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EFFECT OF DRY AND WET SEASON ON SEX RATIO AND FRESH FRUIT BUNCH YIELD IN TENERA OIL PALM

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SUMMARY

In a field investigation with 11 tenera oil palm genotypes a peculiar variation in sex ratio and Fresh Fruit Bunch (FBB) yield was noticed in "Dry" and "Wet" seasons of the year. The dry warm season with bright sunshine was conducive for greater number of female/productive inflorescences and total number of inflorescences. The rainy humid, cloudy and gradually cooling climate from July to December was unfavourable for a desired kind of sex expression. The population mean for sex ratio during dry season over five years was 44 per cent as against 33 per cent in wet rainy season. High female sex ratio during dry season followed by high FFB yield in wet season and low female sex ratio during wet rainy season fallowed by low FFB yield in consecutive dry summer season was the unique feature in oil palm. The genotype OPM-11 showed an uncommon ability to give higher yield in dry season than in wet season.

***Key words*: Dry and wet season, FFB yield, oil palm, sex ratio.**

INTRODUCTION

Sex ratio in Oil palm is conventionally defined as the ratio of female inflorescences to total inflorescences produced by the palm per year (Abdul Halim *et al*. 1988). This ratio is reported to vary with changes in seasonal climate (Broekmans 1957). Yearly dry and wet season results in expression of sex ratio in cycles which ultimately reflects in variation in Fresh Fruit Bunch yield (FFB yield) in consecutive periods. A programme of All India Co-ordinated Research Project on Oil palm has indicated that the Oil palm can be successfully grown in coastal part of Maharashtra. The region is characterized by high annual rainfall (3500 mm) restricted between June to November and complete dry period in remaining part of the year. The current investigation is aimed at assessing the effect of dry and wet season on sex expression, sex ratio and it's relevance with FFB yield of tenera Oil palm in subsequent period.

MATERIALS AND METHODS

Study was conducted on 11 genotypes of tenera oil palm hybrids at Agricultural Research Station, Mulde, Tal. Kudal, Dist. Sindhudurg, Maharashtra (India). The genotypes viz. OPM- 1 (115 D X 291 P), OPM - 2 (104 D X 98 P), OPM-3 (109 D X 291 P), OPM-4 (124 D X 266 P), OPM-5 (220 D X 98 P), OPM-6 (65 D X 111 P), OPM-7 (35 D X 291 P), OPM-8 (82 D X 266 P), OPM-9 (148 D X 98 P), OPM-10 (18 D X 32 P), OPM-11 (128 D X 291 P) planted in August 1991 under All India Co-ordinated Research Project on Oil palm constituted the experimental material. "OPM" is an abbreviation of Oil palm at Mulde. The experiment was conducted in

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Randomized Block Design in three replications. The palms were planted at 9 x 9 m spacing on contour. Eight palms of each genotype were accommodated in each replication. Appearance of male, female inflorescences commenced from the year 1994. The data on number of male, female inflorescences, total inflorescences, total number of fresh fruit bunches and fresh fruit bunch yield (kg/ palm) were recorded from year 1994 up to 1999. The six monthly data i.e. from January to June and July to December of above mentioned trial was used for the purpose of investigation. Sex ratio was calculated by using following formula.

$$\text{Sex ratio} = \frac{\text{No. of productive inflorescences/palm}}{\text{Total no. of inflorescences/palm}}$$

The data on daily minimum, maximum temperature (^{0}C), relative humidity, bright sunshine hours and rainfall were recorded from the meteorological observatory located in the research station itself. The statistical analysis was done according to Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

The monthly meteorological data averaged over 9 years (Table 1) revealed that during January to June the daily maximum temperature were in between 30.8 and 35.4^{0}C, minimum temp. in the range of 16.5 to 25.3 ^{0}C with gradual increase from January towards May. The nights had relative humidity in the range of 82 to 91 per cent and days were relatively dry (RH 35 to 76 %). The period was further characterized by bright sunny days with an average sunshine hrs. in the range of 8.2 to 10 hrs. per day up to May. Thus first half part of the year was dry, free from rains and warm with more bright sunshine hrs. Hence can be termed as "Dry season." The climate during July to December showed gradual decline in average minimum temperature from 24.2 ^{0}C to 17.1^{0}C. However average maximum temperature during the period was steady in between 29 and 33.7 ^{0}C. The humidity was very high (more than 90% during night and 39 to 82 % during day). Out of the total annual rainfall about 70 per cent occurred during this period. During July to October the bright sunshine was received hardly for

Table 1. Monthly meteorological data averaged over 9 years (1991 to 1999).

Month	Rainfall (mm)	Temperature ^{0}C		Relative humidity (%)		Daily Sunshine (hrs)
		Max.	Min.	Morning	Evening	
January	2.3	33.3	16.5	86	36	9.2
February	0.0	34.4	17.0	84	35	10.0
March	0.0	34.9	20.9	85	46	9.0
April	6.9	35.4	23.8	82	51	9.7
May	5.9	34.7	25.3	82	57	8.2
June	945.9	30.8	24.5	91	76	4.0
July	1243.4	29.0	24.2	93	82	2.1
August	604.4	29.1	23.9	94	81	2.7
September	196.9	30.4	23.6	91	71	5.1
October	220.3	32.6	22.8	89	62	6.8
November	18.3	33.7	20.3	84	45	8.3
December	11.8	32.8	17.1	86	39	8.7

2.1 to 6.8 hrs. per day and in November-December it was for about 8.5 hrs. Thus the second half part could be termed as "Wet season" of the year.

The average sex ratio obtained from population for number of female inflorescences and total number of inflorescences during "Dry & Wet "seasons of the years 1994 to1999 are given in Table 2.

