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Correlation studies in palmyrah (*Borassus flabellifer* L.) genotypes

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ABSTRACT

Correlation studies were carried out for neera yield with some of its component traits in 48 genotypes of palmyrah. The genotypes were collected from various palmyrah palm growing regions of India such as Tamil Nadu, Kerala, West Bengal and Puducherry UT during the period 2005-2008. Five morphological traits *viz*., tree height, trunk girth, number of leaves per palm, petiole length and total length of leaves were recorded at the time of germplasm collection at the site itself. Besides, the reproductive component characters such as number of bunches per palm, fruit length, fruit weight, flesh weight, individual seednut weight, seed length, seed circumference and neera yield were also recorded at the time of flowering and fruiting phase of the palms. The recorded data were subjected to standard statistical procedures to study the correlation between neera yield with morphological and reproductive traits. The results revealed the existence of positive association between neera yield and its components in palmyrah palm. Therefore, it would be highly rewarding to lay due emphasis on the selection of these traits for rapid high neera yield in palmyrah.

Key words : Palmyrah, Genotypes, Correlation, Neera.

Palmyrah palm, adorns the dry landscape of the semi arid regions of Tamil Nadu, Andhrapradesh, Orissa, West Bengal, Bihar, Karnataka and Maharashtra. India has nearly 102 million palms and half of the trees are in Tamil Nadu. Out of 51.9 million trees in Tamil Nadu, more than 50% of palms are concentrated in the southern districts of Thoothukudi, Tirunelveli, Virudhunagar and Ramnad, while Thoothukudi district alone has a major share of 10 million trees.It has multifaceted utility for mankind and hence rightly quoted as "Kalpaka Vriksha" and declared as state tree of Tamil Nadu, Government of Tamil Nadu (Anon., 1999).

The sweet sap tapped from inflorescence of both male and female sexes is commonly known as "Neera" (Davis and Johnson, 1987). It contains mineral such as calcium, phosphorus and iron and vitamins like ascorbic acid, thiamin, riboflavin and niacin. It has laxative and cooling properties. It is also used for treating sour throat and dry cough. Besides sweet neera, the endosperm of immature seed nuts from young trait as a delicacy during summer and is known in "Nungu'. Matured fruits are roasted and the mesocarp is also consumed. From the fruit pulp ice cream is prepared with the most delicacy. From the germinated endosperm thavan is taken out and relished. Varieties of fancy and utility articles are made from palm leaves, veins and roots. Palm leaves have been used to write scripts by the ancient people from time immemorial. Matured leaves are cured and used for thatching while senesced leaves are utilized as firewood. The matured outer trunk is used in construction as pillars, Beams and rafters (Kalarani and Annathurai, 1991).

Botanically it is known as *Borassus flabellifer* L. and belongs to the family Arecaceae. The Natural occurrence of palmyrah palms is noticed in countries like India, Pakistan, Bangladesh, Srilanka, Myanmar, Thailand, Malaysia, Indonesia and African countries like Nigeria, Congo, Sudan, and Tanzania etc. (Sankaralingam *et al*., 1999). It is a delicious and drought tolerant palm.

Despite this multivariate utility for human civilization the palm is neglected by the farming community due to its prolonged juvenility, sexual dimorphism and drudgery in tree climbing for neera collection. Hence, it is need of the hour to expose the possibilities of identification of dwarf, high neera yielding palmyrah types with early bearing. With this background various palm explorations were made to the different palmyrah growing parts of India under DBT funded project to identify and collect elite palmyrah types.

The neera yield is polygenically inherited trait that depends directly or indirectly on many other traits affected by a number of its components. The information about the association its components with neera yield is useful in any selection programme. Information on this aspect is scanty in palmyrah. The present investigation was, therefore, undertaken to study the association of neera yield with its components using correlation analysis.

MATERIALS AND METHODS

Explorations were made to identify and collect elite genotypes of palmyrah in palmyrah growing regions of India *viz.*, Tamil Nadu, Andhra Pradesh, Pudhucherry, Kerala and West Bengal. Each state had been explored once during the neera tapping season which usually coincides during March to May except Tamil Nadu. In Tamil Nadu, the key palmyrah habituating districts like Tuticorin, Ramnad, Virudhu Nagar, Tirunelveli, Coimbatore and sub- hub areas of Chennai. Totally 10 clusters were surveyed covering five major palmyrah growing states of India and a total number of 252 genotypes were collected. Out of these, 48 genotypes were identified as elite ones having potential neera yield. The elite type with the place of collection is furnished in Table1.

