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Performance of *tenera* × *tenera* progenies derived from Thodupuzha (Kerala) oil palm germplasm II. Bunch quality components

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ABSTRACTS

The individual palms (77 *T*, 146 *T*, 149 *T*, 132 *D*, 88 *T*, 27*T*, 117*T*, 114*T*, 69*D*, 99*D*, 42*P* and 45*P*) of *Tenera* × *Tenera* (614 *T* × 614 *T*, 137 *T* × 137 *T*, 323 *T* × 323 *T*, 648 *T* × 648 *T*, 65*T* × 323*T*, 663 *T* × 699 *T*) progenies (*D- dura*, *T-Tenera* and *P-Pisifera*), which were yielding more than 125 kg Fresh Fruit Bunches (FFB)/palm/year (average of 2000-01 to 2004-05) were provisionally selected and subjected to bunch component analysis. Among the selected *dura* fruit palms, 69 D recorded high (24.8%) oil to bunch ratio followed by 99 *D* (19.4%) and 132 *D* (19.4%). They are not directly useful for hybrid seed production as their potentiality is confirmed only through progeny testing. The palm number 42*P* from the cross of 663 *T* × 699 *T* recorded maximum oil to bunch (24.3%) and fruit to bunch (42.9%), whereas 45P showed low values (23.1%) for fruit to bunch. Above *pisiferas* (45*P* and 42*P*) are undesirable for seed production as they showed fairly good fruit set (fertile). Because, sterile *pisiferas* with very low or zero % fruit set only selected for hybrid seed production. Two *Tenera* palms (149 *T* from 614 *T* x 614 *T* and 114 *T* from 648 *T* × 648 *T*) showed promising bunch quality components which could be used as parental palms for producing progenies for new seed garden by *inter se* mating or selfing.

Key words: Oil palm, *tenera* × *tenera* progenies, bunch quality components, seed garden.

INTRODUCTION

Oil palm (*Elaeis guineensis* Jacq) is currently the second major source of edible oil. The culture of oil palm is expanding in India in the identified potential states. The success of cultivation of any crop depends to a greater extent on the use of quality planting material. Chadha (1) committee constituted by Government of India has recommended establishment of new seed gardens keeping in view potential area proposed to be covered under oil palm. The oil palm seed production is undertaken by selecting *dura* and *pisifera* palms for the production of planting material (*Tenera*). Oil palm has three fruit forms; the *Dura* (*D*) with thick-shelled fruit, the *tenera* (*T*) with thin shelled fruit and the *Pisifera* (*P*) with shell-less fruit (Wonkyi-Appaih, 12). *Tenera* × *tenera* segregates into 25% *dura,* 50% *tenera* and 25% *pisifera* progenies. *Pisiferas* are generated from *Tenera* × *tenera* or *Tenera* × *pisifera* crosses. Oil palm seed production in India has been based on the Thodupuzha × NIFOR (Nigerian Institute for Oil Palm Research) *pisiferas* as they have high yield potential and utilized as genetic base for oil palm industry in India (Pillai and Nampoothiri, 6). The base populations used for seed production requires continuous improvement (Rajanaidu, 7). To select individual palms for seed production, it is necessary to measure their bunch yield and to analyze bunches for their oil content (Corley and Tinker, 2). In this respect, the performance of the *tenera* × *tenera* progenies were evaluated with an objective to select good performing individual palms for further improvement and augment hybrid seed production.

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MATERIALS AND METHODS

The individual palms (77 *T*, 146 *T*, 149 *T*, 132 *D*, 88 *T*, 27*T*, 117*T*, 114*T*, 69*D*, 99*D*, 42*P* and 45*P*) of progenies (*dura, tenera* and *pisifera*) from six selfed or *inter se* cross combinations (614 *T* × 614 *T*, 137 *T* ×137 *T*, 323 *T* × 323 *T*, 648 *T* × 648 *T*, 65*T* × 323*T*, 663 *T* × 699 *T*) planted during 1991, which were yielding more than 125 kg Fresh Fruit Bunches (FFB)/ palm / year (average of 2000-01 to 2004-05) were provisionally selected (Murugesan *et al*., 3) and subjected to bunch component analysis at Directorate of Oil Palm Research, Regional Station, Palode during 2007-09 as per the procedure prescribed by Murugesan and Gopakumar (4). Three ripe bunches from individual selected palms were analysed during peak season (May to July) of FFB production and average value were reported after statistical analysis for all the bunch component characteristics. The pedigree of the experimental material and evaluation steps followed are given in Fig. 1.

