

# **GENETIC AND SEASONAL VARIATION IN COCONUT PRODUCTION**

BY

K. SATYABALAN <sup>1</sup>

## **ABSTRACT**

Variation in the yield of nuts in the coconut palms due to genetic differences of the palms and seasonal effects in the West Coast Tall cultivar palms grown in a well-maintained estate in Kerala on the west coast of India was studied every month continuously for a period of five years. The varying yield capacity and bearing tendency noticed in the palms may be attributed to the genetic differences between the palms. The marked fluctuations in the yield of palms classified as high yielders- those which yield 80 nuts and above per palm per year and low yielders - those which yield 10 nuts and above per palm per year, do not follow a specific trend as in the case of seasonal variations. The yield of nuts in 66 palms in the estate which comprised of all the three yield groups during the different seasons of the year identified in Kerala as Hot Weather Season during the months of March, April and May, Southwest Monsoon Season during the months of June, July and August, Northeast Monsoon Season during the months of September, October and November and Cold Weather Season during the months of December, January and February showed that high yields of the palms in all the three yield groups were obtained mainly during the Hot Weather Season of the year. This pattern of production due to seasonal influence is seen to persist year after year irrespective of the magnitude of the yield obtained, with minor variations. This is attributed to the cyclic influence of varying seasons in a year on the different critical stages of initiation and development of the inflorescence which takes about 32 months from its initiation to opening and during the development of the nut which takes about 12 months to develop from a fertilized female flower. The palms in the high yield group exhibit only slight variation and maintain their high yields than those in the medium and low yield groups. Data on the yield of palms during a period of five years indicate that those palms which continuously yield 80 nuts and above per year regularly for at least four years turn out to be regular bearers and high yielders. They should, as far as possible be selected as mother palms for propagation.

## **INTRODUCTION**

The long prebearing age, the highly outcrossing nature and the long time taken to attain their optimum production of the heterozygous economic Tall variety coconut palms pose serious problems for assessing the variability necessary for the rapid improvement of the palm. But there is a distinct advantage in that after they attain optimum bearing age after a long period of growth, the same genotype can be monitored for several years over different seasons because of their perennial nature. The Tall variety coconut palms are highly cross pollinated in nature and hence they present day population of the palm exhibit a unique array of variability as a result of their long history of cross pollination. Therefore in an estate of Tall variety coconut palms, each palm is of different genotype which results in varying annual yields from that estate. The varying yield capacity and bearing tendency of the palms naturally result in variation in the annual yield of coconuts.

Besides considerable genetic variation resulting in varying yields, the yield of coconuts are found to vary during the different seasons of the year. Its variation in yield of coconuts during the different seasons of the year follow a specific trend. Thus the yield of coconuts in an estate varies

---

<sup>1</sup> Kerala, India

due to genetic variation of the palms as well as in the course of the year due to seasonal effects during the different seasons of the year. The effect of the different seasons on the inflorescences during their initiation and development which takes about 32 months from initiation till their opening and during the development of the nut which takes about 12 months from the fertilized flower to mature result in variation in yield of nuts and nut characteristics. These two aspects have been studied in detail in the palms of the different yield groups of the West Coast Tall coconut palms grown in Kerala on the West Coast of India and the observations are presented in this paper.

### **Genetic variation in nut production in West Coast Tall Palms**

The West Coast Tall cultivar coconut palms grown in Kerala, India is, like all the Tall coconut cultivars grown elsewhere, predominantly cross pollinated in nature which has resulted in a wide range of variation in yield of coconuts and their nut characteristics like size, shape, colour, etc. To study the variation in yield due to the varying yield capacity and bearing tendency of the palms in this cultivar, the monthly yield of nuts of each of the 66 West Coast Tall palm in an estate in Kerala, India was recorded continuously every month during a period of five years. The palms in this estate were of the same age and were grown under rainfed conditions with uniform treatment of cultivation, manuring and plant protection measures. The annual yield of nuts obtained from the 66 palms during the five year period of observation are presented in Table 1. The data indicate the variation in the annual yield of nuts obtained from the estate. The annual yield of nuts obtained from the estate were 4,884 and 4,980 during the first and fifth year of observation while the annual yield of 4,389, 4,289 and 4,084 nuts were obtained during the second, third and fourth year of observation, respectively.

### **Variation in the yield of palms in three yield groups**

The yield of nuts obtained from the palms during the five year period indicated that each palm is of different yield capacity and bearing tendency. Based on the annual yield of palms during the period of observation, the palms could be grouped into three yield groups. The three yield groups were based on the actual yield of nuts obtained every year during the five year period of observation and not on mean yield of five years.

