International Journal of Advanced Biochemistry Research 2025; SP-9(12): 1337-1342

International Journal of Advanced Biochemistry Research

**ISSN Print:** 2617-4693
**ISSN Online:** 2617-4707
NAAS Rating (2025): 5.29
IJABR 2025; SP-9(12): 1337-1342
www.biochemjournal.com
Received: 08-09-2025
Accepted: 12-10-2025

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# Effect of nutrient application and irrigation on fruit retention, yield and quality of mango (*Mangifera indica* L.) cv. Alphonso under Konkan conditions

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**DOI:** https://www.doi.org/10.33545/26174693.2025.v9.i12Sp.6711

## Abstract
Low productivity and severe fruit drop are major constraints in Alphonso mango cultivation in the Konkan region, primarily due to improper nutrient and water management. A field experiment was conducted during 2023-24 and 2024-25 at the Centre of Excellence for Mango, College of Horticulture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, to study the combined effect of nutrient application and irrigation on fruit retention, yield and quality of mango (*Mangifera indica* L.) cv. Alphonso. The experiment was laid out in a Factorial Randomized Block Design (FRBD) with twelve treatment combinations comprising four nutrient management practices ($F_1$-$F_4$) and three irrigation-mulching regimes ($I_1$-$I_3$) replicated thrice. Results revealed that the combined application of RDF in split (N-30% P-40% K-20% after harvest, N-30% P-40% K 20% during fruit set, N-20% K-30% at marble stage, N-20% P-20% K-30% egg stage) + irrigation and mulching ($F_2I_3$) recorded significantly higher fruit retention (7.28%), number of fruits per tree (145.50) and fruit yield (38.23 kg/tree) compared to other treatments. Improved fruit quality parameters such as fruit weight (263.93 g), fruit length (10.06 cm), fruit width (8.56 cm) pulp: stone ratio (5.54), total soluble solids (18.73 $^{0}$Brix), titratable acidity (%) and minimum days from flowering to harvest (115.77 days) and spongy tissue incidence (2.33%) were also observed under the same treatment. The enhanced performance may be attributed to improved nutrient availability, better soil moisture status and reduced physiological stress during critical stages of fruit development. The study concluded that integrated nutrient management combined with irrigation and mulching is essential for improving productivity and fruit quality of Alphonso mango under Konkan agro-climatic conditions.

**Keywords:** Alphonso mango, nutrient management, irrigation, mulching, fruit retention, yield

## Introduction
Mango (*Mangifera indica* L.) is one of the most important fruit crops of India and occupies a premier position due to its excellent taste, flavour and nutritional value. India accounts for nearly 41 per cent of the world's mango production, with Alphonso being the most prized cultivar, especially in the Konkan region of Maharashtra. Despite its commercial importance, productivity of Alphonso mango remains low, mainly due to excessive fruit drop, irregular bearing and sub-optimal orchard management practices.

Among various factors affecting mango productivity, nutrient and water management play a crucial role in regulating flowering, fruit retention, yield and fruit quality. Mango trees, though tolerant to drought, are highly sensitive to moisture stress during flowering and fruit development stages, which leads to increased fruit drop and poor fruit growth. Similarly, imbalanced or untimely nutrient application adversely affects carbohydrate accumulation, hormonal balance and sink-source relationship, ultimately reducing fruit retention and yield.

Mulching is another important orchard management practice that helps in conserving soil moisture, improving nutrient availability and enhancing microbial activity. Several studies have reported the individual effects of nutrient management, irrigation and mulching on mango productivity. However, information on the combined influence of nutrient application and irrigation with mulching on fruit retention, yield and quality of Alphonso mango under Konkan conditions is limited.

Therefore, the present investigation was undertaken to study the combined effect of nutrient management and irrigation on fruit retention, yield and quality of mango cv. Alphonso.

## Materials and Methods

The experiment was conducted during 2023-24 and 2024-25 in the 30 years old mango orchard, at Centre of Excellence for Mango, Department of Horticulture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri (M.S.).

