



Short Note

Influence of Organic Sources of Nutrients on Soil Fertility and Quality Parameters of Turmeric

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Field experiment was carried out during June 2010 – March 2011 at Agricultural Research Station, Bhavanisagar, Tamil Nadu, to determine the effect of organic sources of nutrients (Wellgro soil, wellgro pellets, wellgro grains and Farm yard manure) on soil fertility and quality parameters of turmeric. The results revealed that soil fertility characters (soil organic carbon content and microbial population) were enhanced with application of 100 % Recommended Dose of Fertilizer (RDF) + 40 % of total weight of chemical fertilizer as wellgro soil (140 kg ha⁻¹) and it was followed by 100 % RDF + 40 % wellgro grains (140 kg ha⁻¹). The quality parameters viz., curcumin, oleoresin and essential oil content were also regimed supreme by application of 100 % RDF + 40 % of total weight of chemical fertilizer as wellgro soil (140 kg ha⁻¹).

Key words: Turmeric, wellgro formulations, soil fertility characters, quality parameters.

India is the land of spices. Turmeric, the golden spice of India is a perennial rhizomatous herb belongs to zingiber family. It is a versatile remunerative cash crop of the tropics, which has been under cultivation in India from time immemorial (Caleb *et al.*, 2000). Organic sources of nutrients is a key factor for soil fertility. Maintenance of soil organic matter at a satisfactory level is necessary. However, organic sources for incorporation into the soil are becoming scarce. The quality of cured turmeric is judged by its colour, size, density, hardness and aroma. The most important quality characteristic which decides price in the export markets is the colour of the turmeric and it depends upon the curcumin content. Essential elements locked up in the organic manures are slowly mineralized and made available to the crops, which increased the yield, fertility and quality of turmeric (Clarson, 1998). Hence, the present study was undertaken to assess the soil fertility and quality of turmeric under application of organic sources of nutrients.

Materials and Methods

Field experiment was carried out during June 2010 to March 2011 at Agricultural Research Station, Bhavanisagar, Tamil Nadu. The soil of the experimental site was red sandy loam having pH 6.27, EC 0.75 dSm⁻¹ and organic carbon 0.5 per cent. The initial status of available N, P and K of the experimental site were 205, 15.7 and 376 kg ha⁻¹, respectively. The experiment was laid out in randomized block design with three replications. Three different wellgro formulations (wellgro soil,

wellgro pellets and wellgro grains) were applied in 12 different treatments at 20 % and 40 % of total weight of chemical fertilizer applied. Two treatments consisted of application of farm yard manure at the rate of 12.5 t ha⁻¹. Recommended dose of fertilizers (150: 60: 100 kg ha⁻¹) was applied along with wellgro formulations as six equal splits at 0,30,60,90,120 and 150 DAP, where as full dose of P was applied as basal. Quantity of wellgro formulations required was calculated and presented in table 1.

Results and Discussion

Addition of organics was found to improve soil health and microbiological process. Application of 100 % RDF + 40 % total weight of chemical fertilizer as wellgro soil recorded increased organic carbon accumulation (Table 2). Incorporation of organic manure resulted in increased total N content of soil and formation of stable complex with humic substances supplied through wellgro soil. It might be due to decreased soil bulk density, increased soil organic matter, total porosity, water infiltration into soil as noticed with the earlier report of Obi *et al.* (1995).

Application of 100 % RDF + 40 % total weight of chemical fertilizer as wellgro soil recorded higher microbial load (bacteria, fungi and actino mycetes). The integrated use of organic sources consists of bulky and concentrated organic manure which provide organic matter and mineral matter to turmeric. These organic manures greatly increased the soil microbial population. The organic manure produces more microbial biomass than inorganic because they increase the proportion of labile carbon and nitrogen, directly stimulating the activity

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Table 1. Quantity of wellgro formulations applied (kg/ha)

Treatment	Wellgro Formulations (kg/ha)		Wellgro (g/ Plot) (1plot – 48 m ²)
	20 %	40 %	
T ₁ - 100 % RDF	-	-	-
T ₂ - 100 % RDF + 20% Wellgro Soil	175 kg	-	840g
T ₃ - 100 % RDF + 40 %Wellgro Soil	-	350 kg	1680g
T ₄ - 75 % RDF + 20 % Wellgro Soil	132.5 kg	-	636g
T ₅ - 75 % RDF + 40 %Wellgro Soil	-	260 kg	1248g
T ₆ - 100 % RDF + 20% Wellgro Pellets	175 kg	-	840g
T ₇ - 100 % RDF + 40 %Wellgro Pellets	-	350 kg	1680g
T ₈ - 75 % RDF + 20 % Wellgro Pellets	132.5 kg	-	636g
T ₉ - 75 % RDF + 40 %Wellgro Pellets	-	260 kg	1248g
T ₁₀ - 100 % RDF + 20% Wellgro Grains	175 kg	-	840g
T ₁₁ - 100 % RDF + 40 %Wellgro Grains	-	350 kg	1680g
T ₁₂ - 75 % RDF + 20 % Wellgro Grains	132.5 kg	-	636g
T ₁₃ - 75 % RDF + 40 %Wellgro Grains	-	260 kg	1248g
T ₁₄ - 100 % RDF + FYM (12.5t/ ha)	-	-	-
T ₁₅ - 75 % RDF + FYM (12.5t/ ha)	-	-	-

of microorganisms. Wellgro soil, a neem based organic manure reduces alkalinity in soil, as it produces organic acids on decomposition. Being totally natural, it is compatible with soil microbes, improves rhizosphere microflora and hence ensures fertility of the soil.

