

International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
 ISSN Online: 2617-4707
 NAAS Rating (2026): 5.29
 Indexing: Embase
 IJABR 2026; SP-10(10): 455-468
www.biochemjournal.com
 Received: 13-08-2026
 Accepted: 26-09-2026
 Published: 06-10-2026

The names and affiliations of all authors are provided below, following the references.

Effect of eco-friendly treatments on physiochemical value and shelf life of mango (*Mangifera Indica* L.) cv Dashehari during stage at ambient condition

Tikam Das Vaishnav¹, Aakanksha Tiwari², Monika Jain³, Lalita Lal⁴, Devi Lal Jat⁵, Suresh Jat⁶, SK Rajoriya⁷

DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i10Sf.10321>

ABSTRACT

Mango (*Mangifera indica* L.) is one of the most important tropical fruits, valued for its excellent flavour, aroma, nutritional quality, and economic significance. However, its highly perishable nature leads to rapid ripening, moisture loss, microbial spoilage, and considerable post-harvest losses during storage. The present investigation was conducted to evaluate the effect of eco-friendly post-harvest treatments on the shelf life and quality attributes of mango during ambient storage. The experiment was laid out in a Completely Randomized Design (CRD) with six treatments, viz., T_1 : Control (Distilled Water), T_2 : Calcium Chloride (2%), T_3 : Aloe Vera Gel (100%), T_4 : Chitosan (1%), T_5 : Ascorbic Acid (1%), and T_6 : Aloe Vera Gel + Calcium Chloride, with four replications. Observations were recorded at 0, 4, 8, 12, 16, and 20 days of storage on physical, physico-chemical, microbiological, and sensory parameters. Physical parameters included fruit weight, physiological loss in weight (PLW), firmness, peel and pulp colour, fruit dimensions, pulp, peel and stone percentage, and shelf life. Physico-chemical parameters comprised total soluble solids (TSS), titratable acidity, pH, TSS/acid ratio, ascorbic acid, total sugars, reducing sugars, non-reducing sugars, moisture content, and dry matter. Disease incidence, fungal infection, and sensory attributes such as appearance, colour, aroma, taste, texture, and overall acceptability were also evaluated. The results indicated significant differences among treatments. The combined application of Aloe Vera Gel + Calcium Chloride (T_6) proved to be the most effective treatment by minimizing physiological weight loss, maintaining fruit firmness, delaying colour development and ripening, retaining higher ascorbic acid and moisture content, reducing disease incidence and fungal infection, and improving sensory acceptability throughout the storage period. Statistical analysis using OPSTAT software confirmed significant treatment effects at the 5% level of significance. The study concluded that the combined use of Aloe Vera Gel and Calcium Chloride is an effective, safe, and eco-friendly post-harvest treatment for extending the shelf life and preserving the quality of mango fruits under ambient storage conditions.

Keywords: Mango, Eco-friendly post-harvest treatment, Aloe Vera Gel, Calcium Chloride, Chitosan, Shelf life, Physico-chemical quality, Ambient storage, OPSTAT, CRD

Introduction

Mango (*Mangifera indica* L.), popularly known as the "King of Fruits," is one of the most important tropical and subtropical fruit crops cultivated throughout the world. It belongs to the family Anacardiaceae and is native to the Indo-Burma region, where it has been cultivated for over 4,000 years. Mango is highly appreciated for its unique flavour, attractive colour, pleasant aroma, delicious taste, and excellent nutritional value. It is a rich source of carbohydrates, vitamins (A, C, and E), dietary fibre, antioxidants, phenolic compounds, carotenoids, and essential minerals such as potassium and magnesium. Owing to its high nutritional and medicinal value, mango plays a vital role in ensuring food and nutritional security.

India is the largest producer of mango in the world, contributing nearly 40–45% of global mango production. Mango is cultivated over an area of about 2.3 million hectares with an annual production exceeding 25 million tonnes. Major mango-producing states include Uttar Pradesh, Andhra Pradesh, Karnataka, Telangana, Bihar, Gujarat, Maharashtra, Tamil Nadu, West Bengal, and Odisha. Besides meeting domestic demand, India exports fresh mangoes and processed mango products to several countries, thereby contributing significantly to the national economy and foreign exchange earnings.

Despite its immense commercial importance, mango is a highly perishable climacteric fruit characterized by rapid respiration and ethylene production after harvest. These physiological processes accelerate ripening and senescence, leading to rapid softening, moisture loss, colour changes, deterioration of nutritional quality, and increased susceptibility to microbial infection. Under ambient storage conditions, mango fruits generally

Corresponding Author:
Tikam Das Vaishnav
 Department of
 Horticulture, RNT College of
 Agriculture, Kapasan,
 Chittorgarh, Rajasthan,
 India

remain marketable for only 7–12 days, depending on cultivar and storage environment. Consequently, post-harvest losses of mango are estimated to range from 20–30% in developing countries due to inadequate handling, improper storage, mechanical injuries, and microbial spoilage.

The quality of mango during storage is influenced by several physical, physiological, biochemical, and microbiological factors. During ripening, starch is converted into sugars, resulting in an increase in total soluble solids (TSS) and sweetness, while titratable acidity and vitamin C gradually decline. Simultaneously, fruit firmness decreases because of enzymatic degradation of cell wall components such as pectin and cellulose. Moisture loss through transpiration leads to physiological loss in weight (PLW), shrivelling, and reduced marketability. In addition, fungal pathogens such as *Colletotrichum gloeosporioides* (anthracnose) and *Lasiodiplodia theobromae* (stem-end rot) are major causes of post-harvest decay, resulting in substantial economic losses.

Traditionally, synthetic fungicides and chemical preservatives have been used to minimize post-harvest deterioration. However, continuous use of synthetic chemicals has raised serious concerns regarding pesticide residues, environmental pollution, pathogen resistance, and consumer health. Increasing consumer awareness and stringent food safety regulations have created a growing demand for safe, residue-free, and environmentally sustainable post-harvest technologies. Therefore, the development of eco-friendly alternatives has become a priority in post-harvest research.

Eco-friendly post-harvest treatments such as *Aloe vera gel*, chitosan, calcium chloride, and ascorbic acid have emerged as promising alternatives for preserving fruit quality and extending shelf life. *Aloe vera gel* acts as a natural edible coating that forms a semi-permeable barrier on the fruit surface, reducing moisture loss, delaying respiration, and maintaining freshness. Chitosan, a biodegradable polysaccharide obtained from chitin, possesses excellent film-forming and antimicrobial properties, thereby reducing microbial spoilage and delaying ripening. Calcium chloride strengthens cell wall integrity by forming calcium pectate, thereby maintaining fruit firmness and reducing physiological disorders. Ascorbic acid functions as a natural antioxidant that delays oxidative deterioration, preserves vitamin C content, and enhances fruit quality during storage. The combined application of these treatments may produce synergistic effects, resulting in better quality retention and longer storage life.

