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STABILITY OF COCONUT YIELD IN COORDINATED MULTI LOCATION TRIALS

H.H.Khan, M.Elangovan, V. Arunachalam, P.T.N. Nambiar, R.V.K.S. Reddy, Prasanna Kumar, D.D. Nagawekar, S. Suresh, S. Giridharan, C. Natrajan, K.U.K.Nampoothiri and V.A.Parthasarathy,

All India Coordinated Research Project on Palms, Central Plantation Crops Research Institute, Kasaragod, Kerala

ABSTRACT

Stability of coconut yield of different varieties in divergent agro-climatic conditions helps to boost the productivity over a range of environment. The average annual nut yield of six varieties at three locations under the All India Coordinated Research Project on Palms centers viz., Ambajipeta (Andhra Pradesh), Ratnagiri (Maharashtra) and Veppankulam (Tamil Nadu) was analysed for G x E interaction. Seven years yield data between 1992-93 and 1999-2000 was analysed for this study. Eberhart and Russels model and Perkins and Jinks method was used to analyse the data and interpret the results. Laccadive Ordinary had shown maximum yield (105.08 nuts/palm/year) with high variance (2225.50). It could perform well in input intensive cultures. Fiji has shown good yield (88.72 nuts/palm/year) with (bi=0.77) good stable performance. Andaman Ordinary has recorded low (67.70 nuts/palm/year) but steady (bi=1.05) yields. Hence, they could be useful in input deficient situation. Cochin China was found to be a non-performer. All the varieties were tested with good input management. Their interaction with environment has brought out the hidden genetic potential.

INTRODUCTION

Studies on adaptability gains prominence while breeding crops for multiple environments. Adaptability of genotypes is judged through stability (Crossa, 1990). The study of Genotype x Environment interaction is an important biometrical aspect not only from genetical and evolutionary point of view but is also considered to be very relevant to production problems of agriculture in general and the plant breeding in particular (Breese, 1969). In all the parametric estimation of stability, the genotypes with least value of 'bi' are considered as most suitable. However, non-parametric estimation through ranking of genotypes has also been considered as an useful tool in determining stability of perennial crops. India has the largest coconut germplasm collection in the world with 117 exotic and 148 indigenous types. The investigation on genetic parameters of yield and yield determining characters in coconut has remained a topic of recent concern (Bavappa and Nampoothiri, 1973). With the available germplasm, its utilization for increasing the production and productivity is our main objective of crop improvement programme. Primarily the varieties are being evaluated for morphological, yield and quality characteristics at various research centers. Based on the preliminary evaluation, the varieties are selected and evaluated further in multi-location trials at ten co-coordinating centers under the All India Coordinated Research Project on Palms (AICRPP). The varieties Laccadive Ordinary (Chandrakalpa) and Philippines Ordinary (Kerachandra) have been released in 1985 and 1995 respectively for cultivation after evaluating their performance. This study was carried out in three centers of AICRPP to analyse the stability of six varieties using the yield data of seven years.

MATERIALS AND METHODS

Six common varieties under the experimental trials of AICRP (Palms) *viz.*, Andaman Ordinary, Fiji Tall, Cochin China,

Table 1. Nature of location and weather particulars of the centres (1999)

Location	Temperature (°C) Max.	Min.	Relative Humidity (%)	Rainfall range (mm)	Monsoon	Remarks
Veppankulam	36.1	26.1	68.3	11.6 – 351.2	North East	East coast
Ambajipeta	31.9	25.0	80.2	23.4 – 238.1	North East	East coast, Cyclone prone area,
Ratnagiri	31.2	22.7	72.6	82 - 970	South West	West coast

Table 2. The range and average coconut yield (nuts/palm/year) over seven years (1993-94 to 1999-2000)

