

Effect of ozone on *Listeria innocua* in bell peppers (*Capsicum annuum* L.) and in contaminated water

Objective

- The main objective was to study the effect of ozone on the microbial load (*Listeria innocua*) of red bell peppers (*Capsicum annuum* L.) and on contaminated water.

Introduction

The development of innovative technologies, promoting fruits and vegetables safety to reduce the risk of related foodborne diseases while maintain its quality attributes, is an actual concern.

Ozone (O₃) is recognized as a strong oxidant and can be applied in food surface disinfection, sanitation of food plant equipment and reuse of wastewater. Several studies demonstrated that ozone reduces the microbial load of fresh fruits and vegetables, thus improving products' safety (Kim *et al.*, 2003; Dufresne *et al.*, 2004).

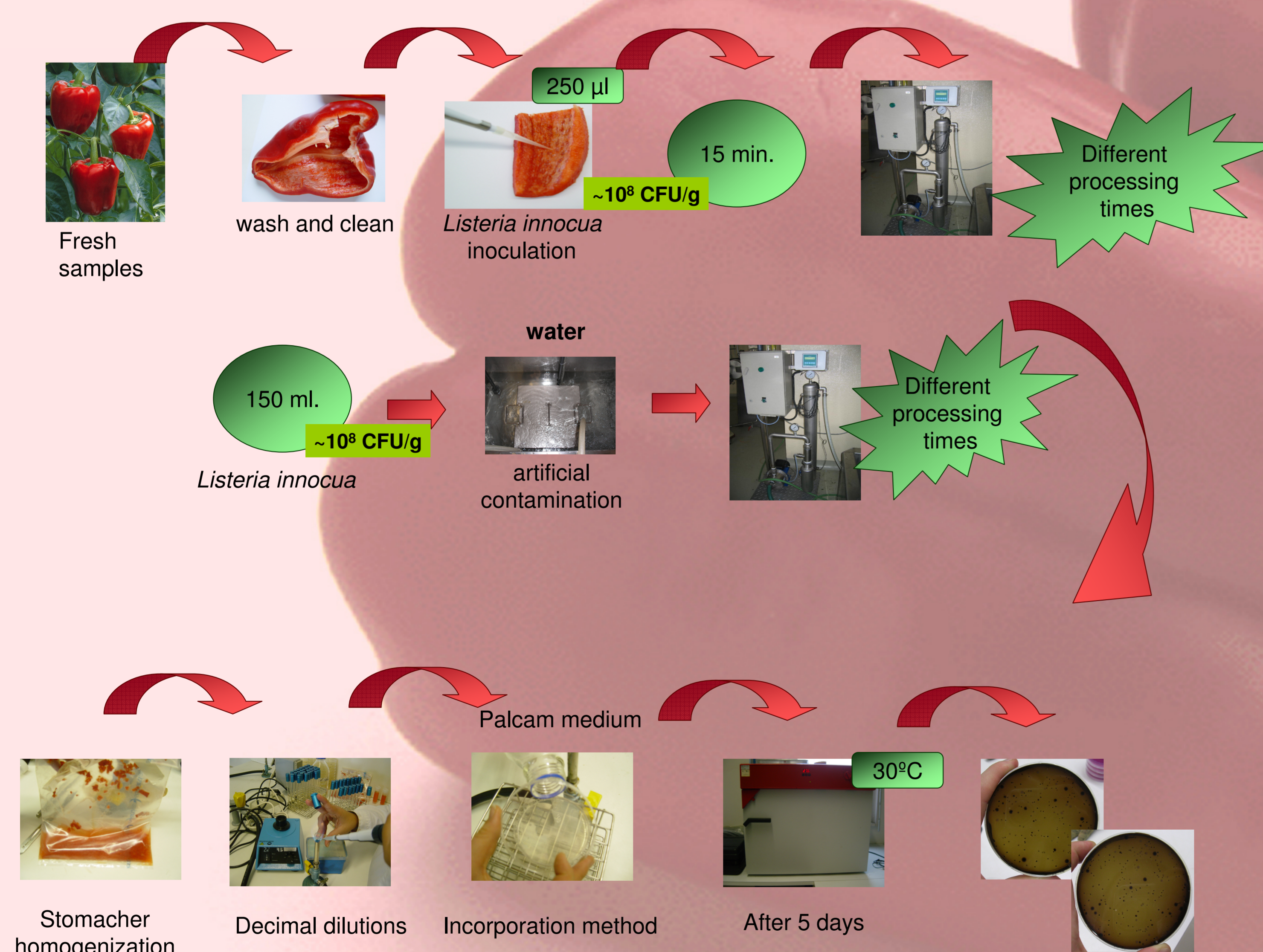
Materials and Methods