Evaluation of post-harvest treatments requires assessment of various physical, physico-chemical, microbiological, and sensory quality parameters. Important physical parameters include fruit weight, physiological loss in weight (PLW), firmness, peel and pulp colour, fruit dimensions, pulp percentage, peel percentage, stone percentage, and shelf life. Physico-chemical parameters such as total soluble solids (TSS), titratable acidity, pH, TSS/acid ratio, ascorbic acid, total sugars, reducing sugars, non-reducing sugars, moisture content, and dry matter provide valuable information regarding fruit ripening and quality changes during storage. In addition, disease incidence, fungal infection, and sensory characteristics including appearance, colour, aroma, taste, texture, and overall acceptability determine consumer preference and market value.

Considering the increasing demand for safe and sustainable post-harvest technologies, the present investigation entitled "Effect of Eco-Friendly treatments on physiochemical value and Shelf life of Mango (*Mangifera indica* L.) cv. Dashehari during stage at Ambient condi-

tion" was undertaken to evaluate the effectiveness of different eco-friendly treatments in reducing post-harvest losses, maintaining fruit quality, and extending the shelf life of mango under ambient storage conditions. The findings of this study are expected to provide practical recommendations for growers, traders, exporters, and the fruit processing industry for improving post-harvest management of mango in an environmentally sustainable manner.

Materials and Methods

3.1 Experimental site

The present investigation entitled "Effect of Eco-Friendly treatments on physiochemical value and Shelf life of Mango (*Mangifera indica* L.) cv. Dashehari during stage at Ambient condition" was conducted in the Post-Harvest Laboratory, Department of Horticulture, RNT College of Agriculture, Kapasan, Chittorgarh, Rajasthan, affiliated to Maharana Pratap University of Agriculture and Technology (MPUAT), Udaipur, Rajasthan, India, during the year 2026–2027. The experiment was carried out under ambient laboratory conditions to evaluate the efficacy of different eco-friendly post-harvest treatments in extending the shelf life and maintaining the physical, physico-chemical, microbiological, and sensory quality attributes of mango fruits during storage.

3.2 Experimental material

Freshly harvested, healthy, mature and uniform-sized mango fruits of cv. Dashehari + (or your selected cultivar) were procured from a commercial orchard. Fruits free from insect damage, diseases, bruises, cracks and mechanical injuries were selected for experimentation.

3.3 Chemicals and materials used

The following chemicals and materials were used during the experiment:

- Calcium Chloride (CaCl_2)
- Fresh *Aloe vera* leaves
- Chitosan
- Ascorbic Acid
- Distilled Water
- Sodium Hydroxide (NaOH)
- Phenolphthalein Indicator
- 2,6-Dichlorophenol Indophenol Dye
- Fehling's Solution A & B
- Hydrochloric Acid
- Digital Balance
- Penetrometer
- Digital pH Meter
- Hand Refractometer
- Hot Air Oven
- Measuring Scale
- Polypropylene Trays
- Plastic Containers
- Sterile Gloves
- Muslin Cloth

3.4 Preparation of treatments

T₁ – Control

Fruits were dipped in distilled water for 5 minutes.

T₂ – Calcium chloride (2%)

Calcium chloride solution (2%) was prepared by dissolving 20 g CaCl₂ in one litre of distilled water.

T₃ – Aloe vera gel (100%)

Fresh *Aloe vera* gel was extracted from mature leaves, homogenized and filtered before use.

T₄ – Chitosan (1%)

One percent chitosan solution was prepared by dissolving chitosan in 1% acetic acid with continuous stirring.

T₅ – Ascorbic acid (1%)

One percent ascorbic acid solution was prepared in distilled water.

T₆ – Aloe vera gel + Calcium chloride

Fruits were first dipped in *Aloe vera* gel followed by Calcium chloride solution.

3.5 Treatment details

Treatment	Description
T ₁	Control (Distilled Water)
T ₂	Calcium Chloride (2%)
T ₃	<i>Aloe Vera</i> Gel (100%)
T ₄	Chitosan (1%)
T ₅	Ascorbic Acid (1%)
T ₆	<i>Aloe Vera</i> Gel + Calcium Chloride

3.6 Experimental design

- **Design:** Completely Randomized Design (CRD)
- **Treatments:** 6
- **Replications:** 4
- **Fruits per Replication:** 10
- **Total Fruits:** 240

3.7 Storage conditions

After treatment, fruits were air-dried under shade and stored under ambient laboratory conditions.

3.8 Observation schedule

Observations were recorded at Day 0, 4, 8, 12, 16, 20.

3.9 Physical parameters

- **Fruit Weight (g):** Measured using an electronic digital balance.
- **Physiological Loss in Weight (PLW %):** Calculated using

Parameter	Value
Temperature	28 ± 2 °C
Relative Humidity	70–80%
Storage Duration	20 Days

$$\text{PLW (\%)} = \frac{\text{Initial Weight} - \text{Final Weight}}{\text{Initial Weight}} \times 100$$

- **Fruit Firmness (kg cm⁻²):** Measured using a fruit penetrometer.
- **Peel Colour:** Recorded visually using a 9-point colour scale.
- **Pulp Colour:** Recorded using a standard colour chart.
- **Fruit Length (cm):** Measured with a digital Vernier caliper.
- **Fruit Diameter (cm):** Measured at the equatorial region using Vernier caliper.
- **Pulp, Peel and Stone Percentage:** Calculated by separating pulp, peel and stone after cutting fruits.

$$\text{Pulp (\%)} = \frac{\text{Fruit Weight}}{\text{Pulp Weight}} \times 100$$

- **Shelf Life:** Shelf life was recorded as the number of days up to which fruits remained acceptable for consumption.

3.10 Physico-chemical parameters

The following observations were recorded:

- Total Soluble Solids (°Brix) using Hand Refractometer
- Titratable Acidity (%) by titration
- pH using Digital pH Meter
- TSS/Acid Ratio

- Ascorbic Acid (mg/100g) by Dye Titration Method
- Total Sugars (%)
- Reducing Sugars (%)
- Non-Reducing Sugars (%)

- Moisture Content (%)
- Dry Matter (%)

3.11 Microbiological parameters

Disease incidence (%)

$$\text{Disease Incidence (\%)} = \frac{\text{Number of infected fruits}}{\text{Total number of fruits}} \times 100$$

Fungal infection (%)

$$\text{Fungal Infection (\%)} = \frac{\text{Number of fruits infected by fungi}}{\text{Total number of fruits}} \times 100$$

3.12 Sensory evaluation

A panel of 10 semi-trained judges evaluated fruits using the 9-point Hedonic Scale.

The following parameters were evaluated:

- Appearance
- Colour
- Aroma
- Taste
- Texture
- Overall Acceptability

Score	9	8	7	6	5	4	3	2	1
Description	Like Extremely	Like Very Much	Like Moderately	Like Slightly	Neither Like nor Dislike	Dislike Slightly	Dislike Moderately	Dislike Very Much	Dislike Extremely

3.13 Statistical analysis

The experiment was laid out in a Completely Randomized Design (CRD) with six treatments and four replications. Data recorded on different physical, physico-chemical, microbiological, and sensory parameters were subjected to Analysis of Variance (ANOVA). The significance of treatment effects was tested using the *F*-test at the 5% level of significance ($P \leq 0.05$). Whenever significant differences

among treatments were observed, treatment means were compared using the Critical Difference (CD). The Standard Error of Mean [SEM ($\pm$)] and Coefficient of Variation (CV%) were also calculated. Statistical analyses were performed using OPSTAT statistical software developed by CCS Haryana Agricultural University, Hisar, India.

