Proceedings of Placrosym XV (2002): 410-413

INTEGRATED NUTRIENT MANAGEMENT IN COCONUT

R. Venkitaswamy and H. Hameed Khan
AICRP Palms center, Coconut Research Station
Aliyarnagr 642 101, Tamil Nadu

ABSTRACT

A field experiment was conducted in the farmer's field near Coconut Research Station, Aliyarnagar from 1996-2001 to study the effect of various organic manures in coconut. The treatment comprised of farmer's practice, 100 % of recommended dose of chemical fertilizers (560: 320:1200 g $NP_2O_5K_2O$/palm/year), 100 % nutrient supply (on N basis) as composted coir pith, 50% of nutrient supply (on N basis) as composted coir pith + 50 % through chemical fertilizers and Neem cake (10 kg/palm/year) + bone meal (2 kg/palm/year)+ ash (20 kg/palm/year). The results of the study from 1997-98 to 2000-2001 revealed that application of composted coir pith on 100 % N basis per palm/year or application of 50 % of composted coir pith on N basis with 50 % of recommended dose of chemical fertilizers per palm per year (280: 160: 600 g $NP_2O_5K_2O$/palm/year) recorded maximum mean nut yield of 151 and 148 nuts/palm/year respectively. Composted coir pith treatment recorded more leaf N and K content of 2.07 and 1.55 % respectively in the 14th leaf. Hundred per cent composted coir pith and 50 % composted coir pith + 50 % of the recommended dose of fertilizers treatments have recorded more net income and benefit cost ratio of Rs.39350, 37988 and 2.05, 2.00 respectively.

INTRODUCTION

Worldwide people realised that pure chemical farming undermines the natural mechanisms operating in the ecosystem and often leads to soil degradation, pollution of groundwater and eutrophication of water bodies with nitrates, phosphates and pesticides (Biddappa *et al.*, 1996 and Upadhyay et al. 1998). Organic manures are important in sustaining soil productivity especially for a perennial crop like coconut, which requires continuous supply of nutrients. Thampan (1972) stated that any organic manure supplemented with required quantity equal to inorganic fertilizers is the best combination for adult bearing trees. For the best growth and productivity of coconut palms integrated and balanced nutrient management is essential (Kamalakshi Amma *et al.*, 2001). However, not much information is available on the performance of composted coir pith, neem cake etc., on coconut. Hence, the present investigation was taken up to study the effect of organic materials like coir pith compost, neem cake, bone meal and ash.

MATERIALS AND METHODS

A field experiment was conducted in the farmer's field near Coconut Research Station, Aliyarnagar from 1996-2001 to study effect of various organic materials in coconut under All India Coordinated Research Project on Palms. The soil was sandy loam with pH of 7.59 and EC of 0.12 dS/m. The soil was low (210 kg/ha), medium (14.5 kg/ha) and high (350 kg/ha) in available N, P_2O_5 and K_20 per ha. The treatment comprised of Farmer's practice, 100% of recommended dose of chemical fertilizers (560: 320:1200 g $NP_2O_5K_2O$/ palm/year), 100% nutrient supply (on N basis) through composted coir pith (CCP), 50% of nutrient supply (on N basis) through composted coir pith + 50% through chemical fertilizers and Neem cake (10 kg/palm/year) + bone meal (2 kg/ palm/year)+ ash (20 kg/palm/year). The experiment was laid out in completely randomized blocks design with four replications. The coconut garden selected was 20 years old planted with West Coast Tall variety. All the organic materials and fertilizers were applied in two equal splits during June and December every year as per treatment schedule. The coir pith was composted by using the fungus *Pleurotus sp.* Regular irrigation and other agronomic methods were adopted to all the treatments. Growth observations on annual leaf production and the number of functional leaves per palm were recorded during June every year. Observations at each harvest stage on number of bunches, female flowers and nuts/palm were recorded at each harvest and added for the particular year (June-July). The leaf sample from 14 th leaf was analysed for leaf major nutrient status. The results of the study from 1997-98 to 2000-2001 are analysed and discussed in the paper.

