

Simulation of cold treatment during a cargo shipment of citrus fruit

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Abstract

The Italian orange fruit export development outside EU countries has required commercial agreements regarding the restriction of parasites spread especially Mediterranean fruit fly. The correct use of cold treatment during the shipment is used to satisfy this requirement. This paper reports the results of a simulated refrigerated transport of citrus fruits (14600 kg of 'Tarocco' oranges) in a 40ft refrigerated container. Temperatures have been monitored inside the refrigerated container in different positions of the load (in the air, in the pallet and in the fruits) using 40 innovative direct-to-digital temperature probes. Moreover, an innovative package (with an increased vented surface) was compared to the standard boxes. Results show that the difference of average temperature between the temperature probes in head space was less than 0.5°C. Temperature peaks showed the on/off cycle of the automatic defrosting system. Though temperature probes placed on the floor showed a good homogeneity, the air temperature reached a minimum level of about -0.8°C, near the cold air outlet, which is considered too low for the oranges cold storage. The vented boxes allowed a more rapid cooling, lowering the overall thermal resistance of fruit boxes, and so making fruits mostly affected by the cold air temperature near the air cooler outlet.