A CRITICAL ASSESSMENT OF *Mangifera indica* L. WITH SPECIAL REFERENCE TO SEED MORPHOLOGY FROM BULDHANA DISTRICT, MAHARASHTRA, INDIA

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Abstract
Mangifera indica L. (mango) is one of the most economically, nutritionally, and culturally significant fruit tree species of tropical and subtropical regions. Despite its importance, detailed regional studies focusing on seed morphology remain limited, particularly from the Vidarbha region of Maharashtra. The present study provides a critical assessment of Mangifera indica with special reference to seed morphology based on field observations and specimen analysis from Buldhana District. Seeds were collected from multiple localities representing different agro-climatic and soil conditions. Morphological characters such as seed size, shape, testa texture, colour, fibrous nature, presence of polyembryony, and embryo structure were examined. The study reveals notable variations in seed morphology, which may be attributed to genetic diversity, environmental factors, and varietal differences. Seed morphological traits are found to be useful diagnostic characters for varietal identification, taxonomic evaluation, and conservation planning. The findings contribute baseline data for future systematic, ecological, and breeding studies of mango in the region.
Keywords: *Mangifera indica, Seed morphology, Angiosperms, Buldhana District, Vidarbha, Taxonomy*

Introduction

Mangifera indica L., belonging to the family Anacardiaceae, is one of the most widely cultivated fruit trees in India and across tropical regions of the world. India is recognized as the primary centre of diversity for mango, with many cultivated varieties and wild relatives. Beyond its economic value as the "king of fruits," mango plays a significant ecological role by supporting pollinators, birds, insects, and soil microfauna (Mukherjee, 1972; Neto *et al.,*2000; Fivaz, 2008).

Seed morphology is an important yet often underutilized tool in plant taxonomy and systematics. Morphological characteristics of seeds such as size, shape, texture, and internal structure provide valuable insights into species identification, evolutionary relationships, and adaptive strategies. In mango, seed traits are also of agronomic importance, influencing germination behaviour, polyembryony, and propagation methods (Dhillon *et al.,* 2004; Kumar and Brahmachari, 2004; Simi, 2006).

Buldhana District of Maharashtra forms part of the Vidarbha region and exhibits diverse agro-climatic conditions, ranging from semi-arid to sub-humid zones. Mango cultivation is common in this region; however, detailed morphological studies, particularly focusing on seed characters, are scarce (Diwakar and Sharma, 2000). The present study aims to critically assess *Mangifera indica* with special reference to seed morphology from Buldhana District, thereby contributing to regional floristic and taxonomic knowledge.

Materials and Methods

Study Area: Buldhana District is situated in the northern part of Maharashtra within the Vidarbha biogeographic zone, lying approximately between 20°17′–21°33′ N latitude and 75°57′–76°49′ E longitude. The district experiences a tropical monsoon climate with hot summers, moderate monsoonal rainfall, and mild winters. Soils are predominantly black cotton soil (regur), along with mixed red–black soils and localized alluvial patches. These favourable geographic, climatic, and edaphic conditions support diverse agriculture and horticulture, including widespread cultivation of mango (*Mangifera indica* L.).

Field Collection: Mature mango fruits were collected during the peak fruiting season from different localities of Buldhana District, including agricultural fields, orchards, village commons, and roadside plantations. Fruits were selected randomly to represent local variability.

Seed Preparation: Seeds were extracted manually after removal of pulp and thoroughly washed with water. The fibrous endocarp was carefully separated where required to examine the true seed structure.

Morphological Analysis: Seed morphological characters were examined using standard taxonomic methods, with detailed observations made on seed size (length, breadth, and thickness), overall shape, colour of the testa and endocarp, surface texture, and the fibrous nature of the endocarp. In addition, the presence or absence of polyembryony and the type and orientation of the

embryo were recorded. Observations were carried out through direct visual examination and hand lens inspection, while precise measurements were obtained using a standard scale and a vernier caliper.

