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Review on development of ash gourd and basil juice followed by studies on processing and storage stability

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Abstract

The Ash Gourd (*Benincasa hispida*) is a widely cultivated vegetable throughout Asia, boasting medicinal properties that are yet to be fully exploited. Predominantly grown in South Asia, notably India, as well as in China and Japan, ash gourd is renowned for its rich nutritional composition. Abundant in essential vitamins, and minerals like sodium, and potassium, it offers an abundance of health benefits. This comprehensive review focuses on the utilization of ash gourd in the creation of vegetable-based beverages, with a particular Highlight on Enhancing its nutritional profile through the incorporation of basil extract. Basil, renowned for its aromatic compounds, serves to enhance the overall nutritional qualities of ash gourd, while also contributing to the taste enhancement of ash gourd juice when combined with lemon and sweetener. Moreover, this study aims to explore deeper into the nutritional values, medicinal properties, and phytochemical compositions of both ash gourd and Genovese basil, shedding light on their intrinsic relationship and potential collaborative effects. Through analysis, this research attempts to uncover new avenues for harnessing the health-promoting properties of ash gourd and basil beverages, Facilitating the way for innovative dietary interventions and therapeutic applications.

Keywords: Ash gourd (*Benincasa hispida*), Genovese basil, phytochemicals, nutritional values, vegetable-based beverage

1. Introduction

We often consume fruit-based juice rather than vegetable-based juice because fruit-based juices are more satisfying in terms of taste. However, enhancing the taste of vegetable-based beverages can increase their acceptability and make them a popular choice as it is rich in nutritional value and a good source of phytochemicals. Ash gourd can be consumed with a combination of other ingredients to make it more acceptable.

1.1 Introduction to Ash Gourd

Ash gourd, scientifically known as *Benincasa hispida* and part of the *Cucurbitaceae* family, is an annual climbing plant that is widely consumed in many countries, especially in South Asia. *Benincasa hispida* is a vine 80 cm long and with a width of 8 to 10 cm. Pandey, S., et al. (2007) [17]. Despite its high value and extensive use in traditional medicine, it remains under-utilized. It is frequently used in Ayurvedic preparations. Palamthodi et al., (2019) [9]. Also known as winter melon, Petha, Kundur, Kushmanda. Bhimkar et al., (2012) [5]. Ash gourd is one of the most naturally energizing foods. It can be used in various culinary dishes, including soups, curries, and desserts. Its mild flavour and colour enable it to absorb the flavours and colours of other ingredients, making it a versatile ingredient in a variety of culinary applications. Islam, M. T., (2021) [13]. Researchers examine the chemical composition and functional attributes, offering insights into the potential development of beverages with enhanced properties through the inclusion of ash gourd Shanooba Palamthodi., et al. (2019) [9]. Interest in consuming foods rich in antioxidants is growing as more individuals understand their potential in preventing chronic diseases. Kadam and Lele (2017) [1]. Vegetables, which are abundant in antioxidants, are highly prized for their capacity to counteract oxidative damage. By increasing the intake of vegetables in their daily meals, people can effectively lower their risk of developing such illnesses. Zheng et al. (2017) [14].

1.2 Introduction to Ash Gourd Preservation: Different preservation methods can be used depending on the requirements. One common approach is refrigeration, where the ash gourd is wrapped in plastic or cling film to prevent moisture loss.

Another method is canning or pickling, which involves submerging the ash gourd in a brine solution or vinegar-based liquid before storing it in a cool, dark place. Dehydration is effective, as removing moisture inhibits microbial growth, storing it in an airtight container in a cool, dry place for months. Maintaining hygiene is crucial, including washing the ash gourd before preservation and using sanitized utensils and containers. In India, products derived from ash gourds, such as candy and nuggets, are popular, though taste, acceptability, and nutritional content can vary among different varieties of ash gourd and it allows them to store for a longer time.

1.3 Nutritional Importance of Ash Gourd

Ash gourd is a nutritious vegetable with several health benefits. It is low in calories and fat, making it suitable for weight management. Key nutritional highlights include.

- **Vitamins:** Ash gourd is rich in vitamins such as vitamin C, B vitamins (thiamine, riboflavin, and niacin), and vitamin A, which support immune function, skin health, and overall wellness.
- **Minerals:** It contains essential minerals like calcium, phosphorus, iron, and potassium, which are crucial for bone health, muscle function, and blood pressure regulation (Souza, 2022).
- **Dietary Fiber:** High in dietary fiber, ash gourd aids digestion and helps prevent constipation. Fiber intake is also associated with a lower risk of chronic diseases, including heart disease and diabetes. Shanooba Palamthodi., *et al.* (2019)^[9].
- **Antioxidants:** The antioxidants in ash gourd may reduce the risk of chronic diseases. Antioxidant activity is often measured using the DPPH method (Kadam & Lele, 2017)^[1].

