

**Title** *Penicillium* inoculum in the citrus cold chain: an indicator of hygiene standards  
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#### **Abstract**

*Penicillium* species are responsible for excessive post-harvest decay of fresh fruit during cold storage and export. The evolutionary function of many *Penicillium* species is the decay of dead or dying organic material. Once harvested, fruits shift their metabolism to senescence, which creates an ideal environment for colonization by opportunistic decay fungi such as *Penicillium* spp. Fruit storage environments are therefore favourable for these pathogens. Since most species are soil-borne, the presence and inoculum load of these species in various indoor environments is indicative of the level of hygiene being enforced. The aim of this study was to follow the citrus cold chain from local packhouses in South Africa to various European destinations, and sample environments such as packhouses, coldrooms, re-pack facilities, distribution centres and retail outlets that the fruit moves through. Swabs were taken from walls and floors, packlines, rollers, brushes etc and processed by dilution plating. All *Penicillium* spp. were isolated, purified, preserved and morphologically identified, and identity confirmed using ITS and b-tubulin sequence data. The dominant species isolated were *P. glabrum*, *P. crysogenum*, *P. polonicum*, *P. paneum*, *P. corylohilum*, *P. crustosum*, *P. brevicompactum*, *P. biourgeianum*, *P. commune* and *P. citrinum*. Inoculum levels were relatively high for walls and floors of repacking and storage facilities. The level and type of *Penicillium* spp present in these environments provided evidence of the hygiene standards enforced and can represent a baseline for international hygiene standards.