



Effect of graded levels of NPK on the productivity of hybrid coconut in *maidan* tract of Karnataka

(Manuscript Received: 26-09-09, Revised: 19-04-10, Accepted: 25-10-10)

Keywords: Copra yield, fertilizer dose, hybrid coconut, nut yield

Nutrient management is an important agronomic practice next to irrigation to improve productivity in coconut. Foliar nutrient content in the range of 1.7-1.8 % N, 0.11-0.12 % P and 0.8-1.0 % K is required for optimum production in coconut (Khan, 1993). It is reported that there is varying response of coconut varieties to applied fertilizers (Khan *et al.*, 1986). The existing fertilizer recommendation of 500:320:1200 g NPK for adult tall coconut palms may not hold good for hybrids recommended for cultivation in Karnataka. Therefore, studies were conducted to find out the optimum dose of fertilizers required for hybrid coconut in *maidan* tract of Karnataka.

A long term field experiment was conducted at Horticulture Research Station, Arsikere, Karnataka under AICRP on Palms to study the effect of NPK on the yield of D x T hybrid (COD x WCT) of coconut. The soil of the experimental site was red sandy loam, medium in available nitrogen (357.0 kg N/ha) and phosphorous (28.9 kg P₂O₅/ha) and rich in available potassium (382 kg K₂O/ha). The average annual rainfall is 694 mm received in 46 rainy days having bimodal distribution with peaks in May-June and September-October. Seedlings of COD x WCT hybrid were planted during 1987 with a spacing of 7.5 m x 7.5 m. The experiment consisting of 27 treatment combinations of NPK with three levels each of N [0 (N₀), 500 (N₁), 1000 (N₂) g/palm/year], P₂O₅ [0 (P₀), 250 (P₁), 500 (P₂) g/palm/year] and K₂O [0 (K₀), 1000 (K₁), 2000 (K₂) g/palm/year] was laid out in 3³ confounded design with two replications. The fertilizers were applied in the form of urea, single super phosphate and muriate of potash in two equal splits during May-June and September-October. The yield of nuts per palm was recorded periodically at each harvest from July to June

and pooled to get nut yield per palm per year. Copra yield per palm was recorded based on the copra content in the nut in each treatment. The nut and copra yield per ha was computed based on the respective yields per palm. The yield data of four years from 2004-05 to 2007-08 is used to draw conclusions. The data was analyzed statistically as per the procedure given by Gomez and Gomez (1984). The gross returns were worked out based on the prevailing market price of Rs. 42 per kg of copra during 2007-08. The cost of production was calculated considering labour charges, manures, fertilizers and other input materials used for coconut production. The net returns were computed as the difference between gross returns and cost of production. The benefit-cost ratio was calculated by dividing the gross returns by the cost of production.

The effect of N application was highly pronounced on nut and copra yield per palm during all the years from 2004-05 to 2007-08 (Tables 1 and 2). Significantly higher nut and copra yield per palm was observed at 1000 g N/palm/year; however the yields were on par with 500 g N/palm/year during 2005-06 and 2006-07. The mean data of four years indicated that the nut and copra yield per palm and per ha were significantly increased with increase in N level from 0 to 1000 g N/palm/year. Similar results of higher nut yield in hybrid coconut at 1000 g N/palm/year was reported by Nagwekar *et al.* (2004) and Venkitaswamy (2004).

The effect of P on nut and copra yield was significant during all the years. The significant increase in yield was observed up to 250 g P₂O₅/palm/year during all the years except for copra yield per palm during 2004-05 and 2005-06 wherein significant increase in copra

Effect of graded levels of NPK on hybrid coconut

Table 1. Main effect of graded level of NPK on nut yield of coconut during 2004-05 to 2007-08

