Int.J.Curr.Microbiol.App.Sci (2019) *8*(2): 2597-2606

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 8 Number 02 (2019)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2019.802.302

Mean Performance of the National and International Coconut Accessions for the Yield Attributing and Nut Quality Traits

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Keywords

Coconut, Accessions, *Cocos*, Arecaceae

Article Info

Accepted:
20 January 2019
Available Online:
10 February 2019

A B S T R A C T

The mean performance study was carried out in coconut for the growth, yield and nut quality traits of exotic and indigenous coconut accessions which is maintained at ICAR, CPCRI, RC, Kidu. Wide variations on the growth parameters observed in the within the studied accessions. Among the twenty eight accessions, maximum vegetative characters *viz*., trunk girth at 1.5m height of stem in Bari Narikel-II (102.7 cm), number of functional leaves in Sambava Green Tall (36.1), length of petiole (172.0 cm) and length of leaflet bearing portion (464.5 cm) in Comoros Red Tall and number of paired leaflet in King Kumbra Tall (123.2) were recorded. The total bunches on the crown was recorded high in Bari Narikel II (17.6), number of bunches on crown with below fist size fruits (4.0) was high in the Comoros Tall Uzirpur Tall, Bari Narikel II and Sri Lankan Yellow Dwarf II and above fist size was high in Bari Narikel II (13.6). The mean number of fruits below fist size was recorded more in Chinashukania Tall (321.9) and above fist size fruits recorded high in Sambava Green Tall (131.5). The maximum nut characters viz., whole fruit weight (1734.7 gm), per cent of husk to whole nut weight (47.4 %) and fresh endosperm (449 gm) were observed in Guelle Rose Tall and Volume of endosperm cavity was in Sri Lankan Red Dwarf II (339.4 ml). From the study of mean performance of the accessions, it is difficult to postulate a single accessions with all the desirable traits combined together. However, based on growth and various yield attributing traits, the tall accessions Bari Narikel-II, Chandan Nagar Tall, Panama Tall, West Coast Tall, Rupdia Tall and Kayemkola Tall can be grouped as promising for the productivity traits. Hence, this accession can be included in to the further breeding programme to develop the new high yielding variety.

Introduction

Coconut (*Cocos nucifera* L.) is the most extensively grown and used crop in the world. It is referred as King of tropical palms and plays a major role in the economic, cultural and social life of more than 80 tropical countries. It is a diploid with chromosome number of 2n = 32 and is traditionally seed propagated with slow growing habit. Purseglove (1968) agreeing with an coconut originated from South East Asia and distributed to many parts of the world including Central and South America, East and West Africa, East Asia and the Pacific Islands. India is the third largest coconut producer after Indonesia and Philippines with total production of 152.56 lakh tonnes from an area of 20.88 lakh hectares. In India, Tamil Nadu, Kerala, Karnataka, Andhra Pradesh and Maharashtra are the major producing states (Anon., 2017). Since coconut is a cross pollinated crop, propagated only through seed, it is highly heterozygous in nature. The dissemination of coconut seeds was achieved through floating in sea currents and subsequent germination on the shore, followed by further human dispersal in various coconut growing countries (Ohler, 1984) and hence the present population differentiation is due the geographic isolation, introgressive hybridization, natural mutation and selection process by human (Perera *et al.,* 2000).

The yield of coconut, being a complex character, is controlled by a number of components and their interaction. Identification of suitable genotypes with superior quality as consumer preference and more number of nuts per palm as farmer's preference will be a favourable step. Hence, coconut accessions, representing indigenous and exotic collection maintained in the *ex situ* field gene bank at ICAR-CPCRI Research Centre Kidu, are proposed for investigation and characterization of vegetative and nut characters for yield and nut quality.

Materials and Methods

The uncharacterized and recent twenty five tall types and three dwarf type accessions collected and maintained at ICAR- CPCRI, research Centre, Kidu has been selected for the present study (Table 1). Among the twenty eight coconut accessions, twenty three exotic and five indigenous types were of different geographical origins. The experiment was laid out in a randomized block design (RBD) with 3 replications with each accession representing 2 palms per replication and accessions taken for study were planted at a distance of 7.5 m x 7.5 m. These accessions were of 18-20 years old at the time of this experiment. Recommended package of practices were followed for all the genotypes (Nampoothiri *et al.,* 2000).