Including ash gourd in the diet can provide various health benefits.

1.4 Introduction of Genovese Sweet Basil

Sweet basil (*Ocimum basilicum* L.) is an economically important herb, particularly in the Mediterranean region. It is a staple in Italian cuisine, famously used in pesto sauce. As a member of the mint family (Lamiaceae), this aromatic herb can grow between two to three feet tall. Its large, tender green leaves have a bright, spicy-sweet flavor with hints of anise, cinnamon, cloves, and mint. The plant also releases a delightful fragrance when its leaves are touched. (Ullah, M. A., *et al.* 2023)^[4].

1.5 Nutritional Important of Genovese Sweet Basil

Sweet basil is a popular culinary herb that not only adds flavour to dishes but also offers various nutritional benefits. Sweet basil is a good source of vitamins, particularly vitamin K, vitamin A, and vitamin C. Vitamin K is essential for blood clotting and bone health, while vitamins A and C are important for immune function and overall well-being. It is rich in antioxidants, including flavonoids and phenolic compounds like rosmarinic acid. It contains essential oils like eugenol, linalool, and citronellol, which contribute to its distinct aroma and flavour. These oils may have antimicrobial and anti-inflammatory properties. Antioxidants help protect the body against oxidative stress and inflammation, potentially reducing the risk of chronic diseases. Al-Maskari, M. Y., *et al.* (2012)^[5].

The pharmacological potential of basil encompasses a wide range of activities, including anti-cancer, radioprotective, antimicrobial, anti-inflammatory, anti-stress, immunomodulatory, anti-diabetic, anti-pyretic, anti-arthritis, antioxidant, prophylactic, and cardiovascular protective effects. These diverse therapeutic properties highlight the significance of basil in traditional and modern medicine, making it a valuable resource for health and wellness. Perna, S., *et al.* (2022)^[6].

2. Literature review

2.1 Ash Gourd and its applications in various industries (Perna Gupta, Sivanand Chikkala *et al.* 2019)^[8] The study investigates the wide-ranging applications of ash gourd across food, pharmacology, and biochemical industries. The primary objective of the research is to offer a thorough insight into the versatile uses of ash gourd, emphasizing its importance beyond its conventional consumption. (Palamthodi *et al.*, 2019)^[9] Ash gourd can be transformed into various value-added products, including jam, ketchup, beverages, cakes, and ice cream.

2.2 Nutritional value of Ash Gourd

A study by Vyawhare (2024)^[9] on winter melon, commonly known as ash gourd, indicates that it is composed primarily of 90% water and is extremely low in calories, fat, protein, and carbohydrates. The vegetable is a good source of vitamins and minerals, including vitamin C and various B vitamins, such as niacin (vitamin B3), thiamine (vitamin B1), and riboflavin (vitamin B2). Additionally, it contains an array of micro and macro minerals, such as iron, sodium, potassium, zinc, calcium, magnesium, iodine, and manganese.

According to Sreenivas *et al.* (2013)^[1], vegetables from the gourd family are renowned for their rich mineral content and are extensively utilized in both culinary and medicinal applications. They are also excellent sources of dietary fiber, both soluble and insoluble.

Research by Pradhan *et al.* (2020)^[18] reveals that ash gourd contains protein levels ranging from 0.2% to 1.6%, and ash content between 0.4% and 0.8%. Its fat content is notably low, contributing less than 0.3% by weight of the edible portion. Micro-nutrients constitute a significant group of nutrients present in ash gourd.

2.3 Ash Gourd medicinal values and health-promoting factors

Pradhan *et al.* (2020)^[18] highlight that ash gourd contains essential vitamins and minerals necessary for various bodily functions. Vitamins are crucial for energy production, immune function, blood clotting, and other physiological processes, while minerals play significant roles in growth, bone health, fluid balance, and other vital functions.

According to Sreenivas and Lele (2013)^[1], ash gourd contains bioactive and therapeutic compounds such as phenolics, sterols, and glycosides. These compounds can be beneficial in treating epilepsy, ulcers, and other nervous disorders. The antacid properties of ash gourd help maintain body pH and counteract the acidity caused by certain foods. Additionally, ash gourd exhibits probiotic activity.

Majumdar *et al.* (2010)^[3] emphasize the medicinal properties of ash gourd fruits, which include antipyretic (fever-reducing), nootropic (cognitive-enhancing), antidepressant, appetite-suppressing, anxiolytic (anxiety-

reducing), anti-inflammatory, analgesic (pain-relieving), diuretic (increasing urine production), antioxidant, antihistamine, antidiarrheal, angiotensin-converting enzyme inhibitory (blood pressure-lowering), and gastroprotective activities.

