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Effect of Organic Manures and Inorganic Fertilizers on the Leaf Yield, Leaf Keeping Quality and Incidence of Pests and Diseases in Betelvine cv. Local Kapoori

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ABSTRACT

Studies were conducted in farmer's fields at Machavaram, Kothapatnam and Inamadugu villages to workout the comparative performance of organic and inorganic manures in Betelvine for two years during *kharif* 2001 and 2002 in Betelvine cultivar Local kapoori. It was observed from the soil analysis that there was no much variation among p^H, EC, nitrogen and potash contents of the soil due to application of various oraganic and inorganic manures. The phosphate is significantly high in the CAN applied plots. Pooled data on plant characteristics over three centres on the average of two years revealed that the national recommendation of 200Kg N, 100Kg P_2O_5 and 100Kg K_2O per hectare + tricontinol 0.05% sprayed thrice at monthly interval found superior over the other treatments in respect of vine growth, leaf yield and keeping quality of leaves. The plots treated with castor cake alone (T1) and neem cake alone (T2) recorded lower incidence of tobacco caterpillar and mites.

Key words : Betelvine, Inorganic fertilizer, Leaf yield, Local kapoori, Organic manures.

Betelvine is one of the most promising commercial crops capable of attracting substantial amount of foreign exchange to the country and popularly called as Green Gold of India. The scientific name of Betelvine is *Piper betel*. It belongs to family Piperaceae i.e black pepper family (Gunther, 1952). In India it is grown in about one lakh hectares mainly in West Bengal, Uttar Pradesh, Karnataka, Bihar, Madhya Pradesh, Tamilnadu, Andhra Pradesh, Orissa and Assam. In Andhra Pradesh, it is grown in an area of 3500ha. Selection of soil for Betelvine cultivation is very important. In coastal saline belt there are different soil types *viz.*, sandy loams, sandy soils etc. A well drained fertile sandy or sandy loam or sandy clay loam soil with p^H range of 5.6-8.2 is considered suitable for its cultivation (CSIR, 1969, Guha and Jain, 1997). Highly acidic and saline soils, ill drained soils are not suitable for Betelvine cultivation.

In Betelvine plant protection chemicals are used in larger scale because the crop is susceptible to insect pests and diseases more particularly the latter. (Guha, 2006). Hence enough care is needed to give ample interval between the application of the chemicals and picking of leaves to reduce the chemical residue below the toxic level, as the leaves are used for chewing in their natural raw condition. Further betel leaf is very perishable commodity and therefore always subject to wastage by quick spoilage due to dehydration, fungal infection, de-chlorophyllation etc. This may cause the post harvest loss ranging from 35%-70% during transport and storage (Rao and Narasimhan, 1977). By keeping the above factors in view, the present investi gation was conducted to know the keeping quality and incidence of pests and diseases under various organic and inorganic fertilizers applied coastal soils.

MATERIAL AND METHODS

The experiment was conducted in farmer's fields at three different locations viz. Machavaram (Guntur district), Kothapatnam (Prakasam district) and Inamadugu (Nellore district) during *kharif* 2001 and 2002 in randomized block design with 14 treatments and 3 replications. The treatments are given below.

T_1 Castor cake @ 5t ha^{-1} (Full dose 200kg N ha^{-1})
T_2 Neem cake @ 5t ha^{-1} (Full dose 200kg N ha^{-1})
T_3 Compost @ 10t ha^{-1} (Full dose 200kg N ha^{-1})
T_4 Urea (Full dose 200kg N ha^{-1})
T_5 CAN (Full dose 200kg N ha^{-1})
T_6 Castor cake + Urea (1:1) at 200kg N ha^{-1}
T_7 Castor cake+ CAN (1:1) at 200kg N ha^{-1}
T_8 Neem cake + Urea (1:1) at 200kg N ha^{-1}
T_9 Neem cake + CAN (1:1) at 200kg N ha^{-1}

Table 1. Pooled data of (of 3 centres for 2 years) on the soil analysis on the comparative performance of organic manures and inorganic fertilizers on Betelvine.

