

THE MALAYAN DWARF COCONUT

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Studies on the yield performance and fruit analysis of green, yellow and red forms of Malayan Dwarf and of green and orange forms of Chowghat Dwarf indicate that Chowghat Dwarf is different from Malayan Dwarf. Nut and copra characters of Malayan Dwarf yellow and red forms studied and those reported from other countries show considerable variation between them. Nut and copra characters of individual palms of Malayan Dwarf yellow studied also show variation between palms. On the basis of fruit analysis the palms of Malayan Dwarf yellow have been classified into four groups. The variation between palms is likely to result in the variable performance of Dwarf x Tall hybrids produced from them.

Introduction

Dwarf coconuts are known to occur in most of the coconut growing countries. Among the different cultivars of dwarf coconuts, Malayan Dwarf coconut is extensively planted in countries where there is fair distribution of rainfall because of its early bearing nature, short stature and easy accessibility for harvest. The Malayan Dwarf race known as "Nyior Gading" is reported to have originated as a sport or mutant in Java [Handover 1919]. It is generally supposed that they were first introduced into Malaya between 1890 and 1900 [Anon,

1938]. Jack and Sands [1922] described the chief characteristics of these dwarf forms and compared them with King Coconut of Sri Lanka and Coconino of Philippines and found them to be quite distinct. They [1929] have recorded their observations on the performance of these dwarfs and compared their production with those of tall palms in Malaya Marechal [1928] compared Malayan Dwarf introduced into Fiji in 1922 with Niuleka—the indigenous dwarf of Fiji and found it to be different from Niuleka. Cooke and Jagoe [1933] found the Malayan Dwarf palms to be more sensitive to unfavourable conditions

than the tall and stated that they have given remarkable yield when conditions were good. The Malayan Dwarf has three distinct colour forms, one form has Ivory yellow, the second apricot red and the third has green nuts. According to Jack [1930], the green race of dwarf is hardier than either the red or the yellow race and produces a larger nut which gives a better copra. Observations on these dwarfs by Jack and Sands [1922] indicate that they are self-pollinated in the low lands of Malaya and that the Ivory yellow forms of the Nyior Gading race appear to breed true since as high as 96 per cent of

the Ivory yellow seedlings were obtained from the nuts of this form which supported the contention that self pollination is the rule in this form. It has been reported that the green form has less uniform progeny but preferred for hardiness and size of nut and that Dwarf Yellow requires greatest number of nuts to make a picul [133 1/3 lbs] of copra [Anon, 1938]

Malayan Dwarf in India

In India there are no large plantations of dwarfs. The only plantation of dwarfs in an area of 16 hectares is in a private estate - New Ambady Estate in Kulasekharam in Kanyakumari District of Tamil Nadu. Three dwarf forms Yellow, Red and Green were introduced into this estate from Sri Lanka during the year 1934 - 1936 [Gopinathan Nair 1959 a]. Though they

were introduced from Sri Lanka they resembled the Malayan dwarfs described in the literature. Besides, the name Torkington Red given to the red dwarf indicated that they must have come from Torkington Estate in Malaysia through Sri Lanka. Though no detailed studies were made on the nut and copra characters of these forms, a few nut characters of these dwarfs were compared with those of the local Tall and Dwarf Green and Orange forms grown on the West Coast of India by Gopinathan Nair [1959 b], who reported that the copra content of these dwarf introductions compared favourably with that of the tall variety commonly cultivated in India. The excellent performance of dwarf forms in this estate, according to Thampan [1975] could be attributed to the well distributed optimum rainfall and the inherent high soil fertility conditions. These palms have not been manured for the past 35-40 years.

Malayan Dwarf Compared with Chowghat Dwarf

In 1960, seedlings of the three dwarf forms - yellow, red and green - were obtained from the New Ambady Estate and planted at the Central Plantation Crops Research Institute, Kasaragod, Kerala. Though these palms were raised under rainfed conditions earlier, since 1972 they are being irrigated as some multi level cropping trials are laid out in this plot. In 1965 a few seedlings of Malayan Dwarf Yellow, Red and Green forms raised from seednuts directly introduced from Malaysia were planted in another plot in the same block and raised under



Fig. 2. Chowghat Dwarf Orange

rainfed conditions. A few seedlings of the local Chowghat Dwarf Orange and Chowghat Dwarf Green forms were also planted in the same field in 1965 for a comparative study of their performance with those of the direct introductions planted in 1965. In general Malayan Dwarf forms are more vigorous in growth than Chowghat Dwarf forms.

