

TB-28/2023

# Appemidi

The Specialty Pickling  
Mangoes of Karnataka



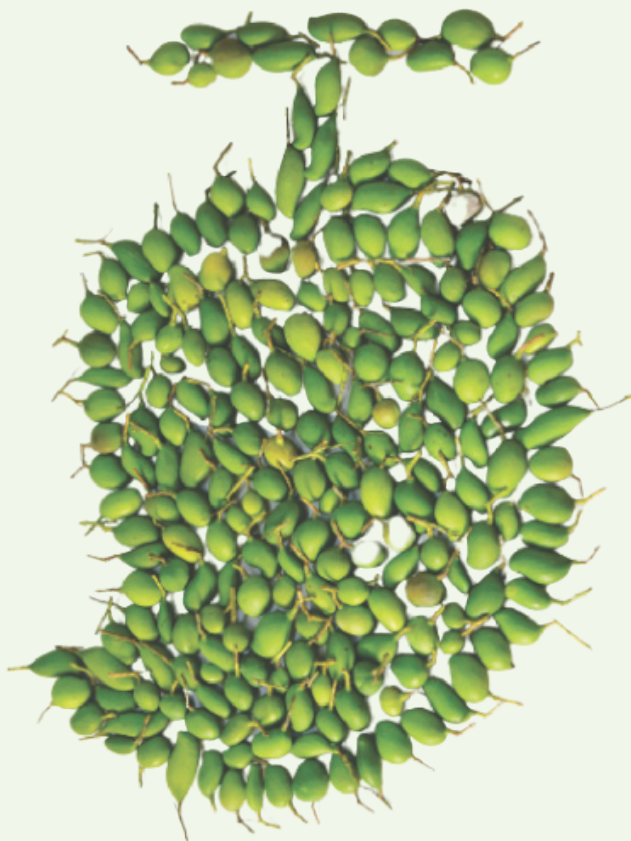
**ICAR - Indian Institute of Horticultural Research**

(Ministry of Agriculture & Farmers Welfare, Government of India)

Hesaraghatta Lake Post, Bengaluru- 560089



# *Appemidi*: The Specialty Pickling Mangoes of Karnataka



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## Foreword

Mango (*Mangifera indica* L.) is the most important fruit crops in India, having socio-economic significance. There are more than 1000 varieties of mango, of which, 20-25 varieties are having commercial importance. In our country, we are having seven mango diversity hotspots, out of which peninsular India holds prominence, especially the Western Ghats region. *Appemidi* is one of those most sought after mangoes for various purposes, especially for tender mango pickling.

Unfortunately, the relentless felling of the forests is threatening the very existence of these mangoes. Government agencies are working actively to collect, characterize and conserve these varieties as an integral component of Karnataka's culture and meet rising demands. The pickling industry of *Appemidi* alone is estimated to be around Rs 100 crore annually and the market is not organised and established.

I am happy to learn that the ICAR-IIHR, Bengaluru, Karnataka has surveyed, collected and conserved more than 250 accessions of *Appemidi* mangoes in the field gene bank which is the National repository. *Appemidi* mangoes hold great significance in the market. In this regard, more prominence should be given to its protection, conservation and popularization.

I am hopeful and confident that the organizing the event like *Appemidi* Diversity Fair will create awareness among the public about the need for protection of *Appemidi* mango diversity in the Country.



**S.K. Singh**  
Director, ICAR-IIHR

**10.04.2023**  
**Bengaluru**



## Introduction

Karnataka state has unique position with respect to the diversity of pickling mango varieties. The state is famous for its tender mango fruits, which is used for pickling known as “*Appemidi*”. “*Appemidi*” (midi means tender mango in Kannada) is considered as the king of all tender mangoes due to its unique size, taste, and aroma, that makes these pickles one of the best in India. Pickles are an integral part of meals in every Indian household, and pickles prepared from *Appemidi* mangoes make for an exquisite culinary experience. The demand for pickles varies from 4,000 to 5,000 tonnes per year, translating to 90 to 100 crore rupees per annum. Ripponpet market in Shimoga sees a turnover of several lakhs of rupees during the months of March and April. A good quality tender mango costs Rs. 2.0 - 3.0; the price for a quintal could go up to almost Rs 6000, depending on demand and availability. Adding just a few midis to an ordinary pickle enhances its taste and flavour. Among the hundreds of varieties of mango pickles, *Appemidi* pickles are the most sought after, as they remain fresh for years. However, the supply of *Appemidi* meets only one-tenth of demand in the market and they are often mixed with other tender mangoes. Considering its huge market potential, *Appemidi* mangoes need attention for conservation and proper utilization.