The height of the palm was measured from ground

Table1: List of elite genotypes with place of collection

Genotype	Name of the cluster	Village	District	State
TNPO 01		Sendrampalayam		
TNPO 02	Pollachi	Sendrampalayam	Coimbatore	Tamil Nadu
TNPO 08		Jameen kaliapuram		
TNPM 06		Pillai madam		
TNPM 08	Pillai madam	Adaikalappattinam	Ramnad	Tamil Nadu
TNPM 09		Adaikalappattinam		
TNPM 10		Adaikalappattinam		
TNTK 01		Adhioothu		
TNTK 02	Tenkasi	Keelachsurandai	Trinelveli	Tamil Nadu
TNTK 06		Parankunrapuram		
TNTK 08		Maruthupuram		
TNT 01		Vadamalaipalayam		
TNT 06	Tuticorin	Soorianallor	Tuticorin	Tamil Nadu
TNT 08		Thiranchendur		
TNT 10		Thiranchendur		
KVIC 02				
KVIC 07	KVIC	KVIC	Chennai	Tamil Nadu
KVIC 09				
KVIC 10				
K 2	Kerala	Palakkad		
K3		Palakkad	Palakkad	Kerala
K4		Kadumthuruthi		
BFNAM 01		Nambiyur		
BFNAM 02		Nambiyur		
BFNAM 07		Piliyampalayam		
BFNAM 09		Piliyampalayam		
BFNAM 12	Nambiyur	Sanar Pudur	Erode	Tamil Nadu
BFNAM 17		Kasipalayam		
BFNAM 22		Kasipalayam		
BFNAM 27		Elathur		
BFNAM 31		Kadathur		
BFNAM 32		Puduchooripalayam		
BFPU 15	Puduchery	Thethampakkam		
BFPU 23		Shompet		
BFPU 24		Shompet	Puduchery	Puduchery UT
BFPU 25		Shompet		
BFPU 26		Shompet		
BFPU 27		Shompet		
WBP 08		Dostopur		
WBP 09	Sub-hub of Kolkata	Dostopur	Kolkata	West Bengal
WBP 12		Dauli		
WBP 14		Ramgar		
TNS 05	Sankagiri	Rayalur		
TNS 13		Rayalur		
TNS 15		Chinnagoundanur	Salem	Tamil Nadu
TNS 17		Chinnagoundanur		
TNS 18		Varuthampatti		
TNS 20		Varuthampatti		

level to the crown and expressed in centimeters (cm). The trunk girth (cm) was measured at one metre height from the ground level. The total number of photosynthetically active green leaves were counted at the time of neera collection and expressed as number/ tree. The petiole length (cm) was measured from the point of clasping with trunk to the starting point of the leaf lamina. Total length of the leaf was measured from edge to edge of the leaf at the broadest point and expressed as centimeters (cm). The number of bunches per palm produced during the previous season was counted and expressed in numbers per palm. Number of fruits per bunch was computed by dividing the total number of fruits in a tree by total number of bunches produced in the current year. The various fruit parameters *viz*, fruit length (cm), fruit circumference (cm), fruit weight (g) and flesh weight (g) were quantified at random for five fruits in each bunch in a palm and the average was derived. The different seed parameters like individual seednut weight (g), seed length (cm) and seed circumference (cm) were taken for 25 seeds per palm at random and the average was derived. During the survey, the sequential neera yield (litres per palm) per season of 90 to 100 days was recorded by collecting in earthen containers with inside lime coating (Davis and Johnson, 1987). The correlation co-efficient analysis was worked out as per the standard formula suggested by Fisher (1954).

RESULTS AND DISCUSSION

The estimates of correlation coefficients are presented in Table 2. A perusal of correlation co-efficient revealed that a positive correlation existed among neera yield and tree height, girth of trunk, length of petiole, total length of leaves, fruit length, weight of fruit, weight of flesh, average weight of individual seed, length of seed and circumference of the seed. The plausible reasons for these positive correlations in palmyrah palm are

The higher rate of sap flow of plant in hanging leaves with long petiole resulting in accumulation of higher neera yield.

The lengthier leaves tend to hang down. Such leaves bear drooping inflorescences which favour higher rate sap flow resulting in high neera yield

Among the positive correlates, the trait seed circumference registered a significant correlation with neera yield (+0.274). It is obvious that an inflorescence with broader fruit registered the maximum neera yield. The traits *viz*., total number of leaves and number of bunches per palm recorded negative correlation with neera yield (-0.215 and -0.149, respectively). The negative correlation by number of leaves with neera yield might be due to partial utilization of photosynthates more towards source (leaves) rather to sink (Inflorescence). Generally defoliation upto 30% is found to enhance neera yield (unpublished data on AICRIP on Palms, AC & RI, TNAU, Killikulam). The negative correlation by number of bunches which was recorded in the previous season with neera yield might be due to the exhaustion of the entire photo-accumulates for fruit growth, development and final nungu yield and leaving only little for the ensuing season for neera production.