The experiment was laid out in a Factorial Randomized Block Design (FRBD) with twelve treatment combinations**,** replicated three times. Each treatment consisted of three trees, with a spacing of 10 × 10 m. The treatments comprised four nutrient management practices (Factor A) and three irrigation-mulching regimes (Factor B).

### Nutrient management (Factor A)

$F_1$: RDF (N 1.5 kg, $P_2O_5$ 0.5 kg and $K_2O$ 1.0 kg per tree)

$F_2$: RDF in split (N-30% P-40% K-20% after harvest, N-30% P-40% K 20% during fruit set, N-20% K-30% at marble stage, N-20% P-20% K-30% egg stage)

$F_3$: RDF + Amrashakti (2.5%) foliar spray at flowering, one month after flowering and two month after flowering

$F_4$: RDF + $KNO_3$ (1%) foliar spray at pea, marble and egg stage

### Irrigation and mulching (Factor B)

$I_1$: No irrigation no mulch

$I_2$: No irrigation with mulch

$I_3$: Irrigation with mulch

Irrigation was applied through basin method at 15-day intervals using 150 liters of water per tree. Organic mulch was applied uniformly around the tree basin.

Observations were recorded on fruit retention, number of fruits per tree, fruit yield and physical and chemical quality parameters. The data of two years were pooled and statistically analyzed using analysis of variance (ANOVA) as per FRBD. Significance was tested at 5 per cent level.

## Results

### Fruit Retention (%)

Fruit retention was significantly influenced during both the years and pooled by the combined effect of nutrient application and irrigation (Table 1.). The maximum fruit retention was recorded in first year, second year and pooled were 6.67, 7.90 and 7.28% in $F_2I_3$ and it was at par with $F_4I_3$ (6.57 and 7.71%) in first year and second year, respectively. The lowest fruit retention was observed under control treatment $F_1I_1$ (RDF without irrigation and mulch) 3.80, 5.89 and 4.85% in first year, second year and pooled, respectively.

This increased fruit retention in treatment $F_2I_3$ might be due to reducing physiological stress during critical stages such as flowering and early fruit set. Split nutrient doses ensure a steady supply of nitrogen, phosphorus, potassium and micronutrients, which supports balanced vegetative and reproductive growth and prevents sudden nutrient depletion that can trigger fruit drop. Adequate irrigation minimizes water stress and maintains turgor pressure in developing fruits, while organic mulch conserves soil moisture, moderates soil temperature and enhances nutrient availability through improved microbial activity. Similar observations were reported by Malshe *et al.*, (2022) [11] in mango, Shinde *et al.*, (2006) [15] in mango and Patra *et al.*, (2003) [13] in guava.

### Days from flowering to harvest (days)

The significant difference was found for days required from flowering to harvest in different treatment (Table 1.). Minimum days required in treatment $F_2I_3$ 113.98, 117.57 and 115.77 days it was at par with treatment $F_3I_3$ 114.86, 118.74 and 116.80 days during first year, second year and pooled, respectively. Maximum day's required for flowering to harvest was found in control $F_1I_1$ 121.52, 122.63 and 122.08 days in first year, second year and pooled, respectively.

Minimum days required from flowering to harvest in treatment $F_2I_3$ might be due to consistent nutrient availability supports stronger sink activity in developing fruit, maintains auxin flow and reduces stress induced delays in fruit enlargement. Adequate irrigation minimized moisture stress, preventing reduction in photosynthetic rate and metabolic slowdown, while mulching conserves soil moisture, moderates soil temperature and enhances root-zone microbial activity, improving nutrient mineralization and chemical availability. Similar observations were reported by Burondkar (2018) [3] in mango, Malshe *et al.*, (2020) [12] in mango and Bhosale *et al.*, (2022) [2] in mango.

