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Energy usage of forced air precooling of pomegranate fruit inside ventilated cartons



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1 **Energy usage of forced air precooling of pomegranate fruit inside ventilated** 2 **cartons**

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12 **Abstract**

13 Energy usage is a crucial factor when computing the cost of storing produce. With the
14 ever-increasing cost of energy and attention to environmental problems, understanding energy
15 use and exploring energy saving options is becoming a priority for the economic sector. In this
16 study, the effect of container design, plastic liners and stack orientation on the airflow, cooling
17 rate and energy usage of forced air cooling of pomegranate fruit were investigated. Electricity
18 usage was calculated based on the power ratings of the air driving fan, evaporator fan,
19 compressor cooling fan and the condenser of the cooling unit with duration of power usage
20 dictated by the seven-eighth cooling time (SECT). SECT for different package types were
21 obtained from the cooling experiments. Efficiency of electricity usage was measured as the
22 ratio of produce cooling accomplished to the total electricity consumed. The energy usage
23 differed by 1.5-fold between container design 1 (CT1) and container design 2 (CT2).
24 Depending on the container design, stack orientation (with respect to the direction of the
25 cooling airflow) can influence the energy usage. Plastic liners affected the precooling process
26 the most, increasing energy usage by up to 3-fold compared to stacks with no liners. Container
27 design with high vent-area reduced the resistance to airflow (RTA) and increased fruit cooling

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