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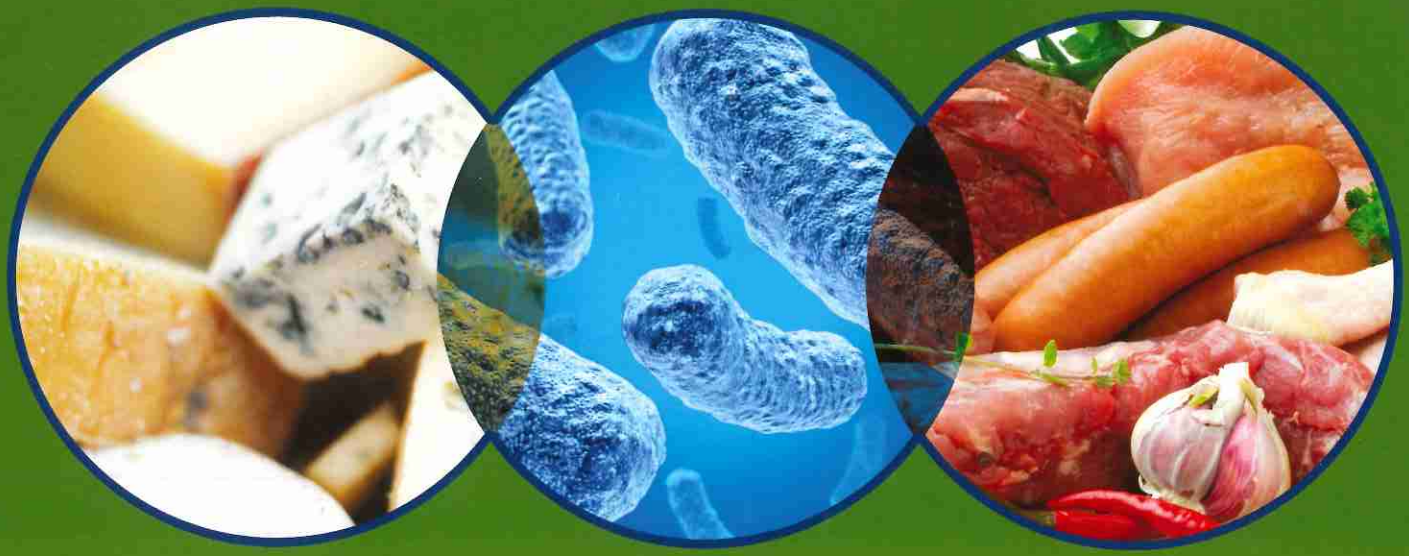

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Survival of pathogenic microorganisms in spices and herbs

Ioanna Stratakou, Ilias Apostolakos, Heidy MW Den Besten and Marcel H Zwietering

Introduction

Spices and dried aromatic herbs can be cultured where hygiene conditions might be difficult to control which may result in high levels of spoilage and pathogenic microorganisms. Although drying can inhibit microorganism growth, it does not however completely inactivate pathogens that may survive for a long storage period such as 2-3 years shelf life of these commodities.

Objective

The purpose of this study was to investigate survival of pathogens during storage of spices and dried herbs.

Method

A meta-analysis was performed on the available published data to identify the most critical factors that influence microbial survival in spices and dried herbs. Inactivation rates were calculated using the linear model

$$\mathrm{Log}N_t = \mathrm{Log}N_0 - (1/D) * t$$

where D is the decimal reduction time (days). The influence of the following factors to data variability were tested for significance: microbial identity, decontamination treatment, product type, temperature and water activity (p=0.05).

Also, survival of *Salmonella* Infantis and *Listeria monocytogenes* was experimentally monitored in powdered paprika under controlled storage conditions at 20°C and water activity of 0.43. The pathogens were inoculated in powdered form.

Results

Meta-analysis: In total 443 D-values were derived from 16 published studies. Gram positive bacteria (both spores & sporeforming cells) showed significantly higher decimal reduction time than Gram negative bacteria (Figure 1).

