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Constraints in cultivation and nursery management of Appemidi mango in the Malnad region of Karnataka

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Abstract

Appemidi, an indigenous tender mango variety (*Mangifera indica* L.) native to Karnataka's Malnad region, holds immense cultural and economic significance and has been granted a Geographical Indication (GI) tag for its unique characteristics. The present study analyzed the major constraints faced by Appemidi farmers and nursery owners using primary data collected from 30 farmers and 10 nursery owners through a structured questionnaire and Garrett's ranking technique. Results revealed that irregular and alternate bearing of trees, high flower drop, poor fruit set, and adverse climatic effects like mist were the major production constraints. Limited availability and high cost of quality planting material, lack of research support, and low awareness of scientific practices further hindered commercial cultivation. For nursery owners, the absence of mother blocks for scion collection, high rootstock mortality, shortage of skilled grafters, and limited access to inputs and credit emerged as key challenges. The study emphasizes the need for dedicated research and propagation programmes, establishment of mother blocks, training in grafting and scientific cultivation, and enhanced institutional support to improve the productivity, profitability, and sustainability of Appemidi cultivation in the Malnad region.

Keywords: Garret ranking, constraints, irregular bearing, grafting, root stock plants

1. Introduction

Appemidi, scientifically known as *Mangifera indica* L., is widely regarded as the pride of Karnataka's Malnad region. It stands apart from other mango varieties due to its distinct genetic, cultural, and geographical identity. This indigenous tender mango, native to the lush and humid landscapes of the Western Ghats, is deeply intertwined with the life and traditions of the Malnad people. Over centuries, Appemidi has journeyed from the natural riverbanks of the region to become an essential part of household kitchens, symbolizing a legacy of taste, culture, and sustainability that continues to this day. In Kannada, the term *"Appemidi"* refers to a tender, immature mango (*"midi"* meaning tender fruit), a stage during which the mango attains its highest value owing to its firm flesh, intense aroma, and distinct sour flavor—ideal for pickle making. The variety is predominantly found growing naturally along the rivers and streams of Shivamogga, Uttara Kannada, and Dakshina Kannada districts. Recognizing its unique regional characteristics and economic importance, Appemidi mangoes from these districts were awarded the Geographical Indication (GI) tag in 2009 (Meena *et al*., 2022) [3]. Among them, Uttara Kannada district is often referred to as the *"Cradle of Appemidi"* (Veena, 2018) [4] for being home to numerous native genotypes and traditional varieties.

The physical appearance of Appemidi also reflects the ingenuity of nature. Its characteristic elongated, boat-shaped form is not merely aesthetic it serves an ecological function that allows the fruit to float along rivers and streams, thereby facilitating natural propagation and regeneration along new riverbanks. This natural phenomenon earned it the traditional name *"Holesalu Midi"*, meaning "the tender mango that travels through rivers." Occasionally, round-shaped fruits can be observed, yet the elongated form remains the hallmark of genuine Appemidi mangoes. Interestingly, despite its wide availability in the wild, the fruit often remains untouched by animals because of its strong sourness, which naturally deters them. This quality ensures its preservation until it reaches human hands, where it finds its finest expression in the preparation of traditional Malnad pickles famed for their authentic taste, long shelf life, and deep-rooted cultural value.

2. Methodology

2.1 Source of data and sampling technique

The study was based on primary data. To document the constraints faced by farmers growing Appemidi and owners of nurseries producing Appemidi grafted seedlings were interviewed through pre-tested structured questionnaire. The information on constraints were collected from the sample farmers (30) and owners of nurseries (10) through snowball sampling technique.

2.2 Garrett's ranking technique

To identify and prioritize the constraints faced by the Appemidi farmers and nursery owners, garrett's ranking technique was employed. Similar tool was employed in the earlier study conducted by Kumar *et al.* (2021) [2] and Choudhary (2022) [1] Farmers were asked to rank the major constraints according to their severity. The ranks given by the respondents were then converted into per cent position using the following formula:

Percent Position = ((Rij - 0.5) / Nj) × 100

Where,

- Rij = Rank given for the *i*th constraint by the *j*th respondent
- Nj = Number of constraints ranked by the *j*th respondent

The per cent positions thus obtained were converted into Garrett scores by referring to Garrett's table. For each constraint, the average score was calculated by dividing the total score by the number of respondents. The constraints were then arranged in descending order of mean scores to identify the most severe constraints in the production and marketing of vegetables in the study region.