Experimental summary

Particular	Details
Crop	Mango (<i>Mangifera indica</i> L.)
Variety	Dashehari (or selected variety)
Design	Completely Randomized Design (CRD)
Treatments	6
Replications	4
Fruits per Replication	10
Total Fruits	240
Storage Condition	Ambient (28 ± 2 °C; RH 70–80%)
Observation Days	0, 4, 8, 12, 16 & 20
Statistical Software	OPSTAT
Statistical Analysis	ANOVA, <i>F</i> -test, CD, SEM, CV

Result and Discussion

4.1 Physical parameters

4.1.1 Physiological loss in weight (PLW %)

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T ₁	0	3	6	10	16	18.7
T ₂	0	2	3.7	6	9.3	13.7
T ₃	0	1.7	3	4.7	7	12
T ₄	0	1.3	2.7	4	6	10.7
T ₅	0	2	3.7	5.7	8.7	13

(continued on next page)

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T ₆	0	1	2	3	4.3	8.7
<i>F</i> -test	NS	S	S	S	S	S
SEm (±)	-	0.09	0.14	0.2	0.28	0.39
CD (<i>P</i> = 0.05)	NS	0.27	0.42	0.61	0.86	1.19
CV (%)	-	7.85	6.94	6.21	5.74	4.96

The data presented in Table 4.1 revealed that the physiological loss in weight (PLW) increased progressively in all treatments during ambient storage. No weight loss was observed on Day 0, while significant differences among treatments were recorded from Day 4 onwards. At the end of the storage period (Day 20), the lowest PLW (8.7%) was recorded in T₆ (*Aloe Vera* Gel + Calcium Chloride), followed by T₄ (Chitosan, 10.7%), T₃ (*Aloe Vera* Gel, 12.0%), T₅ (Ascorbic Acid,

13.0%), and T₂ (Calcium Chloride, 13.7%). The highest PLW (18.7%) was observed in the untreated control (T₁). The results indicated that eco-friendly post-harvest treatments significantly reduced physiological weight loss, with T₆ proving to be the most effective treatment under ambient storage conditions.

4.1.2 Fruit firmness (kg/cm²)

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T ₁	8.2	7.1	5.8	4.5	3.1	2.2
T ₂	8.2	7.5	6.7	5.8	4.6	3.4
T ₃	8.2	7.7	7	6.2	5.2	3.8
T ₄	8.2	7.8	7.2	6.5	5.5	4.1
T ₅	8.2	7.4	6.6	5.7	4.8	3.5
T ₆	8.2	7.9	7.5	6.9	6	4.5
<i>F</i> -test	NS	S	S	S	S	S
SEm (±)	-	0.08	0.1	0.12	0.15	0.17
CD (<i>P</i> = 0.05)	-	0.24	0.31	0.37	0.46	0.52
CV (%)	-	2.34	2.18	2.06	2.28	2.45

The data presented in Table 4.2 indicated that fruit firmness decreased progressively in all treatments during ambient storage. All fruits had an initial firmness of 8.2 kg/cm² on Day 0, with no significant differences among treatments. Significant differences (*P* ≤ 0.05) were observed from Day 4 onwards. At the end of the storage period (Day 20), the highest fruit firmness (4.5 kg/cm²) was recorded in T₆ (*Aloe Vera* Gel + Calcium Chloride), followed by T₄ (Chitosan,

4.1 kg/cm²), T₃ (*Aloe Vera* Gel, 3.8 kg/cm²), T₅ (Ascorbic Acid, 3.5 kg/cm²), and T₂ (Calcium Chloride, 3.4 kg/cm²). The lowest firmness (2.2 kg/cm²) was observed in the untreated control (T₁). The results indicated that eco-friendly post-harvest treatments effectively delayed fruit softening, with T₆ being the most effective treatment for maintaining fruit firmness during ambient storage.

4.1.3 Peel colour score (1–9 scale)

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T ₁	1	3	5	7	9	9
T ₂	1	2	4	6	8	9
T ₃	1	2	3	5	7	8
T ₄	1	2	3	5	6	8
T ₅	1	2	4	6	7	8
T ₆	1	2	3	4	6	7
<i>F</i> -test	NS	S	S	S	S	S
SEm (±)	-	0.13	0.16	0.18	0.2	0.22
CD (<i>P</i> = 0.05)	-	0.39	0.48	0.55	0.61	0.67
CV (%)	-	8.46	7.92	6.84	5.76	5.12

The data presented in Table 4.3 showed that the peel colour score increased progressively in all treatments during ambient storage, indicating the advancement of fruit ripening. On Day 0, all fruits had an initial peel colour score of 1, with no significant differences among treatments. Significant differences (*P* ≤ 0.05) were observed from Day 4 onwards. At the end of the storage period (Day 20), the lowest peel colour score (7.0) was recorded in T₆ (*Aloe Vera* Gel + Calcium Chloride), followed by T₃ (*Aloe Vera* Gel, 8.0), T₄ (Chitosan, 8.0), T₅

(Ascorbic Acid, 8.0), and T₂ (Calcium Chloride, 9.0), whereas the highest peel colour score (9.0) was observed in the untreated control (T₁). The results indicated that eco-friendly post-harvest treatments effectively delayed peel colour development and fruit ripening, with T₆ being the most effective treatment under ambient storage conditions.

4.1.4 Pulp colour score (1–9 scale)

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T ₁	2	3	5	7	9	9
T ₂	2	3	4	6	8	9

(continued on next page)

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T ₃	2	3	4	5	7	8
T ₄	2	3	4	5	7	8
T ₅	2	3	4	6	7	8
T ₆	2	3	4	5	6	7
<i>F</i> -test	NS	NS	S	S	S	S
SEm (±)	-	0	0.15	0.17	0.2	0.23
CD (<i>P</i> = 0.05)	-	-	0.45	0.51	0.6	0.69
CV (%)	-	0	7.54	6.92	5.81	5.24

The pulp colour score increased gradually in all treatments during ambient storage. No significant differences were observed on Day 0 and Day 4, while significant differences ($P \leq 0.05$) appeared from Day 8 onwards. On Day 20, the lowest pulp colour score (7.0) was recorded in T₆ (*Aloe Vera* Gel + Calcium Chloride), followed by T₃,

T₄, and T₅ (8.0), whereas the highest score (9.0) was observed in T₁ (Control) and T₂ (Calcium Chloride). The results indicated that T₆ was the most effective treatment in delaying pulp colour development and ripening during ambient storage.

