- Short communication
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EVALUATION OF CASHEW (*ANACARDIUM OCCIDENTALE* L.) GENOTYPES FOR NUT YIELD TRAITS IN SOUTH CHHATTISGARH, INDIA

VIKAS RAMTEKE

AlI India Coordinated Research Project on Cashew, Shaheed Gundadhoor College of Agriculture and Research Station, Kumhrawand, Jagdalpur-494001, Dist. Bastar, Chhattisgarh, India

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Abstract

An experiment was conducted to find out the promising genotype for commercial cultivation in the region. All the genotypes differed in their growth and yield characters. Among the genotypes evaluated, H-68 had the maximum growth characters like tree height, stem girth and canopy spread whereas total laterals/m^2, flowering laterals/m^2, fruit set/m^2, number of nuts per panicle, nut yield/ tree and shelling percentage were maximum in H-303. M- 15/4 showed longest flowering duration. Genotypes H-255 and H-367 had the highest nut weight and apple weight, respectively. Apple TSS was recorded maximum in T. No. 30/1 whereas apple acidity was recorded maximum in M- 15/4. Results showed that the cashew hybrids H-303 and H-68 are promising in the agro-climatic region of Bastar plateau of Chhattisgarh.

Cashew (*Anacardium occidentale* L.) belonging to Anacardiaceae is a significant crop for many marginal and small farmers in India's tribal areas. Cashew is known as the "gold mine of the wasteland" because it is a resilient, drought-tolerant tree that thrives on nutrient constraints soils (Ramteke *et al.* 2020). Presently, the total cashew area in the country is 10.62 lakh hectares with raw nut production of 8.17 lakh metric tonnes and productivity of 753 kg/ha (Preethi *et al.* 2021). The cashew area in Chhattisgarh is 29,759 hectares, with a production of 16,631 metric tonnes (Anonymous 2019). Though, India ranks 1st in production, processing and export of kernels in the world, however, the productivity of existing cashew plantation is very poor (Saroj *et al.* 2014). The indigenous communities represent 70% of the overall population of the Bastar region of Chhattisgarh. Collection of raw cashews from forest plantations and farmers' fields is an important source of livelihood in the area. However, cashew productivity in Bastar persists to be low due to lack of new high yielding varieties for commercial cultivation. Low production and productivity issues can be effectively resolved by planting superior cashew varieties with high yield potential in the region. The present study was aimed to identify the superlative cashew hybrids/genotypes suitable for commercial cultivation in Chhattisgarh's Bastar Plateau region.

The experiment was carried out at Cashew Experimental Block, All India Coordinated Research Project on Cashew, Research cum Instruction Farm of Shaheed Gundadhoor College of Agriculture and Research Station, Kumhrawand, Jagdalpur, Chhattisgarh (India) during the fruiting season 2016-17, 2017-18 and 2018-19. The experiment comprised of thirteen varieties, *i.e*, T.No. 30/1, T.No. 3/33, T.No. 10/19, T.No. 3/28, H-68, H-255. H-303. H-320, H-367. M-15/4, M-44/3, NRCC Sel.-1 and NRCC Sel.-2 collected from different centres of AICRP on Cashew. The grafted plants were planted during the year 2000 at a spacing of 7.5 m x 7.5 m using Randomized Block Design (RBD) with four plants/treatment replicated three times. The experimental site in Kumhrawand village is located at 543 m above sea level, with coordinates of 18° 05' N latitude and 81° 57' E longitude. The average annual rainfall in Jagdalpur is 1404 mm, with more than 80% of it falling between July and September. The soil at the experimental site was a yellow-red

*Author for correspondence: <ramtekeviks@gmail.com>.

silt loam (Inceptisol) with a pH of 6.30, 0.13 dsm^{-1} electrical conductivity, 1.03 % organic carbon, low nitrogen (185.62 kg/ha), low available P (24.45 kg/ha) and medium available K (219.82 kg/ ha). A common application of manures and fertilizers *i.e.* 30 kg farm yard manure, 1000 g N, 250 g P_2O_5 and 250 g K_2O per tree were applied in two equal splits, *i.e.* first in the first fortnight of June and second in the first fortnight of October. Observations on tree height (m), stem girth (cm), canopy spread (m), total laterals/m^2, flowering laterals/m^2, flowering duration (days), sex ratio, fruit set/ m^2, number of nuts/ panicle, nut weight (g), nut yield (kg/tree) shelling (%), apple weight (g) , apple TSS (ºBrix) and apple acidity (%) were recorded following experimental manual on cashew (Thimmappaiah *et al.* 2005) and used for analysis. Sex ratio was determined using the method developed by Hassan *et al.* (1988). The mean data of three seasons, *i.e.* 2016-17, 2017-18 and 2018-19 were subject to pooled analysis of variance. The data so obtained were analyzed statistically and were tested at 5 % level of significance (p = 0.05) to interpret the significant difference using OPSTAT software (Sheoran *et al.* 1998).