Quality parameters like curcumin, oleoresin and essential oil contents which showed significant difference due to wellgro formulations are presented in Table 2. Application of 100 % RDF + 40 % wellgro soil recorded higher curcumin, oleoresin and essential oil content, which was comparable with

Table 2. Influence of organic sources of nutrients on soil fertility status and quality parameters of turmeric

Treatment	Soil organic carbon (%) at 180 DAP	Microbial population at 180 DAP			Quality parameters of turmeric		
		Bacteria (x 10 ⁷ cfu g ⁻¹ dry wt of soil)	Fungi (x 10 ⁴ cfu g ⁻¹ dry wt of soil)	Actinomycetes (x 10 ³ cfu g ⁻¹ dry wt of soil)	Curcumin (%)	Oleoresin (%)	Essential oil (%)
T ₁ - 100 % RDF	0.555	88.00	63.67	95.00	3.72	8.54	3.35
T ₂ - 100 % RDF + 20% Wellgro Soil	0.669	124.33	85.67	124.67	3.92	8.88	3.55
T ₃ - 100 % RDF + 40 %Wellgro Soil	0.820	169.00	114.67	157.00	4.34	9.38	3.82
T ₄ - 75 % RDF + 20 % Wellgro Soil	0.767	128.00	83.00	125.00	3.99	9.05	3.66
T ₅ - 75 % RDF + 40 %Wellgro Soil	0.713	135.67	93.00	144.33	4.16	9.19	3.59
T ₆ - 100 % RDF + 20% Wellgro Pellets	0.653	124.33	85.33	141.33	3.72	8.91	3.67
T ₇ - 100 % RDF + 40 %Wellgro Pellets	0.626	142.67	97.00	129.67	4.09	9.23	3.54
T ₈ - 75 % RDF + 20 % Wellgro Pellets	0.654	139.00	89.00	126.67	3.88	9.13	3.56
T ₉ - 75 % RDF + 40 %Wellgro Pellets	0.749	150.33	105.33	148.33	4.13	9.33	3.78
T ₁₀ - 100 % RDF + 20% Wellgro Grains	0.678	143.33	96.33	143.67	3.87	8.87	3.53
T ₁₁ - 100 % RDF + 40 %Wellgro Grains	0.766	157.00	103.33	144.33	4.10	9.12	3.60
T ₁₂ - 75 % RDF + 20 % Wellgro Grains	0.662	118.00	95.00	114.67	4.06	9.08	3.45
T ₁₃ - 75 % RDF + 40 %Wellgro Grains	0.696	118.33	92.33	115.67	4.04	8.84	3.59
T ₁₄ - 100 % RDF + FYM (12.5 t/ha)	0.770	132.33	98.33	142.00	3.86	8.88	3.53
T ₁₅ - 75 % RDF + FYM (12.5 t/ha)	0.740	123.67	93.67	135.33	3.91	8.80	3.53
SEd	0.020	2.26	2.29	2.41	0.07	0.07	0.05
CD(P=0.05)	0.330	4.64	4.70	4.93	0.14	0.15	0.11

turmeric applied with 75 % RDF + 40 % wellgro pellets. Organic carbon, available nitrogen and phosphorus in soil were higher due to decomposition of wellgro soil. This may be the main reason for the availability of more quantity of nitrogen in the form of NH₄ – N, which could have promoted the hormonal activity of plants. This would have

increased the curcumin content of rhizomes. This is in confirmation with the findings of Reddy and Rao (1978).

Organic manures produce more chelated phosphates, which are more soluble in water. This easily available form might have triggered the oleoresin content of rhizomes. The present findings

are similar with earlier works of Upadhyay and Misra (1999) who opined that greater uptake of nutrients increased the oleoresin content of rhizomes. The possible reason for higher essential oil content in wellgro soil is that it stimulates the nitrate reductase activity in plants. This enzyme regulates nitrogen availability to plants. Improved nitrogen metabolism particularly through nitrate reductase activity might have exerted higher essential oil content in rhizomes.

Conclusion

From the present study, it is concluded that application of organic sources of nutrients, particularly wellgro soil sustained the soil fertility and productivity and improved the quality of turmeric in comparison to inorganic fertilizers at the recommended levels.

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