



RESIDUAL EFFECTS OF DIFFERENT AMENDMENTS AND N LEVELS APPLIED TO THE PRECEDING RICE CROP ON THE SOIL PROPERTIES AND YIELD OF SUCCEEDING GREENGRAM CROP*

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ABSTRACT

In a field study with different amendments and N levels applied to the preceding rice in a light textured soil under two irrigation regimes revealed that the residual effect of coir-pith significantly increased the available N, P and K and organic carbon contents in soil. The highest greengram grain yield was obtained under the residual effect of clayey soil under I₁ regime but on par with coir-pith treatment. The residual effect of N levels on soil properties and yield were non-significant.

KEY WORDS : RESIDUAL EFFECT, AMENDMENTS, N LEVELS, GREENGRAM, YIELD

In light textured soils, the yield may be drastically reduced because of rapid water movement and very high leaching loss of nutrients especially N. To avoid this, the organic amendments like coir-pith or pressmud could be used. These organic amendments applied to the preceding crops may have the residual effect in succeeding crop also. The present study was carried out to study the residual effect of various amendments and N levels applied to preceding paddy crop on the soil properties and yield of succeeding greengram crop.

MATERIALS AND METHODS

The experiment was conducted in a light textured soil at Agricultural College and Research Institute farm, Madurai during February 1985 to April 1985 using greengram crop in the same layout for paddy. The experiment was conducted in a split plot design where two irrigation regimes (irrigation at sowing and afterwards once in 20 days

to 4 cm depth of water-L₁ and irrigation only at sowing and flowering stage to 4 cm depth of water - L₂) were included under main-plot treatments and the residual effect of amendments (control - A₀, coir-pith @ 15 t/ha - A₁, pressmud @ 15 t/ha - A₂ and clayey soil @ 60 t/ha - A₃) and N levels (120 kg N/ha - F₁ and 90 kg N/ha - F₂) applied to the preceding rice crop were included under sub-plot treatments. The 16 total treatment combinations were randomized and replicated thrice. The soil was sandy loam, low in available N (172 kg/ha) and medium in both available P (16.2 kg/ha) and K (192 kg/ha). The organic carbon content of the initial soil was 0.41 per cent. Soil samples were collected at two stages, one at 30 days after sowing (S_i) and another at harvest (S_{ii}) stage of green gram crop. The available N was determined by alkaline permanganate method suggested by Subbiah and Asija (1956).

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Table 1. Residual effect of amendments and N levels on the available N and P in soil under two irrigation regimes

Treatments	Available N in soil (kg/ha)				Available P in soil (kg/ha)			
	I ₁		I ₂		I ₁		I ₂	
	S _I	S _{II}	S _I	S _{II}	S _I	S _{II}	S _I	S _{II}
A ₀ F ₀	138.1	106.4	134.5	104.1	18.5	10.5	19.0	9.8
A ₁ F ₀	203.5	151.2	203.0	149.2	27.2	16.5	28.0	16.0
A ₂ F ₀	187.1	142.6	189.5	143.4	23.3	13.8	22.5	14.2
A ₃ F ₀	201.3	146.2	198.5	141.5	22.8	13.3	24.2	13.5
A ₀ F ₁	141.2	111.2	136.2	108.6	17.0	11.0	16.0	10.2
A ₁ F ₁	207.5	149.2	204.0	190.2	26.8	15.6	27.0	15.7
A ₂ F ₁	183.5	140.7	187.5	138.6	24.2	13.8	24.0	14.2
A ₃ F ₁	199.2	138.6	201.5	139.4	24.0	13.6	22.5	13.6
Mean	182.7	135.8	181.8	134.4	23.0	13.5	22.9	13.4
	SE _D	S _I CD (0.05)	SE _D	S _{II} CD (0.05)	SE _D	S _I CD (0.05)	SE _D	S _{II} CD (0.05)
Irrigation regime (I)	0.50	NS	0.43	NS	0.18	NS	0.15	NS
Amendments (A)	5.94	12.16**	4.18	8.56**	1.88	3.86**	1.25	2.56**
N levels (F)	4.20	NS	2.96	NS	1.33	NS	0.89	NS
F x A	8.40	NS	5.90	NS	2.66	NS	1.74	NS
I x A	8.40	NS	5.90	NS	2.66	NS	1.74	NS
I x F	5.94	NS	4.18	NS	1.88	NS	1.25	NS
I x F x A	11.87	NS	8.36	NS	3.77	NS	2.96	NS

Table 2. Residual effect of different amendments and N levels on the available K and organic carbon content in soil under two irrigation regimes.