According to the standard procedures (Anon, 1995; Ratnambal *et al.,* 1995 and Ratnambal *et al.,* 2000a) the descriptor traits and DUS test traits notified by PPV and FR Authority (Anon, 2011) was recorded for two seasons. Observations were recorded from all the palms representing each accession in each replication on vegetative and nut characters. Observations were recorded twice, once during August-2016 to September 2016 and another between August-2017 to September-2017 with one year interval. The two year mean values of all the above quantitative characters of the 28 accessions were subjected to statistical analysis. The mean, standard error of deviation and co-efficient of variation were calculated according to Panse and Sukhatme (1961).

Results and Discussion

In the present investigation, significant differences were observed growth characters

like palm trunk girth at 1.5m height, total number of leaves on the crown, petiole length, length of leaflet bearing portion and number of paired leaves among the accessions (Table 2).

Among the twenty eight accessions studied, the differences in stem girth are readily noticeable between palms belonging to different accessions. Long (1993) classified the tall and dwarf based on the stem girth and revealed that the tall varieties showed straight and thick stem at base as compared to dwarf types. Higher trunk girth at 1.5 m height was observed in Bari Narikel-II (102.7 cm) and followed by Comoros Green Tall (101.0 cm) whereas; lowest girth (52.0 cm) was recorded in Coco Bleu Tall.

Annually a palm produces twelve leaves and the number of available functional leaves at a time decides the health of the palms which will reflect on the nut production. Iyer (1980) reported that the increase in trunk height with simultaneous increase in number of leaves contributed to the overall yield of the palm. Regarding the leaf characters *viz.*, number of leaves, length of petiole, length of leaflet bearing portion, number of paired leaflets, length of leaflet, breadth of leaflet among the twenty eight accessions showed noticeable variation amongst themselves. In this study, the average numbers of leaves per palm varied from 23.6 in Coco Bleu Tall and 36.1 in Sambava Green Tall, with a mean value of 28.2 leaves. Generally, the number of leaves was higher in tall accessions than dwarf types. Ratnambal *et al.,* (1995), Renuga (1999), Ratnambal *et al.,* (2000), Ratnambal *et al.,* (2002), Arunachalam *et al.,* (2005), Princy (2013), Samsudeen *et al.,* (2013), Suchithra (2014), Perera *et al.,* (2016a) and Jerard *et al.,* (2017) also reported similar results. Petiole and leaf length an important character, since it decides the ability of the leaf to support bunches in its axils and also the photosynthetic efficiency. Longer the leaf and petiole, the weaker it seems to be and unable to provide ample support to its fruit and bunch. On the other hand, shorter leaves provide adequate support to its bunch (Pieries, 1934). In the present study length of leaf petiole ranged from 90.4 cm in Coco Bleu Tall and 172 cm in Comoros Red Tall. The accessions, Bari Narikel-II, Rupdia Tall, Panama Tall and Bagharpara Tall also recorded higher length of petiole. Generally petiole length was higher in tall accessions than in dwarf accessions. Ratnambal *et al.,* (1995), Renuga (1999), Ratnambal *et al.,* (2000), Ratnambal *et al.,* (2002), Jerard (2002), Arunachalam *et al.,* (2005), Samsudeen *et al.,* (2013) and Jerard *et al.,* (2017) also reported similar results.

The length of leaflet bearing portion decides the number of leaflets borne on the leaves. Higher the number of leaflets higher is the yield as reported by Nair and Nampoothiri (1993) and Ratnambal *et al.,* (1995). The greater length of leaflet bearing portion in leaves was registered in the accession Comoros Red Tall, followed by Comoros Green Tall and Bari Narikel-II. The smallest length of leaflet bearing portion was recorded in Sri Lankan Red Dwarf II followed by Coco Bleu Tall in the present study. Among the twenty eight accessions, the mean number of paired leaflets on both sides of the leaves ranged from 89.8 to 123.2. The highest number of leaflets was recorded by King Kumbra Tall followed by Comoros Red Tall, Comoros Green Tall and Panama Tall. The length of leaflet bearing portion and number of leaflets was lesser in dwarf accessions as reported by Ratnambal *et al.,* (1995), Renuga (1999), Ratnambal *et al.,* (2000), Arunachalam *et al.,* (2005), Suchithra (2014), Perera *et al.,* (2016a) and Jerard *et al.,* (2017). In the present study also lesser number of leaflets was recorded in Sri Lankan Red Dwarf II. Hence this trait could be utilized for

the identification of dwarf/tall palms during germplasm collection programmes. Total bunches on the crown was recorded and found to be highest (17.6 bunches) in Bari Narikel-II and lowest (9.6 bunches) in Comoros Green Tall. Average number of bunches on the crown with below fist size fruits varied from 2.5 in Sambava Tall to 4.0 in Comoros Tall, Uzirpur Tall, Bari Narikel-II and Sri Lankan Yellow Dwarf II. The mean number of fruits below fist size per palm was the highest in Chinashukania Tall (321.9) while the accession Kayemkola Tall recorded the lowest number as 61.5. Higher number of fruits below fist size was also observed in Agailjhara Tall (266.4) and Bhagarapara Tall (236.0).