## *Appemidi* habitat

The *Appemidi* mangoes grow mainly in the forests and also on the riversides. The *Appemidis* are native to the forests of the Western Ghats, where the natural plantations of centuries-old mango trees are found in the valleys of the Aghanashini, Kumudvati, Kali, Varada, Bedthi and Sharavathi rivers in Uttara Kannada and Shimoga districts. These are mainly grown near Sirsi, Sagar, Siddapur, Thirthahally regions. However, the once abundant *Appemidi* mango trees in Malanad region have become endangered due to neglect and destruction. A typical example is that of the variety ‘Gundappe’, the tree which used to yield about 2000 to 3000 fruits only a few years back, has vanished now. The local people opine that the pulp of ‘Gundappe’ was very thick and firm, which none of the other Appe types have.

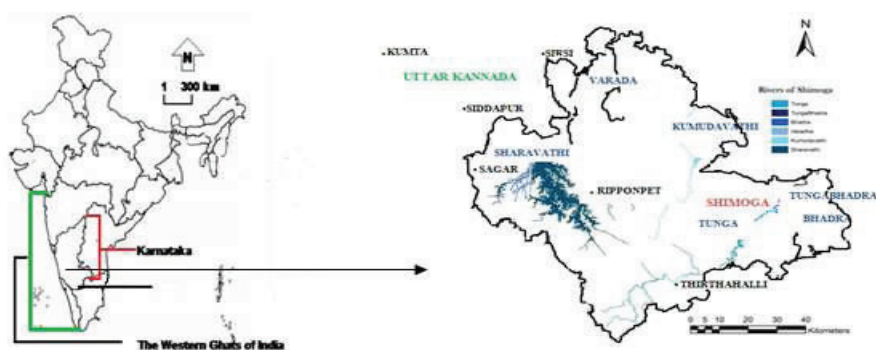


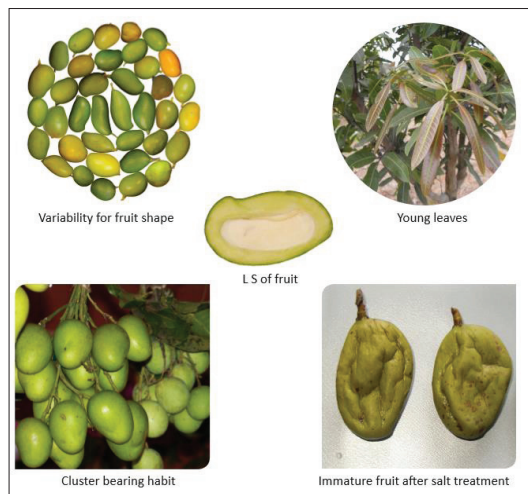
Figure 1. Area map with sampling location of *Appemidi* from Western Ghats region of India



**Figure 2. Appemidi trees growing on riversides**

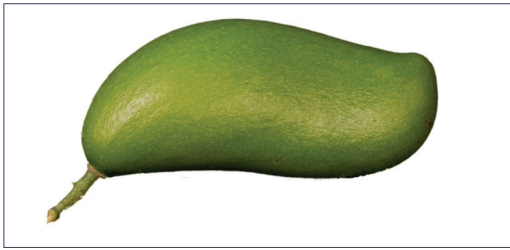
### **Diversity in Appemidi mangoes**

The trees observed in their original habitat in most cases are more than 100 years old. The large variability observed in ‘Appemidi’ is because of the multiplication through seeds. The trees normally branch out to a height of 25 feet, although in some cases they can grow as tall as 80 feet. The fruits are characterized by bunch bearing habit. The yield in most of the trees is anywhere between 2000 to 6000 fruits. Fruits in most of the varieties are small sized and have strong aroma. Immature fruits are exclusively used for making whole fruited pickles. The shape of the fruit varies from round to oblong to ovoid.

