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Evaluation of coconut germplasm in non-traditional Bastar region of Chhattisgarh

Beena Singh, Krishan Pal Singh and Rajesh Patel

Abstract
The present study was undertaken during 2021-22 in the All India Coordinated Research Project on Palms, S.G. College of Agriculture and Research Station, Jagdalpur, Bastar, Chhattisgarh. The results for variability in the growth characters revealed the maximum plant height in accession 610323 (270.2 cm) and plant girth in accession 610327 (135.1 cm). With regard to the petiole length the maximum length was observed in accession 610325 (133.5 cm) which was at par with the accessions 610323 (132.5 cm), 610324 (130.1 cm) and 610326 (128.3 cm). However; the total leaf length was the maximum in accession 610324 (352.2 cm). With regard to the insect incidence the accession 610328 (3.2) recorded the maximum rhinoceros beetle incidence (%) whereas the red palm weevil incidence (%) was the highest in accession 610325 (9.3). The rugose spiriling whitefly incidence and intensity were the maximum in accession 610327 (36.1 and 21.8% respectively).

Keywords: Coconut germplasm, non-traditional, *Cocos nucifera*

Introduction
Coconut (*Cocos nucifera*) belonging to the family Arecaceae is also referred as Kalpavriksha. Coconut palms are monoic, having both male and female flowers on the same inflorescence, perennial diploids (2n = 32) and the sole species of the genus *Cocos* (Perez *et al*., 2022) [6]. The crop plays a considerable role in the Indian economy. Due to its high nutritional value the demand of tender coconut water raised drastically during the pandemic. Apart from this the copra and coconut oil have high market value and is also used in the manufacture of soaps, cosmetics and other industrial products. Coconut oil, the main product of coconut fruit, is the richest source of glycerol and lauric acid and hence is called lauric oil (Kumar, 2011) [4]. Virgin coconut oil (VCO), extracted from the fresh coconut kernel without any chemical processes is abundant in vitamins, minerals and antioxidants. Its husk is a source of fibre which supports the coir industry and certain small scale industries that make biodegradable commodities like kitchenwares/utensils from the shell and many edible products readily available in the market. Cocopeat is an essential by product of coconut which has high market demand. Considering the versatile role of coconut palms in providing food, nutrition, fibers, beverage, medicine, shelter, and wide range of handicrafts (from different parts of the palm) throughout its lifetime, the coconut palm is termed as 'tree of heaven' or 'tree of life' (Rajesh *et al.*, 2015) [9].

Chhattisgarh covers a geographical area of 1,37,360 sq km. and lies within $17^0$45' to $20^0$34' N latitude and $80^0$15' to $82^0$15' E longitude with an altitude ranging from 550 to 850 meters above the mean sea level. The major population of the state i.e. around 65.9% is covered by the tribals and hence it is often implicited as a tribal dominated state. The 'Bastar Plateau Zone' of Chhattisgarh includes the districts viz., Bastar (Jagdalpur), Bijapur, Dantewada, Kanker, Kondagaon, Narayanpur and Sukma. The sub agro-ecological region of Bastar Plateau includes the North Lowland, Keshkal Escarpment, Abujhmad Hills, North-East Plateau, Southern Plateau and Southern Lowland. The major landforms are high-level plateaus, structural hills and valleys and pediments and pediplains.

Although Bastar is a non-traditional coconut growing area and was earlier majorly grown in bunds, yet there is an immense scope of its expansion and exploration. According to Ministry of Agriculture and Farmers Welfare, GOI (2019) [5] there was an increase of approximately 500 ha area under coconut in the tribal belt of Bastar region. According to the land use pattern of Bastar division, maximum area under coconut is covered by the district Kondagaon (671 ha) followed by Bastar (261 ha). The feasibility of soil and agro climatic conditions promotes the growth and vigour of the plant which is now attracting the farmers to raise coconut in their

farming system and growing intercrops in between the spaces. According to the State Directorate of Horticulture the present area under coconut in Chhattisgarh is 1640 ha with a production of 94.5 lakh nuts (3rd advance estimate, Ministry of Agriculture and Farmers Welfare, GOI, 2023) [12].

Materials and Methods

Jagdalpur comes under the seventh agro-climatic region of Indian Eastern plateau and hills which is classified as sub tropical humid with hot summer and cold winter. The south-western monsoon is the reason of the rainfall. The southwest monsoon starts from June and continues till middle of September, winter season spreads from October to February whereas; summer season extends from March to middle of June. Rainfall is the major source of ground water recharge in the area and receives maximum (85%) rainfall during the southwest monsoon season. The winter rainfall is meagre (10-15%). The zone receives high rainfall coupled with comparatively lower temperatures and higher humidity.

