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EVALUATION OF VARIOUS MANGO (*MANGIFERA INDICA* L.) HYBRIDS AND VARIETIES IN EASTERN DRY ZONE OF KARNATAKA, INDIA

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ABSTRACT

The present study was carried out over an extended period from 2011–12 to 2018–19 at the Agricultural Research Station, Balajigapade, Chikkaballapur, Karnataka, India. The primary objective of the experiment was to identify a suitable mango hybrid or variety for cultivation in the Eastern Dry Zone of Karnataka based on their performance in terms of yield and quality parameters. The experimental layout consisted of nine mango hybrids, namely: Arka Puneeth, Arka Neel Kiran, Arka Anmol, Amrapali, Mallika, Rathna, Neelishan, Neelgoa, and Sindhu, which were replicated thrice, and six mango varieties, namely: MA-1, Alphonso, Dashehari, R. Alphonso, Banganapalli, and Kesar, which were replicated four times. The study was conducted using a Randomized Complete Block Design (RCBD), and the data for hybrids and varieties were analyzed separately. Observations were recorded on both physical and chemical characteristics of the fruits, and results revealed that these traits varied significantly among the different hybrids and varieties evaluated under the agro-climatic conditions of the Eastern Dry Zone. Among the hybrids, Mallika demonstrated superior performance, recording the highest average fruit yield of 65.18 kg/tree, outperforming the other hybrids in terms of productivity. Similarly, among the varieties, MA-1 was found to be the most productive, with a significantly highest average yield of 69.05 kg/tree, thus establishing its suitability for commercial cultivation in the region.

Keywords **:** Mango, Hybrids, Evaluation, Eastern Dry zone, TSS, Yield

Introduction

Mango (*Mangifera indica* L.), a member of the family Anacardiaceae, is one of the most important and widely cultivated commercial fruit crops in the world. Among the major fruits globally, mango ranks high with a production contribution of approximately 46.50 million tonnes. It is famously referred to as the "King of Fruits" due to its delectable taste, high nutritional value, and richness in essential vitamins and minerals.

The long history of mango cultivation is well documented and referenced in ancient Indian scriptures, indicating its early domestication and deep-rooted cultural significance. In ancient India, mango was valued not only for its religious and sentimental associations, but also for its economic and societal roles. During the reign of the Muslim kings and Nawabs, the cultivation and promotion of elite mango varieties were encouraged. Notably, "Ain-i-Akbari", the 16th-century Mughal-era encyclopedia compiled in 1590 AD, provides a detailed account of mango cultivation during Emperor Akbar's period (Dinesh *et al*., 2015).

India holds the distinction of being the largest producer and exporter of mangoes in the world. While mango is cultivated across various tropical and subtropical countries, major producers include India (42.02%), followed by China (10.69%), Thailand (7.69%), Mexico (4.92%), and Indonesia (4.89%). In India, the mango cultivation area stands at 22.67 lakh hectares, yielding a production of 202.95 lakh tonnes, which accounts for 42.02% of global production. The leading mango-producing states in India are Uttar Pradesh (23.06%), Andhra Pradesh (16.07%),

Karnataka (9.29%), Bihar (7.52%), Gujarat (6.31%), and Tamil Nadu (5.88%) (Mukund *et al*., 2019).

Karnataka occupies a unique position in India with respect to the diversity of mango varieties. The state recorded an area of 1.44 lakh hectares under mango cultivation with a production of 7.58 lakh tonnes during 2014–15. Mango is cultivated in nearly all districts of Karnataka, with Kolar district contributing the highest production (1.50 lakh tonnes), followed by Ramanagara district (1.02 lakh tonnes) during the same period (Anon, 2015). Notably, the Eastern Dry Zone of Karnataka is considered one of the most promising regions in terms of both mango area and productivity.

India is home to nearly 1,000 mango varieties, but only around 20 varieties are cultivated commercially. Most Indian mango varieties require specific eco-geographical conditions for optimum growth and fruiting. Prominent commercial varieties grown in different regions include (Anon, 2016):

- Northern India: Dashehari, Langra, Chausa, Bombay Green, Fazri
- Southern India: Banganapalli, Totapuri, Neelum, Pairi, Suvarnarekha, Mallika, Mulgoa, Kalapadi, Rumani
- Western India: Alphonso, Kesar, Mankurad, Fernandin, Vanraj
- Eastern India: Langra, Fazri, Chausa, Zardalu, Himsagar, Malda

Each mango variety exhibits distinctive characteristics in terms of shape, size, skin color, weight, Total Soluble Solids (TSS), yield potential, and other fruit quality parameters. Considering this wide variability and the need to identify region-specific superior genotypes, the present study was undertaken to evaluate the performance of selected mango hybrids and varieties under the agro-climatic conditions of the Eastern Dry Zone of Karnataka, India.

