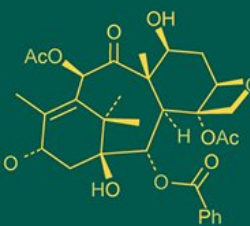
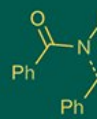
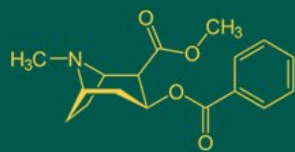


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Studies on cross compatibility of selected mango (*Mangifera indica* L.) genotypes

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Abstract

The present investigation entitled “Studies on cross compatibility of selected mango genotypes” was carried out during the period 2022-23 at Mango Research Station, Nuzvid, Eluru District, Andhra Pradesh. In the present study, revealed that the maximum number of flowers were crossed (737) in cross combination B-20 X Banaganapalle (T₄). The highest initial number of fruits per panicle (54.27) was observed in the cross combination of C-24 X Chinnarasam (T₆). The maximum number of fruits per panicle at 15 days after fruit set (47.45) was recorded in the cross combination of E-3 X Chinnarasam (T₈). Significantly highest number of fruits per panicle at 30 days after fruit set (42.26) was recorded in the cross combination of C-24 X Chinnarasam (T₆). Significantly highest number of fruits per panicle at 45 days after fruit set (38.09) was recorded in the cross combination of C-24 X Chinnarasam (T₆). Among different cross combinations C-24 X Chinnarasam (T₆) (24.54) cross recorded significantly maximum no. of fruits per panicle at 60 days after fruit set. Among the various cross combinations significantly highest number of fruits per panicle at 75 days after fruit set (19.13) was recorded in the cross combination of E-3 X Chinnarasam (T₈). Significantly maximum number of fruits per panicle at 90 days after fruit set (15.68) was recorded in the cross combination of B-20 X Banaganapalle (T₄). Significantly maximum number of fruits per panicle at 105 days after fruit set (9.32) was recorded in the cross combination of B-20 X Banaganapalle (T₄). Maximum fruit set (1.26%) was observed in the cross combination of B-20 X Banaganapalle (T₄) and significantly minimum fruit drop percent of 80.73 was observed in the cross combination of B-20 X Banaganapalle (T₄).

Keywords: Genetic diversity, Cross compatibility, Mango, Genotypes

Introduction

Mango (*Mangifera indica* L.) is the most nutritive and delicious fruit crop belonging to the Anacardiaceae family and originated in Indo-Burma region. Due to its popularity and importance, mango is often named ‘King of fruits’ for its luscious flavour and taste. It is recognized as the pride fruit of India, being the richest source of vitamin A (4800 I.U.), vitamin C, minerals and other nutrients (Bhamini *et al.*, 2018) [1]. In India, mango is cultivated in an area of 2325 thousand hectares with production of 208.99 lakh tonnes and 9.0 MT/ha productivity. The major mango-growing states in India encompass Uttar Pradesh, Karnataka, Andhra Pradesh, Telangana, Bihar, West Bengal and Gujarat. Notably, Andhra Pradesh boasts a substantial cultivation area of 378.94 thousand ha, yielding a production of 4926.22 MT and productivity of 13 MT/ha (NHB Data base, 2020-21). Low productivity of some mango cultivars is associated with low fruit set and high fruit drop of immature fruits. Self-incompatibility and cross incompatibility were reported as the serious factors affecting low fruit set in many mango cultivars (Gehrke-Velez *et al.*, 2012) [2]. Self incompatibility was reported in several commercial Indian mangos such as Bombay Green, Chausa, Dasher and Langra (Singh *et al.*, 1962 and Sharma and Singh, 1972) [8, 7]. Although, under normal conditions the percentage of fruit set in mango varies according to cultivar and ranges from 0.5% to 28%. Only less than 1% of flowers in each panicle develop into fruits and this lower percentage is dependent on the number of hermaphrodite flowers, environmental conditions and cross compatibility between cultivars during pollination. Many varieties were found to be self-fruitful, but cross pollination seemed to be necessary in order to obtain reasonable yields.

Additionally, cross pollination increased fruit set and retention in Alphonso, Goamankur and Kesar mango cultivars (Mahmoud, 2015)^[3].

