SUMMARY

Musaceae, the banana family, are considered as the most ancient family in the order Zingiberales with three genera – *Musa*, *Ensete* and *Musella* (Kress, 1990). The genus *Musa* includes several seeded wild forms and a number of seedless edible cultivars. It is generally considered as one of the taxonomically difficult group, primarily due to its bulkiness and high range of variation (Joe, 2015). The genus consists of plants with large rhizomatous perennial habit with well developed areal shoots, developed by the folded leaf sheaths – the pseudostem and a terminal tuft of leaves. Inflorescence is terminal, developed by the elongation of apical bud and penetrated through the pseudostem. Flowers are epigynous and usually unisexual (bisexual flowers are also seen in some wild species). The fruits are very large and are edible or not. Present study deals with the taxonomy of banana cultivars in South Indian and their phytochemistry.

Banana has been recognized as one of the major fruit crop in India and it ranks second in area of production and first in production (29.19% of global production). Even though the cultivated banana attracts a good deal of research in many aspects, most of them lack a botanical identity and almost all banana cultivars were treated as a single species – either *M. paradisiaca* or *M. sapientum*.

The plants were collected from all parts of South India, notes down the special characters, local names, uses, and all other details available from the farmers itself. The photographs were also taken from the field. The rhizomes were collected and brought to the Calicut University Botanical Garden to develop a live germplasm of South Indian *Musa* cultivars. Herbarium specimens including voucher specimen and standard specimens of all cultivars were prepared and deposited in the Calicut University Herbarium (CALI).
During the present study, 24 *Musa* cultivars were identified from South India with synonyms, and a detailed description, colour photographs and a dichotomous key to all taxa were provided for the easy identification. The genomic constitution of each cultivar was identified using morpho-taxonomic scoring method developed by Simmonds and Shepherd (1955) and compared with the modified score card of Singh and Uma (2000). These include diploids and triploids with the genomic constitutions of AA, AAA, AB, AAB or ABB. There are no tetraploids and pure *M. balbisiana* lines so far found in South India.

**Nomenclature**

All cultivars were named in accordance with the latest Code of nomenclature - ICN (McNeill *et al.*, 2012) and ICNCP (Brickell *et al.*, 2009). For the naming of cultivated bananas, a modified three-tier system, originally proposed by Simmonds and Shepherd (1955), was followed. Instead of only the generic name the binomial (parent name in the case of pure lines and for hybrids *Musa × paradisiaca* was used), followed by the letter combination indicating the ploidy and genomic set in paranthesis and then the cultivar epithet in single inverted comas. In most cases cultivar names are extracted from Jacob (1952) and those, which are not included in this monograph, the mostly used common name is used.

**New synonyms**

All the previous authors except Jacob (1952) treated the *Musa* cultivars under a single name (either *M. paradisiaca* or *M. sapientum*) and it cannot identify the correct in all these cases. Jacob (1952) treated all the banana cultivars in Madras provinces under a new species *M. sapidisiaca* and gave the varietal status to all. But the species itself is found invalid due the lack of diagnosis and he only mentioned the new species as a combination of two Linnaean species (*i.e.*, *M. paradisiaca* and *M. sapientum*); hence all these varieties are also invalid. In the present work, these all varieties were treated
as synonyms under the respective cultivar. Some cultivars shows high range of continuous variation and Jacob (1952) treated some of them as distinct varieties, hence these all such varieties are also treated here as a single cultivar and synonymised.

**Endemism**

Present study revealed that four hill bananas, viz., *Musa acuminata* Colla (AA) ‘Karivazhai’; *Musa × paradisiaca* L. (AAB) ‘Namarai’; *Musa × paradisiaca* L. (AAB) ‘Sirumalai’; *Musa × paradisiaca* L. (AAB) ‘Virupakshi’, are endemic to some hilly areas of Tamil Nadu and one cultivar (*Musa × paradisiaca* L. (AB) ‘Matti’) is found endemic to Andhra.

**Germplasm conservation**

An attempt has been made to conserve all South Indian Banana cultivars in the Calicut University Botanical Garden (CUBG). The fresh rhizomes collected from various localities in South India were collected and planted in the *Musa* garden at CUBG. A collection of 72 accessions of 24 cultivars are surviving in the conservatory. Some of these cultivars are endemic to some hilly areas and some are highly endangered and may be lost in the coming future. So this conservatory may help for further research and can also be made useful for the breeding experiments for the production of improved cultivars.

It is noticed that the hill banana *Musa acuminata* Colla (AA) ‘Karivazhai’ is very difficult to grow in the plains and the other hill bananas also faces some stresses here. Some banana cultivars like *Musa acuminata* Colla (AAA) ‘Grand naine’, *Musa × paradisiaca* L. (AAB) ‘Nendran’, *Musa × paradisiaca* L. (AAB) ‘Rasthali’, etc. needs special care and it needs to replant in every year. The cultivar Red needs double manure and water for its growth where as the cultivars like Neypoovan, Poovan, Vannan, etc. can grow for years in the same clump even without any care. Some shows variation in colour of pseudostem and leaf parts and in the taste with variation in altitude.
*Musa × paradisiaca* L. (AB) ‘Thaenkunnan’ generally produces only female flowers and all are developed into fruits but in the extreme summer or in the severe drought condition, it has a tendency to produce male flowers towards the tip and thus may get normal infructescence.

**Database of South Indian *Musa* cultivars**

A database was prepared for the easy identification of different South Indian *Musa* cultivars. It provides all relevant updated information of all cultivars under study. The taxon can also be searched by valid name, synonyms, common names and endemic status. The close button should be used for closing a window. The database is developed by using the software Visual FoxPro (Version 6) with the help of a computer programmer.

**Phenetic analysis**

Phenetic analyses of twenty four *Musa* cultivars revealed that there are two groups exist in the South Indian cultivated bananas and this well support the genomic classification – I. pure lines of *M. acuminata* (AA & AAA). II. all hybrid cultivars (AB, AAB & ABB). The genetic interrelation ship is highly reflected in the phenogram and are highly reliable (100 bootstraps).

**Phytochemical analysis**

The chemical profiling of fatty acids and the volatile compounds of methanolic extracts of the fruit pulps of thirteen *Musa* cultivars in South India were done using GC-MS analysis. A total of 140 fatty acids and volatile compounds were identified from thirteen banana cultivars with their chemical formula, molecular mass, retention time and area percentage in each cultivar (APPENDIX III). Out of which 105 compounds have much higher concentration (*i.e.*, area percentage is higher than 1%).

The study indicates these are very distinct, in support of the distinct morphological features. In Chemotaxonomic point of view, rather than the closeness of relationship between allied cultivars, the uniqueness of each
cultivar is vivid through the chemical profile of the fatty acids and the volatile compounds. The study also throws some light towards the presence of some important chemical compounds such as 2,3-dihydro-3,5-dihydroxy-6-methyl-4H-pyran-4-one, n-Hexadecanoic acid, Dodecanoic acid, Atriplexinol, maltol, (E,E)-2,4-Decadienal, etc. Such compounds are important with their biological and pharmacognostic activities. The present study is also very significant since it is the first time attempt in most of the cultivars done.