# Effect of different covering material on ripening and physiochemical properties of Dasheri Mango (*Mangiferaindica)*


## Abstract

Thepresent experimentwasconductedatDepartmentofHorticulture,NainiAgricultural Institute,SamHigginbottomUniversityofAgriculture,TechnologyandSciences,Prayagrajduringthes session2021-2022.Theexperimentwaslaidoutinrandomizedblock designwiththree replications,andthestudyconsistsofNine treatmentscombinationsincluding controlbyusingdifferent covering materials on ripening and physiochemical properties of Dasheri Mango ( *Mangiferaindica*)".ThebesttreatmentwasT$_2$(Banana Leaves) & T$_6$(Rice Straw) whichshowshighest valuesinalltheparametersviz.Fruit weight (g) (163 & 155.41),Fruit diameter (mm) (59.16 & 58.41), Days of ripening (11.50 & 10.83), Total soluble solids ($^0$Brix) (13.21 & 12.83), Ascorbicacid(mg/100g) (28.21 & 28.25), Total sugar(%) (12.21 &11.95 ), Reducing sugar(%) (4.87 & 4.88), Non-reducing sugar(%) (7.34 & 7.05) and also found superior in organoleptic score of colour and appearance, texture, flavour and overall acceptability of Mango fruit. In terms of benefit cost ratio, the highest net return was found in the same treatment T$_2$ (Banana Leaves).



**Key words:** Dasheri Mango, Banana Leaves, Sugar,Flavour



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## INTRODUCTION

***Mangiferaindica***, is commonly known as mango, aam. Mangoes belong to genus ***Mangifera*** which consists of about 30 species of tropical fruiting trees in the flowering plant family ***Anacardiaceae***. Mango is the king among tropical fruits. Mango is evergreen tree of about 50-60 feet in height and is greatly relished for its succulence, exotic flavour and delicious taste in most countries of the world (Bhatnagar and Subramanyam, 1973). Apart from its delicacy, Mangoes are important sources of pro-vitamin A (carotenoids), particularly βcarotene (Rodriguez-Amaya 2001). These have diverse roles and benefits for human health including antioxidant activity, cell communication, immune function enhancement and UV skin protection (Palozza and Krinsky 1992.

Mango has its origin in India and approximately a thousand different types of mango fruits are produced in the country. Annual production of mango in India is 15.19 million tonnes (FAO, 2011). Worldwide production of mango is 38.95 million tonnes (FAO, 2011). It is reported that about 75 % of the fruits are knocked off, right from the flowering stage till ripening. The losses, however, can be minimized to a great extent by utilizing the dropped fruits. Fortunately, mango is one of the few fruits which can be utilized in all stages of maturity. But when mango ripened it has delicious taste. Mango can be ripe naturally and artificially, naturally mango is ripened on plant when it goes to the full maturity, but we can also ripen mangos artificially. For artificial ripening we can use chemicals and covering materials which enhance the ripening of mango fruits. In chemical ripening, unsaturated hydrocarbons such as acetylene and ethylene are used because it can help encourage mango in the ripening process and colour change, but it is harmful for human health. Another alternative for ripening mangoes artificially is covering the fruit with different type of covering materials i.e., newspaper, wheat straw, rice straw, plastic bags etc. this is a best option to ripen mangoes artificially. This is not harmful for human health and for the fruit quality. Different covering materials have the different effect on the fruits. By the covering of the harvested fruit, we can enhance the shelf life and the quality retention of the fruit.

## MATERIALS AND METHODS

The present investigation was laid outinthe Post Harvest Laboratory of HorticultureDepartment, SHUATS, Prayagrajduring the year 2021-2022. The experiment was laid out in the RBD with 9 treatments and 3 replications the treatments were $T_0$(Control),$T_1$(Mango leaves), $T_2$ (Banana leaves), $T_3$(Guava leaves), $T_4$(Newspaper), $T_5$(Plastic bags), $T_6$(Rice straw), $T_7$(Wheat straw), $T_8$(Grasses).

**Climatic condition in the experimental site:**

The area of Prayagraj district comes under subtropical belt in the south east of Utter Pradesh, which experience extremely hot summer and fairly cold winter. The maximumtemperature of the location reaches up to 46$^o$ C to 48$^o$ C and seldom falls as low as 4$^o$C to 5$^o$C.The relative

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humidity ranges between 20 to 94 %. The average rainfallis around 1013.4 mm annually. However, occasional precipitation is also not uncommon during winter months.

## RESULTS AND DISCUSSION

**Mango fruit weight(g)**

Data reveals that lowest weight (g) loss was observed in the treatment $T_2$ (Banana leaves) i.e 194.75 at the harvesting time and 163.00 was observed at 12 Days after storage (DAS) and the highest weight (g) loss was observed in treatment $T_0$ (Control) i.e 126.41at harvesting and 87.66 at 12 DAS. It was occurred due to shriveling, high respiration rate, physiological deterioration, etc.