Sl. No.	Genotypes	Yield for seven years (1993-94 to 1999-2000)					
		Range			Average		
		Veppankulam	Ambajipeta*	Ratnagiri	Veppankulam	Ambajipeta	Ratnagiri
1.	Andaman Ordinary	65.8 - 152. 2	8.1 - 77.2	45.0 - 67.0	93.6	52.9	56.6
2.	Fiji Tall	77.9 - 143.3	15.0 - 103.0	93.9 - 120.6	92.0	68.1	106.1
3.	Cochin China	37.8 - 150.0	14.0 - 84.0	29.3 - 41.3	89.1	60.9	32.4
4.	Laccadive Ordinary	85.0 - 167.0	12.0 - 148.7	90.0 - 163.3	107.6	70.5	137.1
5.	Philippines Ordinary	71.0 - 135.0	22.0 - 118.3	80.2 - 126.5	95.6	80.0	104.5
6.	West Coast Tall	77.8 - 220.6	8.0 - 99.5	61.4 - 104.4	122.4	54.2	82.0

The min. yield data after 1996 cyclone

Laccadive Ordinary, Philippines Ordinary and West Coast Tall were assessed for this study. Seven years of yield data in terms of nuts/palm/year was analysed for the stability of the variety. Eberhart and Russels (1966) and Perkins and Jinks (1971) models were used to analyse the data. At multi locations the varieties were raised under recommended levels of inputs (irrigation, nutrient etc.). Three locations used in this study are Veppankulam (TNAU–Tamil Nadu), Ambajipeta (ANGRAU–Andhra Pradesh) and Ratnagiri (KKV– Maharashtra). The nature of locations and weather are furnished in Table 1.

RESULTS AND DISCUSSION

The average and maximum yield over seven years period is presented in the Table 2. The fluctuation in the average and minimum - maximum yield over the different locations reflected the variability available within the genotype and the effect of Genotype x Environment interaction.

The result of the stability analysis is presented in the Table 3. According to Eberhert and Russel (1966) the variety with the smallest mean value would be the one that contributed the least to variety x location interaction and thus, would be considered the most " Stable" variety in the test. In the past the term "stable" variety often has been used to mean a variety that does relatively the same over a wide range of environments. This means that a "stable variety" by this definition, performs relatively better under adverse conditions and not so well in favorable environments.

Table 3. Mean and stability parameters of coconut nut yield at coordinated multi location trials

Sr. No.	Variety	Mean	Variance of mean	Reg. Coeffi. (B)		S^2 di	SD
1.	Andaman Ordinary	67.70	1016.34	1.05	-0.05	302.57	245.47
2.	Fiji Tall	88.72	738.69	0.77	0.23	353.12	296.01
3.	Cochin China	60.80	1604.23	0.59	0.41	1378.43	1321.33
4.	Laccadive Ordinary	105.08	2225.50	1.23	-0.23	1247.29	1190.18
5.	West Coast Tall	86.22	2351.52	1.85	-0.85	135.59	78.49
6.	Philippines Ordinary	93.36	309.39	0.50	0.50	145.40	88.29

* Bi=1-bi

Laccadive Ordinary had shown maximum yield (105.08 nuts/palm/year) with high variance (2225.50). The high cv exhibited by this cultivar could be in response to the fluctuations in environment. This variety also had shown the second high mean square deviation (SD) (1190.18) and moderate regression coefficient (bi=1.23) among the six genotypes tested. The highly significant mean square due to genotypes revealed the presence of genetic variability in the population under consideration. The highest yield performance, a significant regression coefficient (preferably closer to one) and non-significant mean square deviation are the requirement of an ideally adopted genotypes (Eberhert and Russel, 1966). Laccadive Ordinary could perform well in input intensive cultures.

Fiji has shown good yield (88.72 nuts/palm/year) with (bi=0.77) good stable performance. Low value of bi (nearly 1) is desirable for the significant G x E interaction (Becker and Leon, 1988). Andaman Ordinary has recorded low (67.70 nuts/palm/year) but steady (bi=1.05) yields. Hence, it could be a useful cultivar in input deficient situation. Cochin China was found to be a non-performer with low and unstable yield. All the varieties were tested with good input management and their interaction with environment has brought out the hidden genetic potential of the genotypes studied. Fiji Tall variety with good yield and stable performance may be considered for further evaluation of other characters. The variety may be popularized by production of maximum number of seed nuts and seedlings especially for rainfed/input deficit situation.

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