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ABSTRACT

In the maidan tract of Karnataka, closer spacing (7.3 × 7.3 m) gave significantly higher yield of nuts per hectare over wider spacing (9.7 × 9.7 m) after 3 and 4 years in black and red soils respectively. The five year average showed that the yield increase per hectare due to closer planting was 28 per cent in red soil and 3 per cent in black soil. The application of fertilizers did not increase the yield significantly in red soil, whereas it increased the yield significantly in black soil in 4 out of 5 years. Generally, closer planting and fertilizer application increased the yield of Arsikere tall coconut.

INTRODUCTION

Plant population and soil fertility are the two important factors influencing the growth and yield of a crop. Different planting distances advocated for coconut were discussed in some early publications. (Sampson, 1923; Patel, 1938). Whitehead and Smith (1968) and Kannan *et al.*, (1978) studied the influence of the planting distance ranging from 6 to 10m on yield of coconut. The planting density not exceeding 160 plams per hectare in poor soils and 138 palms per hectare in good soils was recommended in Sri Lanka (Child, 1964). Results of spacing experiments in Jamaica were in favour of adopting a higher rate of planting density in pure stands (6.7 to 7.6m).

John and Jacob (1959) reported differential response to fertilizer application in different soils. The series of fertilizer experiments conducted at CPCRI, Kasaragod indicated that it was possible to increase the yield from 17 to 57 nuts/palm/year in the course of 5 years by the application of a balanced NPK mixture (Nelliat *et al.*,

1976). Differential response to fertilizer depending on yield groups was reported in India (Marar, 1962). Adopting a spacing of 9 to 11m without any application of fertilizers to coconut palms was the general practice prevailing in maidan tract of Karnataka. Since experimental findings were not available on the important aspects of spacing and manuring, for the maidan tract of Karnataka, investigations were undertaken on this aspect at Agricultural Research Station, Arsikere (Karnataka) under the All India Co-ordinated Coconut and Arecanut Improvement Project.

Material and Methods

Experiments were conducted on Arsikere Tall coconut cultivar, planted in 1964, in red and medium black soils, at two spacings (S_1=9.7×9.7m, and S_2=7.3×7.3m), The initial nutrient status of red and black soils were; N=8.6 and 6.6 kg/ha; P_2O_5=4.0 and 2.7 kg/ha; and K_2O=240 and 349 kg/ha respectively. Th pH of red and black soils were 7.5 and 8.0. In addition to the spacings, the treatment consisted of three levels of graded dose of NPK (F_0: no fertilizer; F_1=340, 227 and 453g of N, P_2O_5 and K_2O respectively per palm per year; and F_2=680, 454 and 906 g of N, P_2O_5 and K_2O respectively per palm per year). The sources of N, P_2O_5 and K_2O were ammonium sulphate, superphosphate and muriate of potash respectively. The experimental plot size consisted of 10 palms, planted in a RBD with three replicates.

Fertilizer application was started only 6 months after planting, 1/3rd of annual dose being applied in June-July and the 2/3rd in September-October. Fertilizers were applied by making furrow rings of 20 cm depth at 1.5 m away from the bole. During the first three years from planting, 1/3 dose of fertilizers were applied, followed by 2/3 dose, in the next two years and then the full dose of fertilizers. The annual yield of nuts per palm was recorded.

Results and Discussion

The rainfal data for all the five years (Table 1) showed that it was low and ill-distributed, and there was a continuous dry period from December to March. The trends in total rainfall, its distribution and the number of rainy days from year to year were irregular and unpredictable. The yield of nuts follow the rainfall patterns

Table 1. Rainfall (mm) and number of rainy days (in parentheses)

Years	Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1977	—	9	17	21	174	53	38	82	126	272	109	—	901
	—	(1)	(1)	(2)	(10)	(7)	(4)	(7)	(8)	(16)	(6)	—	(62)
1978	—	91	—	38	171	22	44	79	117	150	69	48	829
	—	(1)	—	(2)	(8)	(3)	(8)	(4)	(6)	(12)	(7)	(2)	(53)
1979	—	10	23	31	40	106	30	32	143	160	76	—	651
	—	(2)	(1)	(2)	(3)	(4)	(5)	(3)	(7)	(14)	(5)	—	(35)
1980	—	—	—	83	122	63	66	28	175	82	75	5	699
	—	—	—	(8)	(5)	(4)	(6)	(3)	(8)	(7)	(7)	(1)	(49)
1981	—	—	—	49	158	3	54	65	151	125	20	28	653
	—	—	—	(4)	(7)	(1)	(5)	(5)	(13)	(6)	(2)	(1)	(44)

of the previous year as well as of the year of harvest. Thus rainfall in general, was inadequate for proper growth and production of nuts.

