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INVESTIGATION AND AMELIORATION OF LOSSES IN MANGO
DURING TRANSPORT IN SRI LANKA

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Abstract

The study was undertaken to seek methods of reducing postharvest losses in fresh mango between harvesting and delivery to the domestic market in Sri Lanka. The study examined the methods currently in use, firstly to determine possible reasons for transport and handling losses and secondly so that any proposed new methods could be introduced with minimal disruption to the existing well established systems.

The preliminary investigations done by the Ceylon Institute of Scientific and Industrial Research showed the need for better containers in transport and storage of fresh mango. The existing level of technology and investment precluded the use of techniques such as refrigerated transport and controlled atmosphere storage. Further, the limited time period from harvest to consumption did not necessitate high investment to prolong shelf-life over long periods.

Laboratory work was undertaken to study the effect of external forces on the fruit. These forces were static loading and vibration encountered by the fruit in transport and storage. These two factors were considered important in causing stress, and it was anticipated that they could be overcome by designing new containers. When individual fruits were tested in the laboratory it was found that higher static loads caused an increase in respiration rate. However dynamic loads did not show an increase in respiration rate and a consistent pattern was not observed in this case. The effect of dynamic loads on respiration was observed to depend on the frequency and amplitude of vibration. The effect of temperature on respiration rate over the range of 12°C to 30°C was much greater than the effect of static and dynamic loads.

Taking these findings into consideration two types of crates of different depths were designed, keeping the capacity the same as the currently used tea chest containers for reasons of market expediency. Field trials showed that the advantage of the new crates

arose from the increased ventilation provided by the slatted sides, in contrast to the solid sides of the tea chests. The fruits in the new containers subjected to static loads in combination with vibration, produced results which were not consistent with the behaviour shown by individual fruits under laboratory conditions. The reasons for this were ventilation and packing that took place during transport. The field results also indicated that factors such as duration of transport, climatic conditions at harvest, the location of site and cultural practices caused variation in reject occurrence. In the use of the new crates some indirect benefits accrued from more uniform ripening than occurred in tea chests, so reducing the handling and sorting requirement. These results were confirmed by subsequent laboratory experiments.

The advantages observed in using the new crates were verified by conducting a survey and a financial evaluation based on the experience of commercial mango pickers. The introduction of the new crates to the commercial pickers was made easy by the use of locally available wood in the construction of the crates. Under the present constraints faced by the domestic market the most feasible method of loss reduction in transport and storage was shown to be better ventilation of the containers. The new crates provided a better opportunity to effect ventilation and also reduced handling losses, as frequent sorting to avoid overripening of fruits due to development of hot-spots could be avoided. The shallow crates showed marginally, but non-significantly lower decrease in losses compared to the deep crates. The on-the-road vibration did not increase produce wastage in the trials carried out during the course of this study.

The losses exhibited by fruits in crates, when subjected to the combined effect of static and dynamic loads, did not show a conclusive pattern. The present study thus justifies further work on vibration effects on mangoes and other tropical fruit deterioration as a possible avenue of postharvest loss management in transport and storage.

The applied loads and the duration of vibration for the study were selected from conditions now prevailing in Sri Lanka. However, as production becomes more organised to become commercially viable, larger bins and longer haulage distances will come into operation. The present study indicates that under more demanding conditions the static and dynamic loads may play an important part in fruit deterioration. A thermodynamic approach is proposed in undertaking further studies encompassing various forms of postharvest deterioration.