The aim of the present study was to collect, conserve and evaluate the local specific germplasm in the non-traditional coconut area of Bastar. The treatments consisted of accessions with IC numbers viz., T1-610323, T2-610324, T3-610325, T4- 610326, T5-610327 and T6-610328 planted at distance of 7.5 x 7.5m apart. The accessions of six germplasm from selected germplasm were planted in July 2011 in RBD with four replications @ 4 palms per replication and their growth observations were recorded thereof. The recommended package and practices were followed in the experimental field.

Results and Discussion

The accessions of six germplasm were evaluated for diversity and their growth observations were recorded thereof. According to Jerard *et al.* (2017) [2] the wide diversity for desirable traits existing among different populations forms the basis for most crop improvement programs in coconut. However, the collection, conservation, evaluation and utilization of the coconut genetic resources is a difficult task due to inherent heterozygosity making the population highly variable, long juvenile phase of the crop, lack of viable, reproducible vegetative propagation protocols and requirement of large area and resources for genetic resources management and utilization. Morphological traits in coconut are considered important for selection of parents for hybridization and have also been extensively utilized to assess the extent of genetic diversity.

The perusal of data (Table 1) showed the maximum plant height in accession 610323 (270.2 cm) which was followed by the accession 610324 and 610327 (243.1 and 240.2 cm respectively). The plant girth was the maximum in accession 610327 (135.1 cm). With regard to the petiole length the maximum length was observed in accession 610325 (133.5 cm) which was at par with the accessions 610323 (132.5 cm), 610324 (130.1 cm) and 610326 (128.3 cm). However; the total leaf length was the maximum in accession 610324 (352.2 cm) which was followed by the accession 610326 (346.5 cm). Genetic diversity is usually thought of as the amount of genetic variability among individuals of a variety or population of a species. The characters viz., annual leaf production, functional leaves and number of inflorescence had non-significant difference among themselves. Wide variability and diversity has been reported earlier from coconut populations in many regions using morphological and molecular analysis (Samsudeen *et al*., 2006 and Devakumar *et al*., 2010) [10, 1]. High variation for growth characteristics and composition was also seen in the coconut growing small geographical area of Lakshadweep islands (Krishnamoorthy and Jacob, 1982) [3].

With regard to the insect incidence (Table 2) the accession 610328 (3.2) recorded the maximum rhinoceros beetle incidence (%) whereas the red palm weevil incidence (%) was the highest in accession 610325 (9.3). According to Prathibha *et al*. (2019) [7] the rhinoceros beetle occurs round the year with a peak spike during June to September during which the adults visit the crowns. This ubiquitous and cosmopolitan pest has currently become the greatest impediment in the early establishment of juvenile palms causing more than 20% damage through collar entry while red palm weevil is a fatal enemy and a key pest of coconut palm. Young palms < 20 years succumb to severe damage when infested by this pest. In the present study rugose spiriling whitefly incidence and intensity were the maximum in accession 610327 (36.1 and 21.8% respectively). Rugose spiriling whitefly is an invasive, highly polyphagous pest on coconut (Selvaraj *et al*., 2019 and Patel *et al*., 2020) [11, 8].

Table 1: Growth characteristics in coconut germplasm

S. No.	IC No.	Plant Height (cm)	Girth at base (cm)	Petiole length (cm)	Total leaf length (cm)	Annual leaf production	Functional leaves
1.	610323	270.2	131.3	132.5	335.8	7.1	13.8
2.	610324	243.1	123.1	130.1	352.2	8.3	15.1
3.	610325	221.4	141.3	133.5	346.1	7.9	14.4
4.	610326	210.3	130.8	128.3	346.5	7.7	14.3
5.	610327	240.2	135.1	123.8	345.3	8.0	14.6
6.	610328	223.1	121.4	123.3	339.5	7.7	14.5
C.D.		9.9	6.2	6.4	5.0	NS	NS
SE(m)		3.3	2.0	2.1	1.6	1.3	0.9
C.V.		6.2	3.1	3.3	11.9	12.2	11.9

Table 2: Insect pest incidence in coconut

S. No.	IC No.	Rhinoceros beetle incidence (%)	RPW incidence (%)	RSW (%)	
				Incidence (%)	Intensity (%)
1.	610323	2.3	6.9	22.3	14.3
2.	610324	2.5	5.1	11.2	8.6
3.	610325	1.6	9.3	10.9	7.4
4.	610326	1.0	4.2	19.6	9.2
5.	610327	1.4	3.6	36.1	21.8
6.	610328	3.2	4.1	23.9	13.2

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