**Table 1:** Effect of nutrient application and irrigation on fruit retention (%) and days from flowering to harvest (days) of mango (*Mangifera indica* L.) cv. Alphonso

| Treatment | Fruit retention (%) | | | Days from flowering to harvest (days) | | |
|---|---|---|---|---|---|---|
| | 2023-24 | 2024-25 | Pooled | 2023-24 | 2024-25 | Pooled |
| $F_1I_1$ | 3.80 | 5.89 | 4.85 | 121.52 | 122.63 | 122.08 |
| $F_1I_2$ | 3.90 | 6.15 | 5.03 | 116.41 | 121.78 | 119.09 |
| $F_1I_3$ | 4.23 | 6.41 | 5.32 | 118.65 | 121.69 | 120.17 |
| $F_2I_1$ | 5.25 | 6.66 | 5.95 | 119.18 | 119.53 | 119.35 |
| $F_2I_2$ | 6.30 | 7.46 | 6.88 | 116.32 | 118.70 | 117.51 |
| $F_2I_3$ | 6.67 | 7.90 | 7.28 | 113.98 | 117.57 | 115.77 |
| $F_3I_1$ | 5.90 | 6.56 | 6.23 | 119.74 | 120.26 | 120.00 |
| $F_3I_2$ | 6.28 | 6.72 | 6.50 | 116.53 | 120.16 | 118.34 |
| $F_3I_3$ | 6.14 | 7.47 | 6.81 | 114.86 | 118.74 | 116.80 |
| $F_4I_1$ | 6.24 | 6.85 | 6.54 | 118.12 | 121.02 | 119.57 |
| $F_4I_2$ | 5.55 | 7.11 | 6.33 | 120.87 | 119.10 | 119.99 |
| $F_4I_3$ | 6.57 | 7.71 | 7.14 | 117.23 | 119.37 | 118.30 |
| Mean | 5.57 | 6.91 | 6.24 | 117.78 | 120.05 | 118.91 |
| S.E (m)± | 0.21 | 0.11 | 0.12 | 0.59 | 0.29 | 0.32 |
| C.D at 5% | 0.61 | 0.32 | 0.36 | 1.72 | 0.85 | 0.93 |

**Number of Fruits at Harvest (Per Tree)**

A significantly higher number of fruits per tree (Table 2.) were recorded during first year under $T_4I_3$ (65.67), which was at par with $F_2I_3$ (62.67). During second year and pooled $F_2I_3$ (228.33 and 145.50, respectively) was recorded significantly higher number of fruits per tree and it was at par with $F_4I_3$ (222.67 and 144.17, respectively). The minimum was recorded in control $F_1I_1$ 27.33, 101.33 and 64.33 during first year, second year and pooled, respectively. The increased fruit retention under irrigated and mulched conditions resulted in a greater number of fruits at harvest.

**Fruit Yield (Kg/Tree)**

Fruit yield per tree was significantly influenced by combined application nutrient and irrigation treatments (Table 2.). During first year maximum fruit yield was found in $F_4I_3$ (16.76 kg/tree) which were at par with $F_2I_3$ (15.61 kg/tree). During second year and pooled, fruit yield was recorded in $F_2I_3$ 60.85 and 38.23 kg/tree, respectively and it was at par with $F_4I_3$ 59.18 and 37.97 kg/tree in second year and pooled, respectively and the lowest yield recorded under control $F_1I_1$ during both the years and pooled.

The combined application of split fertilizers, regulated irrigation and mulching significantly increases the number of fruits per tree and fruit yield (kg/tree) at harvest in mango by improving nutrient use efficiency, minimizing physiological stress and enhancing fruit retention throughout the reproductive cycle. Split fertilizer application ensures a steady and stage-specific supply of essential nutrients which are vital for flowering intensity, successful pollination, embryo development and reduction of nutrient deficiency induced fruit drop. Adequate irrigation during fruit set and early fruit development prevented moisture stress. Mulching supported these processes by conserving soil moisture, moderating soil temperature and improving soil structure thereby enhancing root activity and nutrient uptake during critical phenological stages. Dheware *et al.,* (2020) [5] and Malshe *et al.,* (2020) [12] in mango both found an increase in fruit number owing to regular fertilizer treatment. Jadhav *et al.,* (2019) [7] in mango found similar result.

