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Development of Naturally Coloured Tutti Frutti Using Plant-Based Pigments

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Tutti Frutti is a popular candied fruit product traditionally prepared from immature or raw papaya (*Carica papaya* L.) fruits due to their firm texture, neutral flavour, excellent sugar absorption capacity, and year-round availability. In the recent day's watermelon rind also gaining popularity for preparation of Tutti Frutti. In case of watermelon the pulp should be removed entirely and peel the outer green part of the rind for making the product. The product is manufactured by cutting raw papaya/watermelon rind into small uniform cubes followed by blanching, osmotic dehydration, impregnation with concentrated sugar syrup, colouring, drying, and packaging. The final product possesses an attractive appearance, chewy texture, sweet taste, and fruity flavour, making it widely utilized in bakery and dairy industries for the preparation of cakes, cookies, breads, biscuits, ice creams, chocolates, sweets, desserts, and confectionery products.

In India, Tutti Frutti preparation serves as an important value-addition technology for post-harvest utilization of papaya and watermelon which helps in minimizing wastage of horticultural produce.

However, most commercially available Tutti Frutti products are prepared using synthetic colours and chemical additives. Continuous consumption of artificial food colours has been associated with various health concerns such as allergic reactions, hyperactivity, and other adverse effects like cancers etc, increasing consumer awareness regarding food safety and clean-label products has created a growing demand for naturally coloured confectionery products.

Therefore, the development of naturally coloured Tutti Frutti using safe plant-based pigments offers a promising alternative for producing healthier, eco-friendly, and consumer-acceptable value-added products.

Raw materials required for preparation:

The following raw materials are required for the preparation of tutti frutti. Selection of good quality raw materials plays an important role in obtaining a superior product with desirable colour, texture, taste, and shelf life.

1. Raw Papaya or Watermelon Rind

Immature raw papaya (*Carica papaya* L.) is the most commonly used raw material for tutti frutti preparation due to its firm texture, neutral flavour, and excellent sugar absorption capacity. The fruit should be fresh, mature but unripe, free from diseases, bruises, and mechanical damage.

Watermelon rind (*Citrullus lunatus*) can also be used as an alternative raw material. The white inner rind portion possesses a firm texture suitable for candying and value addition. Utilization of watermelon rind also helps in reducing food waste and improving by-product utilization.

2. Sugar

Refined white sugar is used for the preparation of sugar syrup during osmotic dehydration. Sugar acts as a sweetening agent, preservative, and texture improver. It also helps in increasing the shelf life of the product by reducing moisture availability.Sugar requirement is 300-400g for 500g papaya or watermelon rind

3. Water

Clean and potable water is required for washing, blanching, and preparation of sugar syrup. Water quality significantly affects the hygiene and safety of the final product.

4. Natural Food Colours

Food colours are extracted naturally from plants and added to improve the visual appearance and consumer acceptability of tutti frutti. Different colours such as red, green, yellow, and orange are commonly used to produce an attractive multi-coloured product.

5. Citric Acid

Citric acid is added in small quantities @ 0.1-0.2% to improve flavour, maintain acidity, prevent crystallization of sugar, and enhance the overall stability of the product.

Equipment Needed

The following equipment and utensils are commonly used in the preparation of tutti frutti at laboratory, household, and industrial levels.

1. Knife, Peeler, and Cutting Board

These are used for peeling the raw papaya or watermelon rind and cutting them into small uniform cubes of desired size.

2. Boiling Vessel

A stainless steel boiling vessel is used for blanching the fruit cubes and preparing sugar syrup. Stainless steel vessels are preferred to maintain hygiene and prevent contamination.

3. Strainer

A strainer is used to separate blanched fruit cubes from hot water and to drain excess syrup during processing.

4. Drying Trays or Tray Drier

Drying trays are used for sun drying or air drying of the prepared tutti frutti. In industrial processing units, tray driers are employed for controlled drying under hygienic conditions to achieve uniform moisture removal.

5. Boiler

A boiler is used for heating water and preparing concentrated sugar syrup required during osmotic processing.

6. Packaging Machine

Packaging machines are used to pack the final product in moisture-proof and airtight containers or pouches. Proper packaging helps in maintaining quality, preventing microbial contamination, and increasing shelf life.

Step 1: Selection of Raw Papaya or Watermelon Rind:

Fresh, mature, and unripe papaya fruits were selected for the preparation of tutti frutti. The selected fruits were firm in texture with green outer skin and free from bruises, diseases, or mechanical damage. Overripe or partially ripened fruits showing yellow coloration or soft texture were avoided to ensure better product quality and texture retention during processing. The watermelon rind should be thick and with a firm, crisp white layer. Avoid over ripe or soft melons.