A distinct cyclic feature was noticed in the sex expression over the six years of investigation. The sex ratio during 'Dry' season was remarkably higher than that in 'Wet' season every year. The average number of female /productive inflorescences as well as total number of inflorescences during 'Dry' season were higher than those in 'Wet' season. This clearly suggested that the dry warm season with ample of bright sunshine hrs. is conducive for promoting higher number of female/ productive inflorescences and higher sex ratio, whereas humid, rainy and cloudy season with gradually cooling night temperature is unfavourable for desired kind of sex expression in tenera oil palm.

The data on mean sex ratio and FFB yield of 11 individual genotypes pooled over six years period under investigation are given in the Table 3. It is revealed that the average sex ratio over the years and over the genotypes was remarkably higher (0.44) during 'Dry' season than in 'Wet' season (0.33). The range of variation in sex ratio among the genotypes was also wide with a maximum of 0.564 in OPM-6 and minimum 0.330 in OPM-10 during 'Dry' season. In 'Wet' season the sex ratio tended remain 40 per cent with an exception of OPM-11 (45.7%) and OPM-8 (40.7%).

High sex ratio is reported to be a strong determinant of high yield in Oil palm (Hartley 1988). Apparently the sex ratio and FFB yield in a specific season showed no correspondence with each other. This is because ripening of FFB takes place 4 to 6 month after anthesis (Broekmans 1957).

Hence, high sex ratio during "dry season" is followed by high FFB yield during next rainy season. Whereas, low sex ratio in wet season is followed by low FFB yield

Table 2. Effect of dry and wet season on mean number of female inflorescences, total inflorescences and sex ratio pooled for 11 oil palm genotypes during dry and wet season.

Year	Season	Total inflorescences per palm	Female inflorescences per palm	Sex ratio
1994	Dry	10.25	7.40	0.7220
	Wet	12.35	7.70	0.6235
	Total	22.60	15.10	0.6728
1995	Dry	8.29	3.30	0.3981
	Wet	5.92	2.19	0.3547
	Total	14.21	5.49	0.3764
1996	Dry	6.85	3.76	0.5489
	Wet	5.89	0.84	0.1511
	Total	12.74	4.60	0.3500
1997	Dry	10.40	3.76	0.3615
	Wet	7.34	2.01	0.2738
	Total	17.74	5.77	0.3177
1998	Dry	11.23	5.46	0.4862
	Wet	7.36	3.16	0.4293
	Total	18.59	8.62	0.4578
1999	Dry	9.41	4.20	0.4463
	Wet	6.38	2.64	0.4138
	Total	15.79	6.84	0.4301

Table 3. Mean sex ratio, female and total inflorescences, FFB yield and number of FFB per palm in 11 tenera Oil palm genotypes during dry and wet season pooled for years from 1994 to 1999.

Genotypes	No. of total inflorescences			No. of female inflorescences			Sex ratio			No. of FFB/season			FFB yield kg/palm		
	Season			Season			Season			Season			Season		
	Dry	Wet	Mean	Dry	Wet	Mean	Dry	Wet	Mean	Dry	Wet	Mean	Dry	Wet	Mean
OPM-1	7.56	5.90	13.46	3.05	1.85	4.90	0.400	0.314	0.357	2.14	2.71	4.85	18.06	25.15	43.21
OPM-2	9.35	6.81	16.16	3.66	2.31	5.97	0.391	0.330	0.361	3.00	2.72	5.72	23.25	21.13	44.38
OPM-3	8.23	7.19	15.42	3.59	2.62	6.21	0.430	0364	0.397	2.91	3.14	6.05	23.87	27.16	51.03
OPM-4	8.99	7.36	16.35	4.01	2.27	6.28	0.446	0.308	0.377	2.60	3.09	5.69	19.47	25.86	45.33
OPM-5	9.36	6.73	16.09	4.35	2.11	6.46	0.465	0.314	0.389	2.64	2.88	5.52	19.20	21.96	41.16
OPM-6	10.90	6.39	17.29	6.15	2.51	8.66	0.560	0.393	0.479	3.00	4.54	7.54	23.33	39.47	62.80
OPM-7	8.83	6.02	14.85	3.74	1.80	5.54	0.420	0.299	0.360	3.25	2.62	5.87	26.20	22.01	48.21
OPM-8	9.28	5.21	14.49	4.68	2.12	6.80	0.504	0.407	0.456	2.76	3.68	6.44	23.79	29.69	53.48
OPM-9	10.12	7.60	17.72	4.08	1.94	6.02	0.403	0.255	0.329	2.57	3.26	5.83	18.82	29.42	48.24
OPM-10	10.66	6.23	17.89	3.50	1.69	5.19	0.330	0.234	0.282	1.75	2.82	4.57	15.24	26.21	41.45
OPM-11	8.32	5.93	14.25	4.27	2.71	6.98	0.513	0.457	0.485	3.77	3.38	7.15	32.57	28.12	60.69
Mean	9.24	6.58	15.82	4.10	2.18	6.27	0.440	0.330	0.390	2.76	3.17	5.94	22.16	26.93	49.09
S.D.	1.02	0.75	1.46	0.82	0.34	1.01	0.066	0.066	0.060	0.54	0.56	0.83	4.74	5.09	7.34
CV	11.04	11.40	9.254	20.00	15.60	16.11	15.00	20.00	15.38	19.44	17.67	13.97	21.39	18.93	14.95

in consecutive "Dry season". This reveals that the sex expression and yield in tenera Oil palm is under a predominant control of climatic factors and genetic constitution.

An interesting picture was however revealed in three genotypes, Viz., OPM-2, OPM-7 and OPM-11. These genotypes showed an ability to give higher FFB yield in 'Dry' season than in 'Wet' season. The genotype OPM-11 also showed a second ranking performance when assessed on yearly yield basis.

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