

**Title** Inactivation of conidia of *Penicillium chrysogenum*, *P. digitatum* and *P. italicum* by ethanol solutions and vapours

**Author** Thien Dao, Maurice Bensoussan, Patrick Gervais and Philippe Dantigny

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### Abstract

A fractional factorial design,  $2^{(5-1)}$  experiments, was used for assessing the influence of 5 factors: water activity,  $a_w$  [0.7, 0.9], temperature,  $T$  (°C) [10, 30], mode of application,  $A$  [liquid, vapour], ethanol concentration,  $E$  (% w/w) [5, 10] and time,  $t$  (d) [1, 4] on the inactivation of spores of *Penicillium chrysogenum*, *P. digitatum* and *P. italicum*. Survival was determined by germination at optimal conditions within 3d. The experimental response was  $\log(N_0/N_t)$ , where  $N_0$  and  $N_t$  (spore  $\text{ml}^{-1}$ ) the concentrations of viable spores at  $t = 0$  and  $t$  respectively. By a decreasing order of sensitivity to ethanol, moulds were ranked as followed: *P. digitatum*, *P. italicum* and *P. chrysogenum*. A greater inactivation for *P. digitatum*, *P. italicum*, that were the most sensitive moulds to ethanol, was obtained by applying vapour rather than ethanol solution. The order of significance of the main factors depended upon the mould. The key factor for explaining inactivation of *P. chrysogenum* was water activity. But, temperature was the main factor for explaining inactivation of *P. digitatum* and *P. italicum*. In the more drastic conditions, (*i.e.*, 0.7  $a_w$ , 30 °C, 10% w/w ethanol), all spores were inactivated by applying liquid solution for 4d.