The tree height exhibited positive and highly significant correlation with petiole length (+0.575), total number of leaves (+0.518), fruit length (+0.385) and seed length (+0.402) where as a positive and significant correlation was displayed with total number of leaves (+0.298), number of bunches per tree (+0.275) and flesh weight (+0.303). Though the tree height was found to maintain a positive relationship with trunk girth, fruit weight, seed weight and seed circumference they were statistically non-significant. The trait trunk girth showed strong positive and highly significant correlation with individual seed weight (+0.517) while it had negative relationship with total number of leaves (-0.172), number of bunches per palm (-0.119) and seed circumference (-0.105). There existed highly significant correlation between total number of leaves with petiole length (+0.356), number of bunches per palm (+0.675) and seed length (+0.393) whereas it had significant correlation with total length of leaves (+0.333) and fruit length (+0.308).

Length of petiole exhibited positive and highly significant correlation with total number of leaves (+0.894) and seed length (+0.461) as well as significant correlation with number of bunches per palm (+0.344) and fruit length (+0.329) whereas positive and non significant correlation was observed with fruit weight (+0.192), flesh weight (+0.261) and seed circumference (+0.034). However, negative and nonsignificant correlation was noticed with individual seed weight. The trait total length of leaves showed positive and highly significant correlation with number of bunches per palm (+0.417), fruit weight (+0.377), flesh weight (+0.416) and seed length (+0.481) whereas positive but non significant correlation was observed with fruit weight, individual seed weight and seed circumference. Number of bunches per palm had positive and highly significant correlation with seed length (+0.404) and nonsignificant positive correlation with fruit length, fruit weight, flesh weight and seed circumference while it was negatively correlated with individual seed weight (-0.149).

A positive and highly significant correlation was noticed between fruit length with seed length and seed

Table 2: Correlation co-efficients among different characters of palmyrah genotypes

Character	1	2	3	4	5	6	7	8	9	10	11	12	13
1	1.000	0.153	0.298*	0.575**	0.518**	0.275*	0.385**	0.187	0.303*	0.092	0.402**	0.123	0.016
2		1.000	-0.172	0.221	0.186	-0.119	0.164	0.158	0.319*	0.517**	0.070	-0.105	0.124
3			1.000	0.356**	0.333*	0.675**	0.308*	0.174	0.172	-0.236	0.393**	-0.019	-0.215
4				1.000	0.894**	0.344*	0.329*	0.192	0.261	-0.026	0.461**	0.034	0.105
5					1.000	0.417**	0.377**	0.188	0.416**	0.033	0.481**	0.035	0.068
6						1.000	0.186	0.110	0.228	-0.157	0.404**	0.047	-0.149
7							1.000	0.272	0.289*	-0.050	0.545**	0.379**	0.081
8								1.000	0.570**	0.543**	0.371**	0.363**	0.196
9									1.000	0.751**	0.598**	0.286*	0.069
10										1.000	0.203	0.183	0.119
11											1.000	0.620**	0.156
12												1.000	0.274*
13													1.000

* and ** indicates significance of values at P=0.05 and P=0.01, respectively

1. Tree height 2. Girth of trunk 3 . Total number of leaves 4. Length of petiole 5. Total length of leaves
6. Number of bunches/tree 7. Fruit Length 8. Weight of fruit 9. Weight of flesh
10. Average weight of individual seed 11 . Length of seed 12. Circumference of seed 13. Neera yield

circumference whereas there was a negative correlation with individual seed weight. The fruit weight exhibited a very strong highly significant positive correlation with flesh weight (+0.570), individual seed weight (+0.543), seed length (+0.371) and seed circumference (0.363). Similarly fruit flesh weight also registered a positive highly significant correlation with individual seed weight (+0.751) and seed length (+0.598) while a positive significant correlation with seed circumference (+0.286). The individual seed weight showed positive but nonsignificant correlation with seed length and seed circumference. There existed a positive and highly significant correlation between seed lengthy and seed circumference (+0.620).

From the foregoing discussion of the results, it is flamboyant that though the correlation between neera yield and its components is statistically nonsignificant but most of them are positive. Therefore, it would be rewarding to lay due emphasis on the selection of these traits for rapid high neera yield in palmyrah.

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