RESULTS AND DISCUSSION

The results indicated that the annual leaf production and the number of functional leaves

did not differ much among the treatments during all the four years (Table 1). The mean annual leaf production varied from 13.0 to 13.6 per palm and the mean leaf production per palm per month varied from 1.08 to 1.13 palm and it was in the optimum range in all the treatments. The mean number of functional leaves varied from 34 to 38 in different treatments and it was also in the optimum range of 30-40 for getting maximum yield. Application of different sources did not reduce or increase the annual leaf production and number of functional leaves in various treatments.

The number of bunches did not vary among the treatments during different years (Table 2). The mean number of bunches among the different treatments varied from 11.6 to 13.5. The farmer's practice recorded the lowest number of bunches/palm/year. Application of 100% CCP recorded 13.1 bunches and 50 % CCP + 50 % recommended dose of fertilizers recorded 13.5 bunches. The female flowers did not vary among the treatments during different years (Table 2). Maximum mean number of female flowers were observed with 50 % CCP + 50% chemical fertilizers recorded (310 female flowers) followed by 100 % CCP (291).

The nut yield did not vary much among the various treatments during different years (Table 3). Among the various treatments, application of 100 % N as CCP recorded a maximum nut yield during all the years followed by 50% as CCP with 50% as chemical fertilizers. The mean nut yield of fours years was 151 with 100% CCP and with

Table 1. Effect of organic manures and fertilizers on annual leaf production and number of functional leaves

Treatments	Annual leaf production/palm					Functional leaves /palm				
	1997-98	1998-99	1999-2000	2000-01	Mean	1997-98	1998-99	1999-2000	2000-01	Mean
Farmer's practice	13.0	14.5	13.3	11.3	13.0	33	33	34	35	34
Chemical fertilizers	13.8	14.6	13.8	11.6	13.5	41	41	34	35	38
100 % composted coir pith	14.3	14.7	13.1	12.0	13.5	35	36	34	37	35
50 % CCP + 50 % chemical fertilizers	13.7	14.4	14.1	12.4	13.6	39	39	36	39	38
Neem cake + bone meal + ash	13.2	14.3	13.6	12.7	13.4	34	34	35	39	36
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 2. Effect of organic manures and fertilizers on number of bunches and female flowers

Treatments	Bunches/palm/year palm					Female Flowers /palm /year				
	1997-98	1998-99	1999-2000	2000-01	Mean	1997-98	1998-99	1999-2000	2000-01	Mean
Farmer's practice	11.9	10.2	10.7	13.7	11.6	245	246	215	312	255
Chemical fertilizers	11.9	13.2	10.8	13.6	12.3	261	290	225	293	267
100 % composted coir pith	13.8	14.3	10.8	13.6	13.1	312	286	250	316	291
50 % CCP + 50 % chemical fertilizers	13.1	15.2	12.0	13.9	13.5	320	340	265	315	310
Neem cake + bone meal + ash	12.6	13.4	10.7	13.7	12.6	287	295	200	285	268
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 3. Effect of organic manures and fertilizers on nut yield and setting percentage

Treatments	Nuts/palm/year						Setting percentage				
	Pre-treatment yield	1997-98	1998-99	1999-2000	2000-01	Mean	1997-98	1998-99	1999-2000	2000-01	Mean
Farmer's practice	114	118	112	137	171	135	48.1	45.5	63.7	54.8	53.0
Chemical fertilizers	129	123	122	132	163	135	47.1	42.0	58.6	55.6	50.8
100 % composted coir pith	127	139	137	149	178	151	44.5	47.9	59.6	56.3	52.0
50 % CCP + 50 % chemical fertilizers	133	143	132	143	174	148	44.6	38.8	53.9	55.2	48.1
Neem cake + bone meal + ash	128	131	124	133	159	137	45.6	42.0	66.5	55.7	52.4
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

50 % CCP + 50 % chemical fertilizers was 148. Application of chemical fertilizers and farmer's practice recorded lowest number of nuts/palm/year (135).