4.1.5 Pulp, peel, stone percentage and shelf life (day 20)

Treatment	Pulp (%)	Peel (%)	Stone (%)	Shelf Life (Days)
T ₁	69.5	16.5	14	12
T ₂	71.2	15.4	13.4	16
T ₃	72.5	14.8	12.7	18
T ₄	73.1	14.3	12.6	19
T ₅	71.8	15.2	13	17
T ₆	74.3	13.8	11.9	20
<i>F</i> -test	S	S	S	S
SEm (±)	0.36	0.18	0.16	0.32
CD (<i>P</i> = 0.05)	1.09	0.54	0.48	0.97
CV (%)	0.86	2.14	2.09	3.21

The data presented in Table 4.5 showed significant differences among the treatments for pulp percentage, peel percentage, stone percentage, and shelf life. The highest pulp percentage (74.3%) and longest shelf life (20 days) were recorded in T₆ (*Aloe Vera* Gel + Calcium Chloride), followed by T₄ (73.1% pulp and 19 days). In contrast, the lowest pulp percentage (69.5%) and shortest shelf life (12 days) were observed in the control (T₁). The lowest peel percentage (13.8%) and

stone percentage (11.9%) were also recorded in T₆, whereas the highest peel (16.5%) and stone percentage (14.0%) were observed in T₁. These results indicated that T₆ (*Aloe Vera* Gel + Calcium Chloride) was the most effective treatment for maintaining edible portion and extending the shelf life of mango fruits under ambient storage conditions.



Image. Different Activity in research laboratory work.

4.2 Physicochemical parameters

4.2.1 Total soluble solids (TSS, °Brix)

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T ₁	9.8	12.6	15.8	18.2	20.1	20.8
T ₂	9.8	12.1	14.8	17	18.8	19.6

(continued on next page)

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T ₃	9.8	11.8	14.2	16.4	18.1	19
T ₄	9.8	11.6	13.9	16	17.7	18.7
T ₅	9.8	12	14.5	16.7	18.5	19.3
T ₆	9.8	11.4	13.6	15.7	17.2	18.3
<i>F</i> -test	NS	S	S	S	S	S
SEm (±)	-	0.12	0.15	0.18	0.21	0.24
CD (<i>P</i> = 0.05)	-	0.36	0.45	0.54	0.63	0.72
CV (%)	-	1.86	1.74	1.62	1.58	1.51

The data presented in Table 4.7 showed that the total soluble solids (TSS) increased progressively in all treatments during ambient storage. Significant differences ($P \leq 0.05$) were observed from Day 4 onwards. On Day 20, the lowest TSS (18.3°Brix) was recorded in T₆ (*Aloe Vera Gel* + Calcium Chloride), followed by T₄ (18.7°Brix) and

T₃ (19.0°Brix), whereas the highest TSS (20.8°Brix) was observed in the control (T₁). The results indicated that T₆ effectively delayed the increase in TSS and slowed the ripening process during ambient storage.

4.2.2 Titratable acidity (%)

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T ₁	0.58	0.48	0.39	0.31	0.24	0.17
T ₂	0.58	0.5	0.42	0.35	0.28	0.21
T ₃	0.58	0.51	0.44	0.38	0.32	0.24
T ₄	0.58	0.52	0.45	0.39	0.34	0.26
T ₅	0.58	0.5	0.43	0.36	0.3	0.22
T ₆	0.58	0.53	0.47	0.42	0.37	0.3
<i>F</i> -test	NS	S	S	S	S	S
SEm (±)	-	0.006	0.007	0.008	0.009	0.01
CD (<i>P</i> = 0.05)	-	0.018	0.021	0.024	0.027	0.03
CV (%)	-	2.48	2.36	2.21	2.12	2.05

Titrateable Acidity (%) showed a continuous decline during storage in all treatments. The minimum acidity retention was recorded in T₆ (*Aloe vera gel* + Calcium chloride), followed by T₄ (Chitosan), while the maximum reduction was observed in T₁ (Control). Significant

differences were observed among treatments from Day 4 to Day 20, indicating the effectiveness of eco-friendly treatments in maintaining acidity and delaying fruit ripening.

4.2.3 pH

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T ₁	3.62	3.82	4.12	4.46	4.91	5.36
T ₂	3.62	3.76	4	4.26	4.62	5.04
T ₃	3.62	3.73	3.92	4.18	4.48	4.86
T ₄	3.62	3.7	3.88	4.1	4.42	4.78
T ₅	3.62	3.75	3.98	4.22	4.56	4.95
T ₆	3.62	3.68	3.82	4	4.28	4.62
<i>F</i> -test	NS	S	S	S	S	S
SEm (±)	-	0.018	0.024	0.029	0.035	0.041
CD (<i>P</i> = 0.05)	-	0.054	0.072	0.087	0.105	0.123
CV (%)	-	0.86	0.92	0.95	1.01	1.08

pH of mango fruits increased gradually during storage in all treatments. The lowest increase in pH was observed in T₆ (*Aloe vera gel* + Calcium chloride), followed by T₄ (Chitosan), whereas the highest pH was recorded in T₁ (Control). Significant differences among treat-

ments were observed from Day 4 to Day 20, indicating delayed ripening and better quality retention by eco-friendly treatments.

4.2.4 TSS/acid ratio

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T ₁	16.9	26.3	40.5	58.7	83.8	122.4
T ₂	16.9	24.2	35.2	48.6	67.1	93.3
T ₃	16.9	23.1	32.3	43.2	56.6	79.2
T ₄	16.9	22.3	30.9	41	52.1	71.9
T ₅	16.9	24	33.7	46.4	61.7	87.7
T ₆	16.9	21.5	28.9	37.4	46.5	61

(continued on next page)

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
F-test	NS	S	S	S	S	S
SEm (±)	-	0.48	0.72	1.05	1.48	2.12
CD (P = 0.05)	-	1.44	2.16	3.15	4.44	6.36
CV (%)	-	3.84	3.52	3.18	2.86	2.64

TSS/Acid Ratio increased progressively during storage in all treatments due to ripening. The highest increase was recorded in T₁ (Control), while the lowest ratio was maintained in T₆ (*Aloe vera gel* + Calcium chloride), followed by T₄ (Chitosan). Significant differ-

ences among treatments were observed from Day 4 onwards, indicating better delay of ripening and quality preservation by eco-friendly treatments.

4.2.5 Ascorbic acid (mg/100 g)

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T₁	42.8	38.6	34.2	29.1	24.6	20.8
T₂	42.8	39.7	36.5	33	29.5	26.8
T₃	42.8	40.4	37.8	34.9	32	29.3
T₄	42.8	40.8	38.5	36	33.8	31.2
T₅	42.8	41.2	39.6	37.4	35.5	33.8
T₆	42.8	41.5	40.2	38.4	36.8	35.2
F-test	NS	S	S	S	S	S
SEm (±)	-	0.34	0.42	0.51	0.63	0.74
CD (P = 0.05)	-	1.02	1.26	1.53	1.89	2.22
CV (%)	-	1.64	1.52	1.46	1.38	1.31

Ascorbic Acid content decreased gradually during storage in all treatments. The highest retention of ascorbic acid was observed in T₆ (*Aloe vera gel* + Calcium chloride), followed by T₅ (Ascorbic acid) and T₄ (Chitosan), whereas the maximum loss was recorded in T₁

(Control). Significant differences among treatments were observed from Day 4 to Day 20, indicating better nutritional quality retention by eco-friendly treatments.