Materials and Methods

The experiment was conducted to study cross compatibility of selected mango genotypes with checks at Mango Research Station, Nuzvid during the period 2022-23. The experiment was laid out in Randomized Block Design (RBD) with 8 treatments and 3 replications. The cross combinations used in the present study are T₁: B-6 X Banaganapalle, T₂: B-9 X Banaganapalle, T₃: B-17 X Banaganapalle, T₄: B-20 X Banaganapalle, T₅: C-6 X Chinnarasam, T₆: C-24 X Chinnarasam, T₇: E-2 X Chinnarasam and T₈: E-3 X Chinnarasam. The eight genotypes were used as female parents viz., B-6, B-9, B-17, B-20, C-6, C-24, E-2 and E-3. While, two checks viz., Banaganapalle and Chinnarasam were used as male parents.

Pollination methodology

Hand pollination was attempted using the technique described by Mukherjee *et al.* (1961). Panicles directly arising from secondary or tertiary branches were selected. These panicles were bagged on the preceding day of pollination with finely perforated muscline cloth bags (45 x 30 cm). The next morning, freshly opened perfect flowers located on middle of each panicle were retained for pollination and all other unopened buds and flowers were removed. After selection of hermaphrodite flowers, the panicles were then rebagged. Pollens from Banaganapalle and Chinnarasam were collected from freshly opened flowers from panicles bagged previous day. The collected stocks of opened flowers were kept in separate petri dish under partial shade to dehisce anther. After pollen dehiscence, bags from panicles of female parents were removed and hand-pollination was done on stigma of the flower with the desired pollen. The pollinated panicle was immediately rebagged and labelled properly. The bags were removed after 48 hrs and fruit-set was recorded at different intervals.

Results and Discussion

1. Number of flowers crossed

There were significant differences in the number of flowers crossed among different cross combinations. The maximum number of flowers were crossed (737) in cross combination B-20 X Banaganapalle (T₄), followed by C-24 X Chinnarasam (T₆) (692), E-3 X Chinnarasam (T₈) (660). Minimum number of flowers were crossed in B-6 X Banaganapalle (T₁) (496). The results were in agreement with the findings of Srivastav *et al.* (2014) who reported that 637 flowers were crossed in cross combination of Amrapali × Sensation.

2. Initial number of fruits per panicle

Significant variation was observed in the initial number of fruits per panicle among various cross combinations. The highest initial number of fruits per panicle (54.27) was observed in the cross combination of C-24 X Chinnarasam (T₆) which is on par with E-3 X Chinnarasam (T₈) (52.86) followed by B-20 X Banaganapalle (T₄) (48.36). The lowest initial number of fruits per panicle (13.19) was observed in the cross combination of B-17 X Banaganapalle (T₃). Similar findings were reported by Maklad (2015)^[4] who

stated that higher initial number of fruits per panicle (55.93 and 73.25) was observed in the cross combination of Langra x Zebda during 2013 and 2014 seasons, respectively.

3. Number of fruits per panicle at 15 days after fruit set

Significant variation was observed with respect to number of fruits per panicle at 15 days after fruit set among various cross combinations. The maximum number of fruits per panicle at 15 days after fruit set (47.45) was recorded in the cross combination of E-3 X Chinnarasam (T₈) which is on par with C-24 X Chinnarasam (T₆) (46.84), followed by B-20 X Banaganapalle (T₄) (42.59). The minimum number of fruits per panicle at 15 days after fruit set (6.92) was recorded in the cross combination of B-17 X Banaganapalle (T₃). These results were in agreement with the findings of Maklad (2015)^[4] who reported that higher number of fruits per panicle at 15 days after fruit set (38.25 and 35.42) was observed in the cross combination of Langra x Zebda during 2013 and 2014 seasons, respectively.

4. Number of fruits per panicle at 30 days after fruit set

There were significant differences in the number of fruits per panicle at 30 days after fruit set among different cross combinations. Significantly highest number of fruits per panicle at 30 days after fruit set (42.26) was recorded in the cross combination of C-24 X Chinnarasam (T₆), followed by E-3 X Chinnarasam (T₈) (39.81), B-20 X Banaganapalle (T₄) (34.62). There were no fruits at 30 days after fruit set in the cross combination of B-17 X Banaganapalle (T₃). Similar findings were reported by Maklad (2015)^[4] who reported 22.98 and 28.29 number of fruits per panicle at 30 days after fruit set in the cross combination of Langra x Zebda during 2013 and 2014 seasons, respectively.

