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Biopolymer based edible coating for enhancing the shelf life of horticulture products

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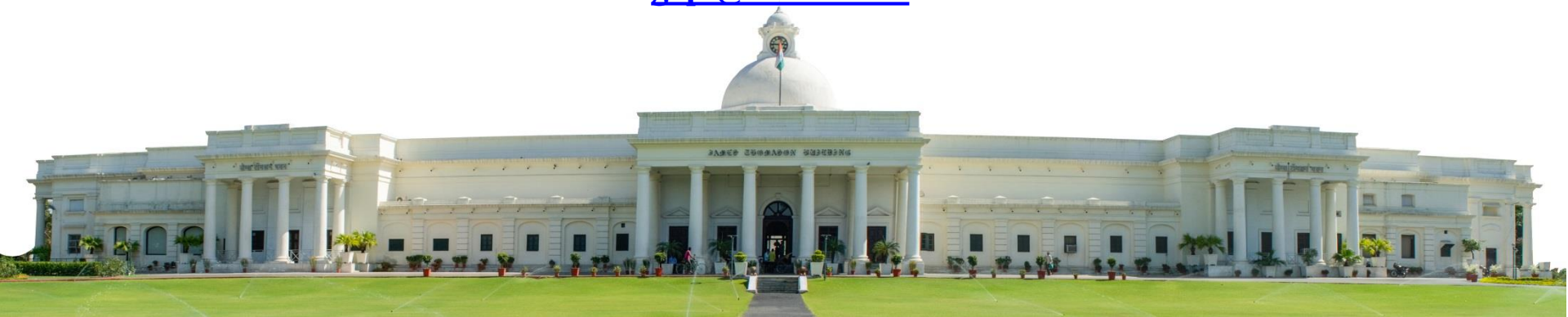