RESULTS AND DISCUSSION

Evaluation was conducted on the segregating populations of seven *tenera* × *tenera* (*inter se*/self) on the basis of bunch component performance,

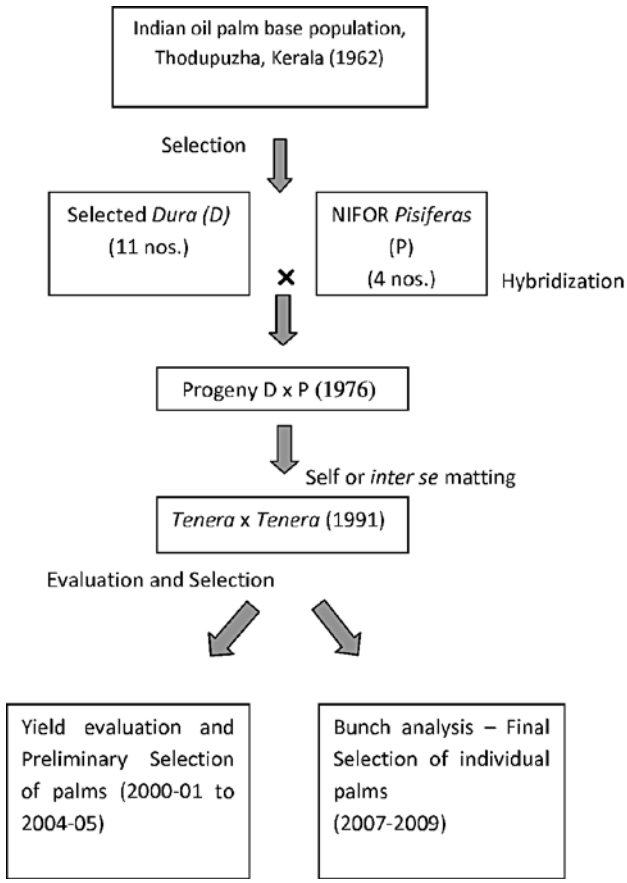

Fig. 1. Pedigree of *tenera* × *tenera* progenies and their evaluation.

Among 168 palms evaluated, two *tenera* (Palm 146 and 149) one *dura* (Palm 69) and two fertile *pisifera* (Palm 42 and 45) from 614 *T* × 614 *T*, 65 *T* × 323T and 663 *T* × 699 *T*, respectively surpassed 150 kg/palm/year based on five year consecutive bunch yields (Murugesan *et al*., 3). Another *tenera* (114*T*) recorded FFB bunch yield of 148.5 kg with high bunch weight (35 kg) which is comparable with 149 T. The FFB yield and bunch component results of promising palms of *tenera* x *tenera* progenies are given in Table 1. Among provisionally selected *Dura* palms, 69 *D* recorded high (24.8%) oil to bunch ratio followed by 99*D* (19.4%) and 132 *D* (19.4%). They also recorded high shell thickness of 4.1 and 2.5 mm, respectively. Though, above selected *duras* had good bunch quality components; they may not be directly useful as their potentiality is confirmed in progeny testing (Corley and Tinker, 2). The 42 *P* from *663 T* × 699 *T* recorded maximum oil to bunch (24.3%) and both 42 *P* and 45 *P* had shell-less kernel with fruit bunch ratio of 42.9% (42 *P*) and 23.1% (45 *P*). Present *pisiferas* (45 *P* and 42 *P*) are undesirable as they showed faired good fruit set (42.9 and 23.1%) in spite their high yielding potential. Work at NIFOR has been already confirmed that fertile *pisiferas*, when used to produce D × P gave *tenera* with thicker shells than sterile *pisifera* (Sparnaaij, 8). Sparnaaij *et al.* (9) has advocated lowest or nil fruit set for ideal *pisifera*. Hence, present *pisferas* are not useful for hybrid seed production. *Pisifera* parents are usually selected within *tenera* x *tenera* crosses. In the present study, two *Tenera* palms (149 *T* from 614 *T* × 614 *T* and 114 *T* from 648 *T* × 648 *T*) showed promising bunch quality components (bunch weight of 39.5 and 35 kg, oil to bunch ratio of 30.6 and 33.5% and Mesocarp to fruit of 86 and 88%, shell thickness of 1.1 and 0.7 mm for 149 *T* and 114 *T*, respectively). Another *tenera* palm 146 *T* showed low bunch quality components especially oil to bunch (24.5%) and mesocarp to fruit (79%) when compared to above *teneras*. According to Sparnaaij *et al*. (10), fruit composition of *tenera* is determined by shell thickness and degree of lignifications of the potential shell region and emphasis low degree of lignifications in *teneras* for selection. The selected *teneras* had relatively thin unlignified mantle of fibres around the shell. The ideal *pisiferas* could be expected from the outstanding *teneras* with excellent fruit and bunch quality traits. Oil yield of the oil palm may be regarded as composite characteristics because its final expression depends on a number of components, *viz*., Fresh Fruit Bunch yield (FFB), and fruit quality traits (Corley and Tinker, 2). Van der Vossen (11) reported high heritability for fruit components and advocated attention of both bunch yield and bunch quality. Mesocarp content of the fruit is a major factor that can influence oil yield in fruit bunches. Consequently, preference would be given to selection of high mesocarp to fruit, considering the requirements for palm oil (Okoye *et al*., 5). Murugesan *et al*. (3) concluded that bunch quality characters should be super imposed on high yielding palms before attempting to use them for hybridization. Based on present results, two *tenera* (149T and 114T) palms are suggested for hybridisation and production of progenies for new seed garden (*T* × *T* male parent block) after *inter se* matting or selfing. Simultaneously, efforts should be continued to identify new *pisifera* and *tenera* sources for inclusion as parents in the seed production programme.

