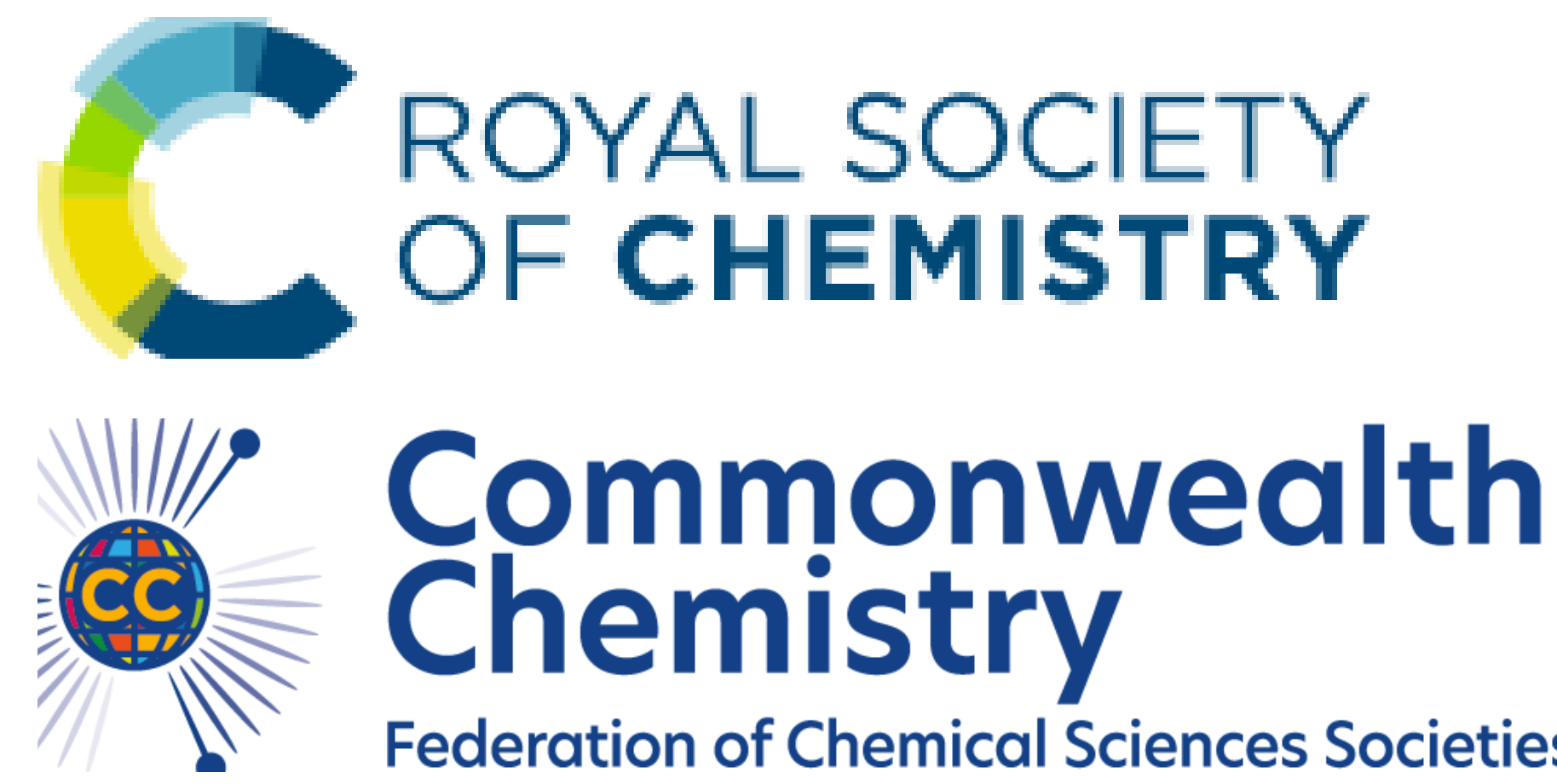




Sustainable Food Packaging Using Fish Scales and Corn Silk : Biodegradable Antimicrobial Films with Dombeya wallichii