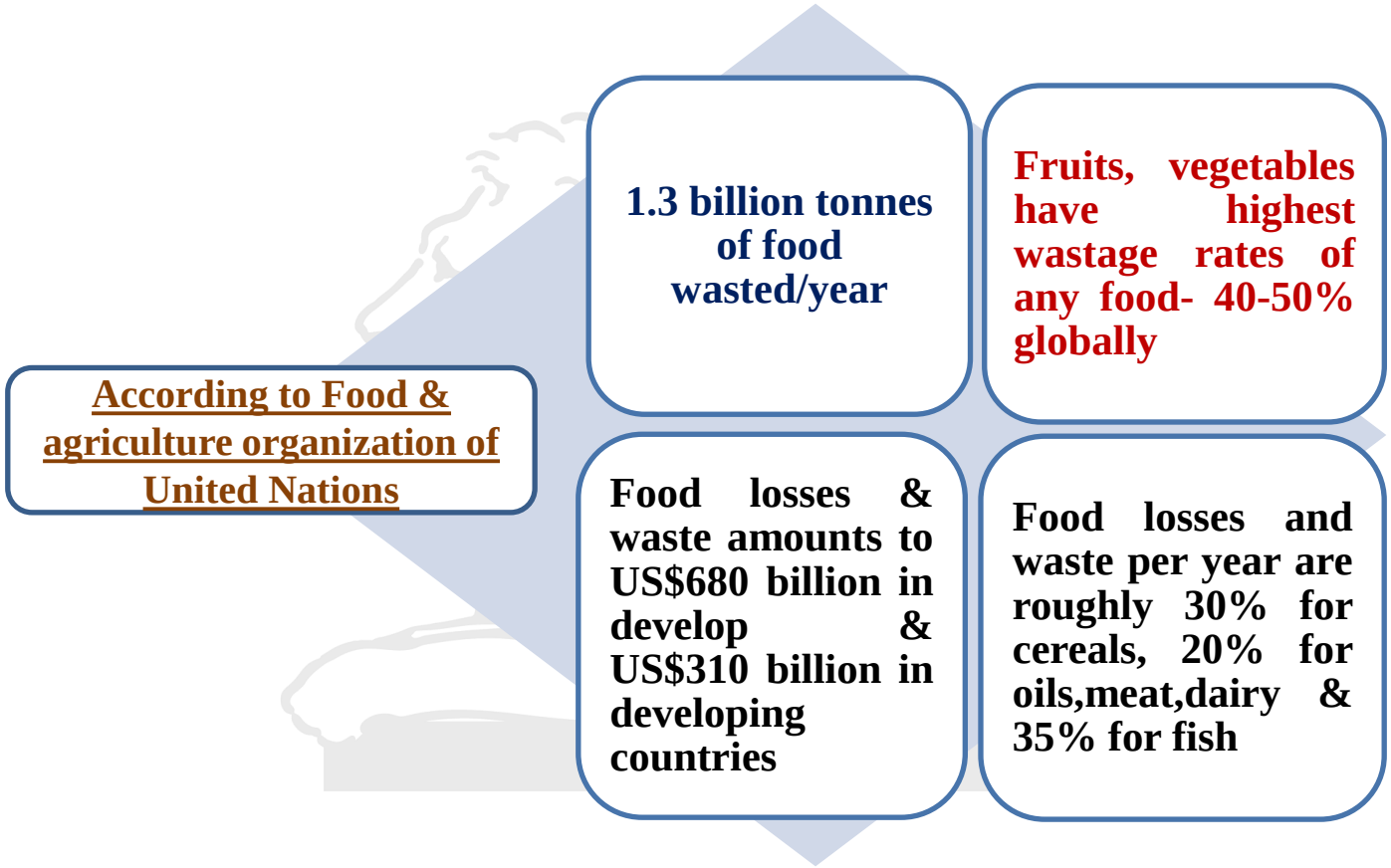
Problems Identification

18% of fruits and vegetables wasted annually in India

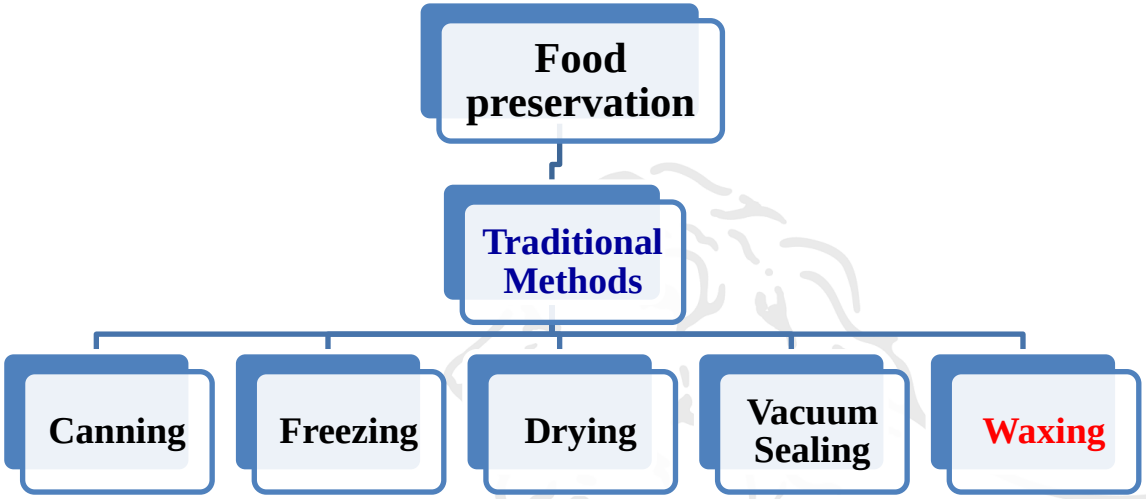
https://citytoday.news/half-of-milk-fruit-vegetable-production-in-india-go-waste-study/

Introduction

Food losses- along production and supply chains, including post-harvest losses.



The amount of food lost or wasted every year is equivalent to more than half of the world's annual cereals crop (2.3 billion tonnes in 2009/2010).

