

AN INDEX FOR EVALUATION OF COCONUT GERMPLASM IN THE NURSERY

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ABSTRACT

Coconut (*Cocos nucifera* L.) is a monotypic species with pantropical natural distribution. There are two distinguishable morphological forms, tall and dwarf. Evaluation of coconut germplasm is a long drawn process due to its long juvenile phase, and also the time it takes for stabilisation of yield. However, preliminary evaluation can be done at different stages; nursery evaluation based on seedling characters, at the 12th month, juvenile evaluation based on prebearing growth, characters, and economic evaluation at the stabilised yield period, based on flowering and yield data.

The possibility of using this index for planning breeding programmes for varietal improvement is discussed.

INTRODUCTION

At Central Plantation Crops Research Institute, Kasaragod, the coconut germplasm collection consists of 62 exotic and 32 indigenous accessions. Evaluation of germplasm in perennials, especially in crops like coconut, is a long drawn process due to the long juvenile phase and the time it takes for stabilisation of yield. Preliminary evaluation can be done at different stages, such as nursery evaluation based on seedling characters recorded at the 12th month, juvenile evaluation based on pre-bearing growth characters and economic evaluation at the stabilised yield period based on flowering and yield data.

For evaluation at the nursery stage, seedling characters such as number of days taken for germination, height, number of leaves

and girth are generally used. Most of these characters are correlated with adult palm yield (Liyanage, 1953; Liyanage and Abeywardena, 1957; Nampoothiri *et al.*, 1975). Several workers emphasised the need for selecting quality planting material based on the nursery characters (Dwyer, 1938; Liyanage, 1955; Menon and Pandalai, 1958). However, no earlier attempt appears to have been made to integrate all the characters for either evaluation or seedling selection. In the present paper, an index has been worked out, integrating all the nursery characters, for evaluation and characterisation of coconut germplasm at the nursery stage.

MATERIALS AND METHODS

Inter se mated progenies of 21 accessions were scored for nursery characters during 1978 and 1979. Characters observed were number of days for germination, girth at collar, seedling height, number of leaves, length and breadth of leaf and petiole length. The data were recorded at the 12th month from the date of germination. The height of the seedling was recorded from the ground to the tip of the last fully emerged leaf. The non-leaflet bearing portion was recorded as petiole length. The length and breadth were recorded on last unsplit leaf. At least 10 seedlings were scored for each accession.

The mean values for each character were ranked in the decreasing order except for the number of days for germination which was ranked in the ascending order. The cumulative mean and CV rank scores were converted to percentage values for convenience in graphic representation.

RESULTS AND DISCUSSION

Available information on the correlation of seedling characters with adult palm yield are listed in Table 1. Most of the workers have taken into consideration the girth at collar, number of leaves, seedling height and number of days taken for germination, for nursery scoring. The correlations obtained for these characters were not very high. No information is available on leaf area (in the present study, $l \times b$ was taken as an index of leaf area) which

Table 1. Correlations between seedling characters and adult palm yield

Seedling characters	Coef. of correlation with adult palm yield		Authors
	Between parents 'r'	Within parents 'r'	
1. Sprouting period of seednuts	-0.424		Liyanage, 1955
2. (a) Sprouting period of seednuts	.. 0.0026	-0.1545+	Liyanage and Abeywardena, 1957
(b) Seedling height	.. 0.0039	0.0821	
(c) Seedling weight	.. -0.3838+	-0.0165	
(d) Seedling leaf number	.. -0.0534	0.0704	
(e) Seedling root number	.. 0.0120	0.0347	
		Geno- typic correlation	Pheno- typic correlation
3. (a) Sprouting period of seednuts	.. 0.170	0.0447	Nampoothiri, Satyabalan and Jacob Mathew, 1975
(b) Seedling leaf number	.. 0.528++	0.2632	
(c) Girth at collar	.. 0.410 +	0.3565++	
(d) Seedling height	.. 0.208	0.0173	

+ Significant at P=0.05

++ Significant at P=0.01

is also an important character for assessing the vigour of seedlings. Hence, while ranking, equal weightage was given to all the characters. The number of days taken for germination has negative and significant correlation with adult palm yield. The mean values for this character were therefore ranked in ascending order, while all the other characters with positive correlation were ranked in descending order. There is no information available on the petiole length of seedlings in relation to adult palm yield. The CV's were ranked in the descending order, so that the cultivars with least variability are better placed than the ones showing high variability.

