

EVALUATION OF CERTAIN OIL PALM HYBRIDS UNDER RAINFED CONDITIONS*

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ABSTRACT

Results of the first comparative trial of oil palm *tenera* hybrids (*Dura* x *Pisifera*) laid out in 1976 indicated that there are significant differences in performance between various combinations. 65 D x 30.103 P, 120 D x 30.103 P and 92 D x 30.3154 P out-yielded the other eight combinations. These gave an overall yield of 100 kg fresh fruit bunches (FFB) per palm per year which is equivalent to 3 MT of palm oil per hectare. This is a very encouraging performance under rainfed conditions. The highest average of 164 kg per palm per year (equivalent to 4.6 MT oil) was recorded from the combinations involving 65 D in 1986.

The main attribute which contributed to the fresh fruit bunch production was the number of bunches. Though the palms started yielding in the fourth year, appreciable yields were obtained only from the ninth year. There was an abrupt increase in yield during 1986 followed by the declining trend in the subsequent years. Implications of these results are discussed.

INTRODUCTION

The *tenera* hybrid obtained between thick shelled *dura* and shell-less *pisifera* is the only planting material used in commercial cultivation of oil palm. *Teneras* have the advantage of possessing a thinner shell resulting in more mesocarp which is the oil yielding portion. Since presence of shell is monogenic, significant yield improvement could be obtained by exploitation of this character (Beirnaert and Vanderweyen, 1941). Considerable variations noticed between various *dura* (D) and *pisifera* (P) combinations necessitate field testing and selection of those hybrids which are commercially exploitable. Results of the first hybrid evaluation trial planted during 1986 in India are presented in this paper.

MATERIALS AND METHODS

Eleven *dura* palms of Malaysian origin planted at the Oil Palm Station, Thodupuzha, Kerala in 1982 were pollinated with four *pisifera* pollen samples imported from the Nigerian Institute for Oil Palm Research, Benin City, Nigeria. The following crosses were planted in a Randomized Block Design with three replications and 16 palms per plot.

1. 65 D x 30.103 P
2. 271 D x 30.4336 P
3. 139 D x 24.3087 P
4. 156 D x 30.4336 P
5. 61 D x 30.4336 P
6. 125 D x 30.103 P
7. 108 D x 30.4336 P
8. 92 D x 30.3154 P
9. 269 D x 30.4336 P
10. 187 D x 24.3087 P
11. 120 D x 30.103 P
12. 210 D x 210 D (Control)

The crosses were planted during 1976 at the Central Plantation Crops Research Institute, Research Centre, Palode, Kerala. The plantation was maintained under rainfed conditions. This area received an annual average rainfall of 3269 mm during 1976-89 distributed over 140 days per year. Regular observations were taken on individual palms with respect to height, girth, leaves, male, female and hermaphrodite inflorescences, number of bunches and weight of fresh fruit bunches (ffb). Sex ratio was calculated as the ratio of female inflorescences to total number of inflorescences expressed in percentage.

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RESULTS AND DISCUSSION

The first yields were obtained from the fourth year after planting. The ffb yield and number of bunches harvested are given in Table-I. There was statistically significant difference among the combinations in cumulative yield for four years i.e., 1986 to 1989. Such differences have been reported by many oil palm breeders (Hartley, 1979; Hardon, 1982). The hybrids 65 D x 30.103 P and 120 D x 30.103 P gave the highest yield, followed by 92 D x 30.3154 P. Combinations 139 D x 24.3087 P, 156 D x 30.4336 P, 269 D x 30.4336 P and 187 D x 34.3087 P were the poor yielders with only 62.1 kg, 43.1 kg, 61.6

kg and 47.8 kg ffb/palm/year respectively.

The highest yields were obtained during 1986 for which introduction of the pollinating weevil (*Elaeobius kamerunicus*) could be one of the main factors (Dhileepan and Nampoothiri, 1989). In this year too the combinations involving 65 D and 120 D were the best, the former giving 164.2 kg ffb/palm which works out to 4.6 metric tonnes of palm oil yield per hectare. This should be considered as a high yield under rainfed conditions.

However, since then there was a decline in yield in subsequent years (Table I). Such decline

Table I. Yield of Dura x Pisifera combinations (FFB in Kg.)

