

## COMBINED EFFECT OF POTASSIUM AND ORGANIC MANURES ON NUTRIENT AVAILABILITY, YIELD AND K UPTAKE BY RICE

A pot culture experiment was conducted using red soil of Coimbatore with four sources of organic manures each at 12.5 t ha<sup>-1</sup> (control, composted coir pith, raw coir pith and farm yard manure) and five levels of K (0, 25, 50, 75 and 100 kg ha<sup>-1</sup>) using rice (var. ADT 36) as the test crop to study the influence of K and organic manures on nutrient availability, yield and K uptake in red soil. The experiment was laid out in a completely **randomized** block design with eight replications. The treatment combinations used are given in Table 1. The soil and plant samples were collected at (1) tillering, (2) panicle initiation, (3) flowering and (4) post harvest stages for chemical analysis.

Table 1. Details of treatments

Notation	Treatments
T1	Control
T2	j 25 kg K ha <sup>-1</sup>
T3	: 50 kg K ha <sup>-1</sup>
T4	: 75 kg K ha <sup>-1</sup>
T5	100 kg K ha <sup>-1</sup>
T6	i Composted coir pith (CCP) at 12.5 t ha <sup>-1</sup>
T7	: CCP + 25 kg K ha <sup>-1</sup>
T8	i CCP + 50 kg K ha <sup>-1</sup>
T9	: CCP + 75 kg K ha <sup>-1</sup>
T10	I CCP + 100 kg K ha <sup>-1</sup>
T11	: Raw coir pith (RCP) at 12.5 t ha <sup>-1</sup>
T12	RCP + 25 kg K ha <sup>-1</sup>
T13	: RCP + 50 kg K ha <sup>-1</sup>
T14	: RCP + 75 kg K ha <sup>-1</sup>
T15	RCP + 100 kg K ha <sup>-1</sup>
T16	: Farm yard manure (FYM) at 12.5 t ha <sup>-1</sup>
T17	FYM + 25 kg K ha <sup>-1</sup>
T18	i FYM + 50 kg K ha <sup>-1</sup>
T19	! FYM + 75 kg K ha <sup>-1</sup>
T20	: FYM + 100 kg K ha <sup>-1</sup>

### Available nutrient status of the soil:

Application of K showed a significant influence on the available N content of the soil (Table 2). The highest availability of N (105.1 ppm) was recorded at tillering stage (S1). Among the manures, composted coir pith led to the highest availability of N followed by farm yard manure, raw coir pith and control. It may be due to the comparatively narrow C:N ratio of composted coir pith (24:1), the degrading microbes would not have utilised the native N for its decay. In contrast, a very low N availability due to application of raw coir pith may be ascribed to its wider C:N ratio (112:1) and exploitation of soil available N by the degrading micro-organisms.

Table 2. Mean values for available N, ppm

Partial-lars	Levels / stages					SE <sub>D</sub>	CD (0.05)
	0	1	2	3	4		
K levels	80.9	86.0	93.6	97.7	99.4	1.20	2.31
Manures	82.5	98.8	89.3	95.5		1.01	2.01
Stages		105.1	93.1	87.4	80.3	1.01	2.01

Table 3. Mean values for available P, ppm

Particu-lars	Levels / stages					SE <sub>D</sub>	CD (0.05)
	0	1	2	3	4		
K levels	6.39	6.70	7.03	7.17	7.30	0.20	0.39
Manures	6.43	7.02	6.78	7.45	-	0.18	0.35
Stages		7.48	6.62	6.69	6.88	0.18	0.35

Available P content was found to increase progressively with increase in K application (Table 3). There is a clear evidence of the synergistic influence of K on P possibly through the formation of comparatively soluble reaction products of K with P which might have led to increased available P (Deb *et al.*,

Table 4. Mean values for available K, ppm

Particulars	Levels / stages					SE <sub>D</sub>	i CD (0.05)
	0	1	2	3	4		
K levels	60.47	71.72	85.73	98.83	106.80	0.93	1.95
Manures	73.19 (control)	97.56 (CCP)	78.26 (RCP)	89.23 (FYM)	-	0.83	1.74
Stages	i	i 103.39	89.38	78.01	68.06	0.83	1.74

Table 5. Grain and straw yield and K uptake (total)

Treatments	Grain g pot <sup>-1</sup>	Straw g pot <sup>-1</sup>	Total mg pot <sup>-1</sup>
T1	7.70	22.77	142.7
T2	8.21	23.91	159.5
T3	8.85	25.09	175.7
T4	9.04	25.78	190.2
T5	10.05	27.46	204.4
T6	18.75	32.95	308.2
T7	19.09	33.55	325.4
T8	20.09	34.40	351.7
T9	21.76	34.55	373.4
T10	22.44	35.10	388.6
T11	15.07	28.65	232.2
T12	15.47	29.10	249.1
T13	15.74	29.45	262.2
T14	16.26	29.80	275.9
T15	16.74	30.25	281.0
T16	18.08	31.15	279.3
T17	18.42	31.45	296.3
T18	19.05	31.70	312.4
T19	19.57	32.15	332.6
T20	20.09	32.50	337.0

1976 and Natarajan, 1980). Maximum value for available P (7.45 ppm) was recorded in farm yard manure treated pots, which might be the result of a reduced fixation of native P

through the release of organic acids during the decomposition of organic manures.

The positive influence of the added K on available K was clearly evident (Table 3). It may be due to the addition of very readily soluble salt of KCl as a source of K to soil. As the composted coir pith or the farm yard manure addition supplies varying amount of K to the soil, such variation of available K is accomplished.

#### Grain and straw yields

With regard to the grain and straw yields, composted coir pith plus 100 kg K ha<sup>-1</sup> treatment was found to be the highest when compared to all other treatments (Table 5). The grain and straw yields were 22.44 g pot<sup>-1</sup> and 35.10 g pot<sup>-1</sup> respectively. It may be due to the higher availability of nutrients released by the decomposing organic manures alone and in combination with K fertiliser resulting in an efficient utilisation of nutrients.

#### K uptake (total)

K uptake values revealed a positive and upward trend with the increased application of K (Table 5). The K uptake was increased significantly up to the application of 100 kg K ha<sup>-1</sup> plus composted coir pith. The increase in K uptake was mainly associated with increase in the drymatter as a result of organic manure and application.

**REFERENCES**

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- Natarajan, S. 1980. Dynamics of soil potassium and its influence on the response of rice and finger millet. M.Sc.(Ag) thesis, TNAU, Coimbatore