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Assessment of Appemidi mango (*Mangifera indica* L.) cultivars for propagation through softwood grafting

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Abstract
Mango (*Mangifera indica* L.) is one of the most important tropical fruits in India, cultivated for both table use and processing, as its diverse genetic resources, the Appemidi group of cultivars is particularly prized for pickle preparation due to its distinctive aroma. To assess their potential for vegetative propagation, an investigation was carried out during 2024-25 in the Appemidi mother block at Ankur Nursery, Ripponpet, Shivamogga district, Karnataka state. The study comprised eight cultivars *viz*., Dombesara jeerige, Genasinakuni jeerige, Kalkoppa jeerige, Quadragi jeerige, Adderi jeerige, Sada appe, Karpooradappe and Kanchappe, evaluated in a randomized block design with three replications. Significant variations were observed among the cultivars for leaf length, leaf breadth, leaf area, dry matter accumulation, survivability and biochemical constituents such as protein, phenol, carbohydrate and total sugars. Dombesara jeerige recorded the maximum values for these parameters, indicating superior vigour and physiological efficiency, followed by Quadragi jeerige, whereas Adderi jeerige consistently showed the lowest performance. Overall, Dombesara jeerige proved to be the most promising cultivar in terms of survivability, dry matter production and biochemical efficiency with softwood grafting.

Keywords: Mango, Appemidi, softwood grafting, cultivars, morphological traits, biochemical traits

Introduction
Mango (*Mangifera indica* L.) is one of the oldest and most cherished fruit crops of the tropics and subtropics. Mango is widely regarded as the "King of Fruits" in India and holds the distinction of being the country's national fruit, owing to its delightful flavour, rich aroma and wide nutritional benefits. It contributes substantially to the country's horticultural economy through domestic consumption, processing industries and exports. While ripe fruits are consumed fresh, tender mangoes serve as an indispensable raw material for pickle production. Nutritionally, mangoes are rich source of carbohydrates, carotenoids, vitamin A, B & C, along with essential minerals like calcium and iron, thereby playing an important role in the human diet (Mukherjee and Litz, 2009; Griesbach, 2003) [7, 3]. India continues to dominate global mango cultivation, producing about 20.77 million tonnes annually from 2.39 million hectares (Anon., 2023) [1]. Karnataka holds a unique position in mango diversity, particularly for Appemidi cultivars, which are highly sought after in pickle making because of their distinct aroma, strong flavour and ability to retain quality over long storage. These tender fruits, mainly grown in the Sirsi, Sagar, Siddapur and Thirthahalli belts, are in great demand but their supply often falls short, leading to a thriving market economy. The cultural and economic significance of these cultivars highlights the need for systematic propagation and conservation. Seed propagation in mango, though traditional, is limited by genetic variability, extended juvenile periods and poor fruit quality. Vegetative techniques such as epicotyl grafting, veneer grafting, inarching and softwood grafting have been developed to overcome these limitations (Karna *et al*., 2018) [4]. Of these, softwood grafting has gained prominence because of its higher success rate, simplicity and ability to generate uniform and true-to-type planting material in a shorter duration (Ram and Pathak, 2006) [12]. However, the response of cultivars to grafting is not uniform, making it necessary to screen genotypes for compatibility and graft survival. Therefore, the present study was undertaken to evaluate the grafting performance of different Appemidi mango cultivars using softwood grafting, with emphasis on identifying types suitable for large-scale propagation.

Materials and Methods

The investigation was conducted during 2024-25 at Ankur Nursery, Ripponpet, Shivamogga, Karnataka. The experiment was laid out in a Randomized Complete Block Design (RCBD) with eight pickling cultivars (Dombesara jeerige, Genasinakuni jeerige, Kalkoppa jeerige, Quadragi jeerige, Adderi jeerige, Sada appe, Karpooradappe and Kanchappe) replicated three times, each replication consisting of 50 grafts, making a total of 1200 grafts. Rootstocks were raised from freshly extracted stones, germinated in sand beds and later transplanted into polybags containing soil, sand and FYM in the ratio of 3:1:1. Scion shoots were collected from healthy 10-year-old Appemidi mother trees, defoliated 10 days prior to grafting and treated with 0.1% Bavistin before use. Softwood grafting was performed 120 days after transplanting using the cleft method and the graft union was secured with polythene strips and polycaps. Standard nursery practices, including irrigation, weeding and plant protection measures, were followed throughout the study. Observations were recorded on leaf length, leaf breadth, leaf area, dry matter accumulation, graft survivability and biochemical traits including protein, phenol, carbohydrate and total sugar at periodic intervals up to 120 days after grafting. The data were analyzed statistically following the method described by Panse and Sukhatme (1967) [10].

