2C2T Centre for Textile Science and Technology

Universidade do Minho
Escola de Engenharia

P2.034

Frontiers in polymer science
29 May - 1 June 2023 | Gothenburg, Sweden
materialstoday
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Use of natural extracts of *Gunnera tinctoria* and *Buddleja globosa* and loaded electrospun fibers with antimicrobial potential for application in the treatment of skin lesions

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Introduction

Skin wounds are susceptible to infection by multiple types of microorganisms, such as bacteria, fungi, and virus (Fig.1).

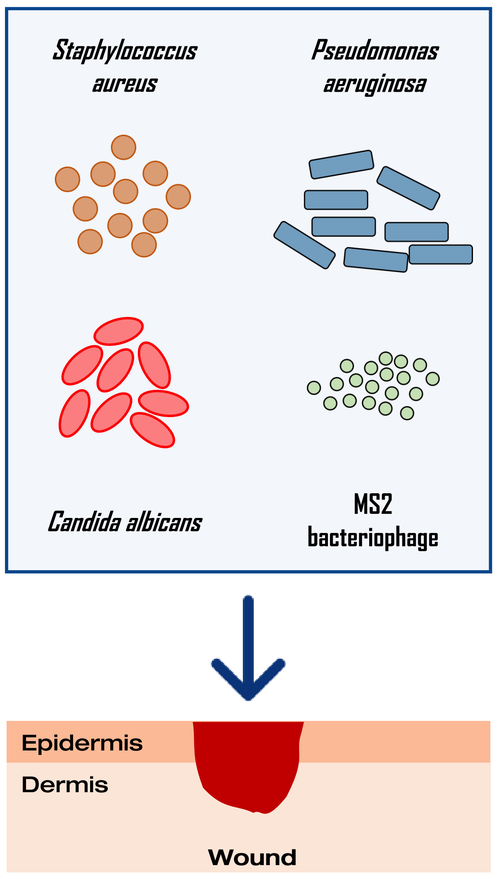

Fig. 1: Wound infection representation.

Using crude extracts of medicinal plants and detecting plant-derived compounds as alternative therapies for microbial infections is gaining increasing interest.

The traditional culture of Chile and recent scientific research have identified several properties associated with *Gunnera tinctoria* and *Buddleja globose* (Fig. 2)

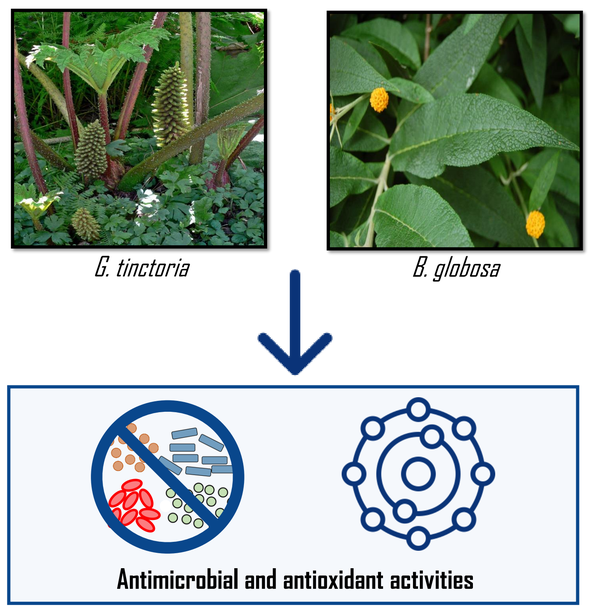

Fig. 2: *G. tinctoria* and *B. globosa* properties

Electrospinning is a versatile and viable technique to generate ultrafine micro and nanometric fibers, advantageous for wound dressing due to: favorable porosity and adequate absorption of exudates.

Methodology

Polyethylene oxide (PEO) solutions comprising lyophilized extracts of *G. tinctoria* and *B. globosa*, were subjected to electrospinning (Fig. 3).