Table.1 Details of coconut accession selected for mean performance study

Sl. No.	Code	Accession name	Habit	Origin
1	SGT	Sambava Green Tall	Tall	Madagascar
2	ST	Sambava Tall	Tall	Madagascar
3	SLYD	Sri Lankan Yellow Dwarf II	Dwarf	Sri Lanka
4	SLRD	Sri Lankan Red Dwarf II	Dwarf	Sri Lanka
5	GTBT	Gon Thembili Tall II	Tall	Sri Lanka
6	CMT	Comoros Tall	Tall	Madagascar
7	CMRT	Comoros Red Tall	Tall	Comoros
8	CMGT	Comoros Green Tall	Tall	Comoros
9	BHT	Bagharpara Tall	Tall	Bangladesh
10	KHT	Khairtala Tall	Tall	Bangladesh
11	UZT	Uzirpur Tall	Tall	Bangladesh
12	AGHT	Agailjhara Tall	Tall	Bangladesh
13	RUPT	Rupdia Tall	Tall	Bangladesh
14	KYKT	Kayemkola Tall	Tall	Bangladesh
15	CHST	Chinashukania Tall	Tall	Bangladesh
16	BNII	Bari Narikel-II	Tall	Bangladesh
17	BNI	Bari Narikel-I	Tall	Bangladesh
18	PBT	Pubail Tall	Tall	Bangladesh
19	CBT	Coco Bleu Tall	Tall	Seychelles
20	GRT	Guelle Rose Tall	Tall	Mauritius
21	KKT	King Kumbra Tall	Tall	Maldives
22	DUT	De La Reunion Tall	Tall	Reunion
23	CNT	Chandan Nagar Tall	Tall	India, West Bengal
24	TNT	Tinisera Tall	Tall	India, Orissa
25	BT	Barajaguli Tall	Tall	India, West Bengal
26	PT	Panama Tall	Tall	Panama
27	WCT	Indian West Coast Tall	Tall	India, Kerala
28	COD	Chowghat Orange Dwarf	Dwarf	India, Kerala

Table.2 mean performance of the coconut accessions for the vegetative growth characters

Sl. No.	Accessions Code	Trunk girth at 1.5 m height (cm)	Total number of leaves on the crown	Length of petiole (cm)	Length of leaflet bearing portion (cm)	Number of paired leaflets
1	SGT	75.2	36.1	132.3	387.7	113.0
2	ST	84.3	27.0	140.3	419.2	111.0
3	SLYD	72.3	25.3	130.7	312.7	104.0
4	SLRD	62.0	27.0	105.7	260.7	89.8
5	GTBT	62.5	26.2	139.7	365.0	104.7
6	CMT	66.0	27.3	138.7	343.5	105.8
7	CMRT	97.0	27.2	172.0	464.5	120.3
8	CMGT	101.0	27.7	140.0	438.5	119.3
9	BHT	91.3	29.7	147.1	365.8	108.2
10	KHT	85.6	28.1	143.9	360.7	100.1
11	UZT	79.7	28.4	142.6	364.4	103.0
12	AGHT	81.2	28.2	145.3	376.4	112.2
13	RUPT	82.7	30.3	149.4	407.8	105.5
14	KYKT	80.5	28.4	134.3	371.7	107.1
15	CHST	77.0	25.2	142.3	361.0	99.9
16	BNII	102.7	30.5	156.5	440.7	113.1
17	BNI	78.3	25.8	146.8	395.6	104.3
18	PBT	70.7	25.3	123.7	393.3	100.9
19	CBT	52.0	23.6	90.4	282.1	92.2
20	GRT	80.7	26.7	142.7	415.8	111.7
21	KKT	84.7	24.8	146.5	374.8	123.2
22	DUT	90.0	31.3	143.7	410.0	110.5
23	CNT	86.7	32.8	144.1	356.8	110.3
24	TNT	87.0	30.0	132.4	406.5	115.3
25	BT	77.8	29.4	142.3	401.9	117.9
27	PT	81.8	33.7	147.1	398.8	119.3
29	WCT	77.0	31.4	145.4	419.4	116.1
30	COD	61.5	26.8	115.3	341.4	104.2
Mean		**78.9**	**28.2**	**137.9**	**377.5**	**108.4**
S. Ed		**6.13**	**1.36**	**7.28**	**18.52**	**4.58**
CD at 5 %		**12.15**	**2.69**	**14.42**	**36.67**	**9.07**
CV (%)		**9.5**	**5.9**	**6.5**	**6.0**	**5.2**