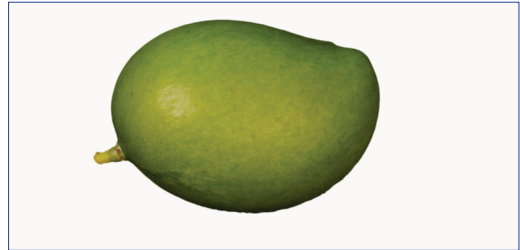


**Figure 3. Diversity in Appemidi mangoes**

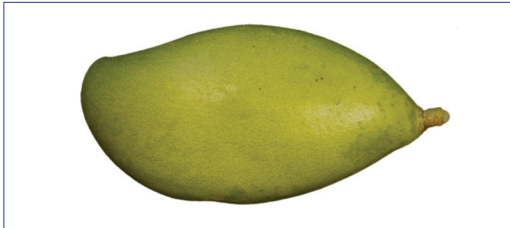
Available in an array of strong aroma ranging from jeera (cumin) to camphor, with three basic categories viz., Jeerige (Cumins seeds flavor), Karpoooraappe (Camphor flavor), Kanchaappe (Sour orange flavor) and Sadaappe (mango flavor). They are highly acidic having thick stalk, small seed, thin skin, thick pulp and generally long fruit, most of them cannot be used as fresh fruit. The shelf life of pickles prepared from these varieties vary between 2 to 5 years.