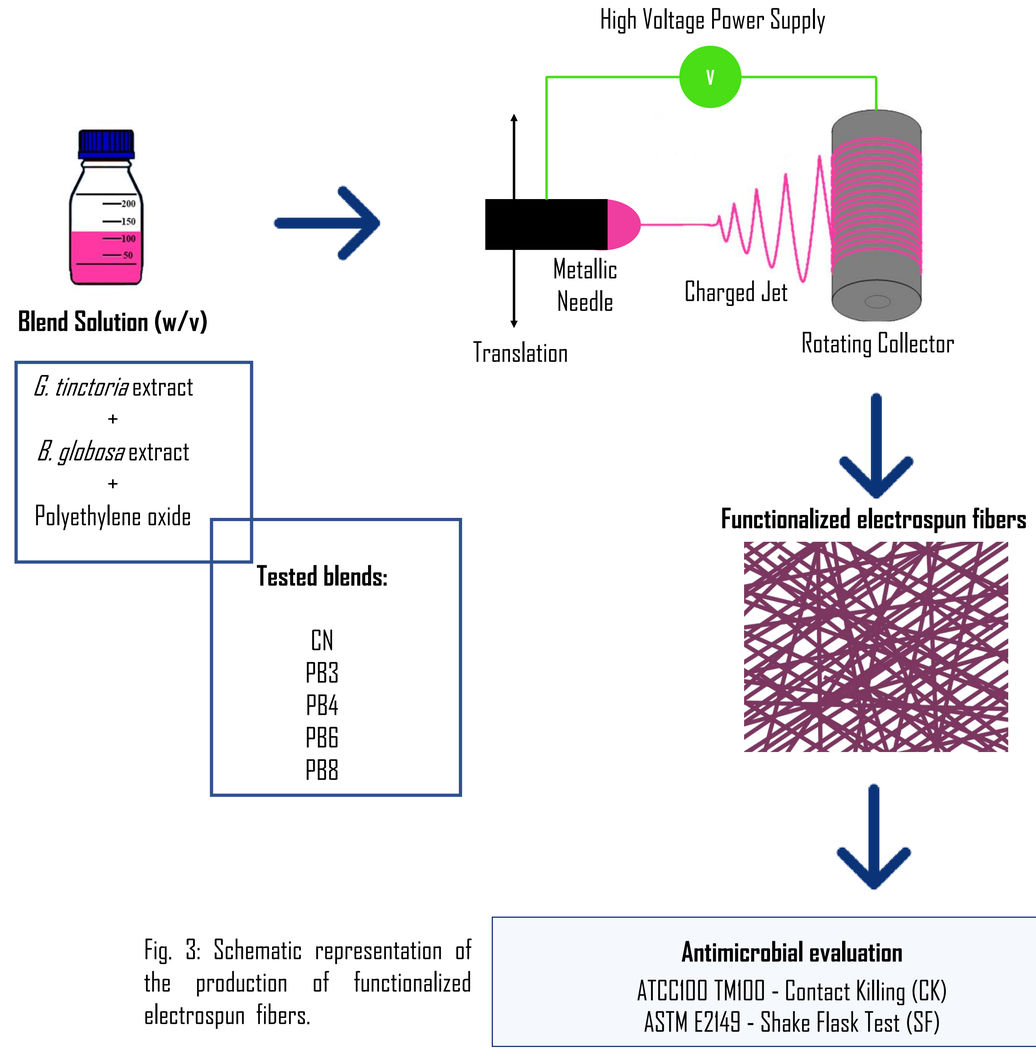

Fig. 3: Schematic representation of the production of functionalized electrospun fibers.

Results and Discussion

Fig. 4 displays the antimicrobial evaluation of the functionalized electrospun mats. CN electrospun mats exhibited weak disinfectant activity against *S. aureus* in both CK and SF. CN also denoted weak decontaminant activity against MS2 encapsulated virus in both static and dynamic conditions. PB3 only showed near weak decontaminant activity against MS2 in CK and SF. PB4 exhibited strong decontaminant activity against *S. aureus* and MS2 in SF, and weak decontaminant activity against MS2 during CK., PB6 electrospun mats also showed weak decontaminant activity against *S. aureus* and MS2 in SF, and in both, respectively. PB8 exhibited a strong decontaminant activity against MS2 in SF. Furthermore, PB8 showed weak decontaminant activity against *S. aureus* and MS, during SF and CK, respectively, A slight tendency for weak decontaminant activity against *P. aeruginosa* is observed during the SF of PB3. Interestingly, these extracts seemed to be decontaminant preferably against Gram-positive bacteria *S. aureus* and the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) surrogate MS2. Furthermore, the higher activities seem to be slightly higher in SF tests in comparison with CK, which may be correlated with the release of the extracts from the electrospun fibers. In other words, the extract blends are not tightly bounded to the electrospun fibers.

