wen, J.W. (1952). Heterosis. Iowa State College, AMES, Iowa, U.S.A.

ird, E.A. (1976). Plant breeding for drought resistance. In water deficit and plant growth. T.T. Kozlowski. ed. New York : Academic Press, p.317-353.

usick, G.J., Fairchild, M.L., Ferguson, V.L. and Zuber, M.S. (1965). A method for measuring root volume in corn (*Zea mays* L.). *Crop Sci.* **5**: 601-602.

encer, J.T. (1940). A comparative study of a seasonal root development of some inbred lines and hybrids of maize. *J. Agric. Res.* **61**: 521-538.

Thompson, D.L. (1968). Field evaluation of corn root clumps. *Agron. J.* **60**: 170-172.

Turner, N.C., Begg, J.E. and Tonner, M.L. (1978). Osmotic adjustment of sorghum and sunflower crops in response to water deficits and its influence on the water potential at which stomata close. *Aust. J. Plant Physiol.* **5**: 197-608.

(Received : December 2001; Revised : January 2003)

Madras Agric. J. 90 (1-3) : 157-159 January-March 2003

search Notes

roduction potential of coconut hybrids and their parents in relation physiological parameters

RAJARATHINAM, S. VINCENT, K. GANESAMURTHY AND C. NATARAJAN
oconut Research Station, Veppankulam - 614 906, Tamil Nadu.

Ever since the hybrid vigour was observed n 1932 in coconut, the increased potentiality s being exploited by the production of hybrid coconuts involving tall and dwarf varieties. Patel (1937) observed that the maximum vigour was obtained in coconut hybrid when the tall variety was used as female and dwarf as the male parent. High degree of allogamy does not permit to obtain genetically pure talls by inbreeding. Therefore the hybrid seedlings are to be chosen carefully in the nursery, so as to eliminate future trees with poor combination of physiological characters. Physiological and biochemical characters such as enzyme activity, chlorophyll content, photosynthetic rate, leaf area and dry matter production are the dependable characters and can be exploited to screen vigorous progenies in the nursery. Shivasankar and Ramadasan (1983) obtained a high positive correlation between nitrate reductase activity and annual nut yield in coconut genotypes. There is not much work has been reported in physiological aspects.

Hence, the present study was undertaken at Coconut Research Station, Veppankulam during 1995 to 1999 in three talls (East Coast Tall, Cochin China, Laccadive Ordinary), three dwarfs (Malayan Orange Dwarf, Malayan Yellow Dwarf, Malayan Green Dwarf) and five hybrids (ECT x MGD, ECT x MYD, ECT x MOD, CC x LO, and LO x CC).

The youngest unfolded leaf (i.e) 11th from the top sampled for apparent photosynthesis (Mathew and Ramadasan, 1974). Chlorophyll content and nitrate reductase activity were studied from the 14th leaf (Mathew and Ramadasan, 1973, Shivasankar and Ramadasan, 1983). The photosynthetic and respiratory rates were estimated by using LCA (ADC, UK). Chlorophyll content was determined spectro-photometrically using the method of Malkinney (1941). The soluble protein (Lowery *et al.* 1951) and nitrate reductase activity (Hageman and Huchlleshby, 1971) were also determined in the leaf samples.

Table 1. Physiological parameters of parents and hybrids

Genotypes	Total Chl. (mg/g of tissue)	NR activity (µ mol/ No_3 g^{-1} h^{-1})	Sol. Protein (mg/ gm of tissue)	Stomatal resistance (m^{-2} S^{-1} mol^{-1})	Transpiration rate (Mol m^{-1} S^{-1})	Photo synthetic rate (u mol m^{-2} S^{-1})	No.of functional leaves/ palm	Trunk girth at 1 m height (cm)	No.of spikelets in inflorescence	No.of button per inflorescence	No.of inflorescence/ palm	Setting (%)	Nut yield/ palm
ECT	2.56	9.5	10.65	13.8	2.11	9.6	32.2	104.8	31	21.5	12	34.8	89.8
LO	2.52	9.4	10.42	12.9	2.24	9.2	32.0	101.7	29	18	12	32.4	73.2
CC	2.49	9.2	10.27	13.1	2.20	9.0	32.1	103.3	27	17.5	12	32.3	71.4
Mean	0.52	9.4	10.45	13.3	2.18	9.3	32.1	103.3	29	19	12	33.7	78.1
MOD	2.20	7.8	8.47	9.6	2.98	7.9	33.0	82.6	33	18.2	13	26.2	62.0
MYD	2.12	7.2	8.22	9.5	3.02	7.7	32.8	81.9	32	17.9	13	27.5	60.3
MGD	2.17	7.3	8.28	9.7	3.11	7.4	32.7	83.0	34	19.1	13	27.3	64.1
Mean	2.16	7.4	8.32	9.6	3.04	7.7	32.8	82.5	33	18.4	13	27.0	62.1
ECT x MGD	2.84	9.9	12.11	11.2	2.78	13.2	33.2	98.3	37.3	29.4	13	37.2	142.2
ECT x MYD	2.83	10.2	12.19	11.6	2.69	12.8	33.6	94.2	37.5	30.0	13	37.6	146.6
ECT x MOD	2.92	10.4	12.29	11.3	2.64	13.7	33.7	94.5	37.2	30.1	14	38.5	156.4
CC x LO	2.80	10.0	11.93	11.5	2.70	11.7	33.1	98.3	36.3	25.7	13	36.0	109.3
LO x CC	2.80	9.9	11.25	11.1	2.69	11.3	33.0	97.1	36.0	26.0	13	35.8	107.8
Mean	2.83	10.08	11.95	11.34	2.7	12.5	33.3	95.3	37.0	27.8	13.1	36.8	107.8

