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Effect of pre-cooling and storage methods on extending the shelf life and quality of mango cv. kesar fruits

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SUMMARY : Freshly harvested Kesar mango fruits were subjected to treatments of forced air cooling (13° C) and hydro cooling (13° C) for 4 hr. These fruits and untreated lot (as control) were kept for storage at ambient condition, cold storage at 13° and 16° C and zero energy cool chamber(ZECC). Result indicated that the Kesar mango fruits treated with hydro cooling (13° C) for 4 hr could be kept up to 31.71 days, as compared with untreated fruits 25.14 days shelf life and in cold storage at 13° C kept up to 38.48 days, as compared with ambient condition 18.69 days shelf life. Data on shelf life, physiological loss in weight (PLW), firmness, TSS, acidity and total sugar indicated that, the hydro cooling and cold storage might be an ideal storage in order to increase the domestics as well as export marketing of Kesar mango fruits.

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Mango (*Mangifera indica* L.) belongs to family Anacardiaceae is the "King of Fruits" owning to its attractive colour, excellent taste, exotic flavour, exemplany nutritive value and its delicacy of table of rich as well as food for million of poor people during summer. It is gaining popularity in various parts of the world mainly due to its wide adaptability, high yield and attractive fruit as well as pulp colour. The storage life of mango fruit is not more than 8-10 days at room temperature and thus early perishability of the fruit poses a problem. Owning to lack of information on appropriate post harvest treatments and cold storage, the fruits only lose their quality but also encounter a substainal post harvest loss. The research efforts have been helped to increase the production of mango fruit but the purpose of obtaining maximum profit will not be served unless the increased production in supplemented with similar efforts to minimise their post harvest losses, which range between 25-30 per cent (Salunkhe and Desai, 1984).

There is a very little information available on Kesar fruit with reference to physio-chemichal changes on pre-cooling and storage methods. Therefore, a detailed study on these aspects was taken to preserve the fruits in good condition for longer period during ripening.

EXPERIMENTAL METHODS

The fruits were harvested early in the morning at proper stage of maturity. Fruit were harvested by using Dapoli harvester and as such the stalk length was kept 2.5 cm. Then the fruits were brought to the Post Graduate Laboratory, Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh. The experiment was conducted in a Factorial Completely Randomized Design (FCRD), with three replications were treated as in control (P_0), forced air cooling 13° C for 4 hr (P_1) and hydro cooling at 13° C for 4 hr (P_2) and stored in ambient condition (S_0), cold storage at 13° (S_1), cold storage at 16° (S_2) and zero energy cool chamber (S_3) and its combinations. Each treatment had consisted twenty fruits.

After that fruits were labelled according to treatments and replication. Initial weight of fruits were recorded and

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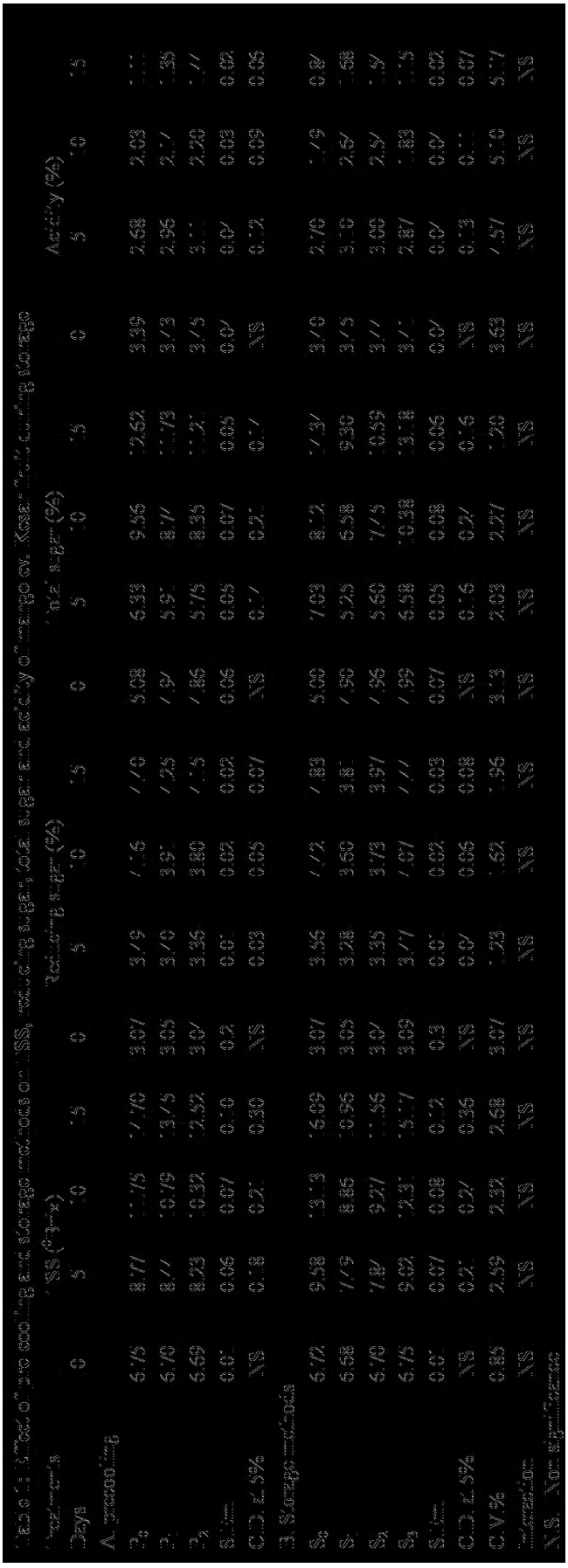
placed in uniform desired plastic carats and were kept in forced air cooling chamber at 13° C for 4 hr. For hydro-cooling treatment, fruits were dipped in ice water at 13° C temperature for 4 hr. The constant temperature was maintained by continuous adding of ice water for pre-cooling. After, treated fruits were kept in carats and stored at ambient condition, cold storage (13° and 16° C) and zero energy cool chambers. The observations on shelf life, physiological loss in weight and firmness were recorded. The acidity of the pulp advocated by A.O.A.C. (1975) and reducing and total sugars were estimated as per the method given by Lane and Eynon (1923). The statistical analysis was carried out with the help of analysis of variance technique using factorial completely randomized design (Snedecor and Cochran, 1994).