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Table 1. Bunch components of selfed or *inter se tenera* × *tenera* progenies of high yielding individual palms during 2007-2009.

Bunch component	Cross and palm Nos. of *Tenera* × *tenera*												$CD_{0.05}$
	614 *T* × 614 *T*			137 *T* × 137 *T*	323 *T* × 323 *T*	648 *T* × 648 *T*	65 *T* × 323 *T*		663 *T* × 699 *T*				
	77 *T*	146 *T*	149 *T*	132 *D*	88 T	27*T*	117*T*	114*T*	69*D*	99*D*	42 *P*	45*P*	
Bunch wt. (kg)	22.5	30.0	39.5	24.0	22.6	19.3	49.0	35.0	25.0	15.0	16.3	13.0	0.64
Single fruit wt. (g)	10.9	10.8	12.4	13.1	10.3	13.9	10.9	10.9	20.7	19.2	10.3	5.4	0.30
Single nut wt. (g)	1.7	2.3	2.4	5.8	1.6	2.8	1.9	1.7	8.8	4.9	0.0	0.0	0.60
Shell thickness (mm)	0.8	1.2	1.1	2.5	0.9	1.4	0.8	0.7	4.1	2.5	0.0	0.0	0.51
Kernel wt. (g)	0.6	0.6	0.9	1.0	0.4	0.8	0.6	0.8	1.3	1.1	0.0	0.0	0.09
Dry wt. of nut (g)	1.4	1.3	2.3	5.0	1.0	2.0	1.8	1.6	7.6	4.3	0.0	0.0	0.53
Mesocarp to fruit (%)	84	79	86	67	88	82	86	88	61	70	100	100	0.33
Kernel to fruit (%)	6.0	5.5	4.9	6.5	3.3	5.1	4.2	5.4	5.8	6.4	0.0	0.0	0.57
Shell to fruit (%)	7.3	6.2	9.3	23.3	5.0	7.6	8.2	5.3	27.5	19.6	0.0	0.0	0.52
Oil to dry mesocarp (%)	71.0	78.1	80.0	69.1	81.3	80.6	75.0	80.0	83.6	76.7	74.4	32.5	0.42
Oil to wet mesocarp (%)	51.4	46.0	57.2	44.8	59.2	55.7	47.7	53.1	65.9	40.8	56.6	16.8	0.31
Oil to bunch (%)	27.6	24.5	30.6	19.4	14.4	31.0	26.2	33.5	24.8	19.4	24.3	3.9	0.34
Kernal oil to bunch (%)	1.81	2.19	1.39	2.51	0.16	2.35	1.14	2.17	1.86	3.31	0.0	0.0	0.54
Fruit to bunch (%)	64.4	67.5	62.0	65.0	27.7	67.6	63.5	71.4	60.0	67.7	42.9	23.1	0.45
FFB yield /palm /year (kg)	138.6	156.5	183.2	136.0	145	135.0	132.0	148.5	153.5	156.4	182.2	185.0	-

T: *tenera*, D = *dura*, P = *pisifera,* FFB = Fresh Fruit Bunch

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