Step 2: Peeling and Cutting

The selected papaya fruits were peeled manually using a stainless-steel knife or peeler or mechanically by using papaya peeler, later cut into halves and seeds were removed completely. The edible portion of papaya was then cut into small, uniform cubes to facilitate uniform blanching, sugar absorption, and drying during subsequent processing operations. Uniform cube size is essential for obtaining a consistent texture and appearance in the final product. In the case of watermelon rind, the outer green peel and the inner red fleshy portion were removed carefully, retaining only the white rind portion suitable for candying.


Step 3: Blanching

The prepared cubes were blanched in boiling water for approximately 5–10 minutes at 850C-100oC. Blanching helps in softening the tissue, reducing raw flavour, inactivating enzymes, and improving sugar penetration during candying. After blanching, the cubes were immediately drained using a strainer to remove excess water before further processing.

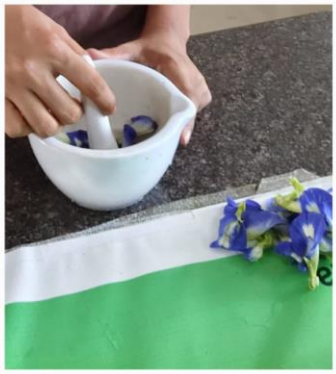
Step 4: Sugar Syrup Preparation and Candying Process


Sugar syrup was prepared by dissolving sugar and water in a 1:1 ratio and heating the mixture until complete dissolution of sugar was achieved. The blanched papaya or watermelon rind cubes were immersed in the sugar syrup and allowed to soak for 24 hours. The concentration of sugar syrup was gradually increased over a period of 2–3 days by the addition of sugar followed by reheating. This process facilitates osmotic dehydration and enables gradual absorption of sugar into the fruit tissues.

The candying process was continued until the cubes became translucent, indicating sufficient syrup penetration and preservation.

Step 5: Natural Colour Extraction and Colouring

Preparation of Natural Blue Colour Extract from Butterfly Pea Flower

Fresh or dried butterfly pea flowers (*Clitoria ternatea*) were collected and cleaned properly to remove dust and foreign materials. Approximately 5–10 g of flowers were immersed in 100ml hot water (80–90°C) for 10–15 minutes. During extraction, the anthocyanin pigments present in the petals were released into the water, producing a deep blue-coloured extract. Anthocyanins are natural water-soluble pigments responsible for the characteristic blue coloration of butterfly pea flowers. The mixture was stirred gently to facilitate maximum pigment extraction. After sufficient extraction, the solution was filtered using a muslin cloth or fine strainer to remove flower residues and obtain a clear blue extract.

The filtered extract was then cooled to room temperature before being added to the candied cubes. The cubes were mixed carefully to ensure uniform coating and absorption of the natural blue colour. The intensity of the colour can be adjusted by varying the concentration of flower extract or duration of soaking.

Preparation of Natural Red Colour Extract from Rose Petals

Fresh rose petals free from pesticide residues and physical damage were selected and washed thoroughly with clean water. The 10g petals were soaked in 100ml warm water (petal-to-water ratio of 1:10 w/v) and gently heated for 10–15 minutes to facilitate extraction of natural pigments.

The extracted solution containing natural anthocyanin and flavonoid pigments was filtered to obtain a clear red-coloured extract. The filtrate was cooled and added to separate portions of candied cubes followed by thorough mixing to achieve uniform coloration.

Advantages of Natural Colour Extraction

- Provides attractive and appealing natural colours
- Reduces dependence on synthetic food colours
- Enhances consumer preference toward natural products
- Butterfly pea flower extract contains natural antioxidants such as anthocyanins
- Improves market value and acceptability of the final product

Colouring

The candied papaya or watermelon rind cubes were divided into separate portions for the incorporation of different natural colours. Natural pigments were utilized to enhance the visual appeal, improve consumer acceptability, and minimize the use of synthetic food additives. The cubes were mixed thoroughly with the prepared natural colour extracts to ensure uniform distribution of colour throughout the product.

Step 6: Drying

The coloured cubes were removed from the sugar syrup and dried either under sunlight or in a tray drier/hot air oven maintained at 50–60°C.

Drying was continued until the cubes attained a firm, non-sticky texture with reduced moisture content suitable for storage. Proper drying is essential to improve shelf life and prevent microbial spoilage.

Step 7: Packing and Storage

The dried tutti frutti cubes were cooled to room temperature and packed in airtight moisture-proof containers or packaging materials. The thickness of planting material should be 2mm.

The packaged product was stored in a cool and dry place away from moisture and direct sunlight to preserve colour, texture, flavour, and shelf stability during storage.

Precautions

- Maintain hygiene
- Avoid overcooking
- Ensure proper drying to prevent spoilage (fungal or mould growth)

Conclusion

The preparation of tutti frutti using natural colours such as blue from *Clitorea ternatea* and red colour using rose petals is a successful healthy alternative to synthetic dyes, producing candied fruit that is visually appealing, delicious, and free from chemical additives. It not only enhances the health profile of the tutti frutti but also aligns with sustainable food preparation.