EXPERIMENTAL FINDINGS AND ANALYSIS

The data presented in (Table 1) clearly indicated that with the advancement of storage period, there was significant increase in TSS, reducing sugar and total sugar content of mango fruit under all storage conditions irrespective of post harvest treatments. The fruit treated with hydro cooling 13° C for 4 hr and stored in cold storage 13° C showed slow increase in TSS, reducing sugar and total sugar content as compared to control ones but the rates of increase in TSS, reducing sugar and total sugar contents were found to be faster in untreated fruit and ambient condition and zero energy cool chambers stored fruits as compared to pre-cooled and cold storage fruits. It may be due to fast chemical changes in fruits. Pre-cooling and prolong the storage of mango fruits at low temperature and high humidity in cold storage impeded the ripening process and resulted in lower values of TSS, reducing and total sugar in all treatment as compared to untreated and ambient condition stored fruits. The observation was similar to finding reported by Singh (1990) and Kapse (1993) in mango

The fruit treated with pre-cooling along with hydro cooling 13° C for 4 hr showed slow decrease in acidity as compared to untreated fruits but the rates of decrease was faster in ambient condition stored fruits as compared to cold storage fruits. This might be due to the fact that high temperature and low humidity at ambient condition resulted in faster degradation of organic acids into sugars and utilization of acids during respiration (Badar, 1990; Gole, 1986; Krishnamurthy and Joshi, 1989). On contrary, the pre-cooling and low temperature and high humidity in cold storage impeded the degradation of organic acids and high values of acidity in all treatments as compared to unprecooled and ambient condition and zero energy cool