Table.3 Mean performance of the coconut accessions for the yield characters

Sl. No.	Accessions Code	Total bunches on the crown	Number of bunches with fruits below fist size per palm	Number of fruits below fist size per palm	Number of bunches with fruits above fist size per palm	Total number of fruits above fist size per palm
1	SGT	14.1	3.50	139.5	10.7	131.5
2	ST	11.5	2.50	72.5	9.0	69.6
3	SLYD	13.3	4.00	87.0	9.3	62.6
4	SLRD	11.0	3.33	79.5	7.6	67.3
5	GTBT	13.3	3.50	115.3	10.8	56.0
6	CMT	14.5	4.00	81.8	10.4	69.8
7	CMRT	11.3	2.83	84.3	8.5	45.5
8	CMGT	9.6	3.17	157.0	6.5	58.8
9	BHT	11.1	3.00	236.0	8.2	85.9
10	KHT	12.7	3.58	135.8	9.1	88.8
11	UZT	16.6	4.00	176.8	12.3	87.2
12	AGHT	13.5	3.25	266.4	10.3	75.1
13	RUPT	15.1	3.83	146.5	11.8	90.4
14	KYKT	14.6	3.33	61.5	11.3	84.8
15	CHST	14.0	3.33	321.9	10.6	73.8
16	BNII	17.6	4.00	307.1	13.6	107.0
17	BNI	11.5	2.75	79.5	8.8	71.8
18	PBT	10.8	3.33	100.1	7.8	47.1
19	CBT	10.9	3.33	80.2	7.5	44.6
20	GRT	12.0	2.67	71.0	9.3	45.8
21	KKT	11.5	2.67	151.0	8.8	61.8
22	DUT	13.1	3.17	180.3	10.1	49.3
23	CNT	15.4	3.67	295.2	11.2	86.4
24	TNT	14.3	3.17	127.7	11.1	69.7
25	BT	12.2	3.67	206.1	8.5	88.4
27	PT	17.0	3.67	116.6	13.5	97.2
29	WCT	14.9	3.75	84.0	11.1	75.0
30	COD	13.3	3.75	73.9	9.5	82.5
Mean		**13.3**	**13.3**	**3.39**	**159.2**	**9.9**
S. Ed		**0.97**	**0.97**	**0.28**	**15.46**	**0.85**
CD at 5 %		**1.93**	**1.93**	**0.55**	**30.60**	**1.69**
CV (%)		**9.0**	**9.0**	**10.2**	**11.9**	**10.5**

Table.4 Mean performance of coconut accessions for fruit quality characters

Sl. No.	Accessions Code	Weight of whole fruit (g)	Husk to whole nut weight (%)	Volume of cavity (ml)	Weight of fresh kernel per fruit (g)
1	SGT	956.3	39.2	184.2	288.4
2	ST	892.1	40.8	175.9	280.6
3	SLYD	758.3	35.0	184.2	245.0
4	SLRD	997.5	28.6	339.4	271.8
5	GTBT	1121.4	28.5	287.9	438.3
6	CMT	1021.7	37.5	219.4	357.9
7	CMRT	1163.8	38.3	247.5	361.5
8	CMGT	919.0	37.8	193.5	302.5
9	BHT	1216.5	30.5	310.0	399.6
10	KHT	1053.4	34.0	258.1	351.7
11	UZT	984.9	34.5	246.9	329.9
12	AGHT	1217.5	34.3	291.8	380.7
13	RUPT	1163.6	37.6	268.4	345.1
14	KYKT	1425.0	37.4	322.7	426.2
15	CHST	1260.3	33.9	299.5	390.0
16	BNII	1365.1	35.4	315.7	425.6
17	BNI	1045.7	38.9	196.1	324.2
18	PBT	1232.6	34.4	289.3	398.2
19	CBT	483.0	35.1	168.3	193.3
20	GRT	1734.7	47.4	283.1	449.0
21	KKT	652.2	47.4	159.6	348.9
22	DUT	923.1	36.4	246.9	335.2
23	CNT	1165.4	36.4	274.6	379.2
24	TNT	1058.4	41.2	213.0	349.8
25	BT	1097.9	43.2	201.1	353.3
27	PT	1209.1	36.9	258.2	389.3
29	WCT	913.4	41.7	175.9	298.7
30	COD	914.3	23.8	285.4	239.3
Mean		**1075.5**	**656.3**	**36.5**	**243.6**
S. Ed		**116.74**	**92.77**	**3.06**	**39.04**
CD at 5 %		**231.15**	**183.70**	**6.07**	**77.29**
CV (%)		**13.3**	**17.3**	**10.3**	**19.6**