**Table 2:** Effect of nutrient application and irrigation on number of fruit at harvest (per tree) and fruit yield (kg/tree) of mango (*Mangifera indica* L.) cv. Alphonso

| Treatment | Number of fruit at harvest (per tree) | | | Fruit yield (kg/tree) | | |
|---|---|---|---|---|---|---|
| | 2023-24 | 2024-25 | Pooled | 2023-24 | 2024-25 | Pooled |
| $F_1I_1$ | 27.33 | 101.33 | 64.33 | 6.57 | 24.58 | 15.58 |
| $F_1I_2$ | 28.67 | 115.00 | 71.83 | 7.08 | 28.78 | 17.93 |
| $F_1I_3$ | 39.33 | 143.33 | 91.33 | 9.59 | 36.31 | 22.95 |
| $F_2I_1$ | 46.67 | 209.67 | 128.17 | 10.92 | 53.22 | 32.07 |
| $F_2I_2$ | 47.33 | 212.33 | 129.83 | 11.76 | 56.21 | 33.98 |
| $F_2I_3$ | 62.67 | 228.33 | 145.50 | 15.61 | 60.85 | 38.23 |
| $F_3I_1$ | 45.00 | 111.33 | 78.17 | 11.38 | 28.74 | 20.06 |
| $F_3I_2$ | 51.00 | 120.67 | 85.83 | 12.85 | 33.12 | 22.99 |
| $F_3I_3$ | 48.33 | 213.00 | 130.67 | 12.29 | 55.11 | 33.70 |
| $F_4I_1$ | 57.00 | 135.33 | 96.17 | 14.30 | 34.32 | 24.31 |
| $F_4I_2$ | 48.00 | 141.33 | 94.67 | 12.00 | 36.62 | 24.31 |
| $F_4I_3$ | 65.67 | 222.67 | 144.17 | 16.76 | 59.18 | 37.97 |
| Mean | 47.25 | 162.86 | 105.06 | 11.76 | 42.25 | 27.01 |
| S.E (m)± | 2.53 | 5.88 | 3.30 | 0.59 | 3.00 | 1.53 |
| C.D at 5% | 7.43 | 17.25 | 9.68 | 1.73 | 8.81 | 4.47 |

**Fruit quality parameters**

**Fruit weight (g)**

The effect of nutrient application and irrigation was found significant on fruit weight in both the years and in pooled (Table 3.). The maximum fruit weight was recorded in first year, second year and pooled were 261.04, 266.82 and 263.93 g in $F_2I_3$ during first year, second year and pooled, respectively. The minimum fruit weight 234.04, 241.56 and 237.80 was found in $F_1I_1$ during first year, second year and pooled, respectively.

**Fruit length (cm)**

The maximum fruit length 9.98, 10.15 and 10.06 cm was recorded in treatment $F_2I_3$ during first year, second year and pooled, respectively. Minimum fruit length 8.90, 9.19 and 9.05 cm was found in control $F_1I_1$ during first year, second year and pooled, respectively.

**Fruit width (cm)**

The maximum fruit width 8.50, 8.62 and 8.56 cm was recorded in $F_2I_3$ during first year, second year and pooled, respectively, whereas minimum fruit width 7.56, 7.80 and 7.68 cm was found in control $F_1I_1$ during first year, second year and pooled, respectively.

The maximum fruit weight, fruit length and fruit width was found in $F_2I_3$ might be due to a steady supply of key macronutrients (N, P, and K) which enhance cell division, cell expansion and dry-matter accumulation leading to larger fruits. Uninterrupted nutrient and moisture availability supported sustained photosynthesis, stronger sink strength in developing fruits, might be improved carbohydrate translocation and balanced hormone regulation (auxin and cytokinin) all of which promote greater fruit enlargement. Similar observations were reported by Bhosale *et al.,* (2022) [2] in mango, Haldavnekar *et al.,* (2018) [6] in mango, Adak *et al.,* (2012) [1] in mango and Burondkar (2018) [3] in mango.