S.No		Treatments	Soil p^H	Soil EC (mmhos/cm)	Soil nutrient status (kg ha^{-1})		
					N	P_2O_5	K_2O
1	T_1	Castor cake @ 5t ha^{-1} (Full dose 200kg N ha^{-1})	7.24	1.07	234.89	41.89	608.22
2	T_2	Nee make @ 5t ha^{-1} (Full dose 200kg N ha^{-1})	7.23	1.02	233.61	54.11	624.00
3	T_3	Compost @ 10t ha^{-1} (Full dose 200kg N ha^{-1})	6.15	1.00	230.22	56.17	627.11
4	T_4	Urea (Full dose 200kg N ha^{-1})	7.11	1.17	241.34	60.17	624.45
5	T_5	CAN (Full dose 200kg N ha^{-1})	7.02	1.25	230.39	89.33	639.34
6	T_6	Castor cake + Urea (1:1) at 200kg N ha^{-1}	7.19	1.04	218.34	65.61	312.62
7	T_7	Castor cake+ CAN (1:1) at 200kg N ha^{-1}	7.06	1.05	235.06	61.06	582.00
8	T_8	Neem cake + Urea (1:1) at 200kg N ha^{-1}	7.14	1.13	224.00	60.56	601.00
9	T_9	Neem cake + CAN (1:1) at 200kg N ha^{-1}	7.32	0.97	213.78	59.45	616.34
10	T_{10}	Compost + Urea (1:1) at 200kg N ha^{-1}	7.06	1.15	236.61	68.00	593.45
11	T_{11}	Compost + CAN (1:1) at 200kg N ha^{-1}	7.16	1.13	244.28	65.23	609.39
12	T_{12}	Tricontinol 0.05% + NPK National Recommendation (i.e 200kg N, 100Kg P_2O_5 and 100Kg K_2O)	10.66	1.12	248.39	60.33	649.17
13	T_{13}	Control –I (National recommendation (i.e 200kg N, 100Kg P_2O_5 and 100Kg K_2O)	7.05	1.06	234.17	69.61	610.67
14	T_{14}	Control –II (Farmer's practice)	7.07	1.17	215.22	65.11	591.11
		SEm±	2.89	0.14	15.18	3.7	36.05
		CD (p=0.05)	NS	NS	NS	10.76	NS
		CV(%)	4.65	15.57	10.51	10.77	10.17
		Initial soil analysis	7.30	1.05	177.67	66.33	488.33

Table 2. Effect of organic and inorganic manures on Betelvine leaf yield, leaf keeping quality and incidence of pests and diseases (Pooled data of all 3 centres for two years)