The first group comprised of palms yielding 80 nuts and above per palm per year were referred to as high yielders. This group comprised of palms yielding 81 to 163 nuts per year during the five year period. The second group comprised of palms yielding 40 nuts and above per palm per year were referred to as medium yielders. In this group the yield of nuts varied from 41 to 156 nuts per year. The third group comprised of palms yielding 10 nuts and above per palm per year. They were referred to as low yielders. In this group the yield of nuts varied from 11 to 182 nuts. In Table 2 are presented the yield data of the palms in the three yield groups which indicate their contribution to the total yield in each year of the five-year period. Of the 66 palms in the estate, 13 palms which formed only 20% of the total number of palms in the estate could be considered as high yielders to be in the first group. They contributed to 29 to 33% of the total yield from the estate during the five year period. The medium yield group comprised of 27 palms and formed about 41% of the total number of palms in the estate, contributed to 42 to 47% of the total yield during the five year period. The remaining 26 palms which formed the low yield group and formed 39% of the total number of palms contributed to 21 to 27% of the total yield of nuts during the five year period. The data indicate that there is irregular bearing in all the palms in the three yield groups but the incidence of irregular bearing is low in the palms of the high yield group whereas it is high in the palms of the medium and low yield groups.

In order to have an idea of the bearing nature of the palms in the three yield groups, the total yield of nuts of the palms in the three yield groups during the first year of observation was compared

with their yields during the second, third, fourth and fifth year of observation. The data in Table 3 indicate the increase or decrease in yield of the palms in the three yield groups. It is evident from the data, that the increase or decrease in yield in the palms of the high yield group is low during the remaining four years whereas the decrease was very high in the palms of the medium and low yield groups, during second to fourth year. In the fifth year there is a slight increase in yield in the palms of the high and low yield groups and a slight decrease in the yield in the palms of the medium yield group. The variations in the yield of palms of the three yield groups may be due to genetic differences between them.

### **Seasonal variation in the yield of palms of the three yield groups**

The variation in the yield of nuts in the palms due to the effect of different seasons in a year is attributed to the cyclic influence of the varying seasons on the different critical states during initiation and development of the inflorescence from its initiation to its opening which takes about 32 months and during the development of the nuts from the fertilized female flower which takes about 12 months.

The seasonal variation takes a specific trend in all the yield groups. In Kerala, India, four seasons have been identified in a year. They are: 1) Hot weather season during the months of March, April and May; 2) South west monsoon season during the months of June, July and August; 3) North east monsoon season during the months of September, October and November and 4) Cold weather season during the months of December, January and February. The yield data of 66 palms during the different seasons of the year during the five year period of observation presented in Table 4a show that about 34 to 45% of the total annual yield is obtained during the Hot weather season of the year whereas 17 to 25% during the South west monsoon season; 18 to 25% during the North east monsoon season and 13 to 28% during the Cold weather season. In the palms of the three yield groups, high yields were obtained during the Hot weather season of the year-March, April and May (Table 4b).

The total and mean monthly yield of nuts in 12 palms selected at random from each yield group during the five year period of observation are presented in Table 5. The data, show that in the palms of the three yield groups, high yields were obtained during the months of March, April, May and also in August. The lowest yield of the palms in the three yield groups was obtained in the month of June.

### **Selection of mother palms for propagation**

It is evident from the data in Table 2 that the mean yield of nuts of the 13 high yielders throughout the five year period of observation was high ranging from 99.0 to 115.3 nuts per year. In Table 6 are presented the annual yield of nuts in 12 palms taken at random from the palms of each yield group during the five year period of observation. The data show that those palms which yield 80 nuts and above per year regularly and continuously for a period of the first four years of observation continue to maintain their high yield unless they are affected by severe drought, serious diseases or other adverse conditions. Such regular bearing and high yielding palms from the estate should as far as possible be selected as mother palms for propagation, than those in the medium and low yield groups which form about 80% of the total number of palms in the estate.

Table 1: Total yield of nuts in 66 West Coast Tall culivar coconut palms grown under rainfed conditions in a well maintained estate in Kerala, India during every year of the five year period of observation

YEARS	TOTAL YIELD
I	4,884
II	4,384
III	4,289
IV	4,084
V	4,980
Total	22,621

Table 2: Total and mean yield of nuts in 66 palms of the three yield groups During the five year period of observation

Yield groups	No of palms	1 year	2 year	3 year	4 year	5 year
High yield group-palms	13	1414	1394	1426	1287	1499
Yielding 80 nuts & above p/a	20	(29)	(32)	(33)	(32)	(30)
	Mean	108.8	107.2	109.7	99.0	115.3
Medium yield group-Palms yielding 40 nuts & above per annum	27	2163	2040	1789	1924	2125
	(41)	(44)	(47)	(42)	(47)	(43)
	Mean	80.1	75.6	66.3	71.3	78.8
Low yield group-palms	26	1307	950	1074	873	1356
Yielding 10 nuts & Above p/a	(39)	(27)	(21)	(25)	(21)	(27)
TOTAL	66	4884	4384	4289	4084	4980

Total            7020  
                       (31)  
                       10041  
                       (44)  
                       5560  
                       (25)  
                       -----  
                       22621