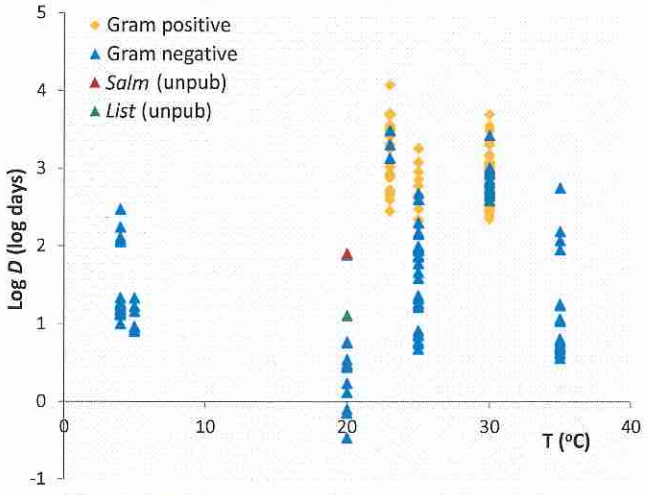

Figure 1: Inactivation of Gram positive and Gram negative bacteria during storage conditions of spices and herbs.

Decontamination treatment and product type significantly influenced survival of Gram positive bacteria in spices and herbs, while for Gram negative bacteria only product type was a significant influencing factor on survival. Data on water activity could only be obtained for *Salmonella* spp., and this showed that inactivation increased at higher water activity (a_w>0.7).

Survival studies: *Salmonella* Infantis survived better than *L. monocytogenes* (Figure 2). The survival curves of *Salmonella* Infantis could be best described by the Weibull model, while *L. monocytogenes* curves could be best described by the biphasic model. This points out to a significantly greater and more rapid decline of *Listeria monocytogenes* in the first phase of storage.

The data obtained from the survival studies are also depicted in Figure 1 to compare them with published studies data.

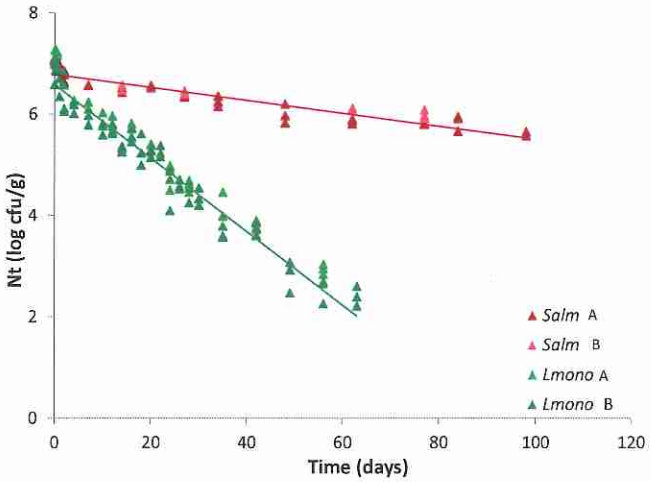

Figure 2: Inactivation of *Salmonella* Infantis and *Listeria monocytogenes* during storage of paprika powder at 20°C. (A and B represents biological reproductions)

Conclusions

- Gram positive bacteria (both spores & sporeforming cells) have higher D-values than Gram negative bacteria.
- Product type significantly affected survival of both Gram positive and Gram negative bacteria.
- *Salmonella* Infantis survived better than *L. monocytogenes* in paprika during storage; with inactivation of *L. monocytogenes* significantly higher in the first phase of storage.

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Wageningen University
P.O. Box 17, 6700 AA Wageningen
Contact: ioanna.stratakou@wur.nl
T + 31 (0)317 48 43 39
www.fhm.wur.nl

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[P.016]	**Survival of pathogenic microorganisms in spices and herbs** I. Stratakou, I. Apostolakos, H.M.W. den Besten, M.H. Zwietering*, *Wageningen University, The Netherlands*
[P.017]	**Predicting safe sandwich production** T. Birk[1], Z. Duan[1,2], C.O.A. Møller[1], H.F. Hansen[3], S. Knøchel[2], T.B. Hansen*[1], *[1]Technical University of Denmark, Denmark, [2]University of Copenhagen, Denmark, [3]Zealand Institute of Business and Technology, Campus Roskilde, Denmark*
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[P.020]	**Effect of pomegranate powder (ellagic acid) on the thermal resistance of Escherichia coli O157:H7 in ground chicken** V. Juneja*[1], U. Gonzales-Barron[1], V. Cadavez[1], S. Mukhopadhyay[1], *[1]USDA-ARS-ERRC, USA, [2]Polytechnical Institute of Braganza, Portugal, [3]Polytechnical Institute of Braganza, Portugal, [4]USDA-ARS-ERRC, USA*
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[P.025]	**Final destination: Outcome of heat treated geobacillus stearothermophilus spores during storage** N. Mtimet*[1,2], C. Trunet[1], A-G. Mathot[1], L. Venaille[2], I. Leguerinel[1], L. Coroller[1], O. Couvert[1], *[1]LUBEM, France, [2]Bonduelle, France*
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