5. Number of fruits per panicle at 45 days after fruit set

Significantly highest number of fruits per panicle at 45 days after fruit set (38.09) was recorded in the cross combination of C-24 X Chinnarasam (T₆), followed by E-3 X Chinnarasam (T₈) (27.84) and B-20 X Banaganapalle (T₄) (26.18). Fruits were not observed in the cross combinations of B-6 X Banaganapalle (T₁), B-17 X Banaganapalle (T₃) and E-2 X Chinnarasam (T₇) at 45 days after fruit set. The results were in conformity with the findings of Maklad (2015)^[4] who found 13.12 and 12.23 number of fruits per panicle during 2013 and 2014 seasons, respectively at 45 days after fruit set in the cross combination of Langra x Zebda.

6. Number of fruits per panicle at 60 days after fruit set

Among different cross combinations C-24 X Chinnarasam (T₆) (24.54) cross recorded significantly maximum no. of fruits per panicle at 60 days after fruit set, followed by E-3 X Chinnarasam (T₈) (22.62) and B-20 X Banaganapalle (T₄) (21.49). No fruits were observed in the cross combinations of B-6 X Banaganapalle (T₁), B-9 X Banaganapalle (T₂), B-17 X Banaganapalle (T₃), C-6 X Chinnarasam (T₅) and E-2 X Chinnarasam (T₇) at 60 days after fruit set. Similar results were found by Maklad (2015)^[4] who reported that higher number of fruits per panicle at 60 days after fruit set (6.73 and 2.66) was observed in the cross combination of Langra x Zebda during 2013 and 2014 seasons, respectively.

7. Number of fruits per panicle at 75 days after fruit set

Among the various cross combinations significantly highest number of fruits per panicle at 75 days after fruit set (19.13)

was recorded in the cross combination of E-3 X Chinnarasam (T₈), followed by B-20 X Banaganapalle (T₄) (18.27) and C-24 X Chinnarasam (T₆) (15.06). Fruits were not observed in the cross combinations of B-6 X Banaganapalle (T₁), B-9 X Banaganapalle (T₂), B-17 X Banaganapalle (T₃), C-6 X Chinnarasam (T₅) and E-2 X Chinnarasam (T₇) at 75 days after fruit set. Similar findings were reported by Maklad (2015) ^[4] who stated that higher number of fruits per panicle at 75 days after fruit set (3.42 and 2.66) was observed in the cross combination of Langra x Zebda during 2013 and 2014 seasons, respectively.

8. Number of fruits per panicle at 90 days after fruit set

Significantly maximum number of fruits per panicle at 90 days after fruit set (15.68) was recorded in the cross combination of B-20 X Banaganapalle (T₄), followed by E-3 X Chinnarasam (T₈) (11.59) and C-24 X Chinnarasam (T₆) (8.24). No fruits were observed in the cross combinations of B-6 X Banaganapalle (T₁), B-9 X Banaganapalle (T₂), B-17 X Banaganapalle (T₃), C-6 X Chinnarasam (T₅) and E-2 X Chinnarasam (T₇) at 90 days after set. The results were in conformity with the findings of Maklad (2015) ^[4] who reported 2.66 and 2.00 number of fruits per panicle at 90 days after fruit set in the cross combination of Langra x Zebda during 2013 and 2014 seasons, respectively.

9. Number of fruits per panicle at 105 days after fruit set

Significant variation was observed in the number of fruits per panicle at 105 days after fruit set among different cross combinations. The maximum number of fruits per panicle at 105 days after fruit set (9.32) was recorded in the cross combination of B-20 X Banaganapalle (T₄), followed by E-3 X Chinnarasam (T₈) (6.14) and C-24 X Chinnarasam (T₆) (2.09). No fruits were observed in the cross combinations of B-6 X Banaganapalle (T₁), B-9 X Banaganapalle (T₂), B-17 X Banaganapalle (T₃), C-6 X Chinnarasam (T₅) and E-2 X Chinnarasam (T₇) at 105 days after fruit set. These results

were in agreement with the findings of Maklad (2015) ^[4] who revealed 1.06 and 1.66 number of fruits per panicle at 105 days after fruit set in the cross combination of Langra x Zebda during 2013 and 2014 seasons, respectively.

