

Optimisation of the Inoculation of *Aspergillus ochraceus* in Coffee for Isothermal Studies Simulating Storage and Marine Transport of Raw Coffee

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SUMMARY

Isothermal study has been a useful tool to understand the behavior of grains in their environment such as relative humidity and temperature conditions as well as fungal growth. At initial stage of storage and maritime transport, coffee does not have the condition for most species of fungi to develop, except for xerophilic fungi. However, there may be situations in which the humidity inside the barns or inside the coffee containers is higher than the moisture of coffee, and for diffusion the moisture of coffee tends to equilibrate at a higher humidity. In case of transport in containers, humidity may also increase because of condensation caused by constant changes in temperature during the voyage. Nevertheless, the moisture gain is gradual and requires time to get to the equilibrium point necessary to reach optimal conditions for fungal growth and toxin production. The present study objective was to compare the traditional fungal inoculation technique, which consists of the direct application of water spore suspension (direct technique) of *Aspergillus ochraceus* in raw coffee versus techniques using solid vehicles (soil, ground coffee and starch) to carry the spores to coffee. Soil and ground coffee were tested at two sieve granulometries, 300 and 850 µm. Three parameters were evaluated: (i) changes in water activity of coffee beans after inoculation, (ii) homogeneity of spores in the vehicle (soil, ground coffee and starch) and (iii) homogeneity in adherence of vehicle to spores in coffee beans.

Soil showed itself to be the best vehicle for spores in relation to water activity changes, as compared to ground coffee and direct suspension. The water activity of coffee which was initially 0.654, increased to 0.669, 0.682 and 0.766 using soil, ground coffee and water as vehicles for spores, respectively. These higher values represented an increase in water activity of 2.4%, 4.3% and 17.1%, respectively. Starch was discharged from the beginning because it formed “grumos” after the inoculum had been added.

Soil and ground coffee at 300 µm sieve had a slight advantage in relation to homogeneity and uniformity of spores/vehicle over 800 µm sieve. Soil was chosen as the vehicle to inoculate spores of *A. ochraceus* due to its low changes in coffee water activity. Electronic microscopic observations showed the distribution and development of *A. ochraceus* inoculated in coffee beans by soil.