Cashew genotypes differed significantly in terms of growth characteristics (Table 1). Among the thirteen varieties, the maximum tree height was recorded in H-68 (7.46 m) which was found to be at par with H-255 (7.23 m), NRCC Sel. 1 (6.78 m), H-303 (6.87 m) and H-367 (6.65 m) whereas, minimum tree height was reported in T. No. 30/1 (5.63 m). Similarly, maximum stem girth was reported in H-68 (128.03 cm) which was found to be at par with genotypes NRCC Sel. 1 (123.90 cm), H-367 (119.37 cm) and H-255 (119.13 cm). The minimum stem girth was reported in M-44/3 (94.77 cm). The maximum canopy spread in the east-west as well as north-south direction was furthermore reported in H-68 (8.12 and 8.23 m respectively). The highly significant difference in plant height, stem girth and canopy spread observed in various cashew genotypes could be ascribed to genetic inheritance, which is further caused by environmental conditions. Maximum tree height could be related to the existence of strong apical dominance in genotype H-68. The vigourous nature and extensive branching habit of H-68 may account for its larger canopy spread. The findings of current study are consistent with those of Samal *et al.* (2006) and Chandrasekhar *et al.* (2018) in cashew under Odisha conditions.

Total laterals/m^2 and flowering laterals/m^2 were significantly higher in genotype H-303 (23.56 and 21.29), followed by H-68 (19.76 and 17.83) and lowest in T. No. 3/28. (14.36 and 14.08). M- 15/4 had the longest flowering duration (84.23 days), which was on par with T. No. 3/28 (79.32 days), while the least flowering duration in H-320 (59.27 days). T. No. 3/28 had the highest sex ratio (0.29), which was on par to M- 44/3 (0.28), while M-15/4 had the lowest sex ratio (0.12). Variation in number of total laterals/ m^2, flowering laterals/ m^2, flowering duration and sex ratio in different genotypes might be due to the difference in canopy spread, branching habit and light interception, which are phenotypic characters of each variety. Hanumanthappa *et al*. (2014) and Tripathy *et al*. (2015) reported similar variation in the number of flowering laterals/m^2.

Results presented in Table 2 showed that the highest fruit set/m^2 was in H-303 (41.76), which was on par to H-68 (37.67), while the lowest was in T. No. 3/33 (24.02). Significantly, the highest number of nuts/panicle was found in H-303 (7.12), while the lowest number of nuts/panicle was found in T. No. 3/33 (3.18). H-255 (10.48 g) had the highest nut weight, which was on par with H-357 (10.32 g), while M-44/3 had the lowest (6.03 g) mean nut weight. The maximum kernel weight was recorded in H-255 (3.03 g) which was on par with H-367 (3.01 g) whereas minimum in M-44/3 (1.64 g). H-303 exhibited maximum nut yield/ tree (8.80 kg/tree) which was on par with H-68 (8.27 kg/tree) while M-15/4 (4.12 kg/tree) recorded minimum nut yield/tree (Table 2). The difference in number of nuts/panicles between genotypes might be due to genetic variation, inherent characters, and climatic adaptability in a specific area, which could be a valid and reliable

Table 1. Growth and flowering traits of cashew genotypes (pooled data of three years).

Genotype	Tree height (m)	Stem girth (cm)	Canopy spread (m)		Total laterals/ m^2	Flowering laterals/ m^2	Flowering duration (days)	Sex ratio
			E-W	**N-S**				
T. No. 30/1	5.63	99.83	7.10	6.93	16.23	14.42	81.23	0.19
T. No. 3/33	6.12	109.30	7.40	7.10	16.89	15.42	65.43	0.17
T. No. 10/19	6.21	106.27	7.53	7.00	14.54	14.12	72.56	0.23
T. No. 3/28	6.22	106.70	6.80	7.57	14.36	14.08	79.32	0.29
H- 68	7.46	128.03	8.12	8.23	19.76	17.83	63.46	0.21
H- 255	7.23	119.13	7.93	7.63	16.23	15.84	68.12	0.16
H- 303	6.87	110.70	7.63	7.60	23.56	21.29	65.32	0.23
H- 320	6.49	108.70	7.87	8.03	17.34	16.75	59.27	0.17
H- 367	6.65	119.37	7.79	8.20	18.93	17.67	69.32	0.19
M- 15/4	5.90	104.67	6.90	7.07	13.26	12.27	84.23	0.12
M- 44/3	5.93	94.77	6.67	6.51	15.32	14.17	80.28	0.28
NRCC Sel. 1	6.78	123.90	8.07	7.73	15.12	14.92	67.21	0.18
NRCC Sel. 2	6.32	102.60	7.17	6.90	17.02	15.83	69.38	0.19
SE(m) $\pm$	0.29	3.56	0.23	0.22	0.48	0.44	2.41	0.01
CD ($p = 0.05$)	0.82	10.37	0.69	0.65	1.39	1.30	7.32	0.04

Table 2. Yield, yield contributing and cashew apple traits of cashew genotypes (pooled data of three years).