**Table 3:** Effect of nutrient application and irrigation on fruit weight (g) and fruit length (cm) of mango (*Mangifera indica* L.) cv. Alphonso

| Treatment | Fruit weight (g) | | | Fruit length (cm) | | |
|---|---|---|---|---|---|---|
| | 2023-24 | 2024-25 | Pooled | 2023-24 | 2024-25 | Pooled |
| $F_1I_1$ | 234.04 | 241.56 | 237.80 | 8.90 | 9.19 | 9.05 |
| $F_1I_2$ | 240.73 | 244.11 | 242.42 | 9.16 | 9.29 | 9.22 |
| $F_1I_3$ | 241.31 | 253.20 | 247.26 | 9.18 | 9.63 | 9.41 |
| $F_2I_1$ | 242.60 | 251.60 | 247.10 | 9.23 | 9.57 | 9.40 |
| $F_2I_2$ | 241.13 | 263.22 | 252.18 | 9.22 | 10.01 | 9.62 |
| $F_2I_3$ | 261.04 | 266.82 | 263.93 | 9.98 | 10.15 | 10.06 |
| $F_3I_1$ | 244.02 | 248.60 | 246.31 | 9.28 | 9.46 | 9.37 |
| $F_3I_2$ | 249.40 | 261.38 | 255.39 | 9.40 | 9.94 | 9.67 |
| $F_3I_3$ | 253.73 | 263.38 | 258.56 | 9.65 | 10.02 | 9.84 |
| $F_4I_1$ | 242.82 | 259.76 | 251.29 | 9.24 | 9.88 | 9.56 |
| $F_4I_2$ | 244.00 | 256.29 | 250.15 | 9.28 | 9.72 | 9.50 |
| $F_4I_3$ | 258.56 | 265.31 | 261.93 | 9.84 | 10.07 | 9.95 |
| Mean | 246.12 | 256.27 | 251.19 | 9.36 | 9.74 | 9.55 |
| S.E (m)± | 1.54 | 1.86 | 0.98 | 0.10 | 0.08 | 0.06 |
| C.D at 5% | 4.52 | 5.45 | 2.89 | 0.30 | 0.24 | 0.19 |

**Pulp: stone ratio**

The significant difference was found for pulp: stone ratio in different treatment. Maximum pulp: stone ratio 5.65, 5.42 and 5.54 was recorded in $F_2I_3$ during first year, second year and pooled, respectively, whereas minimum 4.42, 4.48 and 4.45 was found in control $F_1I_1$ during first year, second year and pooled, respectively. Split nutrient application ensures a continuous supply of nitrogen, potassium, calcium and boron that promotes sustained cell division and cell expansion in the mesocarp (pulp), while preventing nutrient stress that can restrict fruit flesh development. Physiologically, consistent irrigation prevents moisture stress, maintaining high turgor pressure and maximizing photosynthesis and carbohydrate translocation to the pulp, which enlarges mesocarp tissues more than the seed. Similar observations were reported by Sarker and Rahim (2013) [14] in mango, Thakur and Singh (2004) [17] in mango and Bhosale *et al.*, (2022) [2] in mango.