The nut yield progressively increased from 127 during 1996-97(pre-treatment yield) to 151 during 2000-01 in 100% CCP application treatment and from 133 to 148 with 50 % CCP with 50% of chemical fertilizers. Savithiri and Khan (1994) have already reported the beneficial effect of coir pith in agricultural crops. In all the treatments the yields were high when compared to the pre-treatment yield. The setting percentage did not vary among the treatments during all the years. The setting percentage increased during the last two years in all the treatments. The mean setting percentage varied from 48.1 to 53.0 in various treatments. This indicated that continuous application of various materials increased the setting percentage because of optimum supply of nutrients.

The leaf nutrient status indicated that 100 % CCP application treatment recorded very high value of N (2.07%) followed by Neem cake + Bone meal + Ash treatment (2.01%) (Table 4). Leaf P status did not vary among the treatments and it is within the prescribed limit for coconut. Highest leaf K status was observed in 100 % CCP applied treatment (1.55%). Higher leaf N and K status in 100 % CCP treatment would have been due to the better uptake of N and K in CCP application treatment due to the increased availability. Hameed Khan et al., 1996 also reported that palms received fertilizers recorded higher K values.

The quantity of nut water and TSS did not vary among the different treatments (Table 5). The quantity of nut water varied from 360 to 410 ml in different treatments. The TSS value varied from 0.8 to 1.0 Bx in various treatments. The organoleptic evaluation of water taste revealed that the treatments, which received more organic fertilizers, recorded very good taste. The chemical fertilizers and farmers practice recorded slightly salty taste. However taste of the kernel did not vary among the various materials. Economic analysis of the data revealed that application of 100 % CCP and 50 % CCP + 50 % chemical fertilizers recorded more gross income of Rs.76650 and 76125 and net income of Rs.39350/= and 37988/= per ha respectively (Table 6). The benefit cost ratio of the above treatments were Rs.2.05 and 2.00 respectively.

Table 4. Effect of organic manures and fertilizers on leaf nutrient status (1999-2000)

Treatments	N (%)	P (%)	K (%)
Farmer's practice	1.62	0.23	0.89
Chemical fertilizers	1.90	0.22	0.92
100 % composted coir pith	2.07	0.23	1.55
50 % CCP + 50 % chemical fertilizers	2.01	0.25	1.09
Neem cake + bone meal + ash	1.84	0.25	0.84
CD (p=0.05)	0.21	NS	0.16

Table 5. Effect of organic manures and fertilizers on quality aspects (1999-2000)

Treatments	Quantity of water (ml/lit)	Quantity of kernel (g/nut)	TSS Bx	Physical characteristics Water		Organoleptic evaluation Kernel	
				Colour	Taste	Colour	Taste
Farmer's practice	360	10	1.0	Clear	Slightly salty	Slimmy	Very good
Chemical fertilizers	410	10	0.8	Clear	Slightly salty	Slimmy	Very good
100 % composted coir pith	390	20	0.8	Clear	Good	Slimmy	Very good
50 % CCP + 50 % chemical fertilizers	380	10	1.0	Slightly turbid	Very good	Slimmy	Very good
Neem cake + bone meal + ash	380	80	1.0	Slightly turbid	Very good	Slimmy	Very good

Table 6. Effect of organic manures and fertilizers on economic parameters (2000-2001)

Treatments	Gross income	Cost of cultivation	Net income	Benefit cost ratio
Farmer's practice	68250	39975	28275	1.71
Chemical fertilizers	70350	39975	31375	1.81
100 % composted coir pith	76650	37300	39350	2.05
50 % CCP + 50 % chemical fertilizers	76125	38137	37988	2.00
Neem cake + bone meal + ash	70785	48425	22360	1.46

It can be concluded that application of 100 % composted coir pith per palm/year on N basis or application of 50 % composted coir pith per palm/year + 50% of recommended dose $NP_2O_5K_2O$ as chemical fertilizers is optimum for getting maximum nut yield in coconut and net income.

ACKNOWLEDGEMENT

The authors are thankful to ICAR for providing financial and technical assistance under AICRP on Palms to carry out the study at Coconut Research Station, Aliyarnagar.

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