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Kinnow Peel: Solution to Medical Textile

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INTRODUCTION

Kinnow mandarin (*Citrus reticulata*), a hybrid of King and Willow leaf is grown in northern states of India, mainly Haryana and Punjab. In the process of juice extraction from kinnow fruit, 30–34% of peel is generated from a number of fruit processing industries and fruit vendors which has been recognized as the richest source of bioactive compounds with comparatively higher polyphenol content compared to other fractions of fruit. Studies have shown that in most fruits, a significant proportion of the substances showing biological activity are found in the peel, and not in the commonly consumed pulp. Examples include the peels of citrus fruits, apples, grapes, and berries, whose peel is the main source of natural antioxidants The amounts and types of bioactive compounds and their antioxidant power are highly diverse and depend on the species of fruits, its variety, or the part of the fruit, as well as on climatic and cultivation conditions. In order to take full advantage of the benefits of citrus fruits, it is very important to analyse their composition. Knowledge of the chemical composition of the citrus peel, pulp, and whole fruit may encourage their use in the different industries such as food, textile and pharmaceutical industries, hence the need for this type of research.

Chemical Composition of kinnow fruit peel:

Composition	Peel
Moisture (%)	77.47
Ash (%)	0.49
Crude protein (%)	0.67
Crude fat (%)	1.55
Crude fiber (%)	0.64
Potassium (ug/100g)	152.33
Magnesium (ug/100g)	108.45
Calcium (ug/100g)	85.30
Sodium (ug/100g)	176.30
Iron (ug/100g)	8.52
Zinc (ug/100g)	4.44
Copper (ug/100g)	0.34

Nutritional Composition of kinnow fruit peel:

Composition	Peel
Total solid (%)	22.45
TSS (%)	12.50
Ascorbic Acid (%)	41.57
Acidity (%)	1.38
Reducing sugar (%)	5.99
Total sugar (ug/100g)	6.24
Ash (ug/100g)	0.67
Carotenoids (ug/100g)	13.67
B-carotene (ug/100g)	7.43
Pectin (ug/100g)	1.85
Fat (ug/100g)	0.77

Furthermore, the essential oils found in the flavedo layer of kinnow peels are high in carotenoids, terpenes, and linalool and it has been suggested by several researchers that these bioactive chemicals have antibacterial and antioxidant capabilities. As a result, the fruit peel contains a higher concentration of phenolics and has a greater potential for beneficial components than the fruit pulp. Peel was used to extract polyphenol compounds and make value-added goods since it is a potential source of phenolic compounds with functional, antioxidant, and antibacterial characteristics.

Times to turn waste into value added product:

Increasing health awareness around the globe is creating a demand for antimicrobial textiles. Growth of microorganisms can damage the textile material and produce an unpleasant odour, allergies, and infections. To prevent these effects, textiles are being treated with antimicrobial agents. In recent years, natural antimicrobial agents for the development of functional fabrics with antimicrobial properties are being explored.

The major use of the antimicrobial was in the medical and the pharmaceutical industry. However, newer applications are possible. The textile fibers are these days increasingly treated with antimicrobial reagents. The use of kinnow fruit peel has improved the efficiency of some of the present use antimicrobial agents and reduced the environmental issues associated with these agents (such as toxicity and washing durability) and exhibit excellent antimicrobial property versus microorganisms.

Thus, it is capable to imparts the ability, to textile substrate, to inhibit the growth (-static) or reproduction of at least some types of microorganisms or to kill (-cidal) at least some types of microorganisms. Therefore, an antimicrobial finish should be capable to kill the microbes by breaching the cell wall or alter cell membrane permeability, obstructing the synthesis of proteins of microbes, blocking enzyme production necessary for microbes' food.

Necessasity of Antimicrobial finish:

a) To control microorganism growth on fabric.
b) Controlling the spread of disease and the risk of infection after an accident
c) In order to limit the possibility of cross contamination from ward to ward in the hospital
d) Mildew destruction of textiles, particularly natural fibre fabrics, must be controlled.
e) To eliminate odours caused by perspiration, stains, and other filth on textiles

CONCLUSION

Citrus fruit leftovers, which are typically dumped as garbage in the environment, have the potential to be used as functional finish

materials. Such wastes are capable of providing a considerable low-cost antibacterial finish to textile substrates due to their low cost and accessible availability. The use of these bioactive-rich citrus residues could provide an efficient, low-cost, and environmentally friendly platform for developing new finishes or improving existing ones. The extracts from fruit peel hold promise in textile industry as sources of bioactive compounds. Furthermore, a well-established usage of the citrus peel would aid in the reduction of pollution issues caused by improper disposal of such wastes.

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