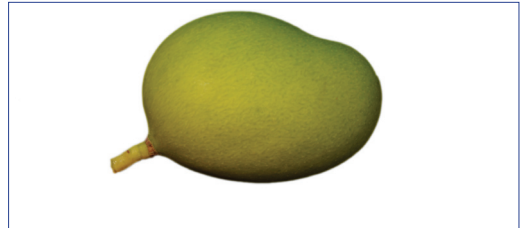
**Addeeri Jeerige appe**



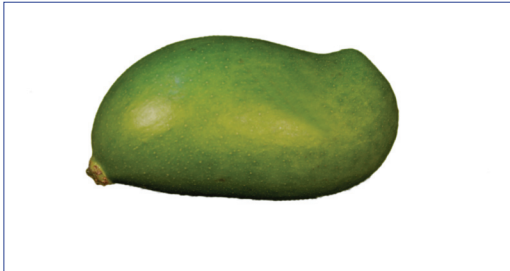
**Isgoor appe**



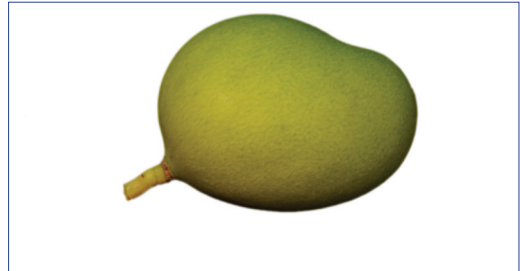
**AnantaBhatt appe**



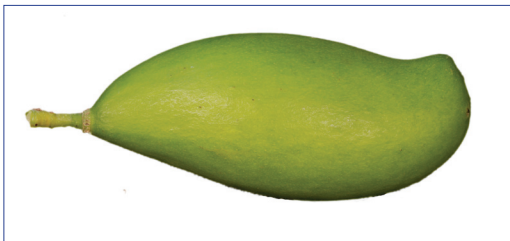
**Isgoor appe**



**Appemidi appe**



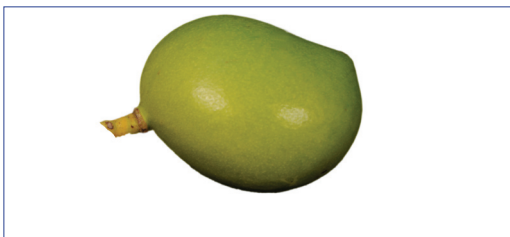
**Kana appe**



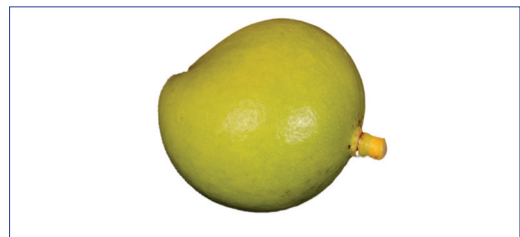
**Aruna Gowda appe**



**Balekoppa appe**

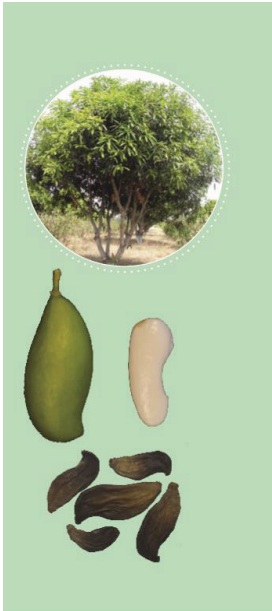


**Malange appe**



**Thumbebedu appe**

**Figure 4. Elite *Appemidi* collections at ICAR-IIHR**



**Aruna Gowda Appe**



**Adderi Jeerige**

### **Conservation of *Appemidi* mangoes**

As mentioned earlier, *Appemidi* mangoes grow in the forests and riversides. Many of the yielding trees are over 100 years old. There are many problems associated with “*Appemidi*” trees. The fruits are harvested majorly from forests, adjacent farmlands and river/stream sides in Western Ghats of Karnataka, and many of the elite trees are old and are on the verge of death. Many a times, the trees are over harvested and increasing demand has spurred many localites to cut branches off in order to make the work easy and quick. Repeated harvests could cause the tree to die. According to the native populace, there are now only a few hundred *Appemidi*

varieties left, down from thousands of varieties. Since it is a soft wood, the *Appemidi* wood is ideally suited for building fishing boats. In the last five decades, the forests in the area have been cut down to make way for developmental works. Further, on realizing the economic importance of ‘*Appemidi*’, many private nurseries have started grafting and mango grafts with their own names, which has led to confusions on their nomenclature. Therefore, there is an urgent need for identifying these trees to be conserved through complementary methods either in situ or ex situ.

### ***Ex situ conservation efforts by ICAR-IIHR***

ICAR-IIHR has systematically surveyed the Malnadu areas of Karnataka, collected and conserved more than 200 accessions of *Appemidi* having variability in bearing habit, size, shape, colour and volatile compositions. Research work on biochemical profiling, characterization, cataloguing and pickling are going on. Based on the pickling quality parameters, the varieties such as Balakoppa Appe, Adderi Jeerige, Malanji, Kana Appe and Sudoor appe are being promoted for commercial cultivation.

### ***Conservation by custodian farmers***

It is to be mentioned here that some of the farmers from other districts have taken some of the choice ‘*Appemidi*’ types and named them after their own place-a variety that can be mentioned here is ‘Kana Appe’. A farmer introduced this variety from the Uttara Kannada district to his village ‘Kana’ in Kasargod district and now it is known by that name. Malanji



Appe, one of the popular varieties is a huge tree found growing near Sirsi in Uttara Kannada. This 60-year-old tree is said to fetch its owners a record Rs 40,000/ year. It has become so popular that the owners have been forced to set up a distribution system for its fruit. The first customers for *Appemidi* are household pickle-makers. Pickle making has become a virtual home industry in the last decade. It is said that over 100 farm households are engaged in making pickle, producing around 100 tonnes a year. Home producers supply pickle in simple glass jars. These homemade pickles have no artificial preservatives; the mango latex itself gives the pickle a shelf life of around four years.