Data on the yield attributes namely spathe production, female flower production, setting percentage and yield of nuts of the three groups of dwarfs are presented in Table 1. The data indicate that the performance of the dwarf forms introduced in 1960 from the private estate is superior to those directly introduced from Malaysia as they have produced more bunches, female flowers and nuts. This may be due to the effect of irrigation and also to the difference in the age of palms. Between the direct introductions

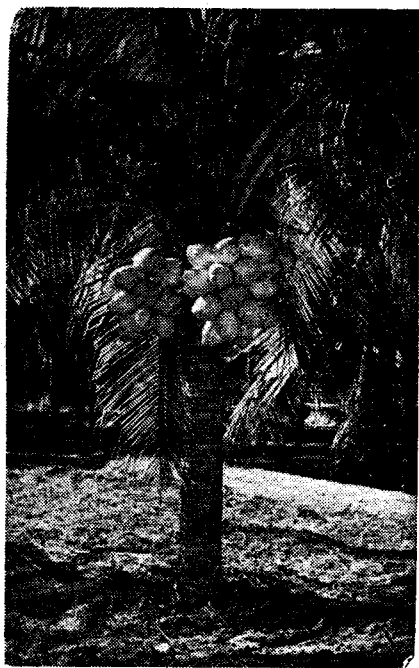


Fig. 1. Malayan Dwarf Yellow

and the local Chowghat Dwarf forms planted in 1965, the Chowghat Dwarf forms produce more female flowers but the setting percentage is low than those of direct introductions. In yield of nuts there is not much difference between the green forms, the Malayan Dwarf Green yielding 67.5 nuts while that of Chowghat Dwarf Green 66.1 nuts. In the case of Malayan Dwarf Yellow and Red, the yield is 50.1 and 50.8 nuts respectively while that of Chowghat Dwarf Orange is 68.8 nuts. According to Jack and Sands (1922) 96.2, 68.7 and 74.6 per cent of seedlings raised from Ivory yellow, green and red respectively are true to type indicating that Ivory yellow is highly self pollinated in nature. In Chowghat Dwarf, Dwarf Green is highly self pollinated while in Dwarf Orange both self and cross pollination occur in nature (Bhavanisankar Rao and Koyamu 1955).

Data on the nut and copra characters of the three groups are presented in Table 2. Since the palms introduced from the private estate are under irrigation, the nut and copra characters of Dwarf Green and yellow forms are superior to those of direct introductions which are raised under rainfed conditions. In Dwarf Red, the direct introduction seems to be better. Between the direct introduction and the local Chowghat Dwarfs, Malayan Dwarf Green is superior to Chowghat Dwarf Green in nut and copra characters. The fruits of Malayan Dwarf Green palms introduced are large sized and have low husk content (46 per cent of the fruit

weight) while those of Chowghat Dwarf Green are small sized and have a high husk content (67 per cent of fruit weight). The husked nut of Malayan Dwarf Green is large sized and has a kernel, water, shell and copra content of 57.6, 22.1, 20.3 and 31.3 per cent respectively of the mean husked nut weight of 470.4 g whereas it is 56.1, 14.1, 29.8 and 41.2 per cent respectively of the mean husked nut weight of 154.4 g in Chowghat Dwarf Green. The copra content per nut is 147.0 g per nut in Malayan Dwarf Green which as reported by Jack (1930) produces a larger nut which gives a better copra whereas in Chowghat Dwarf Green the copra content per nut is 64.7 g and the quality of copra is poor. On account of these distinct differences Chowghat Dwarf Green seems to be distinctly different from Malayan Dwarf Green. Between Malayan Dwarf Yellow and Malayan Dwarf Red, the latter seems to be superior in nut and copra characters. In Chowghat Dwarf, palms with yellow nuts are very rarely met with. Therefore Chowghat Dwarf Orange which is commonly grown on the West Coast of India is compared with Malayan Dwarf Yellow and Red forms which are very distinct. In Malayan Dwarf Yellow and Orange forms the husk content in the fruit is 47.7 per cent and 36.3 per cent by weight respectively whereas in Chowghat Dwarf Orange it is 33.8 per cent. In Malayan Dwarf Yellow and Red forms, the kernel content is 48.6 and 49.8 per cent of the mean husked nut weight of 599.58 and 739.4 g respectively whereas in Chowghat Dwarf Orange it is 43.1 per cent of the

