



## Effect of Organic Wastes and NPK Levels on Nutrient Uptake and Yield of Groundnut in Coastal Sandy Soil

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**An experiment was conducted in sandy soil to study the effect of organics and NPK levels on the nutrient uptake and yield of groundnut. The soil (0-15 cm) had the following characteristics viz., organic carbon- 0.27%, pH - 8.39, EC- 1.61 dS m<sup>-1</sup>, available alkaline KMnO<sub>4</sub>-N 128.32 kg ha<sup>-1</sup>, Olsen P- 10.23 kg ha<sup>-1</sup> and NH<sub>4</sub>OAc-K 196.74 kg ha<sup>-1</sup>. Four levels of NPK viz., no NPK, NPK (100%), NPK (125%) and NPK (150%) were the treatments under Factor A. Different sources of organics viz., control, composted coir pith (CCP) @ 12.5 t ha<sup>-1</sup> and pressmud (PM) @ 12.5 t ha<sup>-1</sup> were the treatments under Factor B. The treatments were replicated thrice in a Factorial Randomized Block Design (FRBD). The test crop was groundnut var. VRI 2. The experimental results indicated that 150% NPK level among the inorganics and composted coirpith @ 12.5 t ha<sup>-1</sup> was significantly superior in increasing the uptake of nutrients by groundnut. This treatment combination also proved efficient in increasing the yield of groundnut by recording 2196 and 2930 kg ha<sup>-1</sup> of pod and haulm.**

**Key words:** Coastal sandy soils, organics, nutrient uptake, yield, groundnut

Organic wastes have been successfully used in enhancing the productivity and fertility of soil and in maximizing yield of crops, as they have profound effect in supplying various nutrients and by rendering them in more available form in soil (Nagarajan *et al.*, 1986; Singh *et al.*, 1990).

The sandy soil constitutes dominant type of soil in coastal regions. It is well known that this soil exhibit very poor physical property and nutrient availability. The fertilizers even when applied are prone to leaching losses. Hence in these soils, it is essential to study the additional nutrient requirement of crops and also to increase the efficiencies of applied nutrients. In this context, the organics play a significant role in sandy soil not only full fill the nutrients demand, but also helps in improving the organic carbon status and supply of sufficient amount of nutrients (Badanur *et al.*, 1990 and Khar, 1993). Hence an attempt was made in the present study with integration of organics and inorganics on groundnut yield and nutrient uptake with different levels of nutrients.

### Materials and Methods

A field experiment was conducted at farmer's field in Ponnanthittu village near chidambaram from December to March, 2006. The soil (0-15 cm) had the following characteristics viz., organic carbon- 0.27%, pH - 8.39, EC- 1.61 dS m<sup>-1</sup>, available alkaline KMnO<sub>4</sub>-N 128.32 kg ha<sup>-1</sup>, Olsen P-10.23 kg ha<sup>-1</sup> and NH<sub>4</sub>OAc-K 196.74 kg ha<sup>-1</sup>. Four levels of NPK viz., No NPK, NPK (100%), NPK (125%) and NPK (150%)

were used as treatments in main plot. Different sources of organics viz., control, composted coir pith (CCP) @ 12.5 t ha<sup>-1</sup> and pressmud (PM) @ 12.5 t ha<sup>-1</sup> were used as treatments in subplot. The treatments were replicated thrice in a Factorial Randomised Block Design. (FRBD). The test crop was groundnut var. VRI 2. N (17 kg N ha<sup>-1</sup>), P (34 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup>) and K (54 kg K<sub>2</sub>O ha<sup>-1</sup>) were applied through urea, super phosphate and muriate of potash respectively. Fifty percentage of the N and 100% of P and K were applied as basal and remaining 50% N was applied in two splits at flowering and peg formation stage. Pressmud and CCP were applied as per the requirement. Pod and haulm yield at maturity stage were recorded. The pod and haulm samples were collected at harvest, dried at 70°C, powdered and diacid extract was prepared. The concentrations of nutrients viz., N, P, K and micronutrients namely Fe, Zn, and B were estimated using the standard procedure as outlined by Jackson (1973) and uptake were calculated.