10. Fruit set per cent

There were significant differences in fruit set per cent among different cross combinations. Maximum fruit set (1.26%) was observed in the cross combination of B-20 X Banaganapalle (T₄) which was on par with E-3 X Chinnarasam (T₈) (0.93%) followed by C-24 X Chinnarasam (T₆) (0.30%). No fruit set was observed in the cross combinations of B-6 X Banaganapalle (T₁), B-9 X Banaganapalle (T₂), B-17 X Banaganapalle (T₃), C-6 X Chinnarasam (T₅) and E-2 X Chinnarasam (T₇). Similar findings were reported by Srivastav *et al.* (2014) ^[10] who stated that maximum fruit set per cent of 5.02 was recorded in the cross combination of Amrapali × Sensation.

11. Fruit drop per cent

Significant variation was observed with respect to fruit drop per cent among various cross combinations. Maximum fruit drop (100.00%) was observed in the cross combinations of B-6 X Banaganapalle (T₁), B-9 X Banaganapalle (T₂), B-17 X Banaganapalle (T₃), C-6 X Chinnarasam (T₅) and E-2 X Chinnarasam (T₇). Significantly minimum fruit drop percent of 80.73 was observed in the cross combination of B-20 X Banaganapalle (T₄), followed by E-3 X Chinnarasam (T₈) (88.37%) and C-24 X Chinnarasam (T₆) (96.14%). Rapid decline in fruit set percentage and increase in fruit drop percentage might be due to abscission of immature fruits of mango cultivars that occurs at all stages of fruit development after pollination (Singh *et al.*, 2005) ^[9]. The results were in conformity with those of Maklad (2015) ^[4] who reported the fruit drop of 98.10% and 97.81% in the cross combination of Langra x Zebda during 2013 and 2014 seasons, respectively.

Table 1. Average number of fruits/panicle from fruit set to maturity in different crosses in mango.

Treatments	Cross combinations	Number of flowers crossed	Initial number of fruits per panicle	Number of fruits per panicle after fruit set at							Fruit set (%)	Fruit drop (%)
				15 Days	30 Days	45 Days	60 Days	75 Days	90 Days	105 Days		
T ₁	B-6 X Banaganapalle	496	16.14	9.26	4.05	0.00	0.00	0.00	0.00	0.00	0.00	100.00
T ₂	B-9 X Banaganapalle	653	25.62	14.74	9.36	3.42	0.00	0.00	0.00	0.00	0.00	100.00
T ₃	B-17 X Banaganapalle	568	13.19	6.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
T ₄	B-20 X Banaganapalle	737	48.36	42.59	34.62	26.18	21.49	18.27	15.68	9.32	1.26	80.73
T ₅	C-6 X Chinnarasam	514	19.15	12.65	7.47	2.75	0.00	0.00	0.00	0.00	0.00	100.00
T ₆	C-24 X Chinnarasam	692	54.27	46.84	42.26	38.09	24.54	15.06	8.24	2.09	0.30	96.14
T ₇	E-2 X Chinnarasam	637	15.39	8.29	3.59	0.00	0.00	0.00	0.00	0.00	0.00	100.00
T ₈	E-3 X Chinnarasam	660	52.86	47.45	39.81	27.84	22.62	19.13	11.59	6.14	0.93	88.37
	Mean	620	30.62	23.59	17.65	12.29	8.58	6.56	4.44	2.19	0.31	95.66
	CD @ 5%		1.61	1.24	0.60	0.33	0.40	0.41	0.24	0.13	0.87	0.43
	SEm±		0.53	0.41	0.20	0.11	0.13	0.14	0.08	0.04	0.29	0.14

* Initial No. of fruits per panicle (fruit set date) were recorded after 3 weeks from pollination treatment.

Conclusion

Significantly maximum number of fruits per panicle at 105 days after fruit set (9.32), maximum fruit set (1.26%) and minimum fruit drop (80.73%) was recorded in the cross combination of B-20 X Banaganapalle (T₄).

F₁ progeny obtained from the crosses i.e. B-20 X Banaganapalle, C-24 X Chinnarasam and E-3 X Chinnarasam have to be evaluated for precocity, yield, quality and resistance to pests and diseases.

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