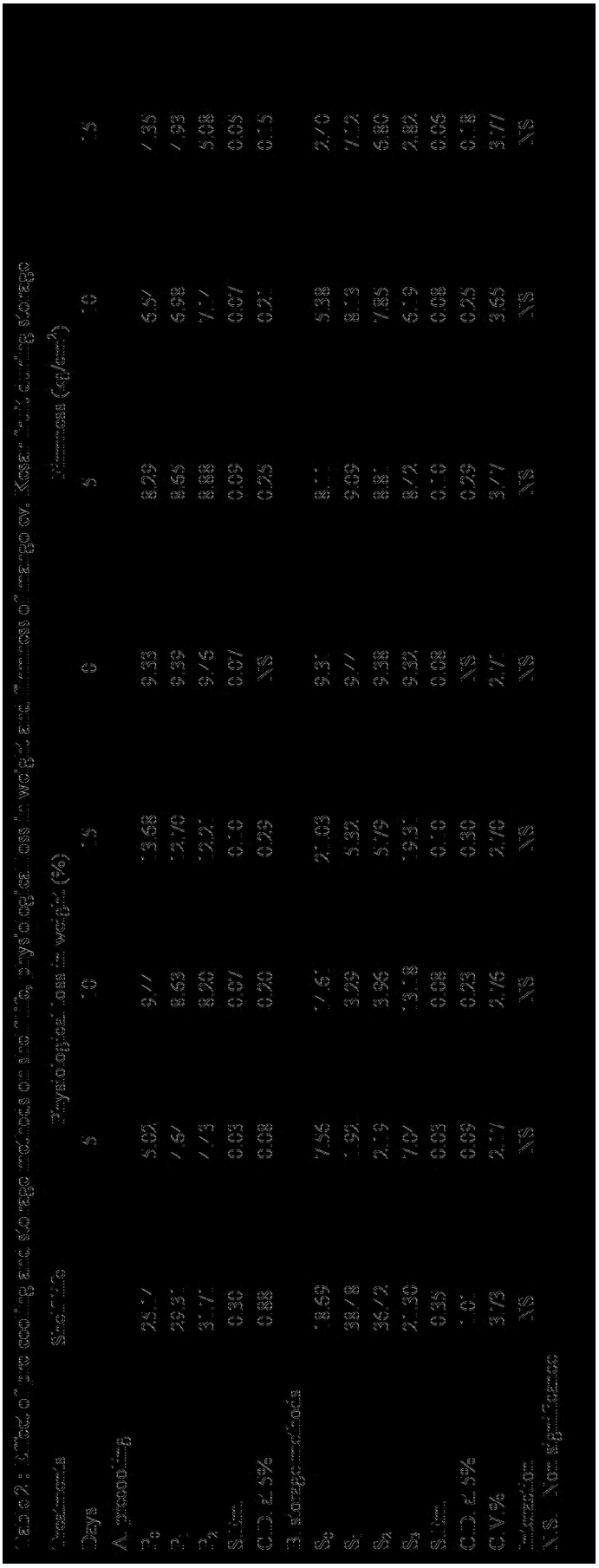
chamber stored fruits. Similar results were also reported by Joshi and Roy (1985) in mango fruits.

The perusal of data resented in (Table 2) revealed that, the rate of increase shelf life of precooled mango fruits was found better than unprecooled mango fruits and fruits stored in cold storage as compared to ambient condition and zero energy cool chambers. Result indicated that the Kesar mango fruits treated with hydro cooling 13° C for 4 hr recorded maximum shelf life 31.71 days as compared to unprecooled ones, which recorded the minimum shelf life 25.14 days, whereas, ambient condition and zero energy cool chambers stored fruits recorded the minimum shelf life 18.69 and 21.30 days, respectively and cold storage at 13° and 16° C showed maximum shelf life 38.48 and 36.42 days, respectively. This could be ascribed to the fact that there was low temperature coupled with high humidity in cold storage which was more effective in extending the shelf life of mango fruits as compared to ambient condition and zero energy cool chambers. Similar results were reported by Joshi (1983), Wasker and Masalkar (1997) in different varieties of mango fruits.

The per cent physiology loss in weight increased throughout the storage conditions. The minimum loss in weight was noted when mango fruits treated with hydro cooling 13° C for 4 hr. The fruits treated with pre-cooling showed lower weight loss due to reduction in rate of respiration and transpiration as well delaying in ripening due to restricted ethylene accumulation in the fruits during ripening. The rate of increase in weight loss of mango fruit increased at a faster rate at ambient condition and zero energy cool chambers stored fruits as compared to cold stored fruits. Similar observations were also recorded by Galathia (2004) and Patel (2006) in mango.

A fall in firmness in all the treatments was observed during storage period. Yet, maximum fruit firmness was recorded in fruits treated with hydro cooling 13° C for 4 hr as compared to unprecooled fruits. Ambient condition and zero energy cool chambers stored fruits had minimizing the softness in fruits as compared to cold storage fruits. Fruit firmness was maintained by the retardation of enzymatic activities might have suppressed the cell wall degradation in the mesocarp cells of the fruits and by controlling the spoilage of fruits. The above treatments performed such activity in more or less level and maintained the fruit firmness throughout the storage. The similar result was obtained by Kapse (1993).

The present study made it clear that cold storage played a vital role in maintaining the quality after harvest



and extending the shelf life of of Kesar mango fruits. The fruits treated with pre-cooling, removal of field heat from the fruits, reduction in rate of respiration and transpiration as well as delaying in ripening was due to restricted ethylene accumulation in the fruits during ripening. Therefore, it is concluded that hydro cooling 13° C for 4 hr and cold storage at 13° C were best treatments after harvesting of mango fruits.

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