**Table 4:** Effect of nutrient application and irrigation on fruit width (cm) and pulp: to stone ratio of mango (*Mangifera indica* L.) cv. Alphonso

| Treatment | Fruit width (cm) | | | Pulp: stone ratio | | |
|---|---|---|---|---|---|---|
| | 2023-24 | 2024-25 | Pooled | 2023-24 | 2024-25 | Pooled |
| $F_1I_1$ | 7.56 | 7.80 | 7.68 | 4.42 | 4.48 | 4.45 |
| $F_1I_2$ | 7.78 | 7.88 | 7.83 | 4.63 | 4.75 | 4.69 |
| $F_1I_3$ | 7.79 | 8.14 | 7.97 | 4.77 | 5.09 | 4.93 |
| $F_2I_1$ | 7.84 | 8.13 | 7.98 | 4.83 | 5.13 | 4.98 |
| $F_2I_2$ | 7.79 | 8.50 | 8.15 | 4.92 | 5.33 | 5.12 |
| $F_2I_3$ | 8.50 | 8.62 | 8.56 | 5.65 | 5.42 | 5.54 |
| $F_3I_1$ | 7.88 | 8.03 | 7.96 | 4.83 | 4.89 | 4.86 |
| $F_3I_2$ | 7.97 | 8.44 | 8.20 | 4.76 | 5.31 | 5.04 |
| $F_3I_3$ | 8.20 | 8.51 | 8.35 | 5.16 | 5.00 | 5.08 |
| $F_4I_1$ | 7.85 | 8.39 | 8.12 | 4.62 | 4.94 | 4.78 |
| $F_4I_2$ | 7.88 | 8.28 | 8.08 | 4.94 | 5.12 | 5.03 |
| $F_4I_3$ | 8.35 | 8.57 | 8.46 | 5.42 | 5.25 | 5.34 |
| Mean | 7.95 | 8.27 | 8.11 | 4.91 | 5.06 | 4.99 |
| S.E (m)± | 0.07 | 0.05 | 0.04 | 0.09 | 0.08 | 0.05 |
| C.D at 5% | 0.21 | 0.14 | 0.13 | 0.27 | 0.25 | 0.15 |

**Quality parameters**

**Total soluble solids ($^0$Brix)**

The TSS ($^0$Brix) was found non-significant in both the year and pooled. Maximum TSS 18.32, 19.13 and 18.73 $^0$Brix was recorded in treatment $F_2F_3$ during first year, second year and pooled, respectively, whereas, minimum TSS 16.45, 18.32 and 17.42 $^0$Brix was recorded in $F_1I_2$, $F_4I_1$ and $F_1I_2$ during first year, second year and pooled, respectively. Total Soluble Solids (TSS) in mango fruit mainly increase during ripening due to the enzymatic breakdown of starch into soluble sugars such as sucrose, glucose and fructose. This process is driven by enzymes like amylase, which converts starch to maltose and glucose and invertase, which hydrolyzes sucrose into simpler sugars, thereby raising the TSS level. (Lizada, 1993) [9].

**Titratable acidity (%)**

The data on titratable acidity (%) in mango cv. Alphonso showed non-significant result among different treatments in first year, second year and pooled. during first year, titratable acidity range varied from 0.32 to 0.39 (%), During second year, 0.29 to 0.35 (%) and pooled its range varied from 0.32 to 0.36 (%).The degradation of organic acids lowers the fruit's overall acidity, contributing to the characteristic sweet flavor of ripe mangoes. Conversion of acids into sugars and their derivatives or as a result of their use in respiration or both Therefore, a decline in titratable acidity is an important indicator of ripening progress and improved palatability. Lakshminarayana (1980) [8] in mango.

**Post-harvest parameters**

**Spongy tissue incidence (%)**

There was significant difference among treatments for spongy tissue incidence in mango cv. Alphonso (Table 5.). Minimum spongy tissue incidence 2.67, 2.00 and 2.33% was found in $F_2I_3$ during first year, second year and pooled, respectively, whereas maximum incidence 16.67, 11.33 and 14.00% was recorded in control $F_1I_1$ during first year, second year and pooled, respectively.

Split doses of nutrients especially calcium, potassium and boron maintained continuous availability during fruit development, strengthening cell walls and improving membrane integrity, which reduced internal breakdown associated with spongy tissue. Physiologically, regulated irrigation prevented fluctuations in soil moisture that lead to uneven water transport and localized hypoxia inside the fruit conditions known to trigger spongy tissue formation. Mulching chemically improved soil organic matter and nutrient mineralization, enhanced cation exchange capacity and stabilizes soil moisture and temperature, ensuring uniform nutrient uptake and reducing metabolic stress in the fruit. Similar observations were reported by Majumder and Sharma (1990) [10] in mango, Burondkar and Gunjate (1993) [4] in mango and Singh and Singh (2015) [16] in mango.