In general, hybrids recorded high photosynthetic rates, nitrate reducta activity and soluble protein content. Th chlorophyll 'a' and 'b' contents wer also higher in hybrids than in the parent. Mathew and Ramadasan (1975) observe a higher chlorophyll content in hig yielding coconut hybrids involving bot combinations *viz.* D x T and T x D whe compared to West Coast Tall variety. The total chlorophyll contents, solubl protein contents and nitrate reductas activity were also higher in hybrid involving ECT like ECT x MOD an ECT x MYD. Among the parents, dwar showed the highest transpiration rate. In hybrids, CC x LO and LO x CC recorded higher transpiration rate. In hybrids, CC x LO and LO x CC recorded higher transpiration rate in higher los indicating a higher relative net assimilation of hybrids. Shivasankar and Ramadasa (1983) reported a higher rate of photosynthesis in Chowghat Orange Dwarf (COD) when compared to T x D, however COD recorded higher dark respiration thereby nullifying the advantage of higher rate of photosynthesis. In the present studies, ECT x MOD had the highest photosynthetic efficiency, (13.7 µmol m^{-2} S^{-1}). Among the talls, ECT recorded higher photosynthetic rate (9.6 µmol m^{-2} S^{-1}). Among the talls, ECT recorded higher photosynthetic rate (9.6 µmol m^{-2} S^{-1}), thus, the hybrids involving ECT recorded higher photosynthetic rate than those hybrids involving other parental types.

The morphological characters viz. number of functional leaves, leaf length, breadth and trunk girth were recorded. Besides the yield characters in terms of number of spikelets in inflorescence, number of buttons per inflorescence, number of inflorescence per palm, setting per cent, and nut yield were also recorded at quarterly intervals except barren nuts and nut yield, which were recorded in bimonthly intervals. Ten palms were taken in each hybrid, tall, and dwarf for the study.

Data on morphological and reproductive aracters revealed that hybrids have a higher mber of functional leaves, leaf length and eadth of middle leaf, spikelets in inflorescence d more setting per cent are the main components, termining the yield. Patel (1938) reported at the length of stem and number of leaves the crown are significantly correlated with erage yield. This was supported by Satyabalan *al.* (1972) who recorded highly significant rrelation between height of the palms, number leaves and yield of nuts. The present study so confirmed this fact that hybrids involving CT recorded higher number of leaves, length d breadth of middle leaf and more number spikelets and had higher nut yield.

The highest yield realised in hybrids were e to higher setting percentage and optimum mber of button as compared to parents. The ghest nut yield was recorded by ECT x MOD able 1).

eferences

igeman, R.H. and Huchlleshby, D.P. (1971). Nitrate reductase from higher plants. *In*: Methods in enzymology 23; Part A (Sanpietro, A. ed.) Academic Press, New York, pp. 491-503.

wery, O.H., Resebrough, N.J., Farr, A.L. and Randall, R.J. (1951). Protein management with the Folin-phenol reagent. *J. Biol. Chem.* **193:** 265-278.

Malkinney, G. (1941). Absorption of light by chlorophyll solutions. *J. Biol. Chem.* **140:** 315-322.

Mathew, C. and Ramadasan, A. (1973). Chlorophyll content in certain cultivars and hybrids of coconut. *J. Plant. Crops,* **1:** 96-98.

Mathew, C. and Ramadasan, A. (1974). Studies on photosynthesis in coconut palm, rate of apparent photosynthesis. *Indian J. Exp. Biol.* **12:** 589-591.

Mathew, C., Ramadasan, A. (1975). Photosynthetic efficiency in relation to annual yield and chlorophyll content in the coconut palm. *J. Plant Crops,* **3:** 26-28.

Patel, J.S. (1937). Coconut breeding. *Proc. Assoc. Econ. Biol.* 5.

Patel, J.S. (1938). The coconut palm - A monograph, Govt. Press, Madras, pp. 60-85.

Shivasankar, S. and Ramadasan, A. (1983). Nitrate reductase activity in coconut leaves. *J. Sci. Food and Agri.* **34:** 1179-1184.

Satyabalan, K., Mathew, J., Radhakrishnan, V. (1972). Yield variation and its relationship with age and growth of under planted coconut palms. *Oleagineux,* **27:** 257-259.

(Received : February 2002; Revised : January 2003)

Madras Agric. J. 90 (1-3) : 159-163 January-March 2003

Research Notes

Growth and yield performance of oil palm genotypes

S. JEYARAMAN AND S. ALAGUDURAI
Sugarcane Research Station, Sirugamani - 639 115, Tamil Nadu.

The oil palm genotypes are being evaluated to express their production potential under uniform condition. Each genotype expresses its phenotypic variation differently depending upon the environmental condition. Eleven oil palm genotypes were evaluated under rainfed condition at Central Plantation Crops Research Institute, Regional Centre, Palode, Kerala during 1986 to 1990 which were planted in 1976. The number of bunches per palm per year ranged from 3.7 to 7.3 with fresh fruit bunch (FFB) yield of 64 to 155 kg per palm per year (Nampoothiri,