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Original Article**Paneer Prepared by Incorporation of *Hibiscus rosa-sinensis* Petals: An Antioxidant Rich Functional Food****Arul Prasath S¹, Kasthuri S² and Dhanvadhini B³**¹Intern-B.V.Sc & AH, Rajiv Gandhi Institute of Veterinary Education and Research, Puducherry²Assistant Professor, Department of Livestock Products Technology, Rajiv Gandhi Institute of Veterinary Education and Research, Puducherry³PhD Scholar, Department of Veterinary Pharmacology and Toxicology, Madras Veterinary College, Chennai*Corresponding author: dhanu2301vet@gmail.com

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INTRODUCTION

Paneer is one of the most widely consumed traditional dairy products in many countries, especially in South Asia. It is a fresh, non-fermented cheese prepared by coagulating milk using food acids such as lemon juice, citric acid and vinegar. Paneer is highly valued for its high-quality protein, calcium, fat, and essential nutrients. Because of its soft texture and neutral flavour, paneer can easily be enriched with natural plant ingredients to improve its nutritional and functional properties. In recent years, researchers have explored the incorporation of hibiscus (*Hibiscus rosa-sinensis*) petals into paneer to enhance its sensory qualities, antioxidant activity, and medicinal value. Hibiscus flowers are widely available in tropical regions and are known for their attractive red colour and rich phytochemical composition. When added to paneer, hibiscus petals can improve both the appearance and health benefits of the product.

Hibiscus petals as a functional ingredient

Hibiscus petals contain several important bioactive compounds including anthocyanins, polyphenols, flavonoids, organic acids, and vitamins. Anthocyanins are natural pigments responsible for the red colour of hibiscus flowers. Polyphenols and phenolic acids act as powerful antioxidants, while flavonoids possess anti-inflammatory and protective biological effects. These compounds provide both nutritional and medicinal benefits, making hibiscus a valuable functional ingredient in paneer production (Ali et al., 2023).

Antioxidant Activity and Phenolic Compounds present in Hibiscus petals:

Hibiscus petals are particularly rich in phenolic compounds and antioxidants which play an important role in protecting the human body from oxidative damage. Phenolic compounds are plant-derived molecules containing hydroxyl groups attached to aromatic rings that provide strong antioxidant properties. Important phenolic compounds present in hibiscus include caffeic acid,

chlorogenic acid, ferulic acid, and gallic acid (Dwivedi and Jain, 2023). The petals also contain flavonoids such as quercetin, kaempferol, and myricetin which contribute significantly to antioxidant activity. Hibiscus flowers also contain anthocyanins, particularly cyanidin-3-sophoroside and cyanidin-3,5-diglucoside. These pigments are responsible for the characteristic red colour of hibiscus petals and possess strong free radical scavenging ability. In addition, hibiscus contains Vitamin C (ascorbic acid), an important antioxidant nutrient that supports immune function and protects body cells from oxidative damage. These antioxidant compounds benefit human health by neutralizing free radicals produced during normal metabolic processes. Phenolic compounds donate electrons or hydrogen atoms to stabilize these radicals, thereby preventing cellular damage and reducing oxidative stress (Sabalpara *et al.*, 2025).