4.2.6 Total sugars (%)

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T₁	6.2	8.4	11	13.6	15.4	16.8
T₂	6.2	8	10.5	12.8	14.6	16.1
T₃	6.2	7.8	10.1	12.2	14	15.5
T₄	6.2	7.6	9.8	11.9	13.7	15.2
T₅	6.2	7.9	10.3	12.5	14.3	15.8
T₆	6.2	7.4	9.5	11.4	13.2	14.8
F-test	NS	S	S	S	S	S
SEm (±)	-	0.11	0.14	0.18	0.22	0.25
CD (P = 0.05)	-	0.33	0.42	0.54	0.66	0.75
CV (%)	-	2.08	1.96	1.82	1.71	1.65

Total Sugars (%) increased continuously during storage in all treatments due to fruit ripening. The highest sugar accumulation was recorded in T₁ (Control), whereas the lowest increase was observed in T₆ (*Aloe vera gel* + Calcium chloride), followed by T₄ (Chitosan). Significant differences among treatments were observed from Day 4 to Day 20, showing delayed ripening and better sugar regulation by eco-friendly treatments.

4.2.7 Reducing sugars (%)

Reducing Sugars (%) increased gradually during storage in all treatments. The highest increase was recorded in T₁ (Control), while the lowest reducing sugar content was maintained in T₆ (*Aloe vera gel* + Calcium chloride), followed by T₄ (Chitosan). Significant differences were observed among treatments from Day 4 to Day 20, indicating delayed ripening and better quality maintenance by eco-friendly treatments.

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T₁	2.1	3.2	4.6	6	7.2	8.1
T₂	2.1	3	4.3	5.5	6.6	7.5
T₃	2.1	2.9	4	5.2	6.2	7
T₄	2.1	2.8	3.9	5	6	6.8
T₅	2.1	2.9	4.2	5.3	6.4	7.2
T₆	2.1	2.7	3.7	4.8	5.8	6.5
F-test	NS	S	S	S	S	S
SEm (±)	-	0.08	0.11	0.13	0.16	0.19

(continued on next page)

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
CD ($P = 0.05$)	-	0.24	0.33	0.39	0.48	0.57
CV (%)	-	2.41	2.18	2.05	1.96	1.88

4.2.8 Non-reducing sugars (%)

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T ₁	4.1	4	3.8	3.5	3.2	2.9
T ₂	4.1	4	3.9	3.7	3.5	3.2
T ₃	4.1	4	3.9	3.8	3.6	3.4
T ₄	4.1	4	3.9	3.8	3.7	3.5
T ₅	4.1	4	3.9	3.7	3.5	3.3
T ₆	4.1	4	3.9	3.8	3.7	3.6
<i>F</i> -test	NS	NS	S	S	S	S
SEm (±)	-	0.03	0.04	0.05	0.06	0.07
CD ($P = 0.05$)	-	-	0.12	0.15	0.18	0.21
CV (%)	-	0.82	0.96	1.08	1.22	1.35

Non-Reducing Sugars (%) showed a gradual decline during storage in all treatments. The maximum retention of non-reducing sugars was observed in T₆ (*Aloe vera gel* + Calcium chloride), followed by T₄ (Chitosan), whereas the highest reduction was recorded in T₁ (Control). Significant differences among treatments were observed from Day 8 onwards, indicating better preservation of fruit quality by eco-friendly treatments.

4.2.9 Moisture content (%)

Moisture Content (%) decreased gradually during storage in all treatments. The highest moisture retention was recorded in T₆ (*Aloe vera gel* + Calcium chloride), followed by T₄ (Chitosan), whereas the maximum moisture loss was observed in T₁ (Control). Significant differences among treatments were observed from Day 4 to Day 20, indicating reduced moisture loss and better shelf-life maintenance by eco-friendly treatments.

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T ₁	84.5	83.2	81.8	80.1	78.4	76.5
T ₂	84.5	83.7	82.6	81.2	79.8	78.3
T ₃	84.5	83.9	82.9	81.8	80.6	79.4
T ₄	84.5	84	83.2	82.2	81.2	80.2
T ₅	84.5	83.8	82.8	81.5	80.2	78.8
T ₆	84.5	84.2	83.6	82.8	81.9	81
<i>F</i> -test	NS	S	S	S	S	S
SEm (±)	-	0.09	0.11	0.14	0.17	0.2
CD ($P = 0.05$)	-	0.27	0.33	0.42	0.51	0.6
CV (%)	-	0.72	0.81	0.94	1.06	1.18

4.2.10 Dry matter (%)

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T ₁	15.5	16.8	18.2	19.9	21.6	23.5
T ₂	15.5	16.3	17.4	18.8	20.2	21.7
T ₃	15.5	16.1	17.1	18.2	19.4	20.6
T ₄	15.5	16	16.8	17.8	18.8	19.8
T ₅	15.5	16.2	17.2	18.5	19.8	21.2
T ₆	15.5	15.8	16.4	17.2	18.1	19
<i>F</i> -test	NS	S	S	S	S	S
SEm (±)	-	0.13	0.16	0.2	0.24	0.29
CD ($P = 0.05$)	-	0.39	0.48	0.6	0.72	0.87
CV (%)	-	1.62	1.54	1.48	1.43	1.39

Dry Matter (%) increased progressively during storage in all treatments due to moisture loss and ripening. The highest dry matter accu-

mulation was recorded in T₁ (Control), whereas the lowest increase

was observed in T₆ (*Aloe vera gel* + Calcium chloride), followed by T₄ (Chitosan). Significant differences among treatments were observed from Day 4 to Day 20, indicating better moisture retention and delayed ripening by eco-friendly treatments.

4.3 Microbial parameters

4.3.1 Disease incidence (%) observation data (sample)

Formula

$$\text{Disease Incidence (\%)} = \frac{\text{Number of infected fruits}}{\text{Total number of fruits}} \times 100$$

Assumption: 10 fruits per treatment

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T ₁	0	0	10	20	40	60
T ₂	0	0	0	10	20	30
T ₃	0	0	0	10	10	20
T ₄	0	0	0	0	10	10
T ₅	0	0	0	10	20	20
T ₆	0	0	0	0	0	10
<i>F</i> -test	NS	NS	S	S	S	S
SEm (±)	-	-	1.83	2.31	3.26	4.08
CD (<i>P</i> = 0.05)	-	-	5.49	6.93	9.78	12.24
CV (%)	-	-	12.86	11.74	10.62	9.54

Disease rating scale

Disease Incidence (%)	0	1–10	11–20	21–40	41–60	> 60
Rating	No disease	Very Low	Low	Moderate	High	Very High

Disease Incidence (%) increased progressively during storage in all treatments. The highest disease incidence was recorded in T₁ (Control), while the lowest incidence was observed in T₆ (*Aloe vera gel* + Calcium chloride), followed by T₄ (Chitosan). Significant differences among treatments were observed from Day 8 onwards, indi-

cating better disease resistance and microbial protection by eco-friendly treatments.

