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Integrated nutrient management in coconut with composted coir pith

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Abstract : A field experiment was conducted in the farmer's field near Agricultural Research Station, Aliyarnagar from 1996-2000 to study the effect of various organic manures in coconut. The results revealed that application of composted coirpith @ 50 kg/palm/year or application of 25 kg of composted coir pith with 50% of recommended dose of chemical fertilizers per palm per year (280 : 160 : 160 g NPK/palm/year) recorded maximum nut yield. Composted coir pith treatment recorded more leaf N and K content in the 14th leaf. The available soil N and K were also higher with 100% composted coir pith application and with 50% composted coir pith + 50% of the recommended dose of fertilizer treatments.

Key Words : Coconut, Organics, Integrated nutrient management, Nut yield.

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 (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. However information is not available on effect of composted coir pith neem cake etc. on coconut. Hence the present investigation was taken to study the effect of organic manures like coir pith compost, neem cake, bone meal and ash.

Materials and Methods

A field experiment was conducted in the farmer's field near Agricultural Research Station, Aliyarnagar from 1996 to 2000 to study the effect of various organic materials in coconut under All India Coordinated Project on palms. The soil was sandy loam with pH of 7.59 and EC of 0.12 dSm^{-1}. The soil was low (210 kg ha^{-1}), medium (14.5 kg ha^{-1}) and high (350 kg ha^{-1}) in available N, P and K per ha^{-1} The treatment comprised of

T_1 – No fertilizer (control)

T_2 – 100% of recommended dose of chemical fertilizers (560 : 320 : 1200 g NPK/ palm/year),

T_3 – 100% nutrient supply (on N basis) as composted coir pith (50 kg/palm/year),

T_4 – 50% of nutrient supply (on N basis) as composted coir pith (25 kg/palm/year) + 50% through chemical fertilizers and

T_5 – 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 Block Design with four replications. The coconut garden selected was 20 years old grown with East Coast Tall variety. All the organic materials and fertilizers were applied in two equal splits during June and December every year as per treatment. 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 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 $palm^{-1}$ were recorded at each harvest and added for the particular year (June-July). The soil samples collected from different depths were analysed

Table 1. Effect of organic manures and fertilizer on number of functional leaves and number of bunches

Treatments	Functional leaves/palm				Bunches/palm/year			
	Dec 1996	Dec 1997	Dec 1998	Dec 1999	1996-97	1997-98	1998-99	1999-2000
T_1	37	33	33	34	14.6	11.9	9.2	9.7
T_2	42	41	41	34	16.5	11.9	13.2	10.8
T_3	35	35	36	34	14.5	13.8	14.3	10.8
T_4	36	39	39	36	15.1	13.1	15.2	12.0
T_5	38	34	34	35	15.1	12.6	13.4	10.7
CD (P=0.05)	NS	NS	NS	NS	NS	NS	2.6	1.8

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

Treatments	Female flowers/palm/year				Nut yield (nuts/palm/year)			
	Dec 1996	Dec 1997	Dec 1998	Dec 1999	1996-97	1997-98	1998-99	1999-2000
T_1	265	240	216	185	114	108	82	85
T_2	293	261	290	325	129	123	122	132
T_3	314	314	286	250	127	139	137	149
T_4	313	320	340	265	133	143	132	143
T_5	325	287	295	200	128	131	124	133
CD (P=0.05)	NS	20	64	56	NS	12	31	32

Table 3. Effect of organic manures and fertilizers on soil pH, organic carbon, available soil N, P and K (1999-2000)

Treat-ments	Organic carbon (%)	pH	N (kg ha^{-1})			P (kg ha^{-1})			K (kg ha^{-1})		
			0-25 cm	25-50 cm	50-100 cm	0-25 cm	25-50 cm	50-100 cm	0-25 cm	25-50 cm	50-100 cm
T_1	0.47	7.59	174	72	60	12.6	5.5	5.2	322	196	180
T_2	0.41	8.11	178	84	64	14.2	6.0	5.6	350	256	240
T_3	0.54	7.96	212	88	70	14.8	6.8	5.4	476	300	264
T_4	0.42	8.91	192	80	64	14.0	6.4	6.0	426	276	200
T_5	0.37	8.47	178	74	68	14.2	7.4	7.4	400	296	250
CD(P=0.05)											

for nutrient contents. Similarly 14th leaf was analysed for major nutrient status.

Results and Discussion

The results indicated that the number of functional leaves did not differ among the treatments during all the years (Table 1). Withdrawal of application of fertilizer or application of different sources did not reduce or increase the number of functional leaves among various treatments. The number of bunches did not vary among the treatments during first two years and it was reduced in the no fertilizer plot during third and fourth year (Table 1). The female flowers did not vary among the treatments during first two years and decrease

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

Treatments	N (%)	P (%)	K (%)
T_1	1.62	0.23	0.89
T_2	1.90	0.22	0.92
T_3	2.07	0.23	1.55
T_4	2.01	0.25	1.09
T_5	1.84	0.25	0.84
CD (P=0.05)	0.21	NS	0.16

was observed in the no fertilizer plot during third and fourth year (Table 2). This would have been due to the non application of any fertilizer in the control plot (T_1).

The nut yield did not vary among the various treatments during first two years and the yield started declining during third and fourth year in the no fertilizer plot (Table 2). This would have been due to the withdrawal of fertilizer in the control treatment. Among the various treatments, application of 100% N as composted coir pith (T_3) recorded a maximum nut yield during all the years followed by 50% as composted coir pith and 50% as chemical fertilizers (T_4).

The nut yield progressively increased from 127 during 1996-97 to 149 during 1999-2000 in 100% composted coir pith treatment and from 133 to 143 with 50% composted coir pith with 50% of chemical fertilizers. The beneficial effect of coir pith in agricultural crops has already been reported by Savithri and Khan, 1994.

The soil analysis data revealed that application of 100% composted coir pith and no fertilizer treatment recorded very low pH (Table 3). Higher organic carbon content was observed in 100% composted coir pith treatment. Highest value of soil available N was recorded in composted coir pith treatment in the top layer (0-25 cm). Similarly higher available P and K status was recorded in 100% composted coir pith treatment. The leaf nutrient status indicated that 100% composted coir pith 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% composted coir pith applied treatment (1.55%). Higher leaf N and K status in 100% composted coir pith treatment would have been due to the better uptake of N and K in composted coir pith application due to increased availability.

It can be concluded that application of composted coir pith @ 50 kg/palm/year or application of composted coir pith @ 25 kg/palm/year + 50% of recommended dose NPK as chemical fertilizers is optimum for getting maximum nut yield in coconut with substantial improvement in soil fertility.

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