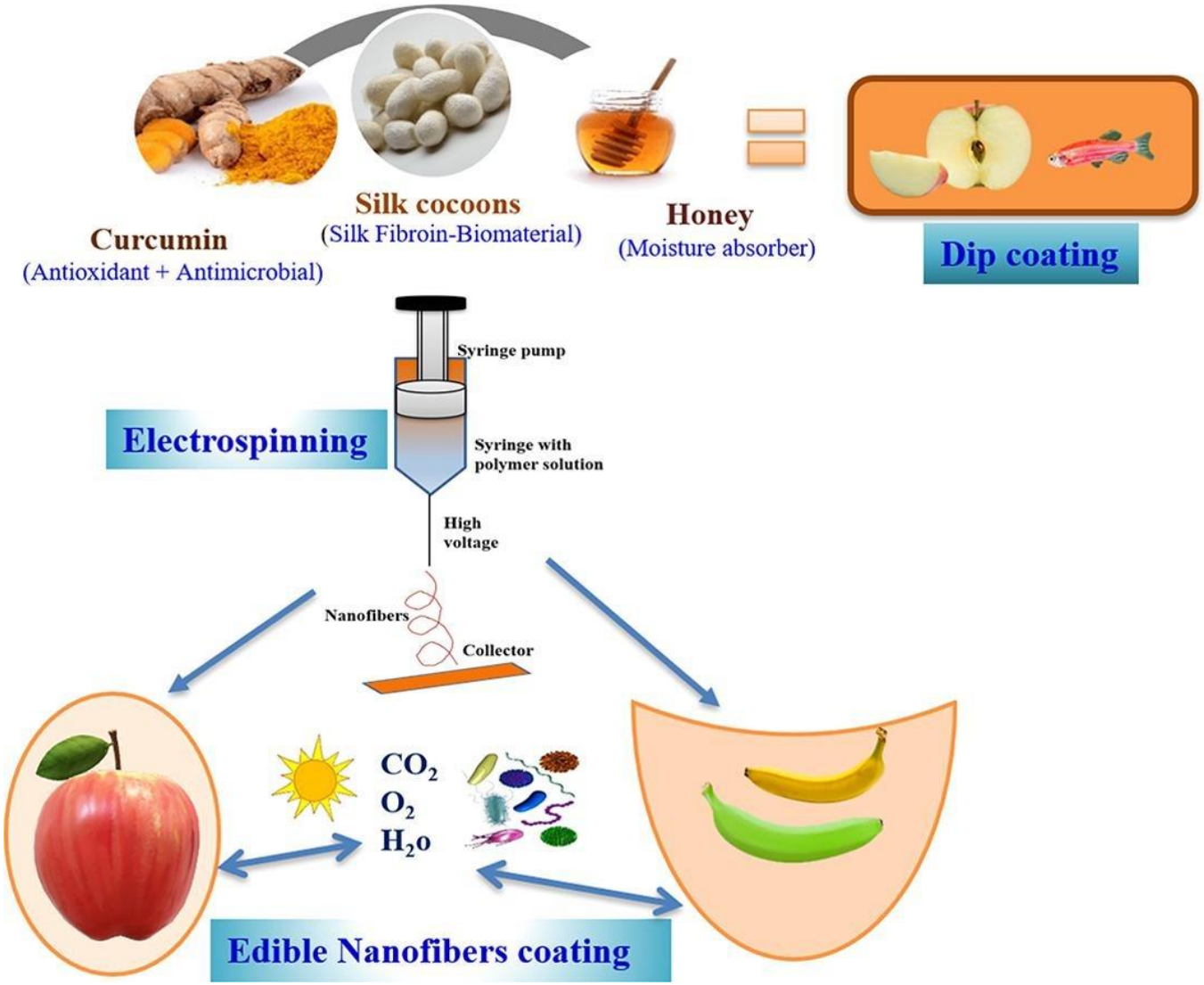


http://giditube.net/news/apple-coated-with-wax-are-being-sold-all-over-the-world-are-they-safe/

Time consuming, loss of nutrients content, change of taste and texture

In most fruit waxes are mixed with *morpholine* and its derivatives (MAID) to ensure that they are applied thinly and evenly. In the presence of nitrate, contained in diet, morpholine can be chemically nitrosated to form N-nitro-so-morpholine (NMOR) a potent carcinogenic compound.Risk to damage of kidneys ,liver ,causes allergies