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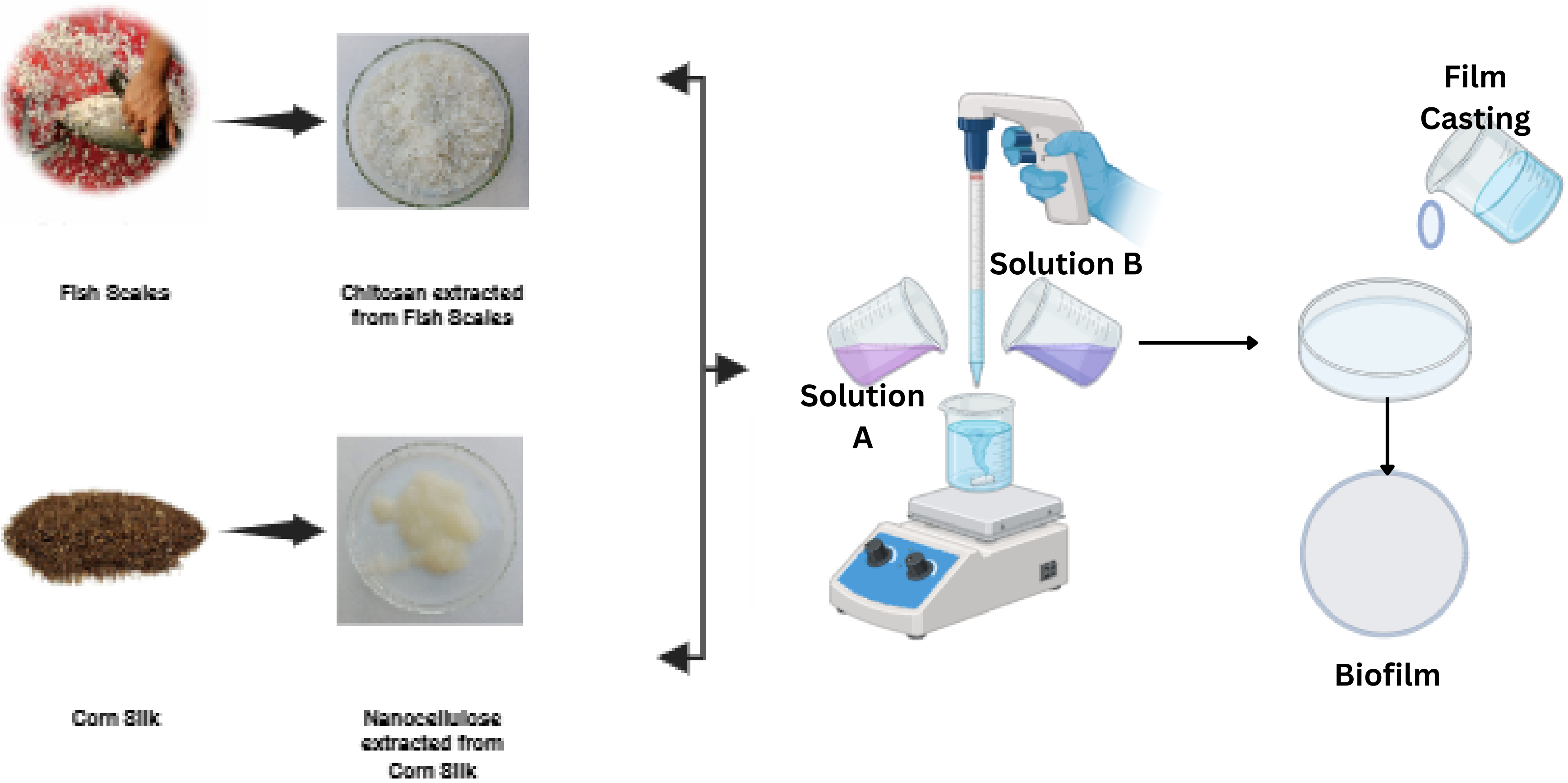
Introduction

