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Effect of soil and foliar nutrient application on fruit retention, yield and quality of mango (*Mangifera indica* L.) cv. Alphonso

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Abstract
Poor fruit retention and low yield are major production constraints in Alphonso mango, often attributed to imbalanced nutrient management. A field experiment was conducted during 2023-24 and 2024-25 at the Centre of Excellence for Mango, College of Horticulture, Dapoli, to study the effect of different soil and foliar nutrient application strategies on fruit retention, yield and quality of mango (*Mangifera indica* L.) cv. Alphonso. The experiment was laid out in a Factorial Randomized Block Design with four nutrient management treatments comprising F_1- recommended dose of fertilizers (RDF), F_2- RDF in split application, F_3- RDF with foliar application of Amrashakti (2.5%) and F_4- RDF with foliar application of KNO_3 (1%), in combination with irrigation and mulching treatments. Results revealed that 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) significantly improved fruit retention (6.71%), number of fruits per tree (134.50) and fruit yield (34.76 kg/tree) compared to other treatment. Improved fruit quality in terms of fruit weight (254.46 g), fruit length (9.69 cm), fruit width (8.23 cm), pulp:stone ratio (5.21) and spongy tissue incidence (5.94%) was also recorded under same treatments. The study indicated that split application of nutrient is essential for enhancing productivity and fruit quality of Alphonso mango under Konkan agro-climatic conditions.

Keywords: Alphonso mango, foliar nutrition, RDF, fruit retention, fruit quality

Introduction
Mango (*Mangifera indica* L.) is the most important fruit crop of India, and Alphonso is the most commercially valued cultivar owing to its superior fruit quality and export demand. Despite its importance, productivity of Alphonso mango remains low, particularly in the Konkan region, due to excessive fruit drop and poor nutrient utilization efficiency.

Nutrient management plays a pivotal role in flowering, fruit set, fruit retention and fruit development in mango. One time application of fertilizers often fails to meet the nutrient demand during critical phenological stages due to losses through leaching, fixation and poor root activity, especially in lateritic soils of Konkan. Split application of nutrients has been found to be an effective method to supply nutrients directly to metabolically active plant parts, thereby improving nutrient use efficiency and reducing physiological fruit drop.

Previous studies have demonstrated the beneficial effects of foliar application of nitrogen, potassium and micronutrients on fruit retention and yield in mango. However, comparative information on different nutrient application strategies involving soil and foliar nutrition under Konkan conditions is limited. Therefore, the present investigation was undertaken to evaluate the effect of soil and foliar nutrient application on fruit retention, yield and quality of Alphonso mango.

Materials and Methods
The experiment was conducted in 30 years old mango orchard at the Centre of Excellence for Mango, Department of Horticulture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, during the years 2023-24 and 2024-25. The soil of the experimental orchard was lateritic in nature. The experiment was laid out in a Factorial Randomized Block Design (FRBD) with three replications.

Nutrient treatments

Four nutrient management practices were evaluated:

- **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 + foliar spray of Amrashakti (2.5%) at flowering, one month and two months after flowering
- **F_4:** RDF + KNO_3 (1%) foliar spray at pea, marble and egg stages

All other recommended cultural practices were followed uniformly. Observations were recorded on fruit retention, number of fruits per tree, fruit yield, physical and chemical quality parameters. Data of two years were pooled and statistically analysed using ANOVA.

Results

Fruit retention (%)

Fruit retention was significantly influenced by nutrient management practices. During first year maximum fruit retention 6.12% was found in F_4 which was at par with F_3 (6.11%) and F_2 (6.07%). During second year and pooled maximum fruit retention 7.34% and 6.71% was recorded in F_2 which was at par with F_4 (7.22 and 6.67% respectively) whereas, minimum fruit retention 3.98, 6.15 and 5.07% was found in control F_1 during first year, second year and pooled, respectively. Maximum fruit retention were recorded in F_2 compared to other treatment might be due to 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. Similar result recorded by Malshe *et al.*, (2022) [10] in mango, Shinde *et al.*, (2006) [14] in mango, Patra *et al.*, (2003) [12] in guava and Khattab *et al.*, (2011) [8] in pomegranate.