Fertilizer level (g/palm/year)	Nut yield (No's/ palm/ year)				Mean nut yield	
	2004-05	2005-06	2006-07	2007-08	Mean (4 yrs)	No's/ha
1. Nitrogen						
N0 : 0	37.69	46.04	58.36	56.36	49.61	8831
N1 : 500	38.96	56.42	69.63	88.23	63.31	11269
N2 : 1000	43.73	58.44	72.24	97.41	67.96	12097
2. Phosphorus						
P0 : 0	36.56	48.62	63.54	71.60	55.08	9804
P1 : 250	43.53	54.28	68.53	83.18	62.38	11104
P2 : 500	40.29	58.00	68.16	87.22	63.42	11288
3. Potassium						
K0 : 0	36.82	46.48	58.99	73.21	53.88	9590
K1 : 1000	42.69	56.54	69.46	83.34	63.01	11215
K2 : 2000	40.87	57.88	71.79	85.45	64.00	11391
S.Em+	1.62	1.17	1.20	1.79	0.78	139
CD (P=0.05)	4.71	3.41	3.49	5.21	2.28	405
	(N,P,K)	(N,P,K)	(N,P,K)	(N,P,K)	(N,P,K)	(N,P,K)

Table 2. Main effect of graded level of NPK on copra yield of coconut during 2004-05 to 2007-08

Fertilizer level (g/palm/year)	Copra yield (kg/ palm/ year)				Mean copra yield	
	2004-05	2005-06	2006-07	2007-08	Mean (4 yrs)	(kg/ha)
1. Nitrogen						
N0 : 0	4.48	5.73	7.29	6.96	6.11	1088
N1 : 500	5.47	7.66	9.43	11.93	8.62	1534
N2 : 1000	6.44	8.04	9.95	13.45	9.47	1686
2. Phosphorus						
P0 : 0	4.69	5.99	7.81	8.76	6.81	1213
P1 : 250	5.63	7.45	9.43	11.46	8.49	1512
P2 : 500	6.06	7.99	9.43	12.12	8.90	1584
3. Potassium						
K0 : 0	4.87	5.74	7.27	9.07	6.74	1199
K1 : 1000	5.62	7.66	9.42	11.36	8.51	1516
K2 : 2000	5.90	8.03	9.97	11.91	8.95	1594
S.Em+	0.14	0.15	0.18	0.25	0.10	18
CD (P = 0.05)	0.40	0.44	0.54	0.72	0.29	52
	(N,P,K)	(N,P,K)	(N,P,K)	(N,P,K)	(N,P,K)	(N,P,K)

Table 3. Yield and Economics of coconut production under graded levels of fertilizer (Mean of 4 years: 2004-05 to 2007-08)

Treatments	Mean nut yield		Mean copra yield		Gross Returns (Rs./ha)	Cost of Production (Rs./ha)	Net Returns (Rs./ha)	B:C Ratio
	(no./palm)	(no./palm)	(kg/palm)	(kg/ha)				
N0P0K0	42.23	7516	4.67	831	34907	15000	19907	2.33
K1	46.30	8241	5.42	966	40554	18035	22519	2.25
K2	48.33	8602	5.53	984	41331	19670	21661	2.10
N0P1K0	44.68	7952	5.28	940	39501	17623	21878	2.24
K1	51.29	9129	6.48	1154	48478	19259	29219	2.52
K2	54.75	9746	7.18	1278	53697	20894	32803	2.57
N0P2K0	48.48	8629	5.71	1016	42655	18848	23808	2.26
K1	54.19	9645	7.02	1250	52489	20482	32007	2.56
K2	56.28	10017	7.73	1376	57804	22118	35686	2.61
N1P0K0	51.65	9194	6.08	1082	45444	17507	27937	2.60
K1	62.44	11114	7.92	1410	59234	19141	40093	3.09
K2	63.28	11263	8.40	1494	62763	20776	41987	3.02
N1P1K0	57.19	10179	7.25	1290	54177	18730	35447	2.89
K1	68.36	12169	9.78	1741	73132	20364	52768	3.59
K2	68.91	12266	10.22	1819	76400	21999	54401	3.47
N1P2K0	58.09	10340	7.61	1355	56901	19954	36947	2.85
K1	70.29	12511	9.95	1771	74382	21589	52794	3.45
K2	69.59	12387	10.38	1848	77606	23223	54382	3.34
N2P0K0	55.95	9959	6.96	1240	52060	18612	33448	2.80
K1	61.64	10971	7.91	1408	59134	20248	38886	2.92
K2	63.93	11379	8.43	1501	63035	21882	41153	2.88
N2P1K0	62.30	11089	8.10	1442	60548	19836	40711	3.05
K1	76.23	13568	10.84	1929	81027	21471	59556	3.77
K2	77.75	13840	11.29	2010	84427	23107	61320	3.65
N2P2K0	64.34	11452	8.98	1599	67158	21060	46099	3.19
K1	76.34	13588	11.30	2012	84487	22695	61792	3.72
K2	73.16	13023	11.42	2033	85371	24330	61041	3.51
S. Em	2.35	418	0.30	54	2268		2268	
CD(P=0.05)	6.83	1215	0.88	157	6593		6593	