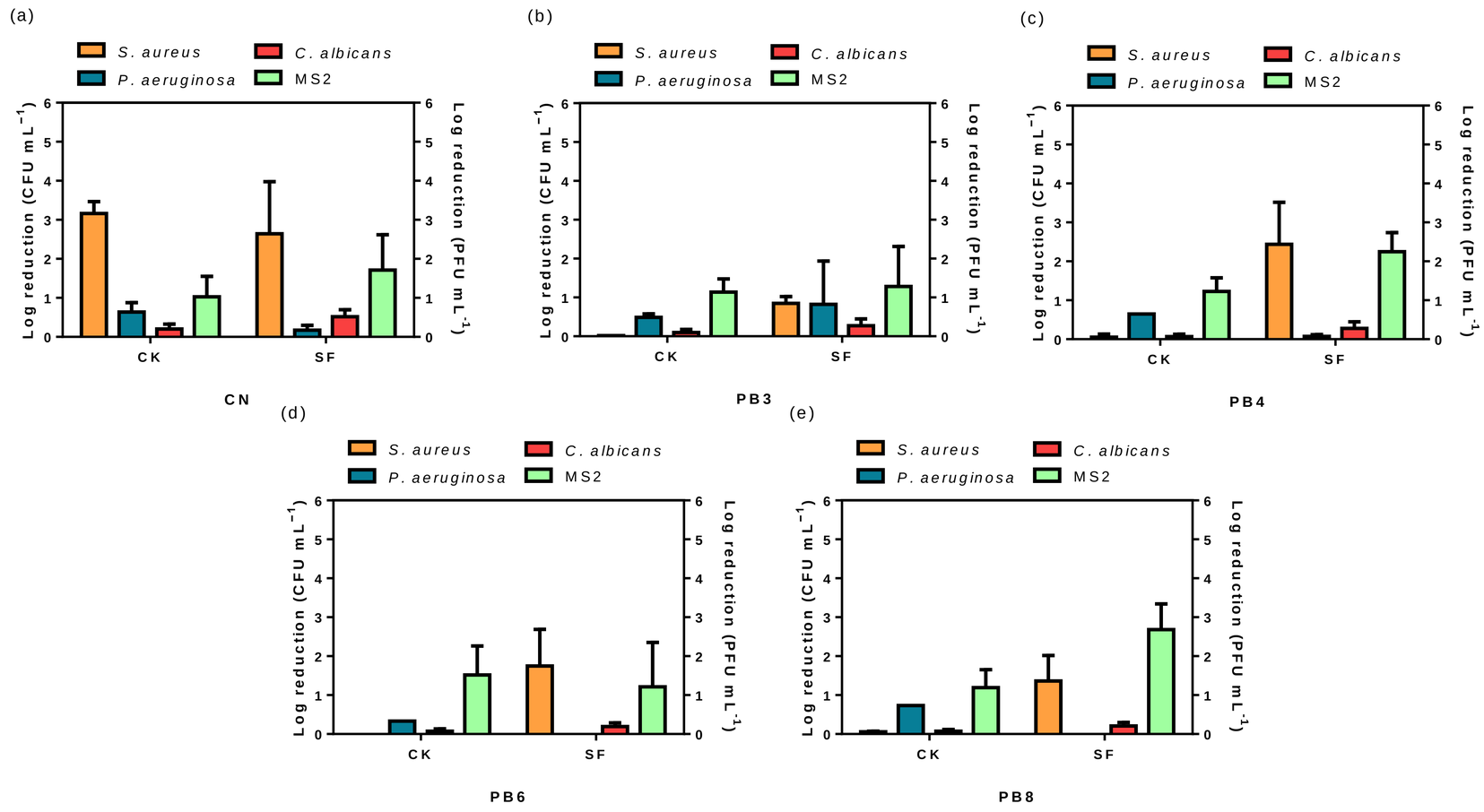

Fig. 4: Antimicrobial activity against *S. aurues*, *P. aeruginosa*, *C. albicans* and MS2 of the electrospun mats acording the blends tested during CK and SF: a) CN, b) PB3, c) PB4, d) PB6 and e) PB8.

Conclusions

- Electrospun fibers loaded with the extracts denoted weak to moderate antimicrobial activity against *S. aureus* and MS2.
- SF exhibited slightly higher inhibition results.
- No relevant antimicrobial activity was observed against *C. albicans* in the electrospun fibers loaded with natural extracts within the concentration range tested.
- Only the fibers loaded with PB3 showed a slight tendency for activity against *P. aeruginosa*

Acknowledgments

This research was funded by FEDER funds through the Operational Competitiveness Program–COMPETE, under the project POCI-01-0247-FEDER-047124, and by National Funds through Fundação para a Ciência e Tecnologia (FCT), under the project UID/CTM/00264/2020. ANID Nº21190396 Chilean Doctoral Scholarship. Doctorado en Ciencias de Recursos Naturales, Universidad de La Frontera, Temuco, Chile.