Number of fruits at harvest (per tree)

A significantly higher number of fruits 56.89 per tree was observed under F_4 which was followed by F_2 during first year and during second year and pooled maximum number of fruit 216.78 and 134.50 was recorded in F_2 which was followed by F_4 166.44 and 111.67, respectively, whereas, minimum number of fruit 31.78, 119.89 and 75.83 was found in control F_1 during first year, second year and pooled, respectively. Split fertilizer application increases the number of fruits per 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. Similar observation were recorded by Bhosale *et al.*, (2022) [1] in mango, Jain *et al.*, (2020) [7] in sapota, Sarker and Rahim (2013) [13] in mango and Shyamal and Mishra (1989) [16] in mango.

Table 1: Effect of soil and foliar application of nutrient on fruit retention (%) and number of fruit at harvest (per tree) of mango cv. Alphonso.

Treatment	Fruit retention (%)			Number of fruit at harvest (per tree)		
	2023-24	2024-25	Pooled	2023-24	2024-25	Pooled
F_1	3.98	6.15	5.07	31.78	119.89	75.83
F_2	6.07	7.34	6.71	52.22	216.78	134.50
F_3	6.11	6.92	6.51	48.11	148.33	98.22
F_4	6.12	7.22	6.67	56.89	166.44	111.67
Mean	5.57	6.91	6.24	47.25	162.86	105.06
S.E (m)±	0.12	0.06	0.07	1.46	3.40	1.91
C.D at 5%	0.35	0.18	0.21	4.29	9.96	5.59

Fruit yield (kg/tree)

Fruit yield per tree was significantly influenced by nutrient application methods. During first year maximum fruit yield 14.35 kg/tree was recorded under F_4 which was followed by F_2 (12.76 kg/tree). During second year and pooled maximum fruit yield 56.76 and 34.76 kg/tree was recorded in F_2 which was followed by F_4 43.37 and 28.86 kg/tree, respectively. Minimum fruit yield 7.75, 29.89 and 18.82 kg/tree was found in control F_1 during first year, second year and pooled, respectively. Split fertilizer application promoted a stable and continuous nutrient supply during critical phenological stages reducing nutrient losses through leaching or volatilization and improving uptake efficiency. Steady nutrient availability maintains hormonal balance (auxin-cytokinin ratio), strengthens sink activity in developing fruits and reduces stress-induced abscission, allowing more fruits to reach maturity. Similar result recorded by Jadhav *et al.*, (2019) [6] in mango, Malshe *et al.*, (2022) [10] in mango, Bibi *et al.*, (2019) in mango and Sarker and Rahim (2013) [13] in mango.

Fruit weight (g)

Fruit weight was significantly influenced by nutrient management practices. During first year maximum fruit weight 249.05 g was recorded in F_3 which was at par with F_4 (248.46 g) and F_2 (248.26 g). during second year maximum weight of fruit 260.55 g was found in F_2 which was at par with F_4 260.45 g and pooled data showed that maximum fruit weight 254.46 g was recorded under F_4 which was at par with F_2 254.40 g whereas, minimum fruit weight 238.70, 246.29 and 242.49 g was recorded in control F_1 during first year, second year and pooled, respectively.

Table 2: Effect of soil and foliar application of nutrient on fruit yield (kg/tree) and fruit weight (g) of mango cv. Alphonso.