mean husked nut weight of 527.7 g. The husked nuts of Malayan Dwarf Yellow and Red have a water content of 34.6 and 31.9 per cent and a shell content of 16.7 and 18.3 per cent of husked nut weight respectively whereas it is 31.4 per cent and 25.5 per cent of husked nut weight in Chowghat Dwarf Orange. The copra content per nut is 124.2 g in Malayan Dwarf Yellow, 181.5 g in Malayan Dwarf Red and 149.0 g in Chowghat Dwarf Orange. These differences indicate that Chowghat Dwarf Orange is different from Malayan Dwarf Yellow and Red forms.

Variation in Nut and Copra Characters of Yellow and Red Forms of Malayan Dwarf Grown in Different Countries.

Malayan Dwarf coconuts are grown in most of the coconut growing countries in the world. Romney (1971) has reviewed the performance of Malayan Dwarf in Malaysia, Fiji, Sri Lanka and Trinidad, and reported that those in Trinidad and Jamaica appear to produce larger nuts than in Malaysia, Fiji and Sri Lanka. The performance of Malayan Dwarf in some of the countries has been discussed by Thampan and Markose (1973). The dwarfs grown in Sri Lanka are, according to Manthirathna (1972), suspected to be of Malayan origin but the data on copra content per nut in green, yellow and red forms reported by him indicate considerable difference between them and those of Malayan Dwarfs. Data on the nut and copra characters of Malayan Dwarf yellow and Red reported by workers in Malaysia and other countries including those obtained in the

present study are presented in Table 3. The data indicate that there is considerable variation in nut and copra characters of Malayan Dwarf Yellow and Red forms grown in different countries. They differ from country to country and even within a country. In Malaysia itself the data reported by different workers indicate the variability in nut and copra characters of both the forms. In Malayan Dwarf yellow the variation in the mean weight of fruit, husked nut, kernel, water and shell is from 634.0g to 1139.4g, from 412.0g to 681.0g, from 223.0g to 334.0g, from 108.0g to 207.7g and from 81.0g to 151.0g respectively. The weight of copra per nut varied from 107.4g in Nigeria (Obasola 1972) to 187.0g in Jamaica (Harries 1971). The husk content in the fruit has been worked out from the percentage of husked nut in fruit. It varied from 27.1 per cent in Nigeria (Obasola 1972) to 47.4 per cent in India (present study). The kernel content in husked nut weight varied from 47.1 per cent in Malaysia (Harries 1970) to 60.0 per cent in Ivory Coast (Fremont and de Nuce de Lamothe 1972). The water content in the husked nut weight varied from 25.0 per cent in Ivory Coast (Fremont and de Nuce de Lamothe 1972) to 34.6 in India (present study) and the shell content from 16.0 per cent in Ivory Coast (Fremont and de Nuce de Lamothe 1972) to 25.2 per cent in Malaysia (Harries 1970). The percentage of copra in husked nut weight varied from 20.7 in India (present study) to 30.0 in Ivory Coast (Fremont and de Nuce de Lamothe 1972). Similarly in Malayan Dwarf Red also considerable

variation is noticed. The variation in mean weight of fruit, husked nut, kernel, water and shell is from 892.0 g to 1159.9 g, from 542.0 g to 739.4 g, from 252.6 g to 377.0 g, from 159.0 g to 236.3 g and from 110.0 g to 153.3 g respectively. The copra content per nut varied from 130.0 g in Malaysia (Chan 1979) to 181.5 g in India (present study). The husk content in fruit varied from 34.2 per cent in Ivory Coast (de Nuce de Lamothe and Rognon 1977) to 45.8 per cent in Malaysia (Harries 1970). The kernel content in husked nut weight varied from 45.0 per cent in Malaysia (Harries 1970) to 53.8 per cent in Ivory Coast (de Nuce de Lamothe and Rognon 1977). The water content varied from 27.7 per cent in Ivory Coast (de Nuce de Lamothe and Rognon 1977) to 32.2 per cent in Fiji (Satyabalan 1976) and the shell content from 17.5 per cent in Ivory Coast (de Nuce de Lamothe and Rognon 1977) to 25.4 per cent in Malaysia (Harries 1970). The percentage of copra in husked nut weight from 24.0 in Malaysia (Chan 1979) to 26.5 in Fiji (Satyabalan 1976).