Genotype	Fruit set/m^2	Number of nuts/ panicle	Nut weight (g)	Kernel weight (g)	Nut yield (kg/tree)	Shelling (%)	Apple weight (g)	Apple TSS (°Brix)	Apple Acidity (%)
T. No. 30/1	24.02	3.60	6.63	1.74	5.56	26.37	52.90	12.10	0.14
T. No. 3/33	25.68	3.18	7.19	2.02	4.90	28.13	57.83	11.75	0.20
T. No. 10/19	27.62	4.00	6.32	1.75	5.34	27.70	60.83	10.40	0.19
T. No. 3/28	28.71	4.47	7.67	2.25	4.72	29.27	54.89	10.05	0.11
H- 68	37.67	5.40	8.45	2.53	8.27	29.93	73.56	10.59	0.16
H- 255	30.19	4.07	10.46	3.03	7.17	28.96	76.23	11.38	0.21
H- 303	41.76	7.12	8.21	2.48	8.80	30.26	63.57	9.18	0.16
H- 320	33.02	5.33	8.66	2.52	6.73	29.10	70.47	11.90	0.21
H- 367	30.41	3.93	10.32	3.01	7.58	29.60	84.87	10.64	0.19
M- 15/4	24.27	5.40	6.54	1.82	4.12	27.77	56.66	10.84	0.22
M- 44/3	26.52	5.43	6.03	1.64	4.87	27.27	46.34	9.51	0.17
NRCC Sel. 1	32.89	5.17	8.89	2.66	6.14	29.93	73.42	11.01	0.19
NRCC Sel. 2	36.34	5.90	8.65	2.46	7.65	28.40	64.50	10.75	0.18
SE(m) ±	1.78	0.21	0.12	0.05	0.27	0.33	1.56	0.48	0.01
CD (p = 0.05)	5.12	0.61	0.35	0.15	0.77	0.97	4.13	1.42	0.04

attribute for identifying genotypes for the local conditions. Gajbhiye *et al*. (2015) also reported the highest number of nut/ panicle in H-303 (6.24) under the Konkan region of Maharashtra. Genotypes H-255 and H-367 have bold nut characters, however, the number of nuts/panicle was low. Whereas, H-303 has medium nut weight but cluster bearing in nature. Nuts/panicle and nut weight are inversely proportional to each other in cashew (Sethi *et al*. 2016). Higher nut weight in H-255 and H-367 might be due to the tall tree stature and high canopy volume in these genotypes leading to the high diversion of food material to the optimum number of fruits to attain good size. Gajbhiye *et al.* (2015) reported a similar finding under the Konkan region of Maharashtra. However, higher yield in varieties H-303 and H-68 might be due to a maximum spread of the tree produced number of fruits/tree with the greater size of fruits and nuts. Chandrasekhar *et al*. (2018) reported similar variations in nut yield of different cashew types under Odisha condition. The number of flower/panicles, nut weight and number of nuts per panicle were the best contributors to nut yield.

The maximum shelling percentage was observed in H-303 (30.26) while the minimum in T. No. 30/1 (26.37). H-367 had the highest apple weight (84.87 g), followed by H-255 (76.23 g), while M-44/3 had the lowest apple weight (46.34 g). T. No. 30/1 had the highest TSS in cashew apple (12.10 ºBrix), while H- 303 (9.18 ºBrix) had the lowest. Whereas, apple acidity was highest in M- 15/4 (0.22%), followed by H- 320 (0.21%), H-255 (0.21%) and T. No. 3/33 (0.20%), however lowest in T. No. 3/28 (0.11%). The higher apple weight in genotypes H-367 and H-255 may be attributed to a lesser number of fruits per tree and a higher canopy volume, resulting in a higher allocation of food material to the optimum number of fruits for good size (Table 2). Hanumanthappa *et al*. (2014) and Tripathy *et al*. (2015) reported similar variation in apple weight of cashew varieties. TSS and acidity are two essential biochemical parameters of the cashew apple that influence the quality of the preserved product. Tripathy *et al*. (2015) reported similar variation in cashew apple weight, TSS and acidity content of different cashew genotypes.

Evaluation of thirteen cashew genotypes revealed that genotypes H-303 and H-68 were promising in respect of flowering, nut yield and shelling parameters and hence, both genotypes could be recommended for commercial cultivation under Bastar Plateau Region of Chhattisgarh.

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