exploring techniques to extend the retention of key nutrients. Overall, the study contributes valuable insights into the preservation of hill lemon juice, emphasizing the importance of standardized techniques and continuous evaluation to ensure high-quality, shelf-stable products with retained nutritional and sensory attributes.

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