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Effect of ethylene absorbent on quality and shelf-life of mango (*Mangifera indica*)*

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India is the most important producer of mangoes in the world contributing about 43% of total production. It is the second major fruit crop in India and at present it is grown in an area of 2.20 million ha with a production of 13.79 million tonnes (NHB 2009). India stands at fifth position among main mango producing countries of the world with a share of 7.6% and third largest exporter in the world.

Usually after harvest, the ripening process in mature green mango (*Mangifera indica* L.) fruits takes 9–12 days (Herianus *et al*. 2003) with good flavour, texture and colour characteristic at 25°C ambient conditions. The shelf- life of mango varies among its varieties depending on storage conditions. The ripening process of mango fruit involves a series of biochemical reactions or metabolic activities that cause chemical changes, increased respiration, ethylene production, change in structural polysaccharides causing softening, degradation of chlorophyll develops pigments by carotenoids biosynthesis, changes in carbohydrates or starch conversion into sugars, organic acids, lipids, phenolics, volatile compounds, etc., thus leading to ripening of fruit with softening of texture to acceptable quality (Herianus *et al.* 2003). Ethylene is the main catalyst for ripening and ripening process. Wrapping in polyethylene containing potassium permanganate ($KMnO_4$) as an ethylene absorbent indicated slightly delay in ripening and extended storage life by a week and lower rate of fresh weight loss in treated Haden mango stored at 15°C with 90% relative humidity (Zambrano and Manzano 1995). Keeping in view the above facts, the present investigation was carried out to optimize the dose of $KMnO_4$ for maintaining the quality of fruit for a longer duration.

The experiment was conducted at Post Harvest Laboratory, Department of Horticulture, Allahabad Agricultural Institute-Deemed University, Allahabad during 2007–08 for determining suitable treatment of $KMnO_4$. The freshly harvested matured fruits of mango 'Dashehari' were procured from the Research Orchard, Department of Horticulture. The freshly harvested fruits were washed with tap water to remove the field heat and also to lower the microbial load. After drying, fruits were packed in 200 gauged polyethylene bags containing different concentration of $KMnO_4$ as per the treatments. The different treatments of $KMnO_4$ were at first packed in a muslin cloth kept inside the fruit containing polyethylene bags. Treated fruits were kept at ambient temperature and observations were recorded on physiological loss in weight (%), acidity (%), total soluble solids (%), reducing sugars (%), total sugars (%), rotting percentage and vitamin C (mg/100 g) at different interval (0, 4, 8, 12 days of storage). All the treatments were laid out in a completely randomized design with 3 replications. There were 5 treatments, ie T_0 (0%), T_1 (3%), T_2 (4%), T_3 (5%), T_4 (6%). The TSS was determined by using the Carl- Zeiss Hand Refrectometer and the results were expressed in percentage. The fruit quality (acidity, reducing sugar, total sugar and vit-C) were analyzed by the method as suggested in AOAC (1984).

There were significant differences among all the treatments for physiological loss in weight at different interval of storage period (Fig 1). Gradual physiological loss in weight were recorded for all the treatment but least physiological loss in weight was observed in the treatment T_4 ($KMnO_4$ @ 6%) and maximum in T_0 (control) at all interval of storage. Jiang and Jouce (2002) reported that

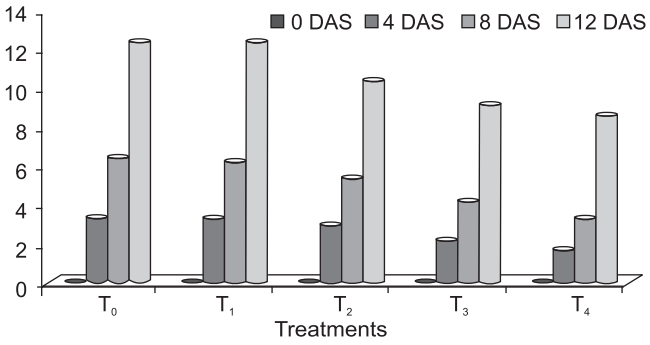

Fig 1 Physiological loss in weight (%) as affected by different treatments (crystal form) during storage period

Short note

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ethylene absorbent decreased the ethylene production, respiration rate, thereby slowed down the loss in weight, softening and colour changes. Similar result was also reported by Fagaria *et al.* (2007).

