

Spore resistance to disinfection treatments by ozone and UV radiation in textiles

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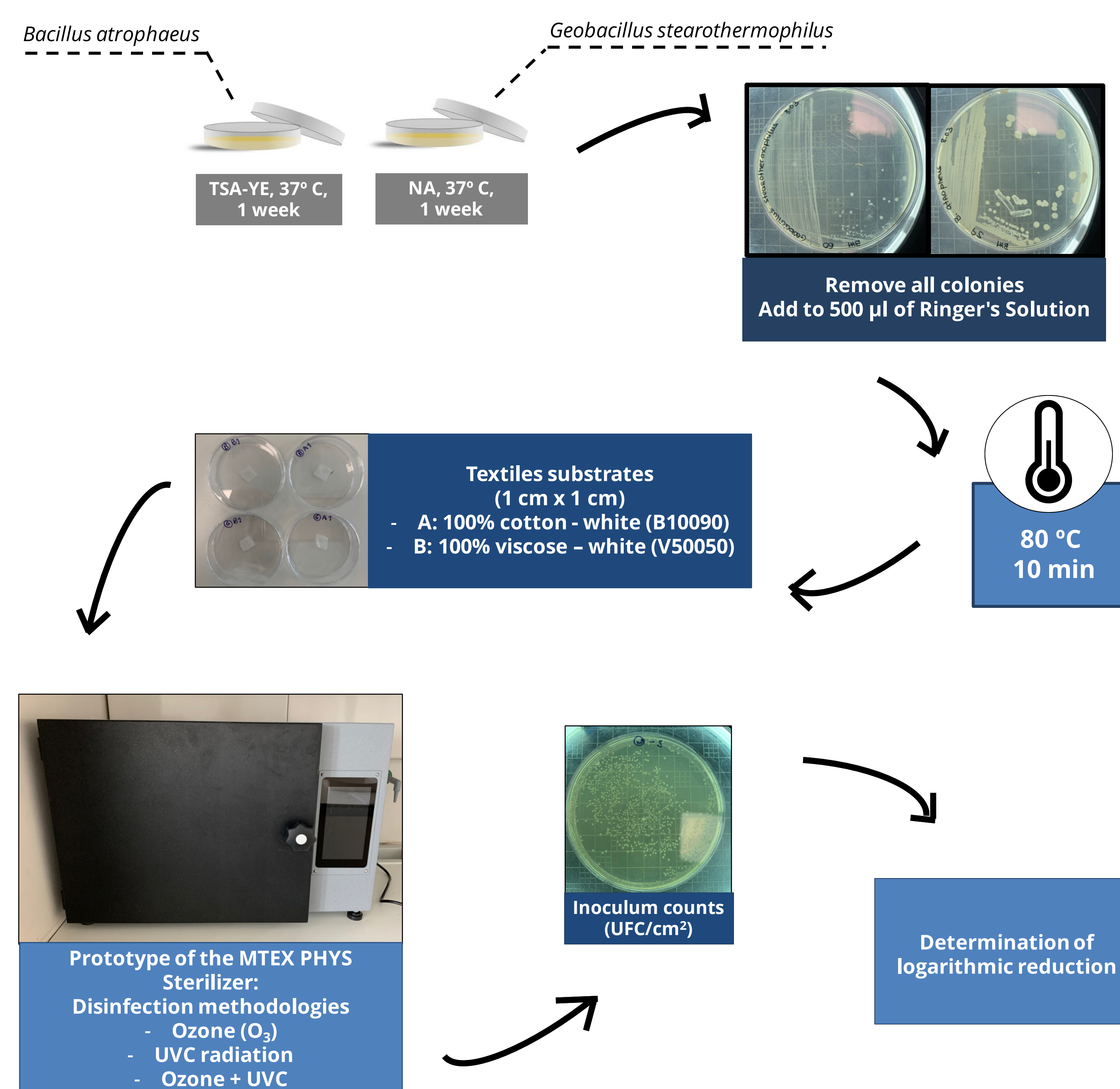
Introduction

The emergence and transmission of the COVID-19 disease in 2019 have led to increased concern about disinfection, including textile clothing. Therefore, the use of disinfection methodologies without resorting to the use of harmful chemicals are under study, such as ozone and UV radiation. Ozone (O₃) has been used for several years as a disinfectant [1]. With an oxidizing power 3,000 times more effective than chlorine, O₃ is the second most powerful oxidant. UVC radiation (200 – 280 nm) has been shown to destroy viruses, bacteria, and fungi [2]. These disinfection tools can be applied in many places, such as nursing homes, hospitals, clinics, clothing stores, hotels, among others.