### **Research and Development**

In addition to the survey, collection and conservation efforts, the institute has been characterizing the different *Appemidi* genotypes through morphological, molecular and biochemical characterization to decipher the fruit parameters attributing to its unique aroma, taste and better shelflife. Studies reveal that the aroma of pickling mangoes is due to the presence of distinct terpenes as well as a completely different combination of monoterpenes. The volatile compounds separated from the water fraction of the sap indicate a clear distinction between the mango types in volatile profiles. The sap constituted mainly terpenoid compounds in all the varieties. Total concentration of aroma compounds is higher in Anantha Bhatta Appe (14.743 mg/ml), followed by Adderi Jeerige (12.39 mg/ml), Isagoor Appe (10.93 mg/ml) and Totapuri (10.91 mg/ml). Aroma concentration was minimum in Kana Appe (6.11 mg/ml) and Amrapali (0.75 mg/ml). Total aroma concentration indicates that Anantha Bhatta Appe has a very strong odour when compared to the other genotypes. Amrapali has a very weak odour, with  $\delta$ -3-carene, (-)- $\beta$ pinene, cis-ocimene, caryophyllene and humulene contributing to 85% of the volatiles. Aromatic profile of compounds showed that the relative percentage of  $\beta$ -phellandrene, limonene and  $\alpha$ -terpinene was about 81–89% of the total volatiles in Anantha Bhatta Appe, Adderi Jeerige, Isagoor Appe and Kana Appe. However, in Totapuri,  $\delta$ -3-carene, (-)- $\beta$ -pinene, cis-ocimene and allo-ocimene were the major compounds amounting to 83% of the total volatiles; This indicates that the aroma of pickle type of mangoes is due to entirely different group of terpenes compared to the other two table-type mangoes.

**Table 1. Information on volatile compounds of sap in various *Appemidi* genotypes**

| Sl. No. | Genotypes           | Compounds       | Concentration (µg/ml Sap) |
|---------|---------------------|-----------------|---------------------------|
| 1       | Sudoor Appe         | β-Caryophyllene | 4436.53                   |
| 2       | Shidakke Appe       | trans-Ocimene   | 1002.4                    |
| 3       | Kalkuni             | trans-Ocimene   | 1054.96                   |
| 4       | Karpooora Jeerige   | cis-Ocimene     | 249.04                    |
| 5       | Holekoppada Appe    | Limonene        | 2000.66                   |
| 6       | Mandamane Appe      | α-Phellandrene  | 1346.54                   |
| 7       | Haldotta Appe       | α-Phellandrene  | 2026.01                   |
| 8       | Kalkuni P1          | α-Phellandrene  | 2593.19                   |
| 9       | Isgoor Appe         | α-Phellandrene  | 1220.78                   |
| 10      | Aruna Gowda Appe    | α-Phellandrene  | 1040.69                   |
| 11      | Muregeeer Appe      | α-Phellandrene  | 644.29                    |
| 12      | Mandoorkatta Appe   | cis-Ocimene     | 680.51                    |
| 13      | Kalkai              | α-Phellandrene  | 1173.69                   |
| 14      | Honasgadde Appe     | Limonene        | 1148.85                   |
| 15      | Karpooora Jeerige   | cis-Ocimene     | 2407.93                   |
| 16      | Athigadde Appe -2   | β-Pinene        | 495.75                    |
| 17      | Kuntehole Appe-5    | cis-Ocimene     | 3315.11                   |
| 18      | Malandoor Appe-1    | cis-Ocimene     | 1159.72                   |
| 19      | Arasalu Appe -1     | Limonene        | 2945.09                   |
| 20      | Arasalu Appe -2     | Limonene        | 2945.09                   |
| 21      | Kancha Appe         | γ-Terpinene     | 5102.03                   |
| 22      | Anantha Bhatta Appe | α-Phellandrene  | 4583.50                   |



Figure 5. Collection of sap from fruit peduncle and sap burning test in *Appemidi*

### Preparation of pickles

Pickling is done in high concentration salt solution. The lactic acid bacteria can tolerate a high salt concentration, which give them an advantage over other less salt tolerant species and allows them to grow and produce acid that inhibits the growth of undesirable microorganisms. The main purpose of addition of salt is to create a saline environment within the fruit pieces that ensures a perfect growing and multiplication environment for the beneficial microbes and thus preventing other detrimental microorganisms.





**Figure 6.** *Appemidi* fruits preservation and pickling

### **Future thrust**

Efforts to identify and document the *Appemidi* genotypes needs to be intensified and the elite *Appemidi* types needs to be popularized among the farming community. Further, reintroducing the genotypes to their natural habitats can permit in situ evolution, in addition to preventing the rare genotypes from extinction. Documentation and validation of the traditional knowledge associated with *Appemidi* mangoes will also largely contribute to the improvement and better utilization of the crop.

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# *Notes*