Variability in Malayan Dwarf Yellow Form

Among the three forms of Malayan Dwarf - Yellow, Red and Green, Yellow is mainly used for the production of Dwarf x Tall hybrids. Fruit analysis of Malayan Dwarf Yellow palms which are reported to be highly self pollinated (Jack and Sand 1922) has indicated considerable variation in nut and copra characters from palm to palm. Data on fruit analysis of 23

Dwarf Yellow palms (which are considered to be of Malayan origin) introduced from the private estate are presented in Table 4. The variation in fruit weight is from 374.8 g to 1061.2 g while in husked nut weight it is from 229.5 g to 810.0 g. The variation in kernel, water and shell weight is from 150.1 g to 392.5 g, from 30.6 g to 288.8 g and from 48.9 g to 154.5 g respectively. The variation of husk content in fruit is from 19.9 to 38.7 per cent of fruit weight while the variation of kernel, water and shell content is from 43.1 to 66.9 per cent from 9.1 to 38.8 per cent and from 14.2 to 24.1 per cent respectively of husked nut weight. The copra content per nut has varied from 78.9 g to 196.3 g which form 21.2 to 35.8 per cent of husked nut weight. On the basis of fruit analysis data the palms can be roughly classified into four groups. The palms in the first group produce nuts which have a mean husk content of 34.5 per cent of fruit weight and 53.7 per cent and 16.7 per cent of its husked nut weight is kernel and shell content respectively. The variation in the copra content is from 102.7 g to 146.5 g per nut. The palms in the second group produce nuts which have a mean husk content of 26.1 per cent of fruit weight and 48.9 per cent and 17.0 per cent of its husked nut weight is kernel and shell content respectively. The variation in copra content is from 153.8 g to 196.3 g per nut. The palms in the third group produce fruits which have a mean husk content of 37.7 per cent of fruit weight and 64.5 per cent and 21.6 per cent of its husked nut weight is kernel

and shell content respectively. The copra content varies from 78.9 to 113.0 g per nut. The palms in the fourth group produce fruits which have a mean husk content of 26 per cent of fruit weight and 54.3 per cent and 21.7 per cent of its husked nut weight is kernel and shell content respectively. The copra content varies from 160.3 to 182.5 g per nut. Thus there is high variation in shell

and copra characters in the palms of Malayan Dwarf Yellow. Similar variation is noticed in the case of Malayan Dwarf Green and Red palms as well as in Chowghat Dwarf Green and Orange palms. On account of this variation in nut and copra characters, it is possible that the performance of Dwarf x Tall hybrids from the Malayan Dwarf Yellow and Red palms as well

as from Chowghat Dwarf Orange palms is likely to vary depending on the combining ability of the parents as indicated by Satyabalan (1982). Therefore each Malayan Dwarf Yellow and Red as well as Chowghat Dwarf Orange palm has to be studied in detail and pollinated with local tall to find out the combining ability of the palms for the production of promising hybrids

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Table - I

Mean values of yield of nuts and attributes related to yield in different forms of local and introduced dwarf cultivars.

Sl. No.	Forms	No. of spathes produced per year	No. of female flowers per year	Setting percentage	Yield of nuts	Source
1.	Dwarf Green	10.1	255.3	30.7	78.3	Introduced from a private estate in India planted in 1960.
2.	Dwarf Yellow	11.4	252.5	33.9	85.7	
3.	Dwarf Red	10.7	211.5	35.5	75.2	
4.	Malayan Dwarf Green	8.9	193.3	34.9	67.5	Direct introduction from Malaysia planted in 1965.
5.	Malayan Dwarf Yellow	9.4	145.9	34.3	50.1	
6.	Malayan Dwarf Red	9.2	146.5	34.7	50.8	
7.	Chowghat Dwarf Green	9.2	219.1	30.2	66.1	Local forms planted in 1965
8.	Chowghat Dwarf Orange	9.4	215.9	31.8	68.8	