The yield data of coconut grown in red and medium black soils are given in Tables 2 and 3 respectively.

Table 2. Effect of spacing and fertilizer on yield (nuts/ha. and nuts/palm in parentheses) of Arsikere Tall cultivar in red soil

Treatment	1977	1978	1979	1980	1981	Average
S_1	4275 (40)	4888 (46)	7640 (72)	8526 (80)	7574 (70)	6580 (61)
S_2	6867 (36)	6726 (36)	10027 (53)	10385 (55)	8127 (44)	8444 (45)
F_0	4672 (32)	5377 (39)	7657 (54)	9036 (43)	5727 (38)	6943 (44)
F_1	6006 (41)	5541 (39)	9003 (64)	9291 (44)	8227 (55)	7114 (45)
F_2	6290 (43)	6501 (45)	9840 (68)	10039 (48)	8760 (56)	8222 (52)
S_1F_0	3922 (37)	4982 (44)	6801 (64)	8360 (79)	7738 (73)	6360 (58)
S_1F_1	4452 (42)	4628 (47)	8041 (76)	8112 (76)	7704 (71)	6587 (62)
S_1F_2	4452 (42)	4982 (47)	8073 (76)	9104 (85)	7162 (66)	6754 (63)
S_2F_0	4914 (26)	5702 (30)	8514 (45)	9712 (51)	7137 (37)	6311 (38)
S_2F_1	7560 (40)	6454 (35)	9964 (52)	10469 (55)	8680 (45)	8625 (45)
S_2F_2	8127 (43)	8021 (48)	11604 (61)	10973 (57)	8873 (46)	9519 (51)
CD at P=0.05						
Spacing	1131	1533	2163	858	NS	
Manuring	NS	NS	NS	NS	NS	
Spacing × Manuring	1959	NS	NS	NS	NS	

Table 3. Effect of spacing and fertilizer on yield (nuts/ha, and nuts/palm in parentheses) of Arsikere Tall cultivar in medium black soil

Treatment	1977	1978	1979	1980	1981	Average
S_1	4417 (42)	3898 (37)	6636 (62)	8030 (75)	6814 (63)	5959 (56)
S_2	6132 (32)	5628 (30)	8325 (44)	10007 (53)	9626 (50)	6144 (42)
F_0	3879 (28)	3550 (27)	6066 (44)	6585 (51)	6330 (42)	5282 (38)
F_1	5957 (41)	4773 (32)	7930 (55)	9798 (67)	8952 (59)	7482 (51)
F_2	5987 (42)	5967 (40)	8446 (60)	10672 (74)	10203 (68)	8246 (57)
S_1F_0	3851 (36)	3887 (33)	5951 (56)	7297 (75)	5534 (51)	5304 (50)
S_1F_1	4477 (42)	3498 (37)	6589 (62)	7935 (68)	6294 (58)	5746 (53)
S_1F_2	4982 (47)	4311 (41)	7368 (69)	8856 (83)	8681 (80)	6839 (64)
S_2F_0	3906 (21)	3213 (27)	6180 (33)	5234 (27)	6366 (33)	4980 (28)
S_2A_1	6804 (36)	6048 (32)	9271 (49)	12298 (66)	11767 (61)	8149 (48)
S_2F_2	6993 (37)	7623 (40)	9523 (50)	12487 (67)	10802 (56)	9485 (50)
CD at P=0.05						
Spacing	1266	1196	NS	NS	2759	
Manuring	1551	1465	NS	2825	3379	
Spacing × Manuring	NS	2075	NS	3996	NS	

Effect of spacing: The yield of nuts was found to be significant in four years in red soil, and in three years in black soil. The closer spacing (7.3 × 7.3 m) generally gave higher yield irrespective of soil types. Overall for the five years, the increase in yield per hectare due to closer spacing was 28 per cent in red soil and 3 per cent in black soil.

Effect of fertilizer: In red soil, the effect of fertilizers on annual yield of nuts was not significant in all the five years, but in black soil, it was significant in 4 out of 5 years. In red soil, though the results obtained were not significant, the increase in yield of nuts due to fertilizer was consistent, and the overall increases in yield due to F_1 and F_2 levels of fertilizer were 2.5 and 18 per cent respectively over control. However, the response to fertilizers was high in black soil; at F_1 and F_2 levels, the increase in 5-year average yield of nuts per hectare was 42 and 56 per cent respectively.

Spacing × Fertilizer effect: Interaction effect was found to be significant for yield of nuts during 1977 in red soil, and 1978 and 1980 in black soil. The closer spacing with the highest level of fertilizer application was found to be the best among the six treatment combinations tried in both the soil groups.

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