Treatment	Fruit yield (kg/tree)			Fruit weight (g)		
	2023-24	2024-25	Pooled	2023-24	2024-25	Pooled
F_1	7.75	29.89	18.82	238.70	246.29	242.49
F_2	12.76	56.76	34.76	248.26	260.55	254.40
F_3	12.17	38.99	25.58	249.05	257.78	253.42
F_4	14.35	43.37	28.86	248.46	260.45	254.46
Mean	11.76	42.25	27.01	246.12	256.27	251.19
S.E (m)±	0.34	1.73	0.88	0.89	1.07	0.57
C.D at 5%	1.00	5.09	2.58	2.61	3.14	1.67

Fruit length (cm)

The effect of nutrient application was found significant on length of fruit (cm) in first year, second year and pooled. Maximum fruit length 9.48, 9.91 and 9.69 cm was recorded in F_2 which was at par with F_4 9.45, 9.89 and 9.67 cm during first year, second year and pooled, respectively. Whereas minimum fruit length 9.08, 9.37 and 9.23 cm was recorded in control F_1 during first year, second year and pooled, respectively.

Fruit width (cm)

The effect of nutrient application was found significant on width of fruit (cm) in first year, second year and pooled. Maximum fruit width 8.04, 8.42 and 8.23 cm was recorded in F_2 which was at par with F_4 8.03, 8.41 and 8.22 cm in first year, second year and pooled, respectively. Whereas minimum fruit width 7.71, 7.94 and 7.83 cm was recorded in control F_1 during first year, second year and pooled, respectively.

Increasing fruit weight, length and width was found in F2 is might be due to split fertilizers ensured 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 result recorded by Bhosale *et al.*, (2022) [1] in mango, Panwar *et al.*, (2007) [11] in mango, Burondkar (2018) [3] in mango, Singh and Singh (2015) [15] in mango and Khattab *et al.*, (2011) [8] in pomegranate.

Table 3: Effect of soil and foliar application of nutrient on fruit length (cm) and fruit width (cm) of mango cv. Alphonso.

Treatment	Fruit length (cm)			Fruit width (cm)		
	2023-24	2024-25	Pooled	2023-24	2024-25	Pooled
F_1	9.08	9.37	9.23	7.71	7.94	7.83
F_2	9.48	9.91	9.69	8.04	8.42	8.23
F_3	9.44	9.81	9.63	8.02	8.33	8.17
F_4	9.45	9.89	9.67	8.03	8.41	8.22
Mean	9.36	9.75	9.56	7.95	8.28	8.11
S.E (m)±	0.06	0.05	0.04	0.04	0.03	0.03
C.D at 5%	0.17	0.14	0.11	0.12	0.08	0.07

Pulp: stone ratio

The significant difference was found for pulp: stone ratio in different treatment. Maximum pulp: stone ratio 5.13, 5.29 and 5.21 was found in F_2 which was followed by F_4 4.99, 5.10 and 5.05 during first year, second year and pooled, respectively. Whereas minimum pulp to stone ratio 4.60, 4.77 and 4.69 was recorded in control F_1 during first year, second year and pooled, respectively. Maximum pulp to stone ratio was found in F2 is might be due to 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. Similar result recorded by Sarker and Rahim (2013) [13] in mango, Thakur and Singh (2004) [17] in mango, Burondkar (2018) [3] in mango, Haldavnekar *et al.,* (2018) in mango and Bhosale *et al.*, (2022) [1] in mango.

Spongy tissue incidence (%)

There was significant difference among treatments for spongy tissue incidence in mango cv. Alphonso. Minimum spongy tissue incidence 6.56, 5.33 and 5.94% was recorded in F_2 which was followed by F_4 7.22, 5.89 and 6.56% during first year, second year and pooled, respectively. Whereas maximum spongy tissue incidence 12.00, 8.89 and 10.44 was found in control F_1 during first year, second year and pooled, respectively. Minimum spongy tissue incidence was recorded in F_2 is might be due to 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. Similar result recorded by Majumder and Sharma (1990) in mango, Burondkar and Gunjate (1993) [4] in mango and Singh and Singh (2015) [15] in mango.

Table 4: Effect of soil and foliar application of nutrient on pulp: stone ratio and spongy tissue incidence (%) of mango cv. Alphonso.