**Comment [DAL1]:** Where did you obtain this results??

**Mango fruit Diameter(mm)**

Data reveals that the treatment $T_2$(Banana leaves) gave the maximum fruit diameter (mm) (61.66) during the harvesting time which was *at par* with $T_1$(Mango leaves). And the treatment $T_2$(Banana leaves) have the maximum fruit diameter (mm) (59.16) after the storage. All the treatments were significantly superior in their fruit diameter (mm) over control ($T_0$). Best fruit diameter (mm) might be due to the better covering material as compared to uncover fruit.

**Mango fruit Shelf life (Days)**

Data indicates that, after 7 days maximum decay/rotting was occurred in treatment $T_0$ (Control)followed by $T_7$ (Wheat straw) . After 12 days of storage the minimum decay was observed in treatment $T_3$ and maximum was found in treatment $T_0$followed by $T_7$,$T_8$&$T_4$. Decay increased rapidly after 12 days of storage. This was increasing respiration rate, retarded ripening etc.This might be due to the accumulation or maintenance of high relative humidity in the covering materials that reduced rate of transpiration.

**Table 1: Shelf Life(Days)**

| Treatment Notation | Shelf life (Days) |
|---|---|
| T0 | 07.67 |
| T1 | 09.83 |
| T2 | 11.50 |
| T3 | 13.67 |
| T4 | 13.00 |
| T5 | 08.50 |
| T6 | 10.83 |
| T7 | 08.00 |
| T8 | 08.50 |

**TSS(°Brix) of Mango fruit**

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TSS of Mango fruit was observed to increase continuously up to the end of research under ambient storage conditions. At beginning of storage maximum Total Soluble Solids (TSS) 10.00 °Brix was observed in $T_6$ (Rice straw) and minimum 8.31 °Brix in $T_0$ (control). It is due to conversion of polysaccharides into sugars during hydrolysis process. Therefore, TSS found to increase slightly with increase in storage period. Similar findings reported by **Manivsagan (2011)** and by **Navitha and Mishra (2018).**

**Ascorbic acid (mg/100 ml) of Mango fruit**

Data reveals that at the beginning of storage maximum Ascorbic acid 54.13 mg/100g was observed in $T_2$ (Banana leaves) and minimum is 47.13 mg/100g in $T_0$ (control). At 12 days after storage maximum Ascorbic acid recorded is 31.43 mg/100g in $T_0$ (Control) and minimum 28.21 mg/100g in $T_2$ (Banana leaves). This could be as result of quick evaporation of water from the fruit and concentration of soluble solids which inhibits the reaction of polyphenolase enzymes (**Desrosier and desrosier, 1977**). The percentage of ascorbic acid loss of this fruit was reported to be about 34-85% with time of storage (**Achinewhu, 1983**).Also other factors of ascorbic acid loss could be attributed by light, temperature and oxidation at high temperature. (**Rai and Chauhan ,2008 and Njoku*et al. 2011***).

**Total sugar (%) of Mango fruit**

Data revealed that maximum total sugar (5.62 and 12.21) at 0 and 12$^{th}$ Days after storage was found in treatment $T_2$ (Banana leaves). Whereas the minimum total sugar (5.38 and 10.35) was found treatment control. The increase in total sugar during storage might beresulting conversion of starch into simple sugar and later reduction in conversion rate was due to utilization of sugar in the process of respiration. Improvement in sugar per cent may be because of converting some cell wall material like hemicelluloses to reducing content under long storing conditions**.** These results are in close similarity with the research because they found, total sugars wereimproved alongwith the higher storing period in guava **Kaur *et al.*, 2019.**

**Reducing sugar (%) of Mango fruit**

Data reveals that at beginning of storage maximum Reducing sugar 2.75% was observed in $T_3$ (Guava leaves) and minimum is 1.89% in $T_6$ (Rice straw). At 12 days after storage maximum Reducing sugar recorded is 5.03% in $T_7$ (wheat straw) and minimum 4.81% in $T_4$ (Plastic bags).The increase in reducing sugars due to conversion of starch into simple sugar and later reduction in conversion rate was due to utilization of sugar in the process of respiration. Improvement in sugar per cent may be because of converting some cell wall material like hemicelluloses to reducing content under long storing conditions**.**

**Non- reducing sugar (%) of Mango fruit**

Data reveals that at beginning of storage maximum non- reducing sugar 3.71% was observed in $T_6$ (Rice straw) and minimum is 2.73% in $T_3$ (Guava leaves). At 12 days after storage maximum non- reducing sugar recorded is 7.34% in $T_2$ (Banana leaves) and minimum 5.48% in $T_0$ (Control). It might be because of an increase in reducing sugars and non-reducing sugars resulting conversion of starch into simple sugar and later on reduction in conversion rate was due to utilization of sugar in the process of respiration. Improvement in sugar per cent may be because of converting some cell wall material like hemicelluloses to reducing content under long storing conditions **(Stahi and Camp, 1971).**Theseresults are in close similarity with the results of **Parihar and Kumar (2007).**

**Sensory Evaluation**

The sensory evaluation of different attribute of stored mango was observed according to the opinion of test panel judges which comprising 5 members. The mean score showed that treatment $T_2$ (Banana leaves) (7.99) was most preferred considering all the points as colour, appearance, texture, taste and overall acceptability followed by treatment $T_6$ (Rice straw) (6.74) and treatment$T_1$(Mangoleaves)(6.37).