### Results and Discussion

#### Growth and yield

The results clearly revealed that, plant height, no. of branches plant<sup>-1</sup>, dry matter production and yield were significantly influenced by application of CCP and PM. The combined application of composted coirpith @ 12.5 t ha<sup>-1</sup> and 150% NPK recorded the highest growth characters, like plant height (53.26 cm), no of branches plant<sup>-1</sup> (10.0) and dry matter production (5226 kg ha<sup>-1</sup>).

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**Table 1. Effect of organics and inorganics on the growth characters and yield of groundnut**

I treatments	Plant height (cm)		No. of branches plant <sup>-1</sup>		Dry matter production (kg ha <sup>-1</sup> )		No. of pods plant <sup>-1</sup>		Yield (kg ha <sup>-1</sup> )			
									pod		Haulm	
A <sub>1</sub> B <sub>1</sub>	22.45		4		3142		12.45		1130		1912	
A <sub>1</sub> B <sub>2</sub>	35.66		5		3763		20.13		1440		2223	
A <sub>1</sub> B <sub>3</sub>	31.86		5		3614		18.08		1413		2101	
A <sub>2</sub> B <sub>1</sub>	30.21		7		3923		21.78		1568		2255	
A <sub>2</sub> B <sub>2</sub>	48.35		9		4545		27.53		1896		2549	
A <sub>2</sub> B <sub>3</sub>	38.27		8		4227		25.28		1738		2389	
A <sub>3</sub> B <sub>1</sub>	40.27		8		4278		25.18		1728		2450	
A <sub>3</sub> B <sub>2</sub>	51.02		10		4879		30.83		2031		2748	
A <sub>3</sub> B <sub>3</sub>	45.86		10		4596		28.58		1906		2590	
A <sub>4</sub> B <sub>1</sub>	46.27		9		4643		26.78		1921		2622	
A <sub>4</sub> B <sub>2</sub>	53.26		11		5226		32.43		2196		2930	
A <sub>4</sub> B <sub>3</sub>	50.81		10		4894		30.20		2019		2775	
	S.Ed	CD	S.Ed	CD	S.Ed	CD	S.Ed	CD	S.Ed	CD	S.Ed	CD
		(p=0.05)		(p=0.05)		(p=0.05)		(p=0.05)		(p=0.05)		(p=0.05)
A	0.37	0.77	0.05	0.10	79.87	165.34	0.09	0.19	27.68	57.30	60.15	124.52
B	0.62	1.30	0.06	0.13	85.27	176.51	0.11	0.22	34.98	72.41	63.59	131.64
AB	0.97	2.01	0.11	0.22	124.90	258.56	0.18	0.38	50.10	103.71	81.75	169.23

A<sub>1</sub> - absolute control; A<sub>2</sub> - 100% NPK; A<sub>3</sub> -125% NPK and A<sub>4</sub> - 150% NPK.

B<sub>1</sub>- control; B<sub>2</sub>- composted coir pith @ 12.5 t ha<sup>-1</sup> and B<sub>3</sub> - pressmud @ 12.5 t ha<sup>-1</sup>

With regard to yield, the highest pod and haulm yield of 2196 and 2930 kg ha<sup>-1</sup> respectively were registered with the treatment 150 % NPK and composted coirpith @ 12.5 t ha<sup>-1</sup>. This treatment was followed by 150 % NPK and pressmud application, which recorded 2019 kg ha<sup>-1</sup> of pod and 2775 kg ha<sup>-1</sup> of haulm.

The increased growth characters with organics and NPK might be due to the improved soil properties and microbial activity as reported by Trivedi (2003). The reduced pH and EC and increased organic carbon resulted in increased nutrient availability in soil which made the plant to absorb more nutrients and increased the yield of

