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Synthesis of chitosan-derivatives with phenyl selenium citronellal and phenyl sulfur citral: Characterization, antimicrobial properties and application as biomaterial

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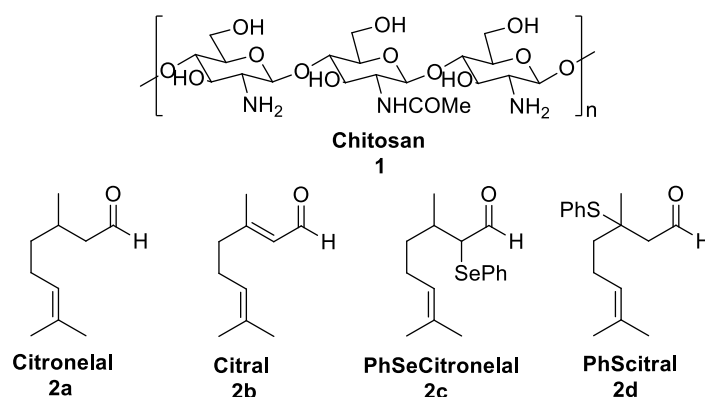
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Highlights

- Chitosan-derivatives were synthesized via the preparation of Schiff bases;
- Chitosan-derivatives were blended with poly(vinyl alcohol) (PVA) to form films;
- The films exhibited remarkable antibacterial activity against different bacterial strains;
- *In vivo* studies assessed the potential of these films to treat atopic dermatitis, a chronic skin disease.

Abstract

Herein, we investigated the synthesis of Schiff bases by reacting chitosan (CS) (**1**) with citronellal (**2a**), citral (**2b**), and their derivatives containing selenium (**2c**) and sulfur (**2d**) in order to obtain CS-derivatives with enhanced biological properties (**Scheme 1**). Previous studies demonstrated that organoselenium and organosulfur compounds have several attractive biological and pharmaceutical activities (e.g. antibacterial, antifungal, and antioxidant), which can be associated with the ability of selenium and sulfur to stabilize free radicals.^{1,2}



Scheme 1

The as-synthesized Cs-derivatives were characterized using different techniques, which confirmed the grafting of these aldehydes on Cs backbone. Additionally, to investigate the potential of the CS-derivatives in practical uses, films based on these products blended with PVA were synthesized by the solvent casting method. These films were characterized in detail and their antibacterial activity was examined using *in vitro* assays. Finally, *in vivo* assays were performed using these Cs-derivative based films as biomaterials for the treatment of atopic dermatitis-like skin lesions in mice.

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