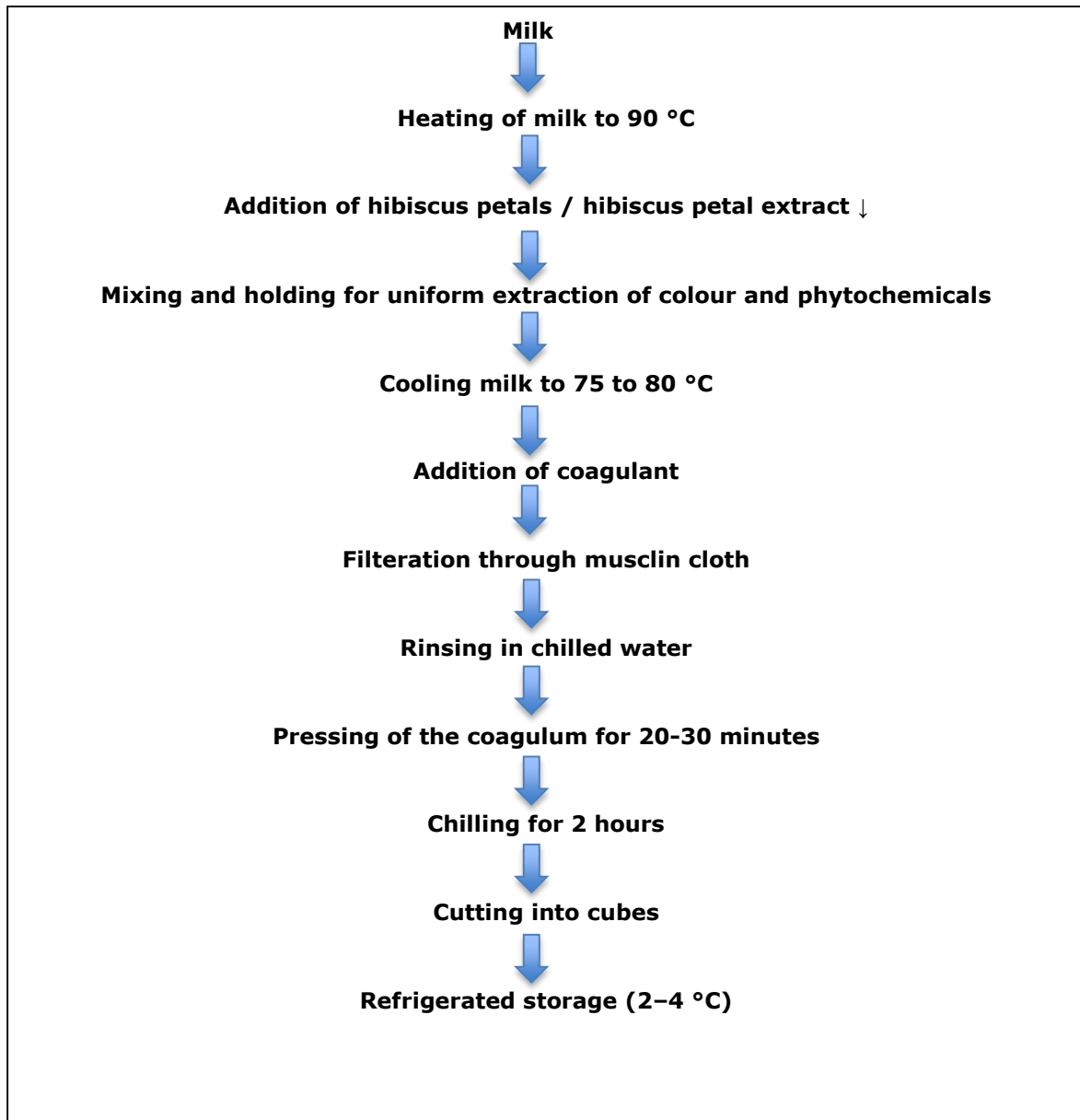
Phenolic antioxidants also help improve cardiovascular health by preventing oxidation of LDL cholesterol which contributes to plaque formation in blood vessels. Many phenolic compounds additionally possess anti-inflammatory properties. The antioxidant activity of hibiscus phenolics is also explained through biochemical mechanisms such as DPPH radical scavenging activity, inhibition of lipid peroxidation, and metal ion chelation. When hibiscus petals are incorporated into paneer, milk proteins such as casein interact with phenolic compounds and help stabilize them, improving their bioavailability and allowing hibiscus-fortified paneer to function as an antioxidant-rich functional food.

Antimicrobial Effect

Hibiscus extracts possess antimicrobial properties that inhibit the growth of spoilage microorganisms. Paneer fortified with hibiscus extract often shows lower microbial counts which can help improve storage stability.

Anti-diabetic and Cholesterol-Lowering Effects

Studies suggest that hibiscus phytochemicals may exhibit hypoglycemic and hypolipidemic effects, helping regulate blood sugar levels and improve lipid metabolism.



Incorporation of Hibiscus in Paneer Preparation

Paneer prepared with hibiscus extract shows improved antioxidant activity, enhanced colour, and better flavour (Sabalpara *et al.*, 2025).

Effect on taste and sensory quality of Paneer

The incorporation of hibiscus petals or their extract into paneer improves appearance, flavour and overall acceptability. Hibiscus imparts a mild fruity and slightly tangy flavour along with an attractive pinkish or reddish colour, which increases consumer appeal. Research studies on hibiscus-fortified paneer have shown that moderate levels of hibiscus extract enhance flavour, colour, texture and overall sensory scores when evaluated by sensory panels. However, very high concentrations

may increase acidity and produce a stronger colour, which can affect sensory acceptability. Therefore, optimum levels of incorporation are important for maintaining desirable taste and texture.

CONCLUSION

The incorporation of hibiscus petals in paneer represents an innovative approach for developing functional dairy foods with enhanced health benefits. Hibiscus improves sensory qualities, antioxidant capacity, and medicinal value due to the presence of phenolic compounds, flavonoids, anthocyanins, and Vitamin C. These compounds help protect the body from oxidative stress and support overall health. Further studies is required on the development and quality evaluation of dairy products incorporated with natural additives.

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