Madras Agric. J., 81(9): 478-480 September, 1994
https://doi.org/10.29321/MAJ.10.A01565

RESIDUAL EFFECT OF MUSHROOM SPENT RICE STRAW COMPOST ON YIELD AND NUTRIENT UPTAKE IN GREEN GRAM

D. SELVI RANGANATHAN AND D. AUGUSTINE SELVASEELAN
Department of Soil Science and Agricultural Chemistry, Tamil Nadu Agricultural University, Coimbatore 641 003

ABSTRACT

The greenleaf manure and mushroom green gram spent rice straw compost applied to the previous crop namely the rice, registered the highest green gram grain yield than composted coirpith and NPK alone. With reference to the soil nutrients, greenleaf manure registered the highest organic C, available N and K, available P by farm yard manure and Ca and Mg by mushroom spent rice straw compost. All the manures were comparable in influencing the N, Ca and Mg uptake whereas P and K uptakes were not influenced by the manures.

The organic manures are composed of complex chemical compounds which will take more time for their complete decomposition. As a result, the nutrients are released slowly and steadily. The applied organic manures are not exhausted its entire nutrient reserve to the first crop itself. So there will be a carry over of some quantities of nutrients in the soils which are likely to be available for the succeeding crops. The residual effects of FYM and GLM have been well defined by many scientists whereas the residual effect of MSC has not been studied elsewhere. Hence the present investigation was carried out to study the extent of increase in yield, availability of nutrients and uptake for residual crop as a result of MSC application to the rice crop.

MATERIALS AND METHODS

A field experiment with IR/20 rice was conducted on an alluvial soil during *kharif* 1989 at Coimbatore. The treatments consisted of the different organic manures *viz.*, mushroom spent rice straw compost - M_2 (MSC), farm yard manure - M_3 (FYM), composted coirpith-M4 (CCP) and greenleaf manure-M5 (GLM) applied at 12.5 t ha^{-1} in combination with 75, 100 and 125 per cent soil test recommended NPK fertilisers (F_1, F_2 and F_3 respectively). The experiment was conducted in a split plot design with three replications. Fifteen days after the harvest of the rice crop, the green gram var.CO 5 seeds were dibbled in between the rice stubbles without any preparatory cultivation. No organic and inorganic fertilisers were applied to the residual crop. The nutrient availability of macro and secondary nutrients and their respective uptake by the crop at post harvest stage was monitored. The treatmental influence on the dry matter production and the grain yield was quantified.

RESULTS AND DISCUSSION

All the manures though comparable among themselves registered a spectacular influence on the total dry matter production of the residual crop than the NPK, MSC registering numerically high maximum drymatter yield. (Table 1) This could be attributed to appreciable build up of various macro and secondary nutrients in appreciable amounts which have direct bearing on crop nutrition and productivity. GLM and MSC though comparable with FYM significantly inclueneed the residual crop grain yield than CCP and NPK alone. The increased grain yield under GLM can be attributed to the slow N fraction as suggested by Bouldin (1987) which would have contributed to the residual effect of green manures and MSC, FYM and this fraction increased the availability of N resulting in increased yields. The residual effect of green manures on yields of succeeding crops was reported by Gaur (1984). The residual effects of FYM in terms of increasing yields have been reported by Maskina *et al.* (1988).

The soil organic C content which ranged from 0.74 to 1.24 per cent initially got reduced to the range of 0.70 to 1.16 per cent during the growth period of green gram crop. GLM being comparable with MSC recorded the highest organic C content but significantly superior to others. This could be due to the slow mineralisation and the resistant organic residues left behind even after seven months of its application. (Table 2). During the growth of the residual pulse crop, there had been a slight build up of available N which could be

Table 1. Organic manures with fertilisers on dry matter production and grain yield (kg/ha) of green gram

Treatments	Total dry matter	Halum yield	Grain
M_1 - No organic manure (NPK alone)	1488	955	533
M_2 - MSC	1566	975	581
M_3 - FYM	1544	974	570
M_4 - CCP	1529	966	563
M5 - GLM	1555	975	581
CD	22	NS	10
F_1 - 75 per cent of soil test recommended NPK	1465	945	520
F_2 - 100 percent - do-	1549	973	576
F_3 - 125 -do-	1590	989	600
CD	20	16	10

attributed, to the biological N fixation by *Rhizobium* sp.

The MSC, FYM and CCP were comparable in their effect next to GLM but significantly influenced the available N than NPK alone. Available P content ranged from 12.2 to 19.1 kg ha^{-1}. FYM and MSC being on par with each other recorded the highest residual available P but significantly superior to other manures. This enhanced P availability could be attributed to the organic acids released during the decomposition of organics incluences the pH, form stable complexes or chelates with cations responsible for P fixation and thus increased P availability. Available K content varied from 618 to 658 kg ha^{-1}. All the

Table 2. Organic manure with fertilizers on soil organic C (per cent) and avilable N, P, K (kg ha^{-1}), Ca and Mg of green crop.