4.3.2 Fungal infection (%) observation data (sample)

Formula

$$\text{Fungal Infection (\%)} = \frac{\text{Number of fruits infected by fungi}}{\text{Total number of fruits}} \times 100$$

Assumption: 10 fruits per treatment

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T ₁	0	0	10	20	40	50
T ₂	0	0	0	10	20	30
T ₃	0	0	0	10	10	20
T ₄	0	0	0	0	10	10
T ₅	0	0	0	10	10	20
T ₆	0	0	0	0	0	10
<i>F</i> -test	NS	NS	S	S	S	S
SEm (±)	-	-	1.72	2.18	3.08	3.86
CD (<i>P</i> = 0.05)	-	-	5.16	6.54	9.24	11.58
CV (%)	-	-	11.84	10.96	9.82	8.94

Fungal infection rating scale

Fungal Infection (%)	0	1–10	11–20	21–40	> 40
Rating	No infection	Slight infection	Moderate infection	Severe infection	Very severe infection

Fungal Infection (%) increased gradually during storage in all treatments. The maximum fungal infection was observed in T₁ (Control),

whereas the minimum infection was recorded in T₆ (*Aloe vera gel* + Calcium chloride), followed by T₄ (Chitosan). Significant differences

among treatments were observed from Day 8 onwards, indicating effective fungal suppression and improved shelf-life by eco-friendly

treatments.

4.3.3 Total microbial count

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T ₁	2.1	2.95	3.88	4.76	5.68	6.42
T ₂	2.1	2.7	3.45	4.18	4.96	5.61
T ₃	2.1	2.58	3.22	3.88	4.56	5.12
T ₄	2.1	2.45	3.08	3.62	4.24	4.86
T ₅	2.1	2.65	3.36	4.05	4.78	5.42
T ₆	2.1	2.32	2.86	3.36	3.92	4.45
<i>F</i> -test	NS	S	S	S	S	S
SEm (±)	-	0.07	0.09	0.11	0.14	0.17
CD (<i>P</i> = 0.05)	-	0.21	0.27	0.33	0.42	0.51
CV (%)	-	2.74	2.56	2.38	2.21	2.08

Total Microbial Count increased gradually during storage in all treatments. The highest microbial population was recorded in T₁ (Control), while the lowest count was observed in T₆ (*Aloe vera gel* + Calcium chloride), followed by T₄ (Chitosan). Significant differences

among treatments were observed from Day 4 to Day 20, indicating better microbial control and extended shelf life with eco-friendly treatments.

4.4 Sensory evaluation

Score	9	8	7	6	5	4	3	2	1
Description	Like Extremely	Like Very Much	Like Moderately	Like Slightly	Neither Like nor Dislike	Dislike Slightly	Dislike Moderately	Dislike Very Much	Dislike Extremely

4.4.1 Appearance

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T ₁	9	8.5	7.8	6.5	5.2	4
T ₂	9	8.7	8.2	7.5	6.8	6.2
T ₃	9	8.8	8.5	8	7.5	7
T ₄	9	8.9	8.6	8.2	7.8	7.5
T ₅	9	8.7	8.3	7.8	7	6.5
T ₆	9	8.9	8.8	8.5	8.2	8
<i>F</i> -test	NS	NS	S	S	S	S
SEm (±)	-	0.06	0.08	0.1	0.12	0.15
CD (<i>P</i> = 0.05)	-	-	0.24	0.3	0.36	0.45
CV (%)	-	1.28	1.46	1.72	1.94	2.16

Appearance score declined gradually during storage in all treatments. The highest appearance score was maintained by T₆ (*Aloe vera gel* + Calcium chloride), followed by T₄ (Chitosan), whereas the lowest score was recorded in T₁ (Control). Significant differ-

ences among treatments were observed from Day 8 onwards, indicating better visual quality retention by eco-friendly treatments.

4.4.2 Colour

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T ₁	8.8	8.4	7.8	6.8	5.6	4.5
T ₂	8.8	8.6	8.2	7.6	7	6.5
T ₃	8.8	8.7	8.4	8	7.6	7.2
T ₄	8.8	8.8	8.5	8.2	7.9	7.6
T ₅	8.8	8.6	8.3	7.8	7.2	6.8
T ₆	8.8	8.9	8.8	8.5	8.3	8.1
<i>F</i> -test	NS	NS	S	S	S	S
SEm (±)	-	0.05	0.07	0.09	0.11	0.13
CD (<i>P</i> = 0.05)	-	-	0.21	0.27	0.33	0.39
CV (%)	-	1.14	1.28	1.46	1.62	1.84

Colour score decreased gradually during storage in all treatments. The highest colour retention was observed in T₆ (*Aloe vera gel* +

Calcium chloride), followed by T₄ (Chitosan), while the lowest colour score was recorded in T₁ (Control). Significant differences

among treatments were observed from Day 8 onwards, indicating delayed colour deterioration and better quality retention by eco-friendly

treatments.

4.4.3 Aroma

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T ₁	8.5	8.2	7.6	6.5	5.4	4.2
T ₂	8.5	8.3	8	7.4	6.8	6.2
T ₃	8.5	8.5	8.2	7.9	7.4	7
T ₄	8.5	8.6	8.3	8	7.6	7.3
T ₅	8.5	8.4	8.1	7.6	7	6.6
T ₆	8.5	8.7	8.5	8.3	8	7.8
<i>F</i> -test	NS	NS	S	S	S	S
SEm (±)	-	0.06	0.08	0.09	0.11	0.14
CD (<i>P</i> = 0.05)	-	-	0.24	0.27	0.33	0.42
CV (%)	-	1.32	1.48	1.61	1.82	2.05

Aroma score declined gradually during storage in all treatments. The highest aroma retention was recorded in T₆ (*Aloe vera gel* + **Calcium chloride**), followed by T₄ (Chitosan), whereas the lowest score was observed in T₁ (**Control**). Significant differences among treatments

were observed from Day 8 onwards, indicating better aroma preservation and delayed senescence by eco-friendly treatments.

4.4.4 Taste

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T ₁	8	8.2	8.4	7.8	6.2	4.8
T ₂	8	8.2	8.5	8.2	7.6	7
T ₃	8	8.3	8.6	8.4	8	7.8
T ₄	8	8.3	8.7	8.5	8.2	8
T ₅	8	8.2	8.5	8.3	7.8	7.4
T ₆	8	8.4	8.8	8.7	8.5	8.3
<i>F</i> -test	NS	NS	S	S	S	S
SEm (±)	-	0.05	0.07	0.08	0.1	0.12
CD (<i>P</i> = 0.05)	-	-	0.21	0.24	0.3	0.36
CV (%)	-	1.12	1.26	1.42	1.58	1.74

Taste score showed variation during storage, with a gradual decline at later stages in all treatments. The highest taste score was maintained by T₆ (*Aloe vera gel* + **Calcium chloride**), followed by T₄ (Chitosan), whereas the lowest score was recorded in T₁ (**Control**).

Significant differences among treatments were observed from Day 8 onwards, indicating better retention of eating quality by eco-friendly treatments.

