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From Leaf to Relief: Bioactive polymeric hydrogel films loaded with *Psidium Guajava* for wound healing potential

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INTRODUCTION & AIM

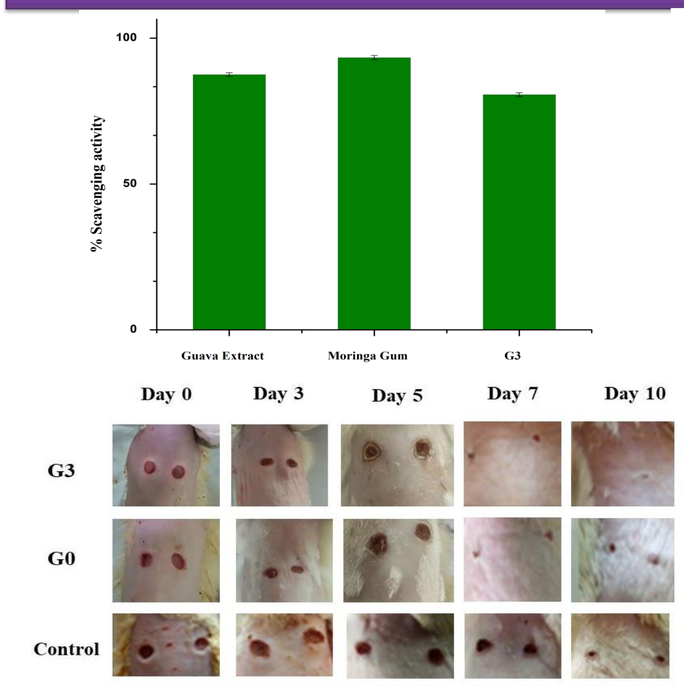
- More than 300,000 people die annually due to different types of skin injuries, autoimmune diseases, wounds, cuts or burns according to world health organization (WHO).
- Wound healing process is a complicated process with main phase of inflammation. For treatment of wounds and inflammation several dressings are available such as bandages, cotton wool, gauzes but these dressings are dry in nature which does not maintains moisture at wound site and also does not deal with wound healing thus lead to dehydration and worsening condition which promotes microbial growth & other side effects so patient remains in pain.
- Aim of the work was to fabricate hydrogel films of *Moringa oleifera* gum encapsulated with Guava leaf extract for anti-microbial and anti-oxidant activity.
- To assess the *in-vitro* and *in-vivo* release of prepared hydrogel films.

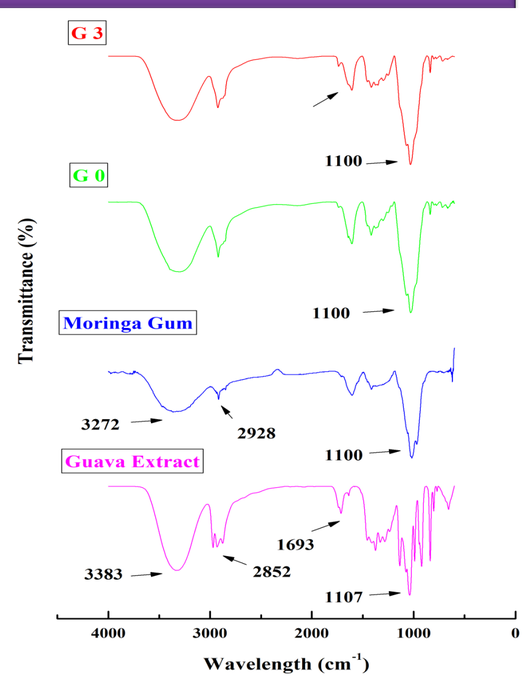
METHOD

- Hydrogel films were prepared using the Solvent casting method, *Moringa Oleifera* gum solutions (2%) were prepared in distilled water and plasticized with polyethylene glycol to improve flexibility .
- A methanolic Guava leaf extract (0-4 %) solution was added to incorporate bioactive components. The blended mixture was poured into petri dishes and dried at room temperature to form hydrogel films. Ionic crosslinking was then achieved by spraying calcium chloride solution (0.5% W/V) over the dried hydrogel films.
- After complete drying, the hydrogel films were removed and prepared for further characterization.

RESULTS & DISCUSSION

- Prepared hydrogel films were brownish, had high mechanical strength and showed high swelling ratio (%) with 3% of Guava extract. Cross-linked films showed a burst release of guava extract *in-vitro* followed by prolonged release (94%) up to 24 hours through non-Fickian mechanism.
- No interaction among polymers and uniform surface morphology support controlled drug release was observed with FTIR and SEM.
- The antibacterial activity against staphylococcus aureus causes an inhibition zone (2.9 mm ± 0.004) to form around the hydrogel films.
- *In-vivo* wound healing study on rats showed 85 % W/V of % wound contraction to treat wound s within 10 days.





CONCLUSION

- Hydrogel films with *Moringa Oleifera* gum and Guava leaf extract were successfully fabricated using Solvent casting method.
- Increasing the concentration of Guava leaf extract within the hydrogel matrix led to a notable rise in pore size, as well as an enhanced swelling ratio (%), which indicates a greater capacity for water absorption.
- FTIR confirmed the presence and compatibility of both components, while XRD showed a shift toward a more amorphous structure. The films also demonstrated stronger antioxidant and antibacterial activity, particularly against *Staphylococcus aureus*, with higher extract content.
- These results indicates that potential of Guava leaf extract not only as a functional additive but also as a therapeutic agent within bioactive hydrogel film system.

FUTURE WORK / REFERENCES

- *Psidium Guajava* extract can be used in combination with different oils for enhancing anti-bacterial effect.

- Huynh, H. D., Nargotra, P., Wang, H. M. D., Shieh, C. J., Liu, Y. C., & Kuo, C. H. (2025). Bioactive Compounds from Guava Leaves (Psidium guajava L.): Characterization, Biological Activity, Synergistic Effects, and Technological Applications. Molecules, 30(6), 1278.