Table - 2

Fruit analysis of Malayan Dwarf and Chowghat Dwarf forms of coconut

S' No.	Forms	Fruit weight (g)	Husked nut		Kernel		Water		Shell		Copra		Source
			Weight (g)	% in fruit	Weight (g)	% in husked nut	Weight (g)	% in husked nut	Weight (g)	% in husked nut	Weight (g)	% in husked nut	
1.	Dwarf Green	951.4	664.5	69.8	344.9	51.9	189.5	28.5	130.0	19.6	183.2	27.5	*
2.	Dwarf Yellow	651.7	443.8	68.1	240.5	54.3	121.1	27.3	82.2	18.4	123.8	27.9	
3.	Dwarf Red	1009.7	643.5	63.7	327.1	50.8	201.2	31.3	115.2	17.9	155.3	24.1	
4.	Malayan Dwarf Green	866.3	470.4	54.3	271.0	57.6	103.8	22.1	95.6	20.3	147.0	31.3	**
5.	Malayan Dwarf Yellow	1139.4	599.5	52.6	291.5	48.6	207.7	34.6	100.3	16.7	124.2	20.7	
6.	Malayan Dwarf Red	1159.9	739.4	63.7	368.1	49.8	236.3	31.9	135.0	18.3	181.5	24.5	
7.	Chowghat Dwarf Green	462.1	154.4	33.4	86.6	56.1	21.7	14.1	46.1	29.8	64.7	41.2	***
8.	Chowghat Dwarf Orange	756.4	527.7	63.2	227.5	43.1	165.6	31.4	134.6	25.5	149.0	28.2	

*Introduced from a private estate in India, planted in 1950

**Direct introduction from Malaysia, planted in 1965

***Local forms grown in Kerala (India)

Table - 3

Fruit analysis of Malayan Dwarf (Yellow and Red) reported from different countries

Forms	Country	Fruit weight (g)	Husked nut.		Kernel		Water		Shell		Copra		Source
			Weight (g)	% in fruit	Weight (g)	% in husked nut	Weight (g)	% in husked nut	Weight (g)	% in husked nut	Weight (g)	% in husked nut	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Malayan Dwarf Yellow	Malaysia	634.0	412.0	65.0	223.0	54.0	108.0	26.0	81.0	20.0	108.0	26.0	Chan (1979)
-do-	-do-	771.0	498.0	64.6	259.5	52.1	125.0	25.1	113.5	22.8	...	...	Harries (1970)
-do-	-do-	870.0	495.0	57.0	233.1	47.1	137.6	27.8	124.7	25.2	...	...	-do-
-do-	-do-	789.0	552.0	69.9	...	...	...	...	...	...	149.0	27.0	Vanialingam <i>et al.</i> (1980)
-do-	Jamaica	1100.0	681.0	61.7	334.0	49.2	196.0	29.3	151.0	21.5	187.0	26.5	Harries (1971)
-do-	Ivory Coast	806.0	558.0	69.0	333.0	60.0	141.0	25.0	90.0	16.0	166.0	30.0	Fremond and de Lamothe (1972)
-do-	Nigeria	642.3	468.8	72.9	...	...	...	...	85.8	18.3	107.4	22.9	Obasola (1972)
-do-	India	1139.4	599.5	52.6	291.5	48.6	207.7	34.6	100.3	16.7	124.2	20.7	Direct introduction from Malaysia. Present study.
-do-	-do-	652.5	443.8	68.1	242.5	54.3	118.9	27.3	82.3	18.4	123.8	27.9	Introduction from a private estate in India. Present study.

Malayan Dwarf Red	892.0	543.0	61.0	272.0	50.0	161.0	30.0	110.0	20.0	130.0	24.0	Chan (1979)
-do-	895.0	542.0	60.5	252.6	46.6	159.0	29.3	131.0	24.1	...	...	Harries (1970)
-do-	1112.0	602.7	54.2	271.2	45.0	178.0	29.6	153.0	25.4	...	...	-do-
-do-	1100.0	665.4	60.5	303.4	45.5	214.0	32.2	148.0	22.3	175.3	25.3	Satyabalan (1976)
-do-	956.5	608.3	63.6	293.8	48.3	182.5	30.2	128.3	21.1	...	...	Harries (1970)
-do-	1079.0	710.0	65.8	377.0	53.1	209.0	29.4	124.0	17.5	171.0	24.1	de Nuce de Lamothe and Rognon (1977)
-do-	1016.0	643.0	63.3	346.0	53.8	178.0	27.7	119.0	18.5	159.0	24.7	
-do-	1159.9	739.4	63.7	308.1	49.8	236.3	31.9	135.0	18.3	181.5	24.5	Direct introduction from Malaysia. Present study.
-do-	1009.7	643.5	63.7	327.1	50.8	201.2	31.3	115.2	17.9	155.3	24.1	Introduction from a private estate in India. Present study.