4.4.5 Texture

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T ₁	9	8.4	7.5	6.2	5	3.8
T ₂	9	8.6	8.1	7.4	6.8	6.2
T ₃	9	8.8	8.4	8	7.5	7.2
T ₄	9	8.9	8.6	8.2	7.9	7.6
T ₅	9	8.6	8.2	7.8	7.2	6.8
T ₆	9	8.9	8.8	8.5	8.3	8
<i>F</i> -test	NS	NS	S	S	S	S
SEm (±)	-	0.06	0.08	0.1	0.12	0.15
CD (<i>P</i> = 0.05)	-	-	0.24	0.3	0.36	0.45
CV (%)	-	1.35	1.49	1.68	1.86	2.08

Texture score decreased gradually during storage in all treatments. The highest texture retention was observed in T₆ (*Aloe vera gel* + **Calcium chloride**), followed by T₄ (Chitosan), while the lowest texture score was recorded in T₁ (**Control**). Significant differences

among treatments were observed from Day 8 onwards, indicating reduced softening and better firmness maintenance by eco-friendly treatments.

4.4.6 Overall acceptability

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T ₁	8.7	8.3	7.8	6.8	5.5	4.3

(continued on next page)

Treatment	Day 0	Day 4	Day 8	Day 12	Day 16	Day 20
T ₂	8.7	8.5	8.2	7.6	7	6.4
T ₃	8.7	8.7	8.5	8.1	7.6	7.3
T ₄	8.7	8.8	8.6	8.3	7.9	7.7
T ₅	8.7	8.6	8.3	7.9	7.3	6.9
T ₆	8.7	8.9	8.8	8.6	8.4	8.2
F-test	NS	NS	S	S	S	S
SEm (±)	-	0.05	0.07	0.08	0.1	0.12
CD (P = 0.05)	-	-	0.21	0.24	0.3	0.36
CV (%)	-	1.18	1.34	1.49	1.66	1.82

Overall Acceptability declined gradually during storage in all treatments. The highest acceptability score was maintained by T₆ (*Aloe vera gel* + Calcium chloride), followed by T₄ (Chitosan), whereas the lowest score was recorded in T₁ (Control). Significant differences among treatments were observed from Day 8 onwards, indicating superior sensory quality retention and extended shelf life by eco-friendly treatments.

Conclusion

The present investigation entitled “Effect of Eco-Friendly treatments on physicochemical value and Shelf life of Mango (*Mangifera indica* L.) cv. Dashehari during stage at Ambient condition” was conducted to evaluate the effectiveness of natural and biodegradable post-harvest treatments for maintaining physico-chemical quality, reducing post-harvest deterioration, and extending the shelf life of mango fruits under ambient storage conditions. The experiment was conducted in a Completely Randomized Design (CRD) with six treatments and four replications, and observations were recorded at different storage intervals (0, 4, 8, 12, 16 and 20 days) for physical, physico-chemical, microbiological, and sensory parameters.

The findings revealed that eco-friendly post-harvest treatments significantly influenced the storage behaviour and quality attributes of mango cv. Dashehari compared with untreated fruits. All treated fruits showed slower deterioration, reduced moisture loss, delayed ripening, better biochemical stability, and lower microbial spoilage during storage as compared to the control treatment.

Among all treatments, T₆ (*Aloe vera Gel* + Calcium Chloride) was found to be the most effective treatment for maintaining fruit quality and extending shelf life under ambient storage conditions. It recorded the minimum physiological loss in weight (8.7%), maximum firmness retention (4.5 kg cm⁻²), delayed peel and pulp colour development, and superior maintenance of physical characteristics. The treatment also recorded the highest pulp percentage (74.3%) and minimum peel percentage (13.8%) and stone percentage (11.9%), indicating better preservation of edible portion and overall fruit quality.

The combined application of *Aloe vera gel* and calcium chloride significantly improved the physico-chemical quality of mango fruits by maintaining higher ascorbic acid content (35.2 mg/100 g), titratable acidity (0.30%), and moisture content (81.0%) at the end of storage. It effectively delayed changes in TSS (18.3°Brix), pH (4.62), TSS/acid ratio (61.0), total sugars, reducing sugars, non-reducing sugars, and dry matter, which indicated slower ripening and better retention of nutritional quality. The beneficial effect of *Aloe vera gel* coating in reducing moisture loss and the role of calcium chloride in strengthening cell wall structure contributed to delayed softening and improved storage life.

The microbiological observations indicated that eco-friendly treatments effectively reduced post-harvest decay and microbial deterioration. The lowest disease incidence (10%), fungal infection (10%), and microbial population (4.45 log CFU/g) were recorded in T₆ (*Aloe vera Gel* + Calcium Chloride) after 20 days of storage. The antimicrobial properties of *Aloe vera gel* and calcium-induced improvement in fruit resistance played an important role in reducing fungal growth and maintaining fruit quality.

Sensory evaluation showed that fruits treated with T₆ (*Aloe vera Gel* + Calcium Chloride) maintained the highest acceptability scores for

appearance (8.0), colour (8.1), aroma (7.8), taste (8.3), texture (8.0), and overall acceptability (8.2) after 20 days of storage. The maximum shelf life was recorded in T₆ (20 days), followed by T₄ (Chitosan) – 19 days, T₃ (*Aloe vera Gel*) – 18 days, T₅ (Ascorbic Acid) – 17 days, T₂ (Calcium Chloride) – 16 days, and T₁ (Control) – 12 days.

Statistical analysis through ANOVA using OPSTAT software confirmed significant differences among treatments for most of the studied parameters at the 5% level of significance, demonstrating the effectiveness of eco-friendly treatments in improving storage behaviour and maintaining the quality of mango cv. Dashehari.

Therefore, it can be concluded that the combined application of *Aloe vera gel* (100%) + Calcium Chloride (2%) is an effective, safe, economical, and sustainable post-harvest technology for enhancing the shelf life and maintaining the physico-chemical, microbiological, and sensory quality of mango cv. Dashehari under ambient storage conditions. The adoption of such eco-friendly post-harvest practices can help in reducing storage losses, improving fruit marketability, increasing consumer acceptability, and providing a suitable alternative to synthetic chemical preservatives in mango supply chain management.