3. Chemical composition and compounds present in Basil

3.1 Chemical Composition and Antimicrobial Properties of Sweet Basil Leaves

Joshi, R. K. (2014) ^[10] conducted a study to investigate the chemical composition and antimicrobial properties of sweet basil leaves. The research analyzed the compounds present in the leaves and assessed their effectiveness against various microorganisms. The results highlighted the potential antimicrobial benefits of sweet basil, revealing a diverse array of chemical constituents, including alkaloids, tannins, flavonoids, cholesterol, terpenoids, glycosides, phenols, cardiac glycosides, carbohydrates, and phlorotannins. Additionally, the study noted the extraction of essential oil from the leaves.

Phytochemicals and Various Compounds in Basil (*Ocimum basilicum*) Nadeem, H. R., (2022) ^[6] conducted a phytochemical analysis on *O. basilicum* leaves, which identified numerous compounds during screening tests. Prior studies on aqueous extracts of *O. basilicum*, traditionally used in folklore medicine, have reported the presence of alkaloids, saponins, flavonoids, steroids, terpenes, tannins, coumarins, and carbohydrates, findings consistent with recent analyses.

Soluble and Volatile Secondary Metabolism of Genovese Basil Zamljen, T., *et al.* (2023) ^[11] studied the effects of stressors, such as salinity, on basil plants, which significantly reduce agricultural yield. In this research, Genovese-type basil was exposed to 100 mM NaCl salt stress and treated with a biostimulant derived from hydrolyzed animal protein, applied both foliar and via nutrient solution. The biostimulant application through irrigation positively impacted primary metabolites in Genovese basil. Specifically, foliar application resulted in increased levels of glucose and ascorbic acid by 23.8% and 25.7%, respectively. Moreover, phenolic content increased significantly in both biostimulant-treated cultivars, with increments ranging from 73.3% to 628.9%, depending on the cultivar and treatment, enhancing basil production under saline conditions.

3.2 Processing and Preservation of Ash gourd juice

Curi, P. N., *et al.* (2017) ^[7]. Ash gourd juice preservation is quite challenging as the major hurdle associated with vegetable-based beverages is preservation. Due to the high pH of the vegetable juices, they are highly prone to microbial contamination. Moreover, vegetables like ash gourd and bottle gourd produce colourless and flavourless juices. Thus, it is ideal to blend these juices with some tropical-coloured fruit juices. This will enhance the shelf-life as well as the aesthetic properties of the beverage. Further, various studies showed that blending enhances the sensory as well as the nutritional quality of the beverages. Incorporation of other juice in ash gourd is suitable as it helps to enhance the flavour and aroma of the juice and it makes it a suitable choice.

Majumdar, T. K., *et al.* (2010) ^[3] A study was conducted on a beverage made from blending ash gourd (*Benincasa*

hispidia) and mint leaves (*Mentha spicata*). The physicochemical, microbiological stability and sensory characteristics of this juice blend were evaluated over six months at room temperature (28 °C). During the storage period, there were slight changes in the pH, total soluble solids, and total acidity of the juice.

Juice was aseptically processed by use of heat treatment sterilized at 95 °C and Blanching were done at 100 °C for 2 min. Packaged in six-layered tetra packs, have shown stability for up to six months which is longer. While some changes are seen in the juice as longer storage time it reduces the vitamin C and β -carotene. However, their exceptional nutritive and therapeutic value presents significant potential for processing into various high-quality products. It shows that with heat treatment shelf life can be enhanced and juice is microbiologically safe to consume. Food processing and preservation help to prevent fruit and vegetable loss and make it available all over the season.

4. Conclusion

The study on the development of ash gourd and basil juice, along with investigations into its processing and storage stability, highlights several key findings and implications.

Firstly, ash gourd (*Benincasa hispida*) is an underutilized vegetable with significant nutritional and medicinal properties. It is rich in vitamins, minerals, dietary fiber, and antioxidants, making it an excellent candidate for health-promoting beverages. However, its bland taste and high pH pose challenges in consumer acceptance and preservation.

The incorporation of basil (*Ocimum basilicum*), known for its aromatic compounds and numerous health benefits, enhances the flavor and nutritional profile of ash gourd juice. Basil contributes essential oils, vitamins, and antioxidants, which improve the sensory qualities and potential health benefits of the beverage.

Processing techniques such as heat treatment and blending with other fruit juices have been shown to improve the stability, flavor, and shelf life of ash gourd juice. Studies indicate that these methods can maintain the juice's microbiological safety and nutritional quality over extended storage periods.

Overall, the combination of ash gourd and basil presents a promising avenue for the development of a nutritious, appealing, and stable vegetable-based beverage. This research not only contributes to the understanding of the functional properties and preservation of such juices but also opens up possibilities for innovative dietary interventions and therapeutic applications.

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