Sl. No.	Cross combination	Cumulative yield		1986	1987	1988	1989	Highest oil yield MT/ha/yr. (Estimated)
		1980-'85	1986-'89					
..... FFB in Kg per palm/year.....								
1	65 D x 30.103 P	18.9 (3.0)	108.0 (7.0)	164.1 (12.6)	87.1 (6.3)	86.3 (4.7)	94.4 (7.0)	4.6
2	271 D x 30.4336 P	15.1 (2.5)	82.3 (6.2)	146.4 (12.9)	71.5 (5.7)	47.4 (2.8)	68.5 (6.2)	4.1
3	139 D x 24.3087 P	15.4 (1.1)	62.1 (4.9)	98.7 (8.7)	61.2 (4.8)	52.9 (3.1)	54.7 (4.9)	2.8
4	156 D x 30.4336 P	5.1 (0.9)	43.1 (3.7)	60.8 (5.9)	53.7 (3.9)	27.0 (3.3)	29.1 (3.7)	1.7
5	61 D x 30.4336 P	12.14 (1.9)	77.6 (5.2)	138.5 (9.1)	77.4 (6.2)	42.3 (2.9)	55.9 (5.2)	3.9
6	125 D x 30.103 P	13.6 (2.3)	90.4 (6.8)	125.7 (11.9)	77.0 (6.1)	85.6 (5.4)	73.8 (6.8)	3.5
7	108 D x 30.4336 P	14.0 (2.6)	81.5 (6.0)	123.0 (12.0)	72.9 (5.1)	67.3 (3.6)	64.6 (6.0)	3.4
8	92 D x 30.3154 P	13.1 (1.9)	93.2 (5.6)	124.7 (8.8)	91.0 (6.8)	49.8 (2.8)	104.7 (5.6)	3.5
9	269 D x 30.4336 P	7.3 (1.3)	61.6 (4.8)	107.2 (8.8)	69.4 (6.1)	28.6 (2.3)	39.8 (4.8)	3.0
10	187 D x 24.3087 P	4.6 (0.8)	47.8 (4.1)	63.3 (6.7)	48.8 (4.7)	36.8 (2.9)	40.5 (4.1)	1.8
11	120 D x 30.103 P	22.1 (2.9)	108.6 (6.7)	159.2 (12.2)	98.3 (6.5)	87.1 (4.4)	75.4 (6.7)	4.5
12	210 D x 210 D	14.3 (2.3)	86.3 (5.7)	139.9 (10.9)	65.3 (4.5)	60.8 (3.8)	80.4 (5.7)	2.2

(No. of bunches within brackets)

in yield after a boost in production consequent to weevil introduction has been reported by Weng (1985). In spite of applying 20 per cent additional fertilizers as recommended by Suwandi *et al.* (1984), the yields have not reached the 1986 level till 1989. The average yield drop in further years were 39.8, 53.7 and 46.1 per cent compared to 1986. It was also found that this variation did not generally depend on the yield potential of the cross combination. However, if the high yield of 1986 is ignored, the yield showed an expected upward trend from 1985 to 1989, average increase during 1987, 1988 and 1989 being 226, 174 and 202 per cent taking 1985 as the base year.

There was a similar trend in the number of bunches produced also. The garden mean for number of bunches for 1986 was 10.0 compared to 5.6, 3.5 and 3.1 for the subsequent years. This indicates that the phenomenon of yield increase cannot be attributed to the weevil introduction alone. Obasola and Nampoothiri (1977) showed that the maximum yields of oil palm in Nigeria was obtained during the 12th and 13th years, after which there is a decline. The trend in production of palms under this study is unlikely to be due to advance in age because these were only 10 years old in 1986. Examination of a few more years data would be required to draw a definite conclusion.

The differences between crosses with regard to the number of leaves produced were low, the range

being 21.3 to 22.8 per palm per year. Sex ratio (%) which gives an idea of the predominance or otherwise of the female inflorescences showed that the maximum value was only 38, recorded in the hybrid 65 D x 30.103 P which was the highest ffb yielder also. However, the positive relationship between sex ratio and ffb yield cannot be generalized since a high yielding combination like 120 D x 30.103 P gave a sex ratio of only 28 whereas low yielding combinations involving 156 D and 187 D gave a sex ratio of 30 and 31 respectively. While the number of female inflorescences and bunches can be a primary factor in increased production, it may be negated by a low bunch weight.

It may be pointed out that the number of female inflorescences, in general, was low in the plot (Table II). The highest number of female inflorescences were produced in 1985 when the best combinations of 65 D and 120 D gave 11.8 and 11.5 inflorescences per palm respectively. The corresponding figures were only 3.7 and 4.2 in 1984. The predominance of male inflorescences resulting in a low sex ratio could be due to the rainfed condition in which they were grown. Since moisture stress is one of the main factors in limiting female flower production the situation must be expected to be improved by supplementary irrigation (Thomas Varghese and Nampoothiri, 1986).

The studies therefore, show that oil palm can be successfully grown in India with an expected yield

Table II. Inflorescence production 1980 - '88

Cross combination	Female	Male	Herma phrodite	Sex ratio %
	Inflorescences per palm per year			
65 D x 30.103 P	6.13	5.36	0.11	37.7
271 D x 30.4336 P	7.90	3.66	0.24	37.7
139 D x 24.3087 P	8.08	4.85	0.06	23.5
156 D x 30.4336 P	9.88	3.13	0.06	30.0
61 D x 30.4336 P	8.29	4.10	0.09	27.9
125 D x 30.103 P	6.90	4.92	0.08	36.2
108 D x 30.4336 P	7.75	4.47	0.12	36.7
92 D x 30.3154 P	8.12	4.19	0.11	36.9
269 D x 30.4336 P	9.12	2.73	0.24	19.8
187 D x 24.3087 P	8.32	4.45	0.10	30.5
120 D x 30.103 P	7.10	4.55	0.10	27.5
210 D x 210 D	7.28	4.23	0.17	36.4

of 3 MT palm oil per hectare/year, even under rainfed conditions. This could be as high as 4.5 MT in the case of best crosses under ideal conditions. The cross combinations involving 65 D, 120 D and 92 D can be recommended for commercial planting. Since there are inter-combination variations, it is necessary to test larger number of *dura* x *pisifera* hybrids to evolve sufficient number of promising lines. It is also necessary to circumvent low sex ratio through better management practices especially irrigation.

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