Treatment	Pulp: stone ratio			Spongy tissue incidence (%)		
	2023-24	2024-25	Pooled	2023-24	2024-25	Pooled
F_1	4.60	4.77	4.69	12.00	8.89	10.44
F_2	5.13	5.29	5.21	6.56	5.33	5.94
F_3	4.92	5.07	4.99	7.00	7.11	7.06
F_4	4.99	5.10	5.05	7.22	5.89	6.56
Mean	4.91	5.06	4.99	8.20	6.81	7.50
S.E (m)±	0.05	0.05	0.03	0.34	0.38	0.22
C.D at 5%	0.16	0.14	0.09	1.00	1.13	0.65

Conclusion

The study clearly resulted that the soil 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) (F_2) 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.

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References

1. Bhosale SS, Dhakare BB, Jadhav SB, Kulkarni SS, Joshi VR. Study the effect of nutrient application in split doses on yield characters under high density planting of mango (*Mangifera indica* L.) cv. Kesar. The Pharma Innovation Journal. 2022;11(6):920-924.
2. Bibi F, Ahmad I, Bakhsh A. Effect of foliar application of nutrients on mango yield and quality. Open Agriculture. 2019;4:1-7.
3. Burondkar MM. Nutrient and water management for improved mango productivity. Scientia Horticulturae. 2018;64(8):432-436.
4. Burondkar MM, Gunjate RT. Effect of nutrient application on fruit retention and yield in mango. Acta Horticulturae. 1993;341:239-246.
5. Haldavnekar PC, Baviskar SB, Raut RA. Effect of micronutrients on yield and physicochemical composition of Alphonso mango. Journal of Pharmacognosy and Phytochemistry. 2018;7(5):2447-2449.
6. Jadhav S, Salvi VG, Deshmukh U, Jadhav SC. Yield and quality of Alphonso mango as influenced by foliar application of nutrients. The Pharma Innovation Journal. 2019;8(10):14-18.
7. Jain KS, Malshe KV, Sawant PS, Khandekar RG. Effect of graded doses of fertilizers on flowering and yield attributes in sapota cv. Kalipatti. International Journal of Chemical Studies. 2020;8(3):1814-1816.
8. Khattab M, Magda SE, Ayman SH, Arafa SA. Growth and productivity of pomegranate trees under different irrigation levels: vegetative growth and fruiting. Journal of Horticultural Science and Ornamental Plants. 2011;3(2):194-198.
9. Majumder D, Sharma DK. Role of mineral nutrition in improving fruit retention of mango. Indian Journal of Horticulture. 1990;12(4):345-349.
10. Malshe KV, Salvi BR, Salvi VG. Influence of post flowering foliar nutrient application on yield and quality attributes of mango (*Mangifera indica* L.) cv. Alphonso under south Konkan conditions. Journal of Eco-friendly Agriculture. 2022;17(1):62-64.
11. Panwar R, Singh SK, Singh CP, Singh PK. Mango fruit yield and quality improvement through fertigation along with mulch. Indian Journal of Agricultural Sciences. 2007;77(10):680-684.
12. Patra RK, Das BC, Hasan MA. Flowering behaviour and fruit yield of guava cv. Sardar as influenced by different soil covers. Research on Crops. 2003;4(3):383-387.
13. Sarker BC, Rahim MA. Mulching and irrigation effects on soil environment, growth and yield of mango. Journal of Agroforestry and Environment. 2013;7(1):85-90.
14. Shinde AK, Dabke DJ, Jadhav BB, Kandalkar MP, Burondkar MM. Effect of dose and source of potassium on yield and quality of 'Alphonso' mango (*Mangifera indica* L.). Indian Journal of Agricultural Sciences. 2006;76(4):213-217.
15. Singh R, Singh G. Influence of irrigation and mulching on mango fruit quality and physiological disorders. Journal of Horticultural Sciences. 2015;44(7):669-675.
16. Syamal MM, Mishra KA. Effect of NPK on growth and fruiting of mango. Acta Horticulturae. 1989;231:276-281.
17. Thakur SK, Singh P. Studies on fertigation of mango cv. Amrapali. Annals of Agricultural Research. 2004;25(3):415-417.