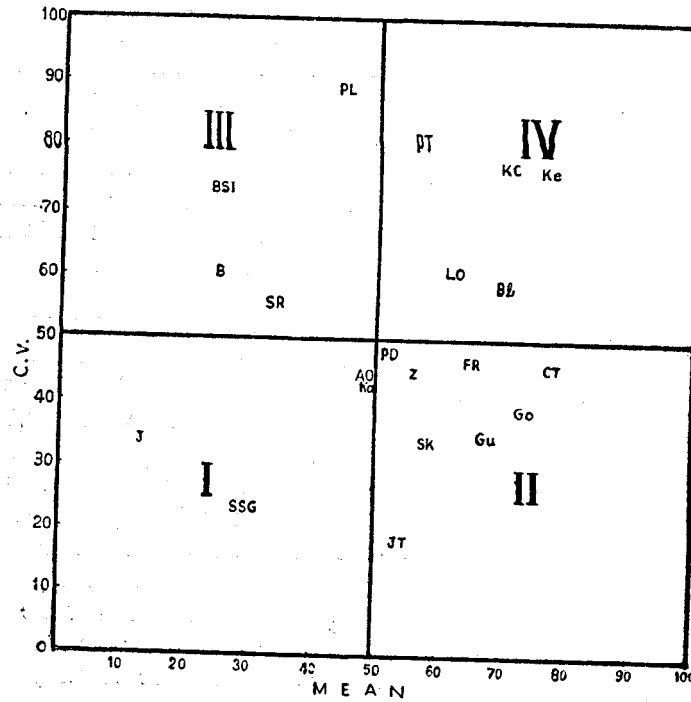


FIG. 1. Scatter diagram of 21 coconut cultivars based on mean and CV indices

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|-----------------------------|------------------------------------|
| 1. AO : Andaman Ordinary. | 2. Bo : Borneo. |
| 3. BI : Blanchissues. | 4. BSI : British Solomon Islands. |
| 5. CT : Ceylon Tall. | 6. FR : Fiji Rotuma. |
| 7. Go : Gonthembili. | 8. Gu : Guam. |
| 9. J : Java. | 10. JT : Jamaica Tall. |
| 11. Ka : Kappadam. | 12. Ke : Kenya. |
| 13. KC : King Coconut. | 14. LO : Laccadive Ordinary. |
| 15. PD : Philippines Dalig. | 16. PL : Philippines Lono. |
| 17. PT : Panama Tall. | 18. SK : Standard Kudat. |
| 19. SR : San Ramon. | 20. SSG : Strait Settlement Green. |
| 21. Z : Zanzibar. | |

Binswanger and Barah (1980) while studying the stability and adaptability, in relation to genotypes, proposed a conceptual model using the means, standard deviation and CV as a measure of risk efficiency. The risk efficiency was defined as (a) the same average yield with lower standard deviation, or (b) the same standard deviation with higher average yield. They also advocated the advantage of using the CV as a measure of variability. In the present evaluation, the index based on the mean and CV will enable us to identify promising risk-efficient accessions, as detailed below.

Each cultivar has a theoretical possibility of a least score of six (when it ranks first for all the characters scored) and a maximum score of 126. The conversion of cumulative scores into (per cent) indices has an added advantage of being able to compare different years' data on the same scale, even when the characters scored or cultivars evaluated are different. The mean and CV indices are presented in Fig. 1. This graph has been arbitrarily divided into four sectors taking the mid-value on both the axes. Sector I (one on the bottom-left) consists of the cultivars which have high mean values for the characters scored and relatively low variability. These can be inferred to possess dominant traits for the characters studied. Their low CV indicated the relative homozygosity. Hence the cultivars falling in this group can be taken as promising cultivars. The cultivars in Sector II (bottom-right) are on par with the cultivars in sector I as far as variability is concerned. However, they show low mean values indicating their relatively recessive nature. The cultivars in sector III are at par with sector I, when the mean values are considered. But their high CV indicates high heterozygosity. Therefore, it is advisable to evaluate these cultivars further, after initial selection for dominant traits in sector I and recessivity in sector II. Sector IV accounts for cultivars with low mean value and high variability indicating highly heterozygous nature of these cultivars.

As mentioned earlier, the data were recorded on the *inter se* mated progenies. The nursery index, in addition to giving preliminary evaluation procedure, also indicates the possibility of selecting palms for *inter se* mating depending upon the selection pressure to be applied. For example, as detailed above, the cultivars in sector III can be improved upon by eliminating the palms

which contribute high variability (can be confirmed by individual palm progeny study). Similarly, the palms which give rise to seedlings with high mean values can be selected for, in the accessions in sector II.

In conclusion, the present study, in addition to integrating the seedling characters for selection, is also useful in evaluating the germplasm in the nursery stage. This also gives an indication of the direction of selection pressure, for improvement of the cultivar.

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