3. Results and Discussion

3.1 Constraints faced by farmers growing Appemidi

The analysis of production-related constraints revealed that Appemidi farmers in the study area encountered a number of challenges that significantly influenced the productivity, profitability, and sustainability of cultivation. The irregular and alternate bearing nature of Appemidi trees was ranked as the most serious constraint, with the highest mean Garrett score of 78.62**,** indicating that inconsistency in fruiting remains a major limitation to achieving stable yields. Appemidi trees tend to bear heavily in one season followed by a poor crop in the next, primarily due to physiological imbalances, nutrient exhaustion, and climatic variations. Such irregular bearing results in fluctuating production levels and income instability among farmers. Similar observations were reported by Reddy *et al*.**,** who noted that alternate bearing is a common problem among traditional mango varieties and poses a major challenge for consistent market supply. The dropping of flowers and poor fruit set ranked second with a mean score of 74.80**,** highlighting it as another crucial constraint affecting productivity. Farmers reported that high flower drop occurs during early flowering stages due to moisture stress, temperature fluctuations, and inadequate pollination. Poor fruit set, often resulting from nutrient deficiency and pest attack during the flowering period, further limits yield potential. Kumar *et al*., also emphasized that poor fruit set in mango varieties is closely linked to environmental stress and hormonal imbalance during the reproductive phase. The adverse climatic effect of mist (locally known as Ibbani) was ranked third (mean score 71.24**),** underscoring the vulnerability of Appemidi cultivation to changing climatic conditions. The heavy mist formation during early mornings in the Malnad region interferes with pollination activity and causes flower drop, thereby reducing fruit retention. Prolonged periods of high humidity also favour the incidence of fungal diseases, compounding the loss. These results align with the findings of Chand (2012)**,** who noted that microclimatic changes significantly influence fruit set and yield in rainfed horticultural crops.

The lack of availability of quality planting material ranked fourth with a mean score of 67.45**.** Farmers indicated that they face difficulty in procuring true-to-type Appemidi grafts due to limited certified nurseries and the absence of a systematic propagation program. The quality of planting material plays a crucial role in maintaining varietal purity and productivity.

The high cost of grafted seedlings ranked fifth (mean score 63.78**),** indicating that the economic burden of purchasing genuine Appemidi grafts limits the area under cultivation. Since grafting requires skilled labour and quality rootstock, nursery production costs are high, leading to higher market prices for seedlings. Small and marginal farmers often find it difficult to afford large-scale planting due to this expense. Limited research and technical guidance was identified as the sixth major constraint (mean score 60.25**).** Farmers expressed that scientific studies and technical recommendations specific to Appemidi cultivation are minimal compared to other commercial mango varieties. The lack of region-specific research on spacing, nutrient management, pest control, and post-harvest handling restricts the optimization of productivity. The non-commercial nature of cultivation, ranked seventh (mean score 56.12**),** revealed that Appemidi is still primarily grown as a traditional and household crop rather than an organized commercial enterprise. The absence of large-scale orchards and poor market orientation restricts investment and technological adoption. Farmers generally depend on naturally grown trees rather than planned cultivation, which results in lower productivity. The limited availability of planting material across nurseries ranked eighth with a mean score of 52.86**,** indicating the uneven distribution of nurseries raising Appemidi grafts. Only a few government or private nurseries produce these grafts, and supply often falls short of local demand. As a result, farmers depend on informal sources or natural seedlings, which leads to variation in plant performance.

The requirement of skilled labour for grafting was ranked ninth (mean score 49.33**).** The process of softwood grafting, commonly used for Appemidi propagation, requires precision and experience. Farmers reported that the shortage of trained grafters and seasonal availability of skilled labour limit the number of grafts produced each year. Finally, the lack of awareness and demonstration on scientific cultivation was ranked tenth, with a mean score of 46.25, showing that knowledge gaps persist among farmers regarding improved practices such as canopy management, integrated pest control, nutrient scheduling, and pruning.

Extension activities specific to Appemidi are minimal, resulting in traditional methods dominating production. Overall, these results indicate that Appemidi cultivation faces biological, economic, and institutional challenges that collectively restrict its transformation into a commercially viable enterprise. Addressing irregular bearing, improving planting material availability, and enhancing research and extension support are essential steps toward sustaining and scaling Appemidi cultivation in the Malnad region.