- Plastic pollution: 400 million tonnes/year → half for packaging → most non-biodegradable.
- Threatens land (SDG 15), oceans (SDG 14), climate (SDG 13), and contributes to food waste (SDG 2).
- Solution: Biodegradable, antimicrobial films from fish scales (marine waste) and corn silk (agro-waste), enhanced with Dombeya wallichii extract.
- Goal: Replace synthetic plastic packaging with a sustainable, compostable alternative.

Objectives

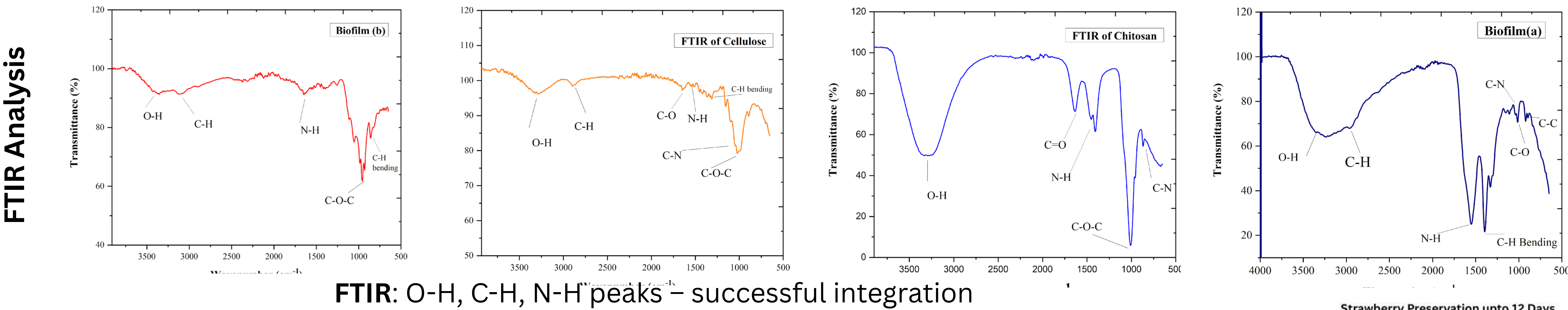
- Extract nanocellulose from corn silk and chitosan from fish scales
- Formulate biodegradable films with Dombeya wallichii extract
- Characterise films (FTIR, XRD, TGA, physical properties)
- Test antimicrobial activity against bacteria and fungus
- Evaluate biodegradability (soil burial) and food preservation (strawberries)
- Demonstrate a sustainable alternative to plastic packaging (SDGs 2,11,13,14,15)