Treatments	Available K in soil (kg/ha)				Organic carbon in soil at harvest (per cent)	
	I ₁		I ₂		I ₁	I ₂
	S _I	S _{II}	S _I	S _{II}		
A ₀ F ₁	164.0	108.5	163.5	109.0	0.28	0.28
A ₁ F ₁	202.5	161.8	203.5	162.0	0.51	0.49
A ₂ F ₁	190.5	150.5	191.0	150.5	0.44	0.44
A ₃ F ₁	195.8	154.8	190.5	152.5	0.39	0.39
A ₀ F ₂	159.5	104.5	158.0	106.0	0.26	0.29
A ₁ F ₂	200.5	164.5	201.0	164.0	0.49	0.51
A ₂ F ₂	192.5	153.8	193.0	154.0	0.46	0.43
A ₃ F ₂	194.0	151.0	195.0	154.5	0.40	0.39
Mean	187.4	143.7	186.9	144.1	0.40	0.40
	SE _D ^{S_I}	CD(P=0.05) ^{S_I}	SE _D ^{S_{II}}	CD(P=0.05) ^{S_{II}}	SE _D	CD(P=0.05)
Irrigation regime (I)	0.36	NS	0.69	NS	0.027	NS
Amendments (A)	4.14	8.47**	4.84	9.90**	0.029	0.060**
N levels (F)	2.93	NS	3.92	NS	0.020	NS
F x A	5.85	NS	6.84	NS	0.036	NS
I x A	5.85	NS	6.84	NS	0.036	NS
I x F	4.14	NS	4.84	NS	0.029	NS
I x F x A	8.20	NS	9.67	NS	0.058	NS

Table 3. Residual effect of amendments and N levels on the greengram grain yield under two irrigation regimes (kg/ha).

Treatments	I ₁	I ₂	Mean
A ₀ F ₁	585.5	560.0	572.8
A ₁ F ₁	668.0	648.5	658.3
A ₂ F ₁	614.5	602.5	608.5
A ₃ F ₁	696.5	678.5	687.5
A ₀ F ₂	590.5	562.5	576.5
A ₁ F ₂	661.0	639.5	650.3
A ₂ F ₂	622.5	604.0	613.3
A ₃ F ₂	686.0	682.5	684.3
Mean	640.6	622.3	
		SE _D	CD(P=0.05)
Irrigation regimes (I)		0.385	1.66**
Amendments (A)		15.53	31.81**
N levels (F)		10.98	NS
F x A		21.96	NS
I x A		21.96	NS
I x F		15.53	NS
I x F x A		31.06	NS

and available P was estimated by a method given by Olsen *et al.* (1954). The available K in soil was estimated by using flame photometer (Standford and English, 1949) and the organic carbon content in soil was estimated by chromic acid wet digestion method (Walkley and Black, 1934).

RESULTS AND DISCUSSION

The irrigation regimes and the residual effect of N levels had no significant impact on the available N, P and K in soil and also organic carbon content in soil. But the amendments have greatly influenced the N, P and K in soil and organic carbon content in soil (Tables 1 and 2). The residual effect of coir-pith application significantly increased the available N, P and K in soil and also organic carbon content in soil. The interactions of irrigation \times amendments, irrigation \times N levels, N levels \times amendments and irrigation \times N levels amendments were non-significant.

In the case of green gram yield, the highest grain yield was recorded under the residual effect of clayey soil treatment (1085.5 kg/ha), but on par with residual effect of coir-pith treatment (994.5 kg/ha) as seen in Table 3 followed by pressmud and control in decreasing order. Among the irrigation regimes, I₁ regime recorded significantly

higher grain yield (640.6 kg/ha) than that under I₂ regime (622.3 kg/ha). The interactions between irrigation \times amendments, irrigation \times N levels, N levels \times amendments and irrigation \times N levels \times amendments were non-significant.

The highest available N recorded under coir-pith might be due to the residual effect of amendment containing some trapped N during preceding rice crop which would have otherwise been leached out from this light textured soil. The highest available P under coir-pith might have resulted owing to the probable dissolution of the soil plus fertilizer P by the organic acids produced during decomposition of this amendment. The highest available K under coir-pith might be due to the residual effect of it containing some K and also solubilization of K from K bearing minerals and release from exchange complex. The highest grain yield under clayey soil and coir-pith treatments might be due to favourable moisture retention, facilitating better availability and uptake of nutrients. Moreover, trapping of otherwise leachable nutrients either in fine soil particles or humus under such soil condition during the preceding crop period might have increased the yield. These findings are in line with the finding of Clarson (1983) especially with respect to residual effect of organic amendments.

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