- Experiments were carried out using an ozone generator, interconnected to a container (30L) filled with tap water. Ozone was continuously incorporated in water, and its content was indirectly measured by potential difference.
- Red bell peppers were acquired in a local market.
- Artificially contaminated bell peppers, with *Listeria innocua* (initial load ~ 10⁸ CFU/mg), were washed in water (control) and in ozonated water (O₃ concentration ~ 0.25 p.p.m.), for different times till a maximum of 60 minutes.
- Artificially contaminated water with *Listeria innocua* (initial load ~ 10⁵ CFU/mg) was treated with ozone (O₃ concentration ~ 0.25 p.p.m.) continuously incorporated into the water, till a maximum of 15 minutes.
- Listeria* enumeration was assessed, in duplicate, using Palcam agar containing selective supplement (Merck, Darmstadt, Germany). Samples were incubated at 30 °C during 3 days, for posterior counts (ISO 11290-1).



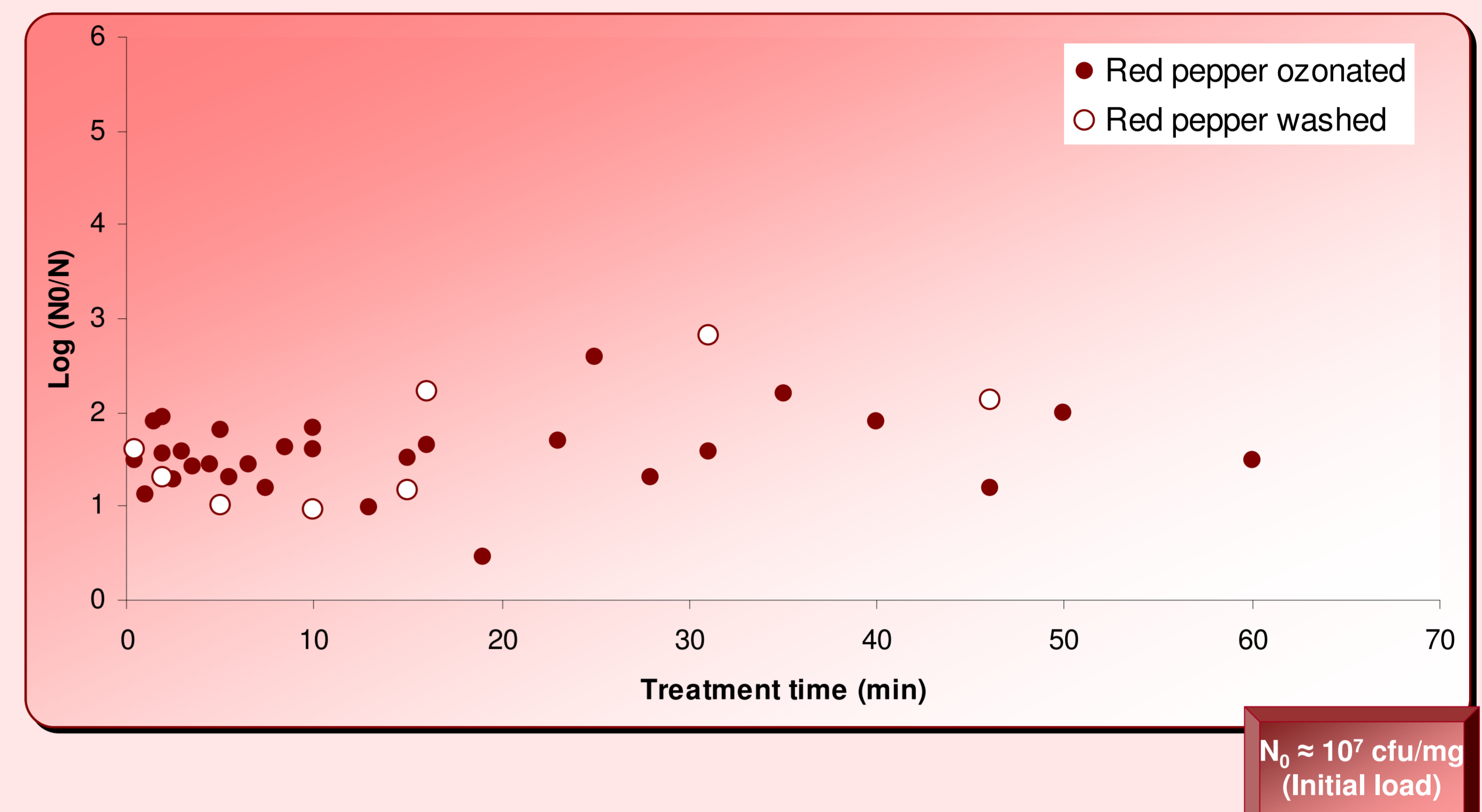
Figure 1. Ozone generator.