Objectives

The aim of this study was to investigate the impact of treatments with ozone (30 and 60 ppm) and UVC radiation and their combination at different times (60 and 90 minutes) on the elimination of spores inoculated in different textile substrates. These treatments were applied in a prototype of the MTEX PHYS Sterilizer. Spores of *Bacillus atropthaeus* and *Geobacillus stearothermophilus* were used due to their high resistance to different decontamination processes.

Methods



Results

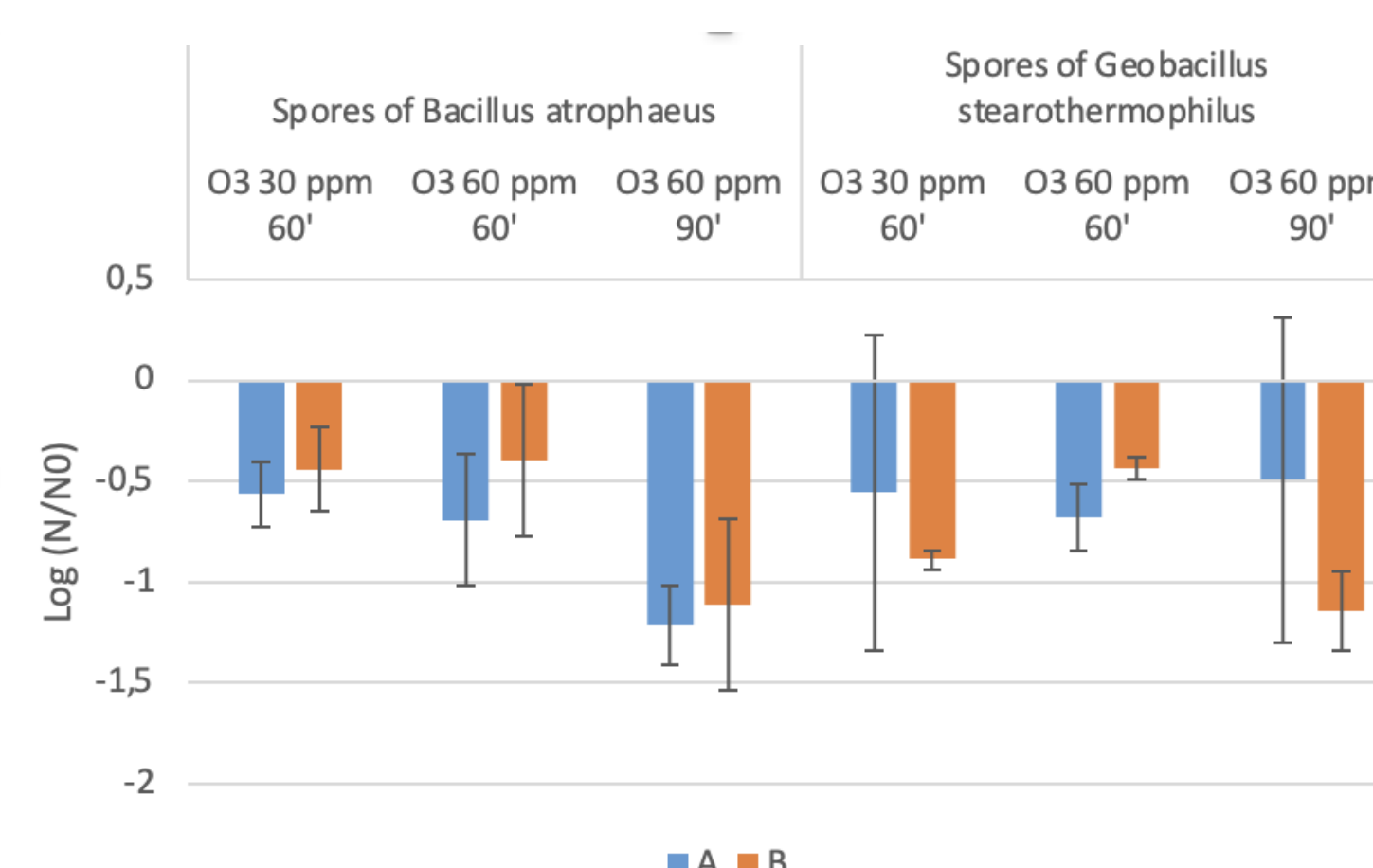


Figure 1. Logarithmic reduction of spores of *Bacillus atropthaeus* and *Geobacillus stearothermophilus* in textiles substrates after ozone treatments.

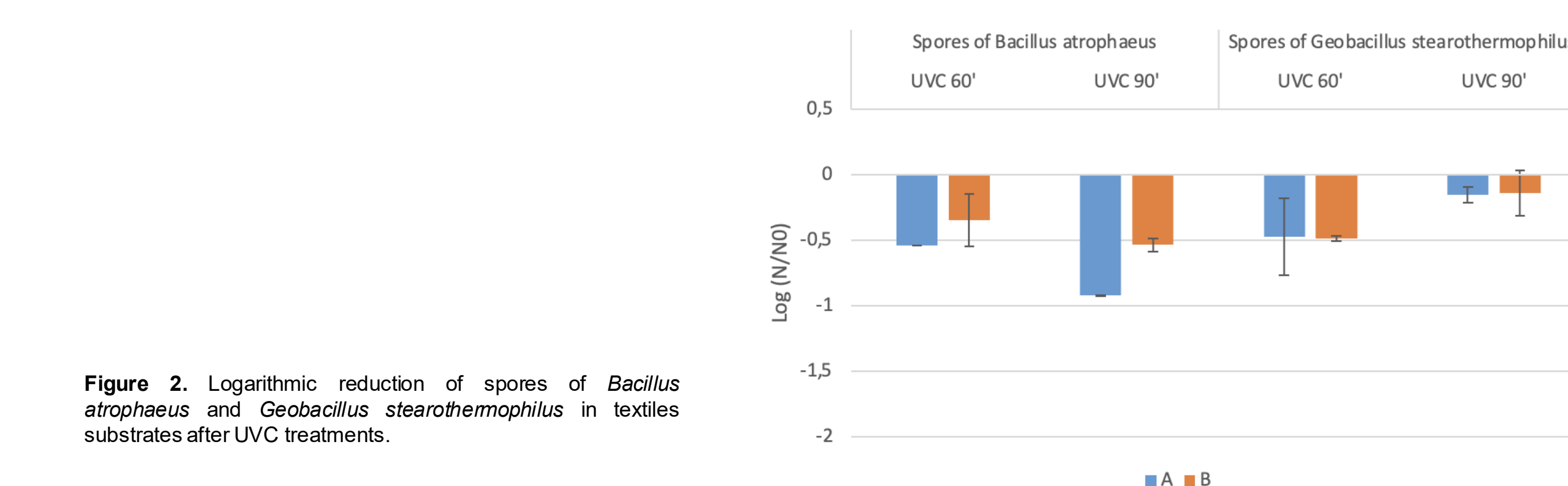


Figure 2. Logarithmic reduction of spores of *Bacillus atropthaeus* and *Geobacillus stearothermophilus* in textiles substrates after UVC treatments.