S.No		Treatments	Vine elongation month^{-1} (cm)	Number of laterals per vine	Leaf yield (number of leaves in lakh ha^{-1})	Weight of 100 leaves (grams)	Keeping quality (No. of days to 50% rotting)	Percent of leaves damaged by tobacco caterpillar	Percent of leaves damaged by mites	Percent of plants damaged by sesbania stem borer	Percent incidence of Phytophthora root rot
1	T_1	Castor cake @ 5t ha^{-1} (Full dose 200kg N ha^{-1})	35.86	26.05	102.44	167.39	11.44	7.96 (15.93)	7.56 (15.93)	15.7 (23.08)	5.49 (12.52)
2	T_2	Nee make @ 5t ha^{-1} (Full dose 200kg N ha^{-1})	33.68	29.16	107.89	175.11	11.50	7.43 (15.56)	6.60 (14.84)	11.73 (19.63)	2.76 (8.78)
3	T_3	Compost @ 10t ha^{-1} (Full dose 200kg N ha^{-1})	34.87	25.05	104.00	170.99	11.28	11.30 (19.60)	9.30 (17.7)	14.13 (21.83)	7.31 (14.54)
4	T_4	Urea (Full dose 200kg N ha^{-1})	28.98	26.77	100.55	170.27	12.27	18.63 (25.53)	17.96 (25.01)	22.56 (28.28)	17.22 (23.12)
5	T_5	CAN (Full dose 200kg N ha^{-1})	31.60	28.50	108.99	170.00	11.94	11.90 (20.15)	8.46 (15.86)	17.20 (24.29)	26.53 (29.90)
6	T_6	Castor cake + Urea (1:1) at 200kg N ha^{-1}	36.38	27.33	105.61	181.72	10.27	12.73 (20.84)	12.13 (20.40)	18.70 (25.46)	11.05 (18.49)
7	T_7	Castor cake+ CAN (1:1) at 200kg N ha^{-1}	29.21	28.39	114.78	183.27	12.05	11.33 (19.65)	10.93 (19.30)	17.73 (24.78)	2.32 (7.94)
8	T_8	Neem cake + Urea (1:1) at 200kg N ha^{-1}	32.06	28.61	103.66	181.99	11.72	11.43 (19.55)	10.66 (18.90)	15.60 (23.04)	3.64 (9.87)
9	T_9	Neem cake + CAN (1:1) at 200kg N ha^{-1}	34.84	30.39	115.83	179.99	11.66	9.40 (17.61)	8.36 (16.80)	15.66 (23.10)	19.45 (24.88)
10	T_{10}	Compost + Urea (1:1) at 200kg N ha^{-1}	33.96	26.22	110.05	174.83	11.83	13.36 (21.35)	11.33 (19.50)	17.10 (24.29)	13.12 (18.58)
11	T_{11}	Compost + CAN (1:1) at 200kg N ha^{-1}	28.32	23.77	104.94	178.27	11.78	10.63 (18.95)	10.36 (18.80)	16.26 (23.62)	5.44 (12.67)
12	T_{12}	Tricontinol 0.05%+ NPK National Recommendation (i.e 200kg N, 100Kg P_2O_5 and 100Kg K_2O)	40.38	34.22	129.28	193.05	13.11	14.56 (22.41)	15.60 (23.30)	18.46 (25.38)	14.57 (21.35)
13	T_{13}	Control –I (National recommendation (i.e 200kg N, 100Kg P_2O_5 and 100Kg K_2O)	30.46	23.66	101.55	181.00	11.72	14.06 (21.95)	14.03 (21.90)	13.70 (21.57)	16.08 (23.08)
14	T_{14}	Control –II (Farmer's practice)	29.02	26.17	95.66	172.50	11.16	17.86 (24.92)	17.66 (24.80)	17.56 (24.65)	8.46 (16.27)
		SEm±	1.29	1.72	4.01	4.31	0.47	0.697	1.02	0.65	2.24
		CD (p=0.05)	3.75	5.00	11.66	12.53	1.37	2.02	2.97	1.90	6.51
		CV(%)	6.67	9.70	6.22	4.33	7.03	11.52	16.12	13.98	22.42

T_{10} Compost + Urea (1:1) at 200kg N ha^{-1}
T_{11} Compost + CAN (1:1) at 200kg N ha^{-1}
T_{12} Tricontinol 0.05% + NPK National Recommendation (i.e 200kg N, 100 Kg P_2O_5 and 100Kg K_2O)
T_{13} Control –I (National recommendation (i.e 200kg N, 100Kg P_2O_5 and 100Kg K_2O)
T_{14} Control –II (Farmer's practice)