Overview



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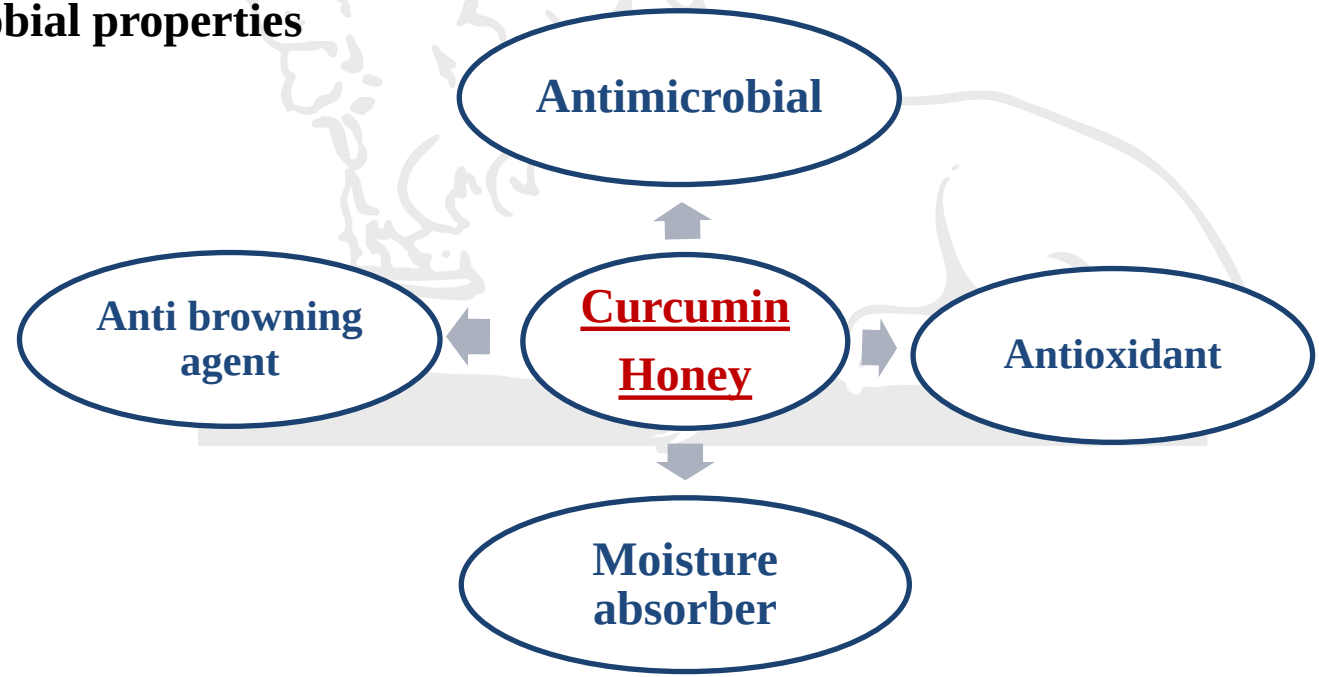
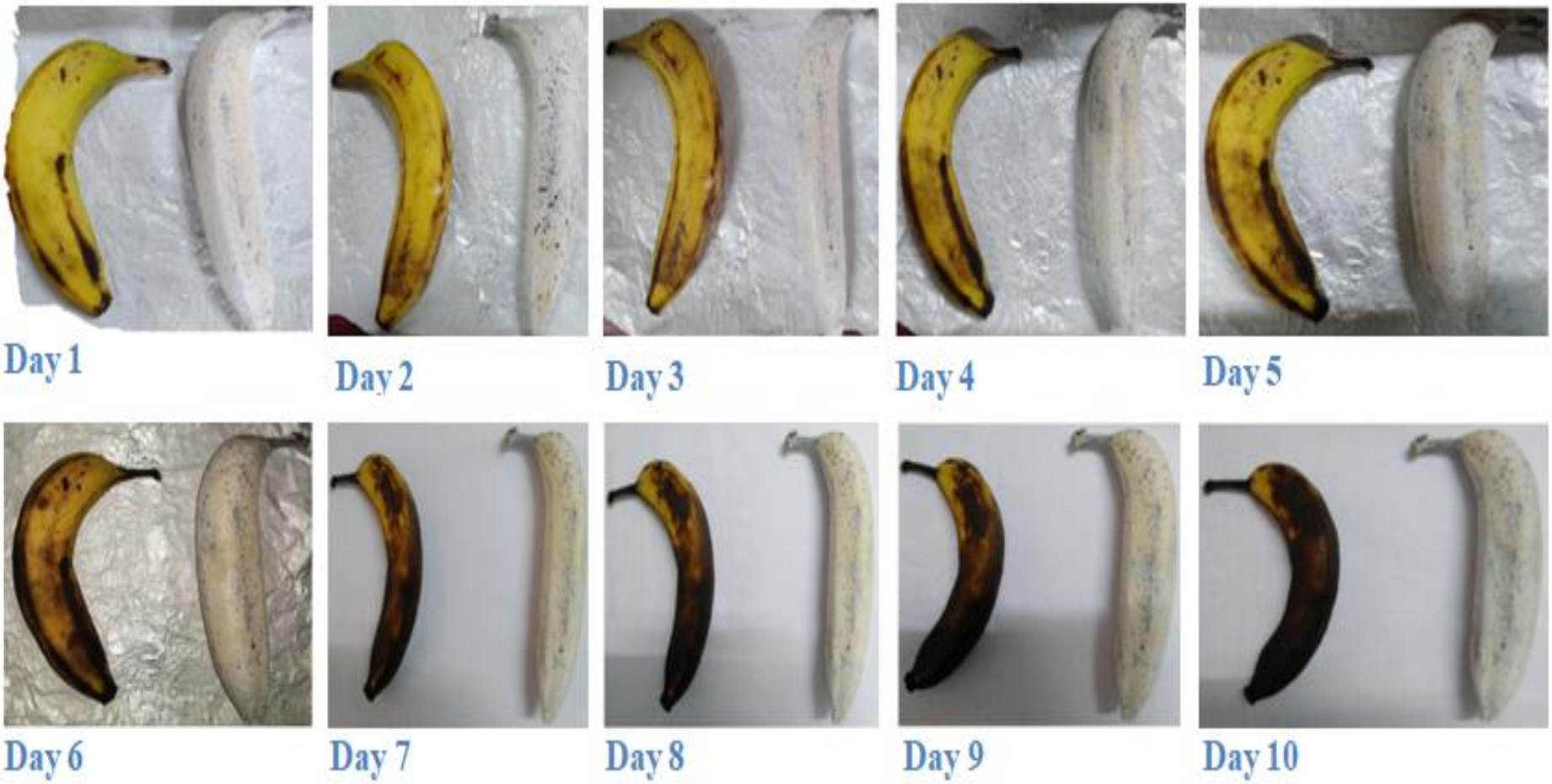
Why Silk Fibroin , Curcumin & Honey?