**Table 2. Effect of organics and inorganics on NPK uptake (kg ha<sup>-1</sup>) of groundnut**

Treatments	N-uptake				P-uptake				K-uptake			
	pod		Haulm		pod		Haulm		pod		Haulm	
A <sub>1</sub> B <sub>1</sub>	21.24		20.46		2.27		3.75		6.78		22.94	
A <sub>1</sub> B <sub>2</sub>	32.83		29.12		3.86		5.78		11.52		34.01	
A <sub>1</sub> B <sub>3</sub>	28.40		28.57		3.67		7.21		10.88		31.09	
A <sub>2</sub> B <sub>1</sub>	34.97		29.77		5.03		6.07		12.86		36.08	
A <sub>2</sub> B <sub>2</sub>	49.11		38.24		6.45		8.13		18.96		45.88	
A <sub>2</sub> B <sub>3</sub>	37.89		35.36		5.72		7.17		15.64		4.85	
A <sub>3</sub> B <sub>1</sub>	40.44		36.51		6.22		7.50		16.07		43.86	
A <sub>3</sub> B <sub>2</sub>	56.87		45.62		7.86		9.54		22.54		52.21	
A <sub>3</sub> B <sub>3</sub>	48.90		40.66		7.01		8.44		19.44		47.66	
A <sub>4</sub> B <sub>1</sub>	48.22		41.95		7.32		8.65		19.02		48.77	
A <sub>4</sub> B <sub>2</sub>	67.64		52.44		9.03		10.87		25.91		58.01	
A <sub>4</sub> B <sub>3</sub>	58.69		46.34		7.83		9.66		22.06		53.56	
	S.Ed	CD	S.Ed	CD	S.Ed	CD	S.Ed	CD	S.Ed	CD	S.Ed	CD
		(p=0.05)		(p=0.05)		(p=0.05)		(p=0.05)		(p=0.05)		(p=0.05)
A	0.55	1.13	0.54	1.12	0.13	0.27	0.15	0.31	0.54	1.11	0.91	1.89
B	0.74	1.54	0.64	1.34	0.14	0.30	0.17	0.35	0.64	1.34	1.04	2.15
AB	1.69	3.50	1.15	2.40	0.75	0.51	0.34	0.70	1.01	2.10	1.84	3.80

A<sub>1</sub> - absolute control; A<sub>2</sub> - 100% NPK; A<sub>3</sub> -125% NPK and A<sub>4</sub> - 150% NPK.

B<sub>1</sub>- control; B<sub>2</sub> - composted coir pith @ 12.5 t ha<sup>-1</sup> and B<sub>3</sub> - pressmud @ 12.5 t ha<sup>-1</sup>

groundnut. The reports of Nagarajan *et al.* (1986) and Solamalai *et al.* (2001) confirm the present findings.

#### **Major nutrient uptake**

Sandy soil exhibit very low nutrient status because of low organic status, microbes and poor physical properties. In the present study, the influence of organics in enhancing better nutrition of groundnut with respect to major nutrient uptake was well evidenced. Both the sources of organics viz. CCP and PM proved their usefulness in increasing the uptake of major nutrients. However, the effect of CCP was much pronounced. Among the inorganic levels, 150 per cent NPK recorded the highest yield. The highest uptake of NPK by pod and haulm was recorded by the treatment 150 per cent NPK with CCP application (A<sub>2</sub>B<sub>2</sub>). The addition of organics along with inorganic fertilizers enhanced the uptake of nutrients through increased availability of these nutrients and improved soil conditions as created by addition of organics (Kachot *et al.*, 2001). Application of organic manures helped in solubilization of native nutrients due to chelating effect of complex immediate organic molecules as produced during their decomposition and mobilization of different nutrients towards plant systems and accumulates in crops (Dosani *et al.*, 1999).

#### **Micronutrients uptake**

Micronutrients play a significant role in sustaining the groundnut yield. In the present study, all the organics evaluated along with different levels of NPK fertilizers significantly increased the micronutrients uptake by groundnut (Thampan, 1993 and Bisht and Chandel, 1996). Among the sources of organics, application of CCP registered the highest micronutrients uptake followed by PM application. The combined application of 150 per cent NPK and CCP

@ 12.5 t ha<sup>-1</sup> recorded the highest Zn uptake of 248.17 and 171.41 g ha<sup>-1</sup>, Fe uptake of 502.44 and 757.55 g ha<sup>-1</sup> and B uptake of 3.037 and 5.801 g ha<sup>-1</sup> by pod and haulm respectively. This treatment was followed by the combined application of 150 per cent NPK and PM application. The chelation properties of organics might have prevented precipitation and fixation of micronutrients, making them available for plant uptake (Talashilkar *et al.*, 1997).

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