Material & Methods

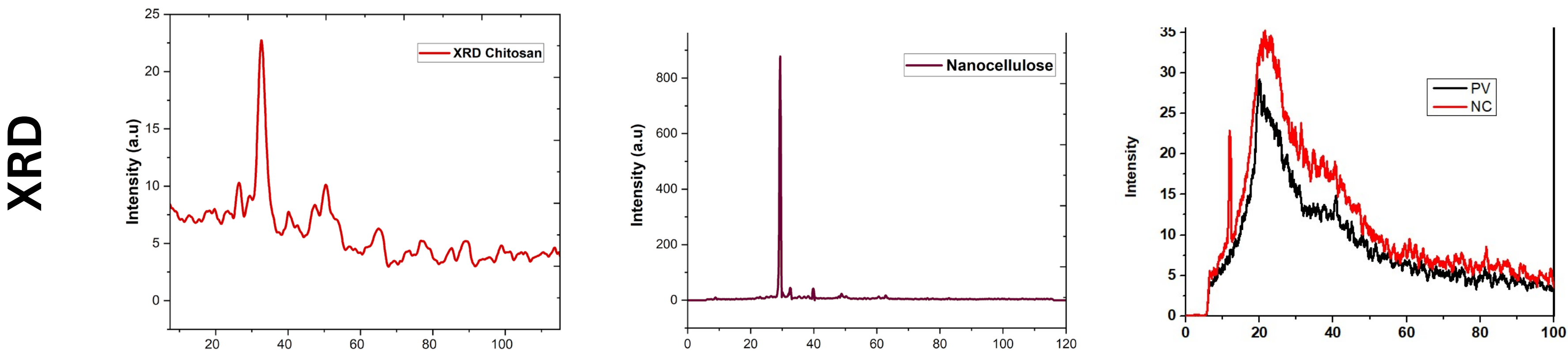


Solvent Casting Method

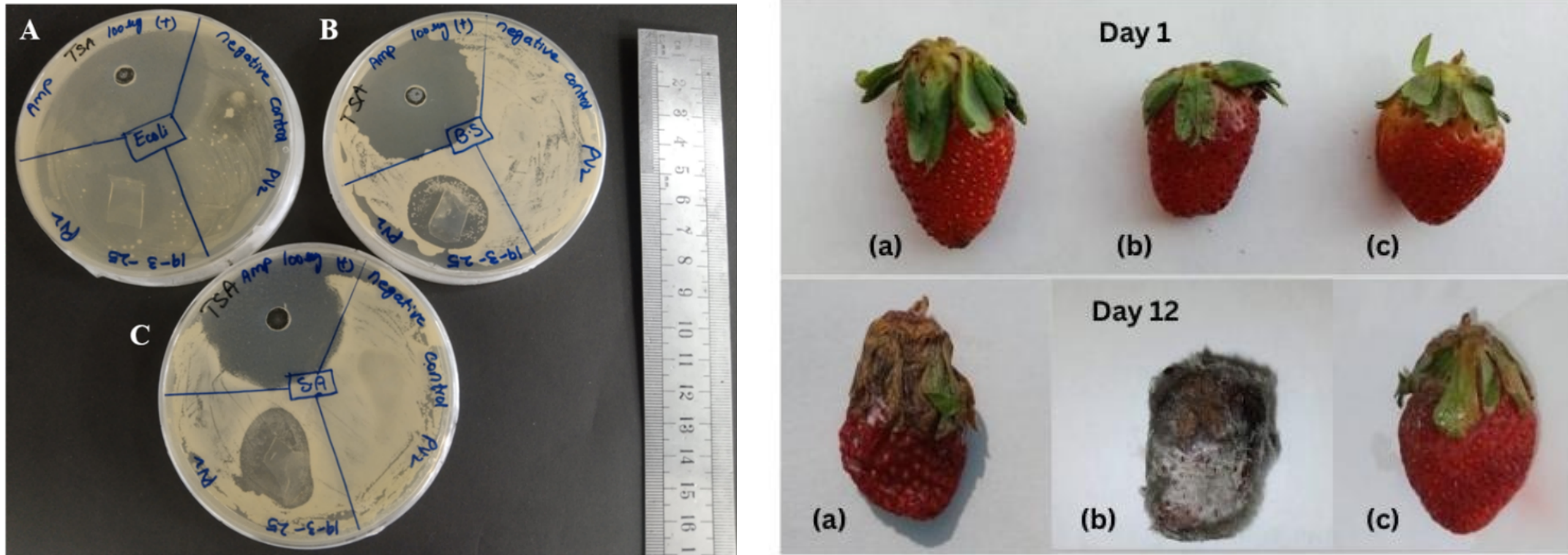
Results & Characterisation



FTIR: O-H, C-H, N-H peaks – successful integration



XRD: Peak at 22.5° – high crystallinity

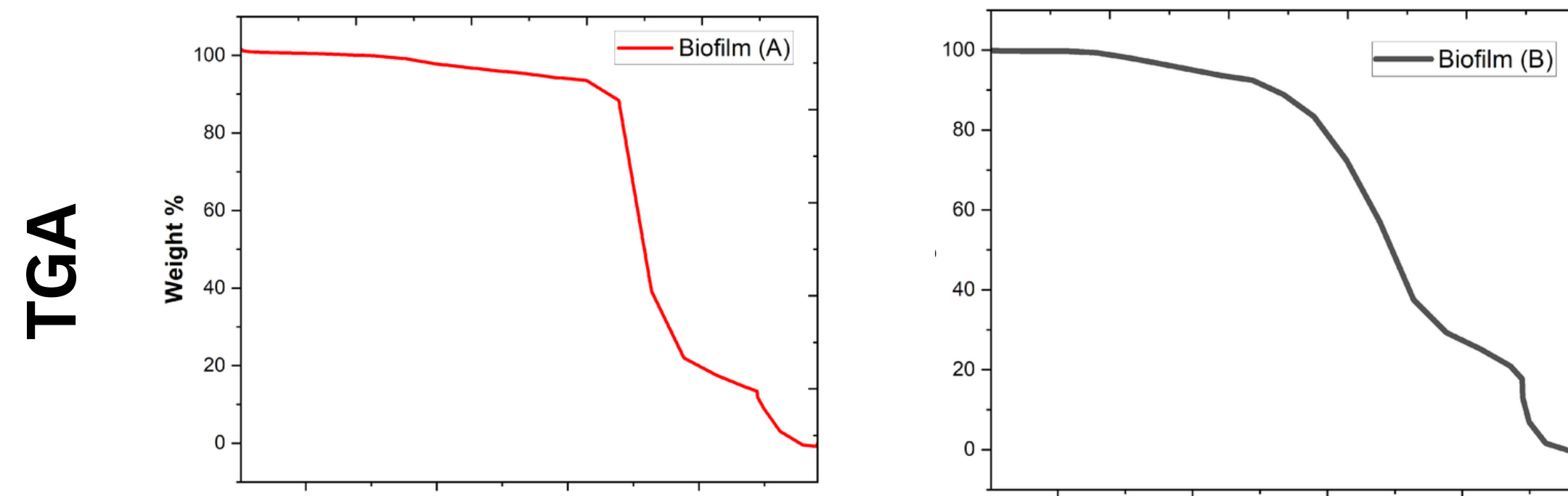


Property	Biofilm	Commercial Plastic Wrap
Biodegradable (10days)	100%	0% (500+ years)
Antimicrobial	Yes	No
Made from waste	Yes	No
Food preservation (strawberries)	14 days	3–5 days
Microplastic residue	None	Yes

Thickness: 0.3 mm | **Moisture:** 12%
Solubility: 100% in 24h
Antimicrobial: 16 mm zone vs. E. coli
Biodegradation: 100% in 10 days
Food test: Strawberries fresh for 2 weeks

Significance:

- Sustainable alternative
- Potential for sustainable food packaging and reducing global plastic waste



TGA: Onset ~250°C – thermally stable

Relevant SDGs



Future Direction

- Expand food testing (meat, bread, vegetables)
- Scale up to industrial production
- Validate in real packaging conditions

References

- Latif, S. et al., Int. J. Biol. Macromol. 266 (2024) 131262.
- Kumar, S. et al., Innovations in food packaging (2024).
- Shalma, S. et al., Environ. Technol. Innov. 32 (2023) 103386.

Conclusion

- Strawberries stayed fresh for 2 weeks vs. 3–5 days with commercial plastic wrap – reducing food waste.
- Waste-to-value: Biodegradable antimicrobial film from fish scales, corn silk & Dombeya extract.
- 100% biodegradation in soil within 10 days – no microplastic residue, fully compostable.