Total soluble solids showed significant difference among all the treatment up to 12 days of storage period (Fig 2). The increasing trends was recorded for all the treatment but maximum increase and least decline in total soluble solid was estimated in the treatment T_4 ($KMnO_4$ @ 6%) while minimum increase in total soluble solids was recorded in T_0 (control) at all interval of storage. Gautam *et al*. (2003) reported that $KMnO_4$ impregnated in chalk stick when impose to mango cultivar 'Lucknow Safeda' stored under ambient condition increased the total soluble solid while firmness, greenness and acidity content decreased on prolonging the storage period. These results are also in alignment with the earlier result of Fagaria *et al.* (2007).

Storage of freshly harvested mango fruit in polyethylene bags containing $KMnO_4$ showed significantly increasing trend up to 8 days of storage period and then decreasing trend of total sugars in all the treatments (Fig 3). The maximum increasing trend and retention of total sugars was recorded in T_4 ($KMnO_4$ @ 6%) and minimum in T_0 (control) at all interval of storage. Wang *et al*. (1998) also reported that the fruit firmness, total soluble solids, ascorbic acid content, total sugar and total acidity of lime fruit were highest in 0.025 mm polyethylene bags containing $KMnO_4$ as compared to 0.025 mm polyethylene bags without $KMnO_4$.

$KMnO_4$ treated and without treated fruits differed significantly among all the treatment for reducing sugars during storage period (Fig 4). An increasing trend of reducing sugars up to 8th days of storage period and then decline trend was recorded in all treatments. Maximum increase as well as retention in reducing sugars were estimated in the treatment T_4 ($KMnO_4$ @ 6%) and minimum in T_0 (control) at all interval of storage.

Exposure of $KMnO_4$ to mango fruits effectively increased the retention of ascorbic acid content during storage period (Fig 5). Maximum retention of ascorbic content was recorded in T_4 ($KMnO_4$ @ 6%) and minimum in T_0 (control) at all interval of storage. Jiang and Jouce (2005) reported highest ascorbic acid content and titrable acidity in $KMnO_4$ treated mango fruit during storage period.

Significant difference was observed among all the treatments for acidity. Maximum increase in acidity was recorded in the treatment T_4 ($KMnO_4$ @ 6%) and it was also at par with the treatment T_3 ($KMnO_4$ @ 5%), whereas minimum increase in acidity was recorded in T_0 (control). Hiwal *et al*. (2003) reported that air dried packed fruit in polyethylene bags containing $KMnO_4$ inhibited ripening and enhanced acidity as compared to control.

Freshly harvested fruit packed in polyethylene bags

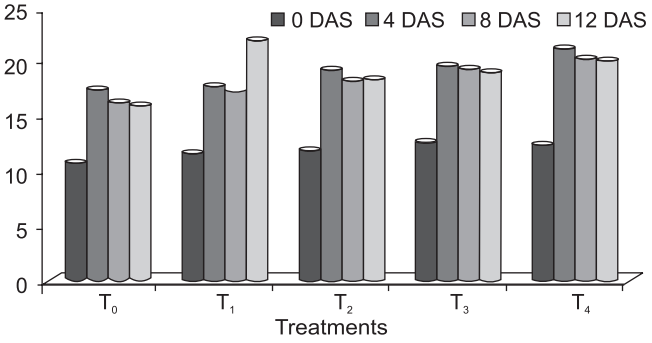

Fig 2 Total soluble solids (TSS) as affected by different treatments (crystal form) during storage period

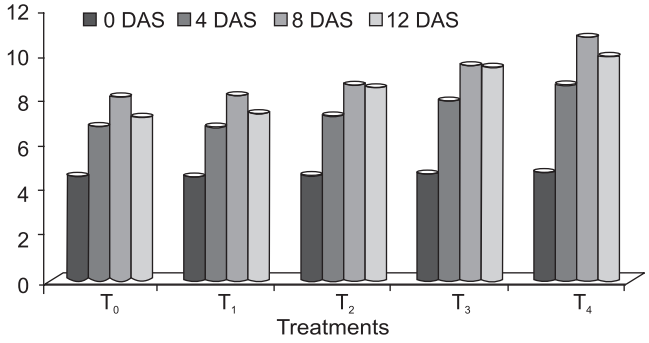

Fig 4 Reducing sugar as affected by different treatments (crystal from) during storage period