- Silk fibroin (SF) is a protein polymer possessing strong mechanical properties
- SF is hydrophobic in nature which makes it an ideal polymer for coating
- SF is FDA approved & being a protein it adds extra nutrition to the fruits and vegetables
- In addition to it SF is biodegradable, biocompatible and thermally stable
- Turmeric contains a compound name curcumin which has excellent antioxidant and antimicrobial properties



Time lapse study of Banana coated with SFNFs loaded with Honey



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Time lapse study of raw banana coated with SFNFs loaded with Honey and Nano-curcumin

Day 1

Day 3

Day 9

Day 12

Day 15

Day 18

Day 21

Fungal growth

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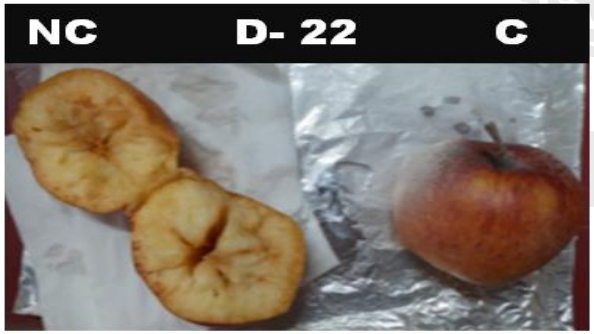
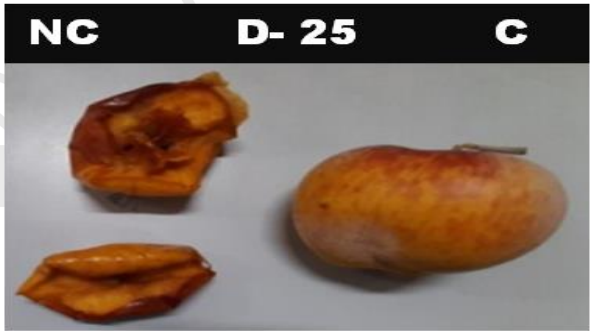
Time lapse study of Apple