Results and Discussion

General Seed Morphology: Seeds of *Mangifera indica* L. collected from different localities of Buldhana District are characteristically large and robust, reflecting the typical morphological features of the species. The seeds are generally flattened to oblong–elliptical in outline and are enclosed within a thick, hard, and fibrous endocarp that provides mechanical protection to the embryo. The external colour of the seed coat shows noticeable variation, ranging from pale cream to light brown, which appears to be influenced by the degree of maturity, post-harvest drying, and varietal differences. The overall structure of the seed indicates an adaptation for protection and successful germination under varying environmental conditions (Knight, 2009; Litz, 2009; Bhat *et al.*,, 2010).

Variation in Seed Size and Shape: Marked variation in seed size and shape was observed among samples collected from different sites within the district. Seed dimensions varied from moderately large to very large, suggesting the influence of both genetic factors and local agro-climatic conditions such as soil type, moisture availability, and nutrient status. While most seeds exhibited an oblong form, some samples were more elongated with slightly tapering ends, whereas others appeared broader and more compressed. This morphological variability is significant, as seed size and shape are known to affect germination rate, seedling vigour, and early establishment (Selvan *et al.,* 2010; Majumder *et al.,* 2011; Rajwana. *et al.,* 2011).

Testa and Endocarp Characters: The seed coat (testa) of *Mangifera indica* is thin, delicate, and membranous, closely adhering to the seed contents. In contrast, the endocarp is thick, woody, and densely fibrous, forming a tough protective layer around the seed. The extent of fibrosity of the endocarp varied considerably among the examined samples. In some seeds, the fibrous network was highly compact and rigid, whereas in others it was relatively loose. Such variation in endocarp structure may influence water absorption, mechanical restriction during germination, and the ease of seedling emergence, thereby playing an important role in reproductive success (Vasugi, *et al.,* 2012; Ali, 2013; Joshi *et al.,* 2013).

Embryo Characteristics: Both monoembryonic and polyembryonic seeds were recorded in the present study, indicating considerable reproductive diversity within mango populations of Buldhana District. Polyembryony, a well-known and agriculturally important characteristic of mango, was found to be more prevalent in certain locally cultivated varieties. Embryos were generally well developed, with clearly distinguishable cotyledons and a prominent embryonal axis. The presence of multiple embryos in polyembryonic seeds has important implications for clonal propagation, genetic uniformity, and nursery practices, highlighting the significance of embryo characteristics in mango cultivation and improvement programmes (Ribeiro *et al.,* 2013; Barholia and Yadav, 2014; Sennhenn *et al.,* 2014)

Hence, the seed morphological variation in *Mangifera indica* observed in the present study reflects the combined influence of genetic diversity, environmental conditions, and cultivation practices. Similar observations have been reported in earlier floristic and taxonomic studies, where seed traits proved valuable in distinguishing cultivars and landraces (Kheshin *et al.,* 2016; Vieccelli *et al.,* 2016; Galal *et al.,* 2017)

Polyembryony, an important reproductive feature in mango, has direct implications for propagation and breeding programmes. The presence of both monoembryonic and polyembryonic seeds within the district highlights the genetic richness of mango

populations in Buldhana. These views are also in well agreement with Devi *et al.,* (2021), Singh *et al.,* (2021), Durgam *et al.,* (2021), Singh *et al.,* (2025) and name a few

From a taxonomic perspective, seed morphology provides stable diagnostic characters that complement vegetative and floral traits. Ecologically, variations in seed structure may influence dispersal, germination success, and seedling establishment under different environmental conditions.

Conclusion

The present study provides a critical assessment of *Mangifera indica* with special reference to seed morphology from Buldhana District, Maharashtra. Significant variations in seed size, shape, fibrosity, and embryonic structure were recorded. These morphological traits are valuable for taxonomic identification, understanding intraspecific variation, and supporting conservation and breeding efforts. The study offers baseline data for further systematic, ecological, and genetic investigations of mango in the Vidarbha region.

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