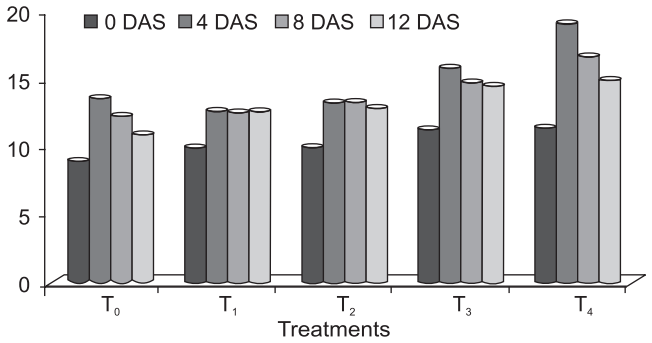

Fig 3 Total sugar as affected by different treatments (crystal form) during storage period

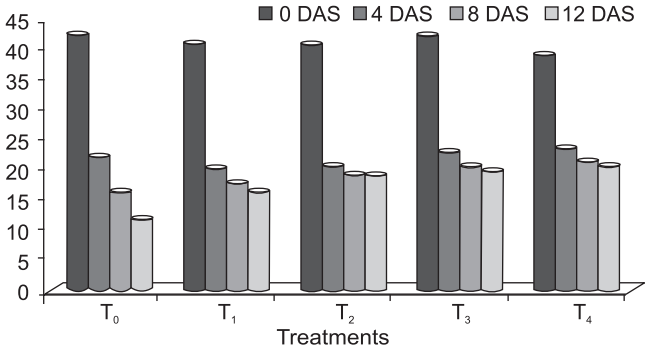

Fig 5 Ascorbic acid (vitamin C) as affected by different treatments (crystal form) during storage period

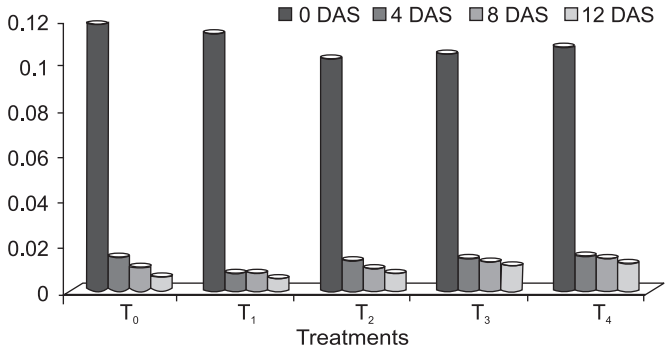

Fig 6 Acidity (%) as affected by different treatments (crystal form) during storage period

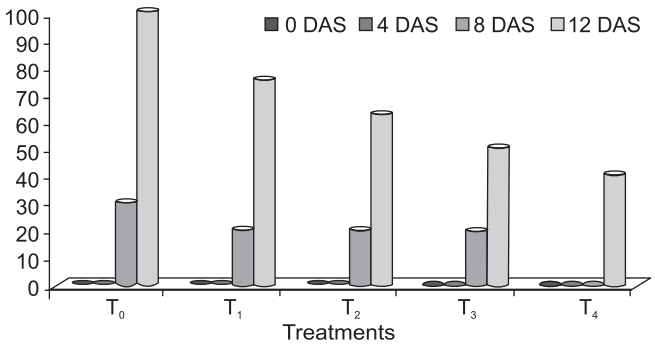

Fig 7 Rotting percentage as affected by different treatments (crystal form) during storage period

containing $KMnO_4$ and stored at ambient temperature had the better quality in terms of rotting percentage during storage period (Fig 7). Minimum rotting was recorded in the treatment T_4 ($KMnO_4$ @ 6%) and maximum in T_0 (control) at all interval of storage period. Significant variation among all the treatments in terms of physiological loss in weight and spoilage were observed on the sixth days of storage in guava fruit (Hiwal *et al.* 2003).

SUMMARY

An experiment was conducted during 2007–08 to study the effect of ethylene absorbent on quality and shelf life of Dashehari mango (*Mangifera indica* L). Uniform and healthy freshly harvested matured fruits were taken for this study were packed in a 200 mm gauge polyethylene bags containing different concentration of $KMnO_4$ in different bags. The fruits which were packed in polyethylene bags containing $KMnO_4$ @ 6% showed better results in terms of least physiological loss in weight, rotting percentage with highest total soluble solids, vit-C, total sugars, reducing sugars and shelf- life over control during 12 days of storage period.

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