Results and Discussion

Significant variation was observed among the pickling cultivars of mango with respect to leaf morphology, dry matter accumulation and survivability (Table 1). Dombesara jeerige (T_1) recorded the maximum leaf length (15.64 cm), leaf breadth (4.21 cm), leaf area (46.32 cm²), dry matter accumulation (7.74 g) and survivability (77.48%). In contrast, Adderi jeerige (T_5) exhibited the minimum leaf length (9.89 cm), leaf breadth (1.17 cm), leaf area (8.27 cm²), dry matter (5.54 g) and survivability (55.79%). The remaining cultivars showed intermediate values.

The superiority of Dombesara jeerige in leaf traits and dry matter may be attributed to stronger vigour, better photosynthetic efficiency, efficient cell expansion and higher assimilate partitioning, which in turn supported higher survivability. On the other hand, the smaller leaves and reduced survivability in Adderi jeerige may be linked to weaker graft union, limited metabolite translocation and poor physiological activity. These findings were agree with the reports of Nalage *et al*. (2010) [9], Kumar *et al*. (2012) [5] and Mishra *et al*. (2023) [6], who observed that larger leaf area and dry matter are associated with vigorous scion growth and graft survival in mango. Similarly, Singh *et al*. (2014) [13] and Deshmukh *et al*. (2020) [2] emphasized that higher assimilate mobilization and strong scion vigour improve survivability of grafts.

Biochemical analysis also revealed significant differences in protein, phenol, carbohydrate and sugar content among the cultivars (Table 2). The maximum protein content (3.57 g), phenol (3.00%), carbohydrate accumulation (12.90%) and total sugars (8.11%) were recorded in Dombesara jeerige (T_1), whereas the minimum protein (1.22 g), phenol (2.90%), carbohydrate (9.22%) and sugar (4.15%) were found in Adderi jeerige (T_5).

The higher accumulation of biochemical constituents in Dombesara jeerige could be attributed to greater leaf area, efficient photosynthesis and higher translocation of metabolites, which promoted better growth and survivability. Conversely, lower values in Adderi jeerige may be due to weaker physiological activity and poor assimilate partitioning. Similar observations have been reported by Waghmare *et al*. (2019) [14], Priyavadhana and Pandarinathan (2023) [11] and Naik *et al*. (2013) [8] in mango, who noted that increased protein, phenol and carbohydrate levels are closely linked with vigour and survival of grafts.

Table 1: Effect of softwood grafting on morphological parameters after grafting in different mango pickling cultivars

Treatments	Leaf length (cm)	Leaf breadth (cm)	Leaf area (cm²)	Dry matter production (g)	Survivability of graft (%)
T_1: Dombesara jeerige	15.64	4.21	46.32	7.74	77.48
T_2: Genasinakuni jeerige	12.75	2.43	21.91	6.99	67.30
T_3: Kalkoppa jeerige	11.90	2.15	18.44	6.29	62.67
T_4: Quadragi jeerige	14.14	3.81	38.32	7.53	72.70
T_5: Adderi jeerige	9.89	1.17	8.27	5.09	55.79
T_6: Sada appe	10.43	1.66	12.24	5.60	58.82
T_7: Karpooradappe	13.96	3.32	32.81	7.30	69.27
T_8: Kanchappe	11.29	1.92	15.25	5.93	60.08
S. Em.±	0.53	0.11	1.48	0.24	2.35
CD @ 5%	1.62	0.34	4.49	0.73	7.13

Table 2: Effect of softwood grafting on biochemical parameters after grafting in different mango pickling cultivars

Treatments	Protein (g)	Phenol (%)	Carbohydrate (%)	Total sugar (%)
T_1: Dombesara jeerige	3.57	3.00	12.90	8.11
T_2: Genasinakuni jeerige	2.81	2.52	11.93	6.30
T_3: Kalkoppa jeerige	2.27	2.33	10.92	5.66
T_4: Quadragi jeerige	3.29	2.90	12.51	7.83
T_5: Adderi jeerige	1.22	1.45	9.22	4.15
T_6: Sada appe	1.44	1.89	9.67	4.84
T_7: Karpooradappe	3.15	2.64	12.14	7.08
T_8: Kanchappe	1.96	2.24	10.81	5.36
S. Em.±	0.12	0.12	0.44	0.23
CD @ 5%	0.38	0.38	1.34	0.70

Conclusion

The study clearly indicated significant variation among the pickling cultivars of mango in terms of leaf traits, dry matter accumulation, survivability and biochemical constituents. Dombesara jeerige (T_1) consistently outperformed the other cultivars, recording larger leaf dimensions, higher dry matter and greater survivability, along with elevated levels of protein, phenol, carbohydrate and sugars. These attributes reflect its superior vigour, efficient photosynthetic capacity and better assimilate partitioning. Overall, the results suggest that Dombesara jeerige is a promising cultivar for maintaining vigorous growth and higher survivability in mango softwood grafts of pickling cultivars.

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