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Weight % loss

Fruit	Initial wt. gm	Final wt. in gm	Wt.% loss
Coated Banana	69.15	60.14	13.02%
Uncoated Banana	61.17	45.60	25.45%
Coated Apple	93.82	78.15	16.70%
Uncoated	95.71	29.46	69.21%

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Time lapse study of apple slice with dip coating of Aq. SF blend with nano-curcumin and honey

After 4 days

Uncoated slice wt % loss = 67.2%

Coated Slice wt % loss = 30.6%

Uncoated apple slice turns brown & size decreases due to loss of water content

Left side- without dip coating

Right side – Dip coating

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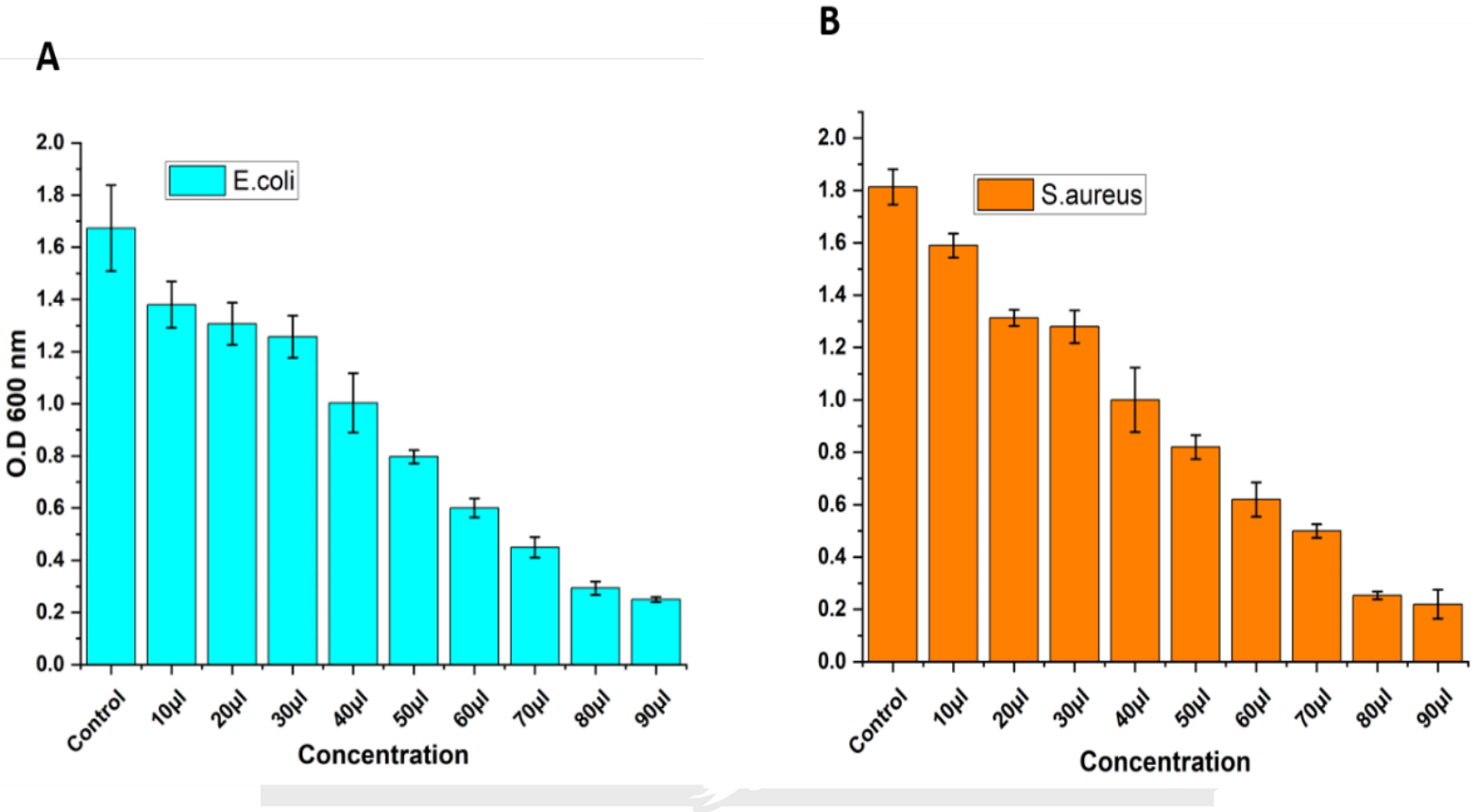
Antibacterial studies