**Table 2: Sensory evaluation (Organoleptic score) of Mango fruit**

| Treatment Notation | Colour and Appearance | Texture | Taste and Flavour | Overall acceptability |
|---|---|---|---|---|
| T0 | 5.25 | 5.50 | 6.00 | 5.58 |
| T1 | 6.50 | 6.25 | 6.37 | 6.37 |
| T2 | 8.12 | 7.87 | 8.00 | 7.99 |
| T3 | 6.00 | 6.37 | 6.25 | 6.20 |
| T4 | 5.75 | 6.25 | 6.12 | 6.04 |
| T5 | 5.37 | 5.00 | 5.62 | 5.33 |
| T6 | 7.00 | 7.12 | 6.12 | 6.74 |
| T7 | 5.50 | 5.87 | 6.50 | 5.95 |
| T8 | 5.75 | 5.25 | 5.87 | 5.62 |

**Table3: Effect of different covering materials on ripening and physiochemical properties of Dasheri Mango at 0 Days after storage**

| Treatment Notation | Fruit Weight | Fruit Diameter | TSS (°Brix) | Ascorbic Acid (mg/100ml) | Total Sugar (%) | Reducing Sugar (%) | Non-reducing sugar(%) |
|---|---|---|---|---|---|---|---|
| T0 | 126.41 | 52.83 | 8.31 | 47.13 | 5.38 | 2.31 | 3.06 |
| T1 | 174.00 | 59.16 | 9.38 | 52.23 | 5.58 | 2.36 | 3.17 |
| T2 | 194.75 | 61.66 | 9.76 | 54.13 | 5.62 | 1.92 | 3.70 |
| T3 | 171.83 | 58.50 | 9.55 | 50.51 | 5.48 | 2.75 | 2.73 |
| T4 | 153.41 | 57.33 | 9.35 | 51.28 | 5.48 | 2.32 | 3.16 |

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|---|---|---|---|---|---|---|---|
| T5 | 143.91 | 56.33 | 9.36 | 48.71 | 5.46 | 2.53 | 2.97 |
| T6 | 186.66 | 60.50 | 10.00 | 52.71 | 5.61 | 1.89 | 3.71 |
| T7 | 201.33 | 59.33 | 9.05 | 51.45 | 5.46 | 2.23 | 3.22 |
| T8 | 157.41 | 56.16 | 9.13 | 50.61 | 5.47 | 2.37 | 3.25 |

**Table4: Effect of different covering materials on ripening and physiochemical properties of Dasheri Mango at 12 Days after storage**

| Treatment Notation | Fruit Weight | Fruit Diameter | TSS (°Brix) | Ascorbic Acid (mg/100ml) | Total Sugar(%) | Reducing Sugar (%) | Non- reducing sugar(%) |
|---|---|---|---|---|---|---|---|
| T0 | 87.66 | 51.25 | 11.70 | 31.43 | 10.35 | 4.86 | 5.48 |
| T1 | 153.25 | 57.75 | 12.66 | 28.81 | 11.78 | 4.83 | 6.97 |
| T2 | 163.00 | 59.16 | 13.21 | 28.21 | 12.21 | 4.87 | 7.34 |
| T3 | 143.00 | 57.08 | 11.83 | 30.48 | 11.10 | 4.91 | 6.19 |
| T4 | 129.00 | 55.83 | 11.25 | 29.38 | 11.28 | 4.81 | 6.46 |
| T5 | 117.16 | 54.91 | 11.60 | 30.68 | 10.97 | 4.90 | 6.07 |
| T6 | 155.41 | 58.41 | 12.83 | 28.25 | 11.95 | 4.88 | 7.05 |
| T7 | 130.16 | 57.66 | 11.35 | 30.15 | 11.01 | 5.03 | 5.98 |
| T8 | 139.00 | 54.66 | 11.81 | 29.16 | 11.03 | 4.87 | 6.16 |

## Conclusion

Based on the present findings, it is concluded that treatment T2 (Banana leaves) performed best in terms of TSS (13.21°Brix), Ascorbic acid (28.21mg/100 ml), total sugar (12.21%), reducing sugar (4.87%), non-reducing sugar (7.34%) and the treatment $T_3$ (Guava leaves) gave the longest shelf life (13.67 Days) followed by treatment $T_4$ (Newspaper) and treatment $T_2$ (Banana leaves) (13.00 Days & 11.50 Days) respectively.

Highest B:C ratio (1.7) was also found in the same treatment i.e., T2 (Banana leaves) and the lowest B:C ratio (1.3) found in treatment $T_0$ (control).

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