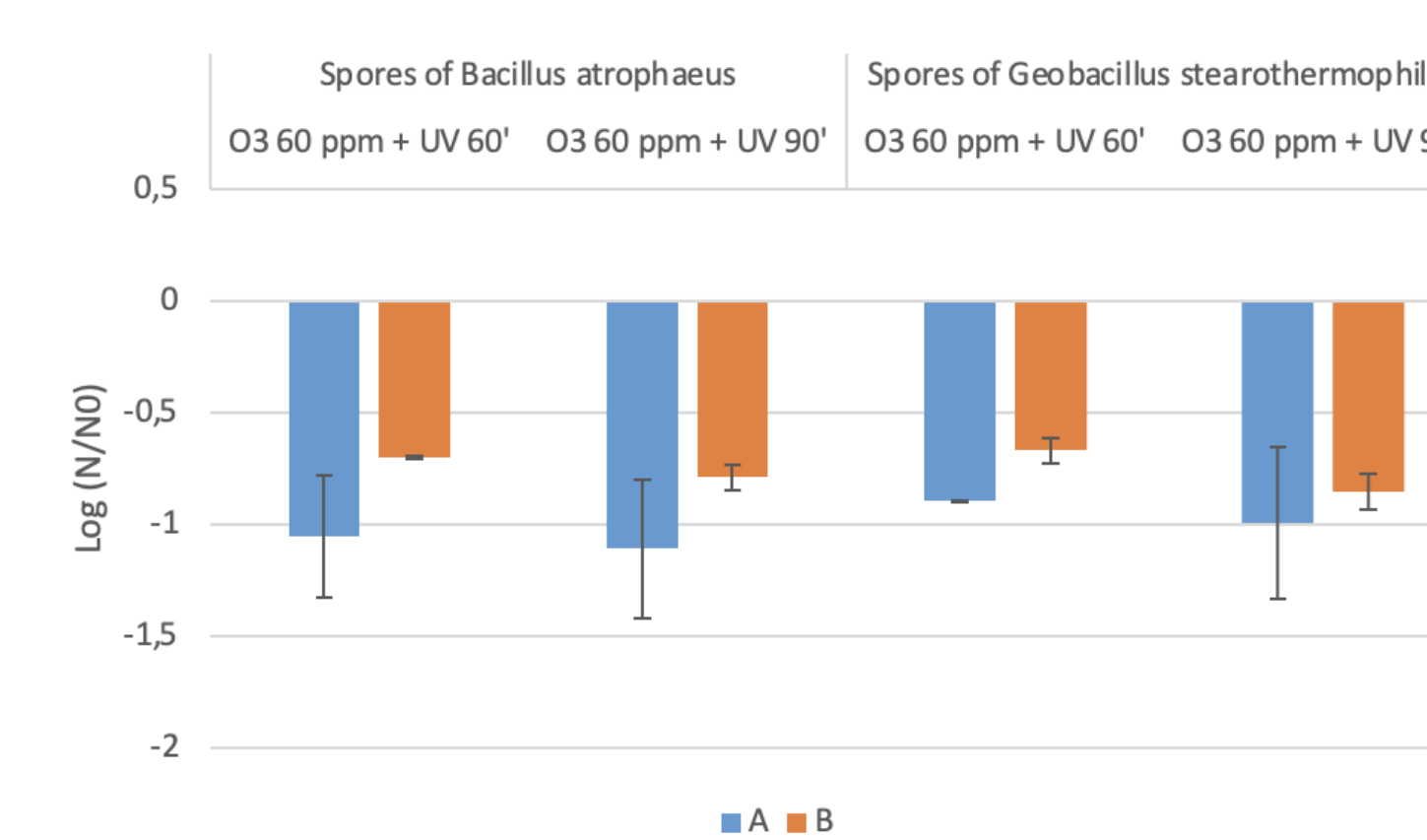


Figure 3. Logarithmic reduction of spores of *Bacillus atropthaeus* and *Geobacillus stearothermophilus* in textiles substrates after ozone and UVC treatments.

The spore reduction was similar and low for the three disinfection techniques. However, the greatest reduction was for the ozone treatment.

Conclusions

- The inactivation of treatments observed was low, with reductions of only up to 1.4 log cycles, with ozone treatment (60 ppm for 90 minutes).
- This demonstrates the resistance of the spores to ozone and UVC treatments and the need for study other combinations and/or treatments to efficiently eliminate them from textile clothing.

References

- 1] Grignani E. et al. Safe and Effective Use of Ozone as Air and Surface Disinfectant in the Conjunction of Covid-19. Gases 2020, 1: 19-32.
- 2] Mackenzie D. Ultraviolet Light Fights New Virus. Engineering 2020, 6: 851-853.

Acknowledgements

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