The antibacterial study using UV-vis spectrophotometer at an optical density (O.D) of 600 nm (A) *E.coli* (B) *S.aureus*

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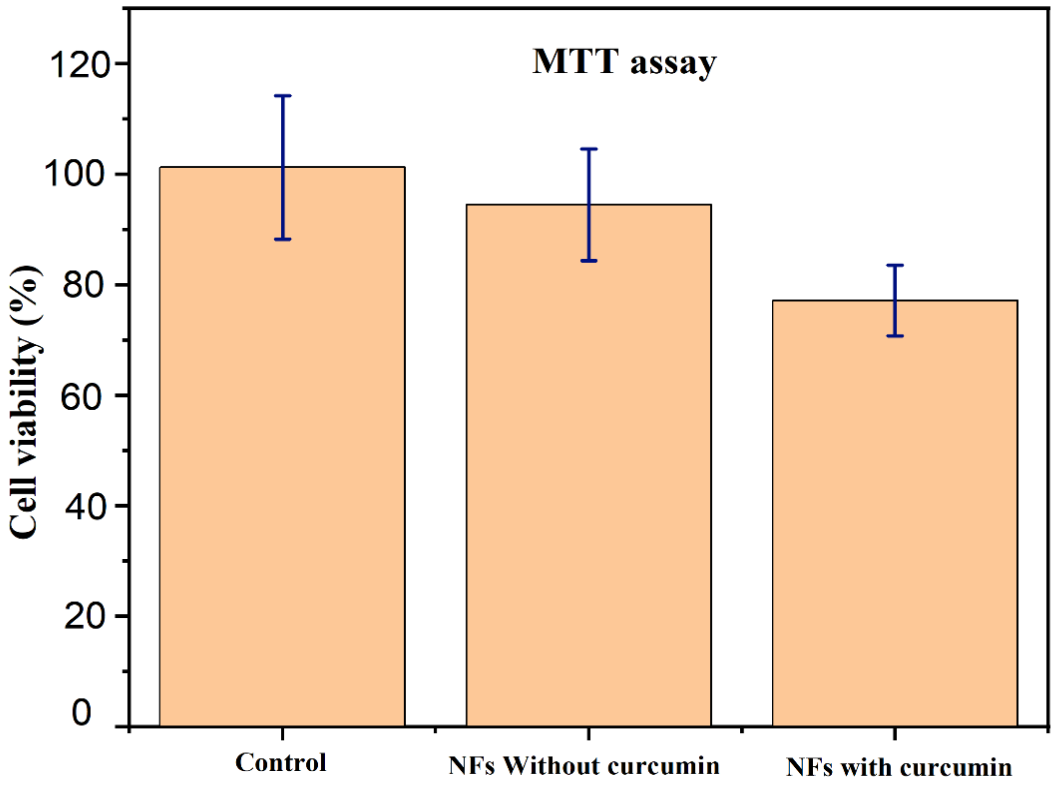
Cytotoxicity test



Cytotoxicity test (MTT assay) performed on T3T mouse embryonic cell lines illustrates the cell viability % with or without curcumin (250 µg/mL) w.r.t. control

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Conclusion

- All the ingredients used in the synthesis of composite nanofibers are FDA approved.
- The edible coating of nanofibers on perishable fruits enhances the shelf-life of fruits and vegetables.
- It maintains the texture, stiffness and taste for prolonged time (almost doubles the shelf-life)
- Honey was able to work as a moisture absorber.
- Nano-curcumin possesses antimicrobial and antioxidant property .
- The edible coating adds extra nutrition to the food.

Thanks….