**Table 5:** Effect of nutrient application and irrigation on TSS ($^0$Brix), acidity (%) and spongy tissue incidence (%) of mango (*Mangifera indica* L.) cv. Alphonso

| Treatment | TSS ($^0$Brix) | | | Titratable acidity (%) | | | Spongy tissue incidence (%) | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2023-24 | 2024-25 | Pooled | 2023-24 | 2024-25 | Pooled | 2023-24 | 2024-25 | Pooled |
| $F_1I_1$ | 16.53 | 18.37 | 17.45 | 0.35 | 0.36 | 0.36 | 16.67 | 11.33 | 14.00 |
| $F_1I_2$ | 16.45 | 18.39 | 17.42 | 0.39 | 0.33 | 0.36 | 12.00 | 4.67 | 8.33 |
| $F_1I_3$ | 18.08 | 18.87 | 18.47 | 0.37 | 0.34 | 0.36 | 7.33 | 10.67 | 9.00 |
| $F_2I_1$ | 16.76 | 18.62 | 17.69 | 0.38 | 0.35 | 0.36 | 10.33 | 7.33 | 8.83 |
| $F_2I_2$ | 17.77 | 18.76 | 18.26 | 0.35 | 0.33 | 0.34 | 6.67 | 6.67 | 6.67 |
| $F_2I_3$ | 18.32 | 19.13 | 18.73 | 0.38 | 0.29 | 0.34 | 2.67 | 2.00 | 2.33 |
| $F_3I_1$ | 17.35 | 18.95 | 18.15 | 0.35 | 0.32 | 0.33 | 11.00 | 8.00 | 9.50 |
| $F_3I_2$ | 17.16 | 18.78 | 17.97 | 0.35 | 0.29 | 0.32 | 5.33 | 8.33 | 6.83 |
| $F_3I_3$ | 17.34 | 18.87 | 18.10 | 0.38 | 0.29 | 0.34 | 4.67 | 5.00 | 4.83 |
| $F_4I_1$ | 18.01 | 18.32 | 18.17 | 0.39 | 0.34 | 0.36 | 11.67 | 7.67 | 9.67 |
| $F_4I_2$ | 16.78 | 18.60 | 17.69 | 0.36 | 0.29 | 0.33 | 5.67 | 5.67 | 5.67 |
| $F_4I_3$ | 18.23 | 19.04 | 18.64 | 0.32 | 0.32 | 0.32 | 4.33 | 4.33 | 4.33 |
| Mean | 17.40 | 18.73 | 18.06 | 0.36 | 0.32 | 0.34 | 8.20 | 6.81 | 7.50 |
| S.E (m)± | 0.56 | 0.49 | 0.43 | 0.03 | 0.02 | 0.02 | 0.59 | 0.67 | 0.39 |
| C.D at 5% | N.S | N.S | N.S | N.S | N.S | N.S | 1.73 | 1.95 | 1.13 |

**Conclusion**

The study clearly resulted that the combined application of RDF in split (N-30% P-40% K-20% after harvest, N-30% P-40% K 20% during fruit set, N-20% K-30% at marble stage, N-20% P-20% K-30% egg stage) + irrigation with mulching ($F_2I_3$) proved to be the most effective for fruit retention, yield and quality parameters and can be recommended for sustainable and profitable cultivation of Alphonso mango in the Konkan region.

**Acknowledgement**

The authors are thankful to the College of Horticulture, Dr. BSKKV., Dapoli, and Chhatrapati Shahu Maharaj National Research Institute (SARTHI) for facilitating guidance and funds, respectively to conduct the investigation.

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