Materials and Methods

A field experiment comprised of 9 hybrids and 6 varieties was conducted during the period 2011-12 to 2018-19 at Agricultural Research Station Balajigapade Chikkaballapur to identify suitable hybrid /variety of mango to the eastern dry zone. The nine hybrids of mango under the study are ArkaPuneeth, ArkaNeelkiran, ArkaAnmol, Amrapali, Mallika, Rathna, Neelishan, Neel goa and Sindu. Similarly the six varieties under study are MA-1, Alphanso, Dashehari, Alphanso, Banganapalli and Kesar. These nine hybrids replicated thrice and six varieties replicated four times in a Randomized complete block design (RCBD). Need based plant protection and agronomic practices are followed.

Every year during the mango season (2011-19, eight years), physical and chemical parameters of fruits *viz*., TSS (^{0}Brix), pulp weight (gram/fruit), peel weight (gram/fruit) number of fruits per tree was counted at the time of harvest and yield was calculated based on the weight of the fruit per tree was recorded. The maturity was judged on the basis of fruit colour changes from greenish to the pinkish, reddish, yellowish depending on the variety/hybrid, flatness of the tubercles and smoothness of the epicarp as suggested by Pandey and Sharma (1998). The data were recorded on TSS (^{0}Brix) was determined by putting two drops of homogenized juice on the prism of hand refractometer and values were expressed as percentage. Reducing sugar was estimated by Lane and Eynon (1923). Pulp weight and peel weight is estimated by separation of pulp and peel of the well matured fruits and expressed in gram/fruit. Number of fruits per tree is recorded carefully by totaling the number of fruits harvested from the particular tree from initiation of the mango season till the end of mango fruits in the tree. Similarly the weighted of the harvested fruits is totaled and expressed as yield per plant.

The data collected was statistically analyzed using the standard procedure and the results were tested at five per cent level of significance (Gomez and Gomez 1984). The critical difference was used to compare treatment means.

Results and Discussion

The data pertaining to Total Soluble Solids (TSS), pulp weight, peel weight, stone weight, number of fruits per tree, and yield per tree across different mango hybrids and varieties are discussed under the following subheadings:

Total Soluble Solids (TSS °Brix)

The Total Soluble Solids (TSS), which indicate the sugar content and overall sweetness of the fruit, varied significantly among the tested hybrids and varieties. Among the mango hybrids, Mallika exhibited the highest TSS content (20.27 °Brix), which was statistically at par with Amrapali (19.29 °Brix), suggesting that both hybrids are desirable in terms of sweetness. In contrast, Arka Anmol recorded the lowest TSS among the hybrids (14.13 °Brix), indicating relatively lower sweetness.

When comparing different mango varieties, the highest TSS value was observed in MA-1 (18.96

°Brix), which was statistically similar to Dashehari (18.65 °Brix). Banganapalli also showed a high TSS of 17.85 °Brix. The lowest TSS among the varieties was found in the Kesar variety. These findings are supported by Vijayanand *et al.* (2015), who also reported higher sugar content in the Mallika cultivar.

Pulp Weight (g/fruit)

Pulp weight, which contributes directly to the edible portion of the fruit, showed significant variation across the genotypes. Among the hybrids, Mallika recorded the highest pulp weight of 223.13 g per fruit, making it superior among all the evaluated hybrids. In contrast, Neelishan had the lowest pulp weight (71.65 g/fruit), indicating less edible portion.

Among the varieties, Banganapalli stood out by recording the maximum pulp weight (197.35 g/fruit), significantly higher than other varieties. Conversely, Dashehari exhibited the lowest pulp weight (70.35 g/fruit), suggesting limited usable pulp despite its favourable sweetness.

Peel Weight (g/fruit)

Peel weight is an important quality trait, especially for processing and consumer preference. Among the mango hybrids, Amrapali showed the lowest peel weight (32.90 g/fruit), which is advantageous in terms of higher edible percentage. On the other hand, Arka Neel Kiran had the highest peel weight (45.11 g/fruit), which may affect its overall desirability.

In the case of mango varieties, MA-1 had the least peel weight (32.13 g/fruit), followed by other varieties, whereas Banganapalli exhibited the highest peel weight (47.75 g/fruit), suggesting a thicker and heavier peel.

Stone Weight (g/fruit)

Stone weight is another important parameter affecting the fruit's edible proportion. Among the hybrids, Sindhu recorded the lowest stone weight (29.16 g/fruit), closely followed by Neelishan (29.37 g/fruit), which is advantageous for increasing the pulp-to-stone ratio. Arka Anmol, however, had the heaviest stone among the hybrids (54.45 g/fruit).