Among the dwarfs, mean number of fruits below fist size was high in Sri Lankan Yellow Dwarf II (87.0) followed by Sri Lankan Red Dwarf II (79.5). Average number of bunches with above fist size fruits varied from 6.5 in Comoros Green Tall and 13.6 in Bari Narikel-II. The mean number of fruits above fist size per palm was the highest in Sambava Green Tall (131.5) while the accession Coco Bleu Tall recorded the lowest number (44.6).

Among the dwarfs, it was high in Chowghat Orange Dwarf (82.5) followed by Sri Lankan Red Dwarf II (67.3). In present study, the significantly higher number of nuts per bunch, number of bunches per palm and total number of nuts per palm was recorded in the tall accessions (Table 3), Bari Narikel-II and Panama Tall, Uzirpur Tall and Chandan Nagar Tall. Similar results in West Coast Tall were reported by Potty *et al.*, (1980), Suchithra (2014) and Jerard *et al.*, (2017) on comparison of coconut varieties and different accession for number of bunches per palm. Satyabalan (1993) results showed that high female flower production and high setting per cent contributed more for higher yield. Pillai *et al.*, (1991) and Thampan (1970) expressed this trait among coconut germplasm and it is a highly variable factor and is influenced by management practices, season, soil condition and manurial status, the varietal nature and the inherent yield potential of the palm.

Wide variation was observed for the nut characters among the studied accessions (Table 4), weight of whole fruit ranged from 483.0 g (Coco Bleu Tall) to 1734.7 g (Guelle Rose Tall) with a general mean of 1075.5 g. Among the dwarfs, weight of whole fruit was higher in Sri Lankan Red Dwarf II (997.5 g) followed by Chowghat Orange Dwarf (914.3 g). Percentage of husk to whole nut weight ranged from 23.8 % (Chowghat Orange Dwarf) to 47.4% (Guelle Rose Tall and King Kumbra Tall), with grand mean 36.5%. The range for fresh endosperm (kernel) weight was between 193.3 g (Coco Bleu Tall) to 449.0 g (Guelle Rose Tall). Among the tall accessions, Gon Thembli Tall II (438.3 g), followed by Kayemkola Tall (426.2 g) and Bari Narikel-II (425.6 g) recorded the higher weight of fresh kernel. Volume of the endosperm cavity was also found to vary widely between the accessions. Sri Lankan Red Dwarf II recorded higher cavity volume of 339.4 ml followed by Kayemkola Tall (322.7 ml), Bari Narikel-II (315.7 ml) and Bhagarpara Tall (310.0 ml) and the minimum volume of cavity was recorded in King Kumbra Tall (159.6 ml) followed by 184.2 ml in the Sambava Green Tall.

From the study of mean performance of the accessions, it is difficult to postulate a single accessions with all the desirable traits combined together. However, based on growth and various yield attributing traits, the tall accessions Bari Narikel-II, Chandan Nagar Tall, Panama Tall, West Coast Tall, Rupdia Tall and Kayemkola Tall can be grouped as promising for the productivity traits. Among the dwarfs, Chowghat Orange Dwarf, Sri Lankan Red Dwarf II can be grouped as promising. Hence, this accession can be included in to the further breeding programme to develop the new for high yielding variety.

Acknowledgment

A first author is grateful to ICAR for awarding study leave to complete higher studies, Ph.D. Horticulture programme. Also to ICAR-CPCRI, RC, Kidu to provide the facility to conduct the research work smoothly.

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How to cite this article:

Khadke, G.N., V. Niral, M.S. Kulkarni, N.K. Hegde, N. Sandhyarani and Naika, M.B.N. 2019. Mean Performance of the National and International Coconut Accessions for the Yield Attributing and Nut Quality Traits. *Int.J.Curr.Microbiol.App.Sci.* 8(02): 2597-2606.
doi: https://doi.org/10.20546/ijcmas.2019.802.302