Experimental Description



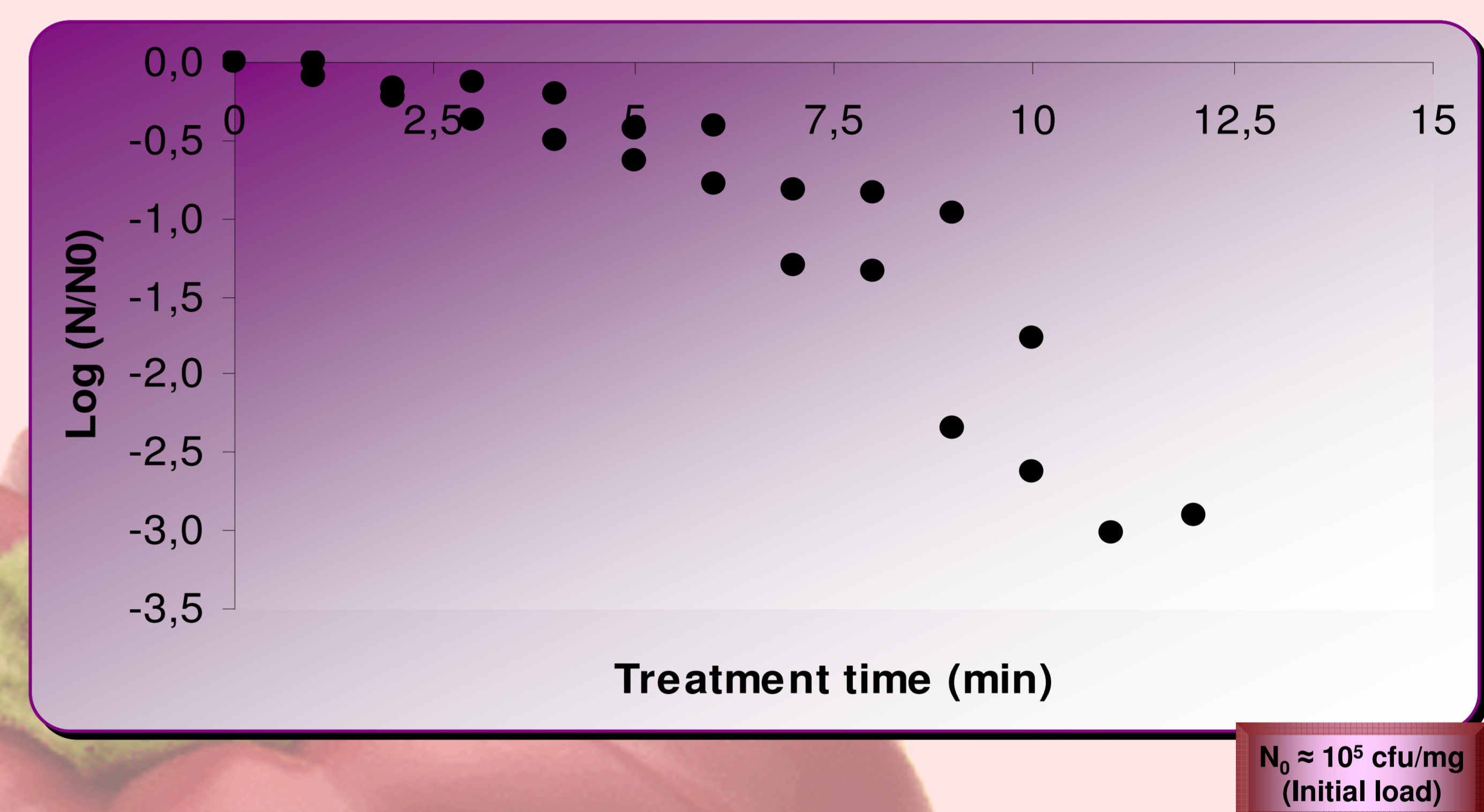
Results and Discussion

Listeria innocua in red bell peppers



- Results showed that, in average, ozone-washings reduced 1.6 ± 0.4 log-cycles (\pm standard deviation) of *Listeria* in bell peppers, being this process equivalent to a simple water-washing.
- The time of treatment did not affect the results.

Listeria innocua in water



- The effect of ozone on contaminated water was different. *Listeria* in water suffered a reduction dependent on the time of treatment, similar to a thermal inactivation kinetics behaviour (initial lag phase ~ 5 minutes, followed by a maximum death rate of ~ 0.5 min⁻¹).

Conclusions

In red bell pepper, the ozone effect was equivalent to a water-washing.

In water, the ozone treatment inactivated *Listeria innocua*. The kinetics was similar to a thermal inactivation behaviour.

References

- DUFRESNE, S.; HEWITT, A.; ROBITAILLE, S. 2004. Ozone sterilization: Another option for healthcare in the 21st century. *AJIC*, 32 (3).
- KIM, G.; YOUSEF, A.E.; KHADRE, M. 2003. Ozone and its current and future application in the food industry. *Advances in Food and Nutrition Research*, 45:167-218.

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