Initial soil analysis was done in 3 locations for soil pH, soil EC (mmhos cm^{-1}), N (kg ha^{-1}), P_2O_5 (kg ha^{-1}) and K_2O (kg ha^{-1}) and after application of organic and inorganic manures for 2 years, again soil analysis for the above parameters was done. Soil samples were analysed in the Department of Agricultural Chemistry and Soil Science, Agricultural College, Bapatla using standard procedures. Castor cake, neem cake and compost were applied as basal dose. Tricontinol 0.05% was sprayed thrice at monthly interval. In each treatment data was collected on vine elongation $month^{-1}$ (cm), number of laterals per vine, leaf yield (number of leaves in lakh ha^{-1}), weight of 100 leaves (grams), keeping quality (number of days to 50% rotting), percent of leaves damaged by tobacco caterpillar, percent of leaves damaged by mites. Percent of plants damaged by sesbania stem borer, percent incidence of Phytophthora root rot. The data was analysed as per standard statistical procedures (Singh and Choudhary 1977).

RESULTS AND DISCUSSION

The initial soil analysis *i.e.* before application of treatments shown that the p^H value of 7.3, soil EC of 10.5 mmos cm^{-1}, nitrogen 177.67 N kg ha^{-1}, 66.33 P_2O_5 kg ha^{-1} and 488.33 K_2O kg ha^{-1} (Table 1). After imposition of treatments in both the years, final soil analysis was done. The increase in p^H was highest in T_{12} which showed 10.66 p^H, increased from 7.02 to 7.32. The remaining all the treatments showed no significant differences for soil p^H and soil EC. Regarding soil nutrient status, the nitrogen content and K_2O content in soil were increased from 177.67 to 248.39 kg N ha^{-1} in T_5 respectively. But all the difference are not significant.The P_2O_5 content in soil showed significant difference .The highest increase in soil P_2O_5 was observed in T_1(66.33 to 89.33 kg P_2O_5 kg ha^{-1}),where as decrease in soil P_2O_5 was observed in T_1 (66.33 to 89.33 kg P_2O_5 kg ha^{-1}) and T_2 (66.33 to 54.1133 kg P_2O_5 kg ha^{-1}).

The pooled data of all three centers over 2 years for leaf yield and other ancillary character indicated significant differences among all the treatments. The vine elongation per month was highest in T_{12} (40.38 cm) followed by T_6 (36.38cm). The number of laterals per vine ranged from 23.66 (T_{13}) to 34.22 (T_{12}). The treatment T_{12} had given highest leaf yield of 129.28 lakh leaves /ha ,193.05 grams of 100 leaves weight (g) with good keeping quality (13.11days to 50%rotting of leaves)followed by T_9 for yield (115.83lakh leaves /ha), T_7 for 100 leaf weight (183.27g)and T_3 for Keeping quality (12.27 days at 50% rotting of leaves). Use of fertilizer to increase the leaf yield was also reported by Jahan (1998).

Regarding pests and diseases incidence, the tobacco caterpillar and mites damage was observed in T_2 (7.43% and 6.6% respectively) followed by T_1 (7.96% and 7.56% respectively) where as highest damage was observed in T_4 (18.63% and 17.96% respectively) and T_{14} (17.86% and 17.66% damaged leaves respectively). The incidence of more pests in these treatments may due to application of more amount of nitrogen which leads to the susceptibility of the vines to (pests (Table 2). The damage caused by sesbania stem borer was lowest in T_2 (11.73%) followed by T_{13} (13.7%) where as highest damage was observed in T_4 (22.56%)followed by T_{12} (18.46%). The phytophthora foot rot incidence was highest in T_5 (26.53) followed by T_9 (19.45) whereas the lowest incidence was in T_7 (2.32%) followed by T_2 (2.76). The results indicated that the plots received with neem cake and castor cake alone showed lower incidence of pests and diseases. This might be due to pesticidal property of both neem cake and castor cakes in addition to the nutrition.

Based on the above results it can be concluded that the application of tricontinol in addition to national recommended dose of fertilizer yields more in terms of number of leaves with heavy leaf weight and good keeping quality and plots received with neem cake alone and castor cake alone showed lower incidence of pests and diseases.

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