yield per palm was observed up to 500 g P₂O₅/palm/year. The mean data of four years showed that the nut and copra yield per palm and per ha were significantly increased with increase in P level from 0 to 500 g P₂O₅/palm/year. Similarly Nagwekar *et al.* (2004) observed higher nut yield in hybrid coconut at P level of 500 g P₂O₅/palm/year.

Application of K had significant effect on nut and copra yield during all the years. The increase in nut and copra yield per palm was significant up to 1000 g K₂O/palm/year during all the years except for copra yield per palm during 2006-07 wherein significant increase in copra yield per palm was observed up to 2000 g K₂O/palm/year. The mean data of four years showed that the nut and copra yield per palm and per ha were significantly increased with increase in K level from 0 to 2000 g K₂O/palm/year. Nagwekar *et al.* (2004) also reported similar response of hybrid coconut at K level of 2000 g K₂O/palm/year.

The NPK interaction data revealed that the mean nut yield per palm was significantly higher with N₂P₁K₂ which was on par with N₂P₁K₁, N₂P₂K₁ and N₂P₂K₂ (Table 3). Similarly the mean copra yield per palm was significantly higher with N₂P₂K₂ and was on par with N₂P₂K₁, N₂P₁K₂ and N₂P₁K₁. The gross returns were higher with N₂P₁K₂ while, the cost of production was higher with N₂P₂K₂. The net returns were higher with N₂P₁K₂ followed by N₂P₂K₁, N₂P₂K₂ and N₂P₁K₁. The B:C ratio was higher with N₂P₁K₁ followed by N₂P₂K₁, N₂P₁K₂

and N₁P₁K₁. Hence a fertilizer dose of 1000:250:1000 g N, P₂O₅, K₂O per palm per year is recommended for hybrid coconut in the *maidan* tract of Karnataka.

Acknowledgements

The financial assistance and facilities provided by AICRP on Palms (ICAR) to take up this study is gratefully acknowledged. The authors are thankful to Dr.S Arulraj, Project Coordinator (Palms), CPCRI, Kasaragod and Dr.T.K Prabhakara Setty, Former Director of Research, UAS, Bangalore for their constant encouragement and support.

References

- Gomez, K.A. and Gomez, A.A. 1984. Statistical Procedures for Agricultural Research, 2nd Edition, John Wiley and Sons, New York.
- Khan, H.H. 1993. Fertilizer management in coconut. In: *Fertilizer management in commercial crops*. (Ed). Tandon, H.L.S. Fertilizer Development and Consultation Organization, New Delhi, India. pp.176.
- Khan, H.H., Gopalasundaram, P., Joshi, O.P. and Nelliath, E.V. 1986. Effect of NPK fertilization on the mineral nutrition and yield of coconut genotypes. *Fertilizer Research* **10**(2): 185-190.
- Nagwekar, D.D., Sawant, V.S., Magdum, M.B., Joshi, G.D., Khan, H.H. and Jambhale, N.D. 2004. Effect of NPK fertilizers on yield of COD x WCT hybrid of coconut under Konkan condition of Maharashtra (India). *J. Plantn. Crops* **32** (Suppl.): 186-189.
- Venkitaswamy, R. 2004. Effect of NPK levels on dwarf x tall hybrid coconut (COD x WCT) in Tamil Nadu. *J. Plantn. Crops* **32** (Suppl.): 169-172.