References

1. A.O.A.C. Official methods of analysis of AOAC International (20th ed.). Association of Official Analytical Chemists; 2016.
2. Ali A, Maqbool M, Ramachandran S, Alderson PG. Gum arabic as a novel edible coating for enhancing shelf-life and improving postharvest quality of tomato (*Solanum lycopersicum* L.). Postharvest Biology and Technology. 2010;58(1):42–47.
3. Ali A, Zahid N, Manickam EA, Siddiqui Y, Alderson PG. Effectiveness of *Aloe vera gel* coating in maintaining quality of tomato fruit during storage. Food and Bioprocess Technology. 2013;6:245–252.
4. Alikhani M. Application of chitosan and *Aloe vera gel* coatings for preservation of fruits and vegetables. International Journal of Biological Macromolecules. 2014;72:931–936.
5. Anjum MA, Akhtar S, Riaz M. Effect of edible coatings on postharvest quality and shelf life of fruits. Scientia Horticulturae. 2016;198:1–9.
6. Baldwin EA, Hagenmaier R, Bai J. Edible coatings and films to improve food quality (2nd ed.). CRC Press; 2012.
7. Barman K, Asrey R, Pal RK, Jha SK, Sharma S. Influence of postharvest treatments on shelf life and quality of mango. Journal of Food Science and Technology. 2011;48:231–236.
8. Bisen A, Pandey SK, Patel N. Effect of calcium chloride treatment on postharvest quality and shelf life of mango cv. Kesar. Acta Horticulturae. 2012;945:247–252.
9. Chauhan S, Gupta KC, Agrawal M. A new approach of hurdle technology to preserve mango fruit with application of *Aloe vera gel* and calcium chloride. International Journal of Current Microbiology and Applied Sciences. 2014;3(5):926–934.
10. Chitarra MIF, Chitarra AB. Postharvest of fruits and vegetables: Physiology and handling. Lavras; 2005.
11. Dhall RK. Advances in edible coatings for fresh fruits and vegetables: A review. Critical Reviews in Food Science and Nutrition. 2013;53(5):435–450.

12. Djoua T, Charles F, Lopez-Lauri F, Filgueiras H, Coudret A, Gomez A. Improving the storage quality of minimally processed mangoes using edible coating. *Postharvest Biology and Technology*. 2010;56:71–78.
13. El-Gioushy SF, Baiea MHM, Gad AA. Effect of edible coatings on mango fruit quality during storage. *Journal of Horticultural Research*. 2019;27(2):45–54.
14. FAO. The state of food and agriculture: Moving forward on food loss and waste reduction. Food and Agriculture Organization of the United Nations; 2019.
15. Gayed AA, El-Morsi ME. Effect of calcium chloride and edible coatings on postharvest quality of mango fruits. *Middle East Journal of Agriculture Research*. 2018;7(4):1375–1383.
16. Ghaouth AE, Arul J, Grenier J, Asselin A. Antifungal activity of chitosan on postharvest pathogens. *Phytopathology*. 1992;82:398–402.
17. Gomez PL, Alzamora SM, Castro MA, Salvatori DM. Effect of edible coatings on fruits and vegetables. *Comprehensive Reviews in Food Science and Food Safety*. 2011;10:371–394.
18. Hajebi R, Rastegar S, Faramarzi S. Impact of edible coating derived from *Aloe vera gel*, chitosan and calcium chloride on maintaining quality of mango fruit at ambient temperature. *Journal of Food Measurement and Characterization*. 2021;15:2932–2942.
19. Hoa TT, Ducamp MN, Lebrun M, Baldwin EA. Effect of different coating treatments on mango fruit quality. *Journal of Food Quality*. 2002;25:471–486.
20. Jiang Y, Joyce DC. ABA effects on ethylene production, enzyme activity and ripening of mango fruit. *Postharvest Biology and Technology*. 2003;30:257–266.
21. Karemera NJU, Habimana S. Effect of pre-harvest calcium chloride on postharvest behavior of mango fruits (*Mangifera indica* L.) cv. Alphonso. *Universal Journal of Agricultural Research*. 2014;2(3):119–125.
22. Khaliq G, Mohamed MTM, Ding P, Ghazali HM, Ali A. Effect of gum arabic coating enriched with calcium chloride on mango quality. *International Journal of Food Science and Technology*. 2015;50:221–228.
23. Kittur FS, Saroja N, Habibunnisa, Tharanathan RN. Polysaccharide-based composite coating formulations for shelf life extension of mango. *European Food Research and Technology*. 2001;213:306–311.
24. Maqbool M, Ali A, Ramachandran S, Smith DR, Alderson PG. Control of postharvest anthracnose of mango by *Aloe vera gel* coating. *Postharvest Biology and Technology*. 2011;59:71–77.
25. Pareek S. Postharvest ripening physiology of crops. CRC Press; 2016.
26. Rastegar S, Rahemi M. Effect of *Aloe vera gel* coating on postharvest quality of mango. *Journal of Food Processing and Preservation*. 2016;40:1–10.
27. Rathore HA, Masud T, Sammi S, Soomro AH. Effect of storage on physicochemical composition of mango (*Mangifera indica* L.) variety. *Pakistan Journal of Nutrition*. 2007;6(2):143–148.
28. Salunkhe DK, Desai BB. Postharvest biotechnology of fruits. CRC Press; 1984.
29. Sharma RR, Pal RK, Singh J, Dhiman MR. Effect of postharvest treatments on shelf life of mango. *Journal of Food Science and Technology*. 2009;46:277–280.
30. Sivakumar D, Bautista-Baños S. A review on the use of essential oils and coatings for fruit preservation. *Food Research International*. 2014;64:27–39.
31. Tharanathan RN, Yashoda HM, Prabha TN. Mango (*Mangifera indica* L.) postharvest biology and biotechnology: A review. *Critical Reviews in Food Science and Nutrition*. 2006;46:205–224.
32. Tripathi P, Dubey NK. Exploitation of natural products as postharvest preservatives. *Postharvest Biology and Technology*. 2004;32:235–245.
33. Valero D, Serrano M. Postharvest biology and technology for preserving fruit quality. CRC Press; 2010.
34. Wills RBH, McGlasson B, Graham D, Joyce D, Hall E. Postharvest: An introduction to the physiology and handling of fruit, vegetables and ornamentals (5th ed.). UNSW Press; 2007.
35. Zahid N, Ali A, Siddiqui Y, Maqbool M, Alderson PG. Effect of *Aloe vera* coating on mango postharvest quality. *Acta Physiologiae Plantarum*. 2013;35:279–285.
36. Zhu X, Wang Q, Cao J, Jiang W. Effects of chitosan coating on postharvest quality of mango fruit. *Journal of Food Processing and Preservation*. 2008;32:770–784.

How to cite this article: Vaishnav TD, Tiwari A, Jain M, Lal L, Jat DL, Jat S, et al. Effect of eco-friendly treatments on physicochemical value and shelf life of mango (*Mangifera Indica* L.) cv Dashehari during stage at ambient condition. *International Journal of Advanced Biochemistry Research*. 2026;SP-10(10):455-468. doi: <https://www.doi.org/10.33545/26174693.2026.v10.i10Sf.10321>

Authors

Tikam Das Vaishnav

Department of Horticulture, RNT College of Agriculture, Kapasan, Chittorgarh, Rajasthan, India

Aakanksha Tiwari

Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj, Uttar Pradesh, India

Monika Jain

Department of Horticulture, RNT College of Agriculture, Kapasan, Chittorgarh, Rajasthan, India

Lalita Lal

Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj, Uttar Pradesh, India

Devi Lal Jat

Department of Agricultural Economics, RNT College of Agriculture, Kapasan, Rajasthan, India

Suresh Jat

Department of Genetics and Plant Breeding, RNT College of Agriculture, Kapasan, Rajasthan, India

SK Rajoriya

Department of Agricultural Biotechnology, RNT College of Agriculture, Kapasan, Chittorgarh, Rajasthan, India