Table 1: Constraints Faced by Farmers Growing Appemidi In the Malnad Region

Sl. No.	Constraints	Mean Garrett Score	Rank
1	Irregular and alternate bearing of trees	78.62	I
2	Dropping of flowers and poor fruit set	74.80	II
3	Mist (*Ibbani)* - adverse climatic effect	71.24	III
4	Lack of availability of quality planting material	67.45	IV
5	High cost of grafted seedlings	63.78	V
6	Limited research and technical guidance	60.25	VI
7	Not yet commercially cultivated like other mango varieties	56.12	VII
8	Planting material not available in all nurseries	52.86	VIII
9	Grafting technique requires skilled labour	49.33	IX
10	Lack of awareness and demonstration on scientific cultivation	46.25	X

3.2 Constraints faced by nursery owners in producing Appemidi grafted seedlings

The analysis of nursery-related constraints revealed that searching and collecting suitable scion material without an own mother block was the most severe problem (mean score 78.12**).** Nursery owners reported that identifying true-to-type Appemidi scions from scattered natural trees is time-consuming and laborious, often limiting large-scale propagation. The high mortality rate of rootstock plants ranked second (75.03**),** mainly due to poor germination, irregular watering, and pest or disease attack during the early growth stage. Requirement of skilled labour for grafting was the third major constraint (71.50), as successful softwood grafting demands trained manpower, which is often scarce and costly during peak seasons. Labour-intensive nursery operations such as grafting, potting, and scion collection ranked fourth **(**69.20**),** increasing labour costs and limiting efficiency. The need for continuous care and supervision of grafted seedlings until sale was another major challenge (66.40**),** as seedlings are delicate and highly susceptible to weather stress, requiring regular watering, shading, and pest management.

The limited availability and high cost of quality nursery inputs like polybags, potting media, and shade nets ranked sixth **(**63.10**),** raising the overall cost of production. The lack of timely credit and working capital **(**60.05**)** further constrained nursery expansion, as many small-scale nurseries depend on personal savings due to limited institutional finance. Timely irrigation management difficulties **(**54.80**)** were also reported, particularly during dry months when water availability becomes a major limitation. Pest and disease incidence on rootstocks and grafts **(**51.60**)** caused seedling losses and reduced marketable output. Finally, mortality or damage during transport and delivery to farmers **(**48.95**)** was the least ranked but still significant constraint, as mishandling during transportation often leads to losses before planting. Overall, the results indicate that the absence of dedicated mother blocks, shortage of skilled labour, high input costs, and lack of credit support are the key bottlenecks hindering efficient and sustainable Appemidi nursery management in the Malnad region.

Table 2: Constraints Faced by Nursery Owners in Producing Appemidi Grafted Seedlings

Sl. No.	Constraints	Mean Garrett Score	Rank
1	Searching & collecting suitable scion material is time-consuming and difficult without an own mother block	**78.12**	I
2	High mortality rate of root stock plants	75.03	II
3	Grafting requires skilled labour	71.50	III
4	Nursery operations are labour-intensive (grafting, scion collection, potting)	69.20	IV
5	Grafted seedlings need continuous care and supervision until sale	66.40	V
6	Limited availability / high cost of quality inputs (polybags, potting media, shade nets)	63.10	VI
7	Lack of access to timely credit / working capital for scaling nursery	60.05	VII
8	Timely irrigation requirement is difficult to manage (water access issues)	54.80	VIII
9	Pest and disease incidence affecting rootstock and grafts	51.60	IX
10	Mortality/damage during transport and delivery to farmers	48.95	X

4. Conclusion

The study on the constraints faced by Appemidi farmers and nursery owners in the Malnad region revealed that both production and nursery stages are influenced by biological, technical, and institutional limitations. Among the production constraints, irregular and alternate bearing of trees, flower drop, and poor fruit set emerged as the major factors limiting yield and income stability. Adverse climatic conditions, particularly mist during the flowering stage, further affect productivity. The unavailability and high cost of quality planting material, coupled with limited research support and lack of scientific awareness, continue to hinder the commercial cultivation of Appemidi. On the nursery front, difficulties in collecting scion material without

dedicated mother blocks, high rootstock mortality, shortage of skilled grafters, and labour-intensive operations were the key bottlenecks. Limited access to quality nursery inputs, irrigation challenges, and lack of timely credit also restricted nursery expansion.

Overall, the findings highlight the need for a systematic propagation and research programme dedicated to Appemidi, establishment of mother blocks for quality scion supply, capacity building of farmers and nursery owners through training on scientific cultivation and grafting, and improved institutional support through credit, input supply, and extension services. Strengthening these areas can enhance productivity, profitability, and sustainability of Appemidi cultivation, thereby safeguarding this unique heritage crop of the Malnad region.

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