Among the varieties, Dashehari recorded the least stone weight (27.60 g/fruit), whereas Banganapalli exhibited the highest stone weight (57.73 g/fruit), potentially reducing the edible pulp portion.

Number of Fruits per Tree

Fruit count per tree directly influences yield and commercial productivity. In the hybrid group, Amrapali recorded the maximum number of fruits per tree (251.64 fruits/tree), statistically on par with Arka Anmol (209.90 fruits/tree). Neelishan, on the other hand, showed the least number of fruits (152.18 fruits/tree), indicating lower productivity.

Among the varieties, MA-1 recorded the highest fruit count (287.24 fruits/tree), which was at par with Dashehari (274.64 fruits/tree), both reflecting high productivity. The lowest fruit count was observed in the Alphonso variety (170.03 fruits/tree). The findings were found in agreement with the experimental outcomes of Hada and Singh (2015).

Fruit Yield per Tree (kg/tree)

Fruit yield per tree is a critical economic trait for mango cultivation. Among the hybrids, Mallika produced the highest yield (65.18 kg/tree), which was statistically on par with Arka Anmol (59.54 kg/tree), confirming their high productivity potential. Neelishan recorded the lowest yield (19.93 kg/tree), making it less desirable from a commercial perspective. These results are in agreement with the findings of Krishna *et al*. (2017), who also reported superior yield in the Mallika hybrid.

Among the varieties, MA-1 stood out with the highest yield (69.05 kg/tree), followed closely by Banganapalli (57.37 kg/tree), indicating their commercial promise. The Alphonso variety recorded the lowest yield (40.98 kg/tree), despite its premium market value, likely due to lower fruit count and moderate fruit weight. Similar outcomes were reported by Kishore *et al*., (2015)

Table 1: Variation in TSS(^{0}Brix), Pulp weight (g/fruit), Peel Weight (g/fruit), Stone Weight (g), fruits/pant and yield per tree (kg/tree) in different mango hybrids (Pooled data of eight years)

Hybrids	TSS (^{0} Brix)	Pulp weight (g/fruit)	Peel weight (g/fruit)	Stone weight (g/fruit)	No. of fruits/plant	Yield/tree (kg/tree)
ArkaPuneeth	17.57	120.95	37.03	44.01	165.20	45.54
ArkaNeelkiran	17.13	120.73	45.11	39.80	165.68	51.30
ArkaAnmol	14.13	135.80	44.83	54.45	209.90	59.54
Amrapali	19.29	93.91	32.90	33.43	251.64	52.52
Mallika	20.27	223.13	41.50	49.88	165.62	65.18
Rathna	17.95	114.52	38.78	36.10	169.95	34.30

Neelishan	14.49	71.65	38.10	29.37	152.18	19.93
Neel goa	18.13	77.19	42.67	37.91	173.88	24.76
Sindu	17.66	151.18	37.71	29.16	169.91	36.38
S.Em±	0.59	15.51	4.00	4.43	15.80	3.91
CD(p=0.05)	1.75	46.07	11.89	13.17	46.95	11.63

Table 2: Variation in TSS(^{0}Brix), Pulp weight (g/fruit), Peel Weight (g/fruit), Stone Weight (g), fruits/pant and yield per tree (kg/tree) in different mango varieties (Pooled data of eight years)

Hybrids	TSS (^{0} Brix)	Pulp weight (g/fruit)	Peel weight (g/fruit)	Stone weight (g/fruit)	No. of fruits /plant	Yield/tree (kg/tree)
MA-1	18.96	147.19	32.13	34.97	287.24	69.05
Alphanso	17.16	132.77	43.40	36.01	170.03	40.98
Dashehari	18.65	70.35	28.17	27.60	274.64	46.25
R.Alphanso	16.51	162.75	46.81	44.60	145.28	43.19
Banganapalli	17.85	197.35	47.75	57.73	175.08	57.37
Kesar	16.03	95.74	34.74	33.76	211.39	41.25
S.Em±	0.55	9.35	2.88	3.04	16.69	3.67
CD(p=0.05)	1.63	27.78	8.56	9.05	49.6	10.89

Conclusion

Each mango hybrid and variety possesses its own unique characteristics and consumer preferences, such as flavor, aroma, texture, and appearance. However, when evaluated specifically for overall performance and yield potential under the agro-climatic conditions of the Eastern Dry Zone of Karnataka, India, notable differences were observed. Among the hybrids studied, Mallika emerged as the most superior, exhibiting excellent chemical and physical properties along with the highest yield, thereby outperforming the other hybrids in the region. Similarly, among the commercially cultivated varieties, MA-1 demonstrated outstanding performance, recording the highest yield and favourable quality traits, establishing it as the best-performing variety in this specific agro-ecological zone.

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