Note: In fruit analysis some workers have reported the data on the weight of nut and copra characters but have not given the percentage of the different components while some have reported the percentage of the components but not the data on the weight of nut components. In both cases the percentage of the components on the basis of the data reported and the data of the components based on the percentage reported have been worked out and presented in the table to indicate the variation in nut components in different countries.

Table - 4

Fruit analysis of Malayan Dwarf Yellow form

Sl. No.	Fruit weight (g)	Husked nut		Kernel		Water		Shell		Copra	
		Weight (g)	% in fruit	Weight (g)	% in husked nut	Weight (g)	% in husked nut	Weight (g)	% in husked nut	Weight (g)	% in husked nut
1	2	3	4	5	6	7	8	9	10	11	12
Group I											
1.	731.3	469.0	64.2	259.3	55.2	130.0	27.7	79.7	17.1	131.3	27.9
2.	696.7	445.0	63.8	259.3	58.2	110.0	24.7	75.7	17.1	133.3	29.9
3.	717.5	530.0	73.8	302.5	57.1	135.0	25.5	92.5	17.5	141.0	26.6
4.	672.5	431.3	64.0	234.8	54.5	123.8	28.7	72.8	16.9	120.8	28.0
5.	678.3	438.3	64.6	286.0	65.2	81.7	18.7	70.6	16.2	122.0	27.8
6.	870.0	560.0	64.4	288.0	51.4	177.5	31.8	94.5	16.9	135.3	24.1
7.	671.7	431.7	64.3	207.3	48.0	150.0	34.7	74.3	17.2	102.7	23.8
8.	673.8	445.0	66.1	241.3	54.2	128.8	28.9	76.0	16.0	118.0	26.5
9.	818.0	565.0	69.1	300.5	53.3	171.3	30.3	83.3	16.5	140.8	24.9
10.	882.3	559.5	63.5	274.8	49.1	196.3	35.0	88.5	15.9	146.5	26.3
11.	785.0	513.0	65.3	262.3	51.1	163.8	31.9	87.0	16.9	142.8	27.9
Mean	751.4	491.7	65.5	264.3	53.7	145.2	29.5	82.3	16.7	130.7	26.6

	1	2	3	4	5	6	7	8	9	10	11	12
<u>Group II</u>												
12.		1050.0	776.8	74.0	361.8	46.6	273.8	35.3	141.2	18.1	195.0	25.1
13.		970.0	745.0	76.7	221.3	43.1	288.8	38.8	135.0	18.1	157.5	21.2
14.		894.3	635.0	71.0	328.5	51.8	206.3	32.4	100.3	15.8	172.5	27.2
15.		1061.2	810.0	76.3	392.5	48.5	268.8	33.2	148.8	18.4	196.3	24.2
16.		748.8	600.0	80.1	326.3	54.3	188.8	31.5	85.0	14.2	153.8	25.7
17.		933.0	615.0	65.9	314.0	51.0	197.5	32.2	103.5	16.9	159.0	25.8
Mean		942.9	696.9	73.9	340.7	48.9	237.3	34.1	118.9	17.0	172.3	24.7

<u>Group III</u>												
18.		374.8	229.5	61.3	150.1	66.2	30.6	13.5	48.9	21.3	78.9	34.4
19.		580.3	359.8	62.1	240.5	66.9	32.5	9.1	86.8	24.1	113.0	31.4
20.		472.5	333.3	70.4	185.3	55.5	77.5	23.4	70.5	21.3	98.0	29.4
Mean		400.1	249.1	62.3	160.6	64.5	34.7	13.9	53.8	21.6	83.3	33.4

<u>Group IV</u>												
21.		663.8	487.3	73.3	296.3	60.8	82.5	17.0	108.5	22.3	160.3	32.9
22.		651.3	437.5	67.3	276.5	63.2	57.5	13.2	103.5	23.7	157.0	35.8
23.		965.0	756.3	78.3	338.0	44.7	263.8	34.9	154.5	20.5	182.5	24.2
Mean		760.0	560.4	73.7	303.6	54.3	134.6	24.1	122.2	21.7	166.6	29.8
General Mean		652.5	443.8	68.1	242.5	54.3	118.9	27.3	82.3	18.4	123.8	27.9