Treat ments	Organic C	Avai lable N	Avai lable P	Avai lable K	Avai lable Ca	Avai lable Mg
M1	0.72	183	13.7	625	10.6	7.6
M2	1.08	225	17.6	643	13.2	9.9
M3	0.91	221	18.1	649	12.7	8.6
M4	0.85	221	15.5	648	12.9	8.9
M5	1.09	229	17.2	649	12.9	8.4
CD	0.03	6	0.6	10	0.4	0.3
F1	0.88	200	15.0	634	12.1	7.7
F2	0.98	217	16.6	644	12.6	9.0
F3	0.93	230	17.7	651	12.7	9.3
CD	0.03	4	0.5	8	0.2	0.3

Table 3. Organic manures with fertilizers on total plant N, P, K, Ca and Mg uptake (kg ha^{-1}) of green gram crop.

Treat ments	N	P	K	CA	Mg
M1	45.3	7.3	22.7	23.3	5.4
M2	52.5	7.9	24.4	35.7	6.8
M3	52.1	7.9	25.1	33.5	6.5
M4	52.3	7.9	25.0	35.7	7.2
M5	53.5	7.9	24.5	36.3	6.9
CD	2.5	NS	NS	2.4	0.5
F1	45.9	7.2	22.7	29.4	4.9
F2	52.3	7.9	24.5	33.9	7.0
F3	55.3	8.3	25.9	35.5	7.9
CD	2.6	0.4	1.1	1.4	0.4

manurial treatments though influenced positively towards the build up of available K were comparable among themselves but superior to NPK. The higher amounts of total K which could have been steadily released to the available pool during their process of decomposition, was the reason for this enhanced K availability. MSC recorded the highest available Ca and Mg than the others. The MSC which analysed for higher total Ca and Mg contents which was basically drawn from the raw materials like gypsum and poultry manure could be the possible reason for the above trend.

The N uptake ranged from 42.0 to 58, kg ha^{-1} (Table 3). All the manures were equal in their residual effect in enhancing the N uptake of green gram markedly over and above the NPK treatment. Guar (1984) reported the residual effect of GLM on succeeding crops. Only the residual effect of the applied fertilisers was evident in progressively enhancing the P uptake in accordance to the levels. This could be due to the release of fixed P which is made available because of favourable microbial activity under rhizosphere system of pulse crop. A similar tread as that of P uptake was noticed for K uptake under residual crop situation where it ranged from 21.0 to 28.0 kg ha^{-1}. A comparable residual effect of all the manures investigated was evident, though all of them were significantly superior to NPK. This could be attributed to the continued mineralisation and release of Ca and Mg from the organic manures compared to the limited availability of NPK treatment.

The mushroom spent compost is found to be a good reserve of plant nutrients which are made available in a phased manner contributing to substantial yield increase which worked out to be 9.0 per cent than 125 per cent NPK alone. Also it had appreciable residual effect as evidenced by its contribution towards the build up of available nutrients as well as yield increase.

REFEREBCES

BOULDIN, D.R. 1987. Paper presented at the symposium on sustainable agriculture. The role of green manure crops in rice farming system 25-29, May. 1987 IRRI, Los Banos, Philippines.

GAUR, A.C. 1984. In : **Organic Matter and Rice.** IRRI, pp. 503 - 516.

MASKINA, M.S., YADVINDER SINGH AND BIJAY SINGH. 1988. **Biol. Wastes. 26** : 1-8.

Madras Agric. J., 81(9): 480-483 September, 1994

BASIS FOR FERTILIZING RICE - GROUNDNUT PULSE SEQUENCE IN LBP AYACUT

S. NATARAJAN, V. MURUGAPPAN AND G.V. KOTHANDARAMAN.
Department of Soil Science, Tamil Nadu Agricultural University, Coimbatore.

ABSTRACT

Linear polynomial model was employed to predict the soil test values of intervening soil samples in rice-groundnut-pulse cropping sequence utilising the soil test crop response data of these crops for LBP ayacut area. This model prediction was satisfactory and well within permissible limit of variation. A basis has been provided for making fertilizer recommendations for this crop sequence using the model predictions.

Fertilizing a cropping sequence posses problems because of one cannot always go for making a soil test on account of the shorter interval available between any two crops in the sequence. Thus, providing a basis for assessing the fertilizer needs of all the crops in the sequence from the initial soil analysis will be of immense use to the farmers for ensuing scientific farming. In the past, researchers have made attempts to provide such basis for fertilizing cropping sequences (Gangwar, 1987). The paper attempts to propose a basis for rice - groundnut - blackgram sequence which is followed in the Lower Bhavani Project ayacut area of Tamil Nadu which constitutes 83,000 hectares.

Table 1. Quantity of fertilizers, (Kg/ha) applied to rice, groundnut and black gram

Levels	Rice	Groundnut	Blackgram
Nitrogen (as N)	0	0	0
N_0	34	14	7
N_1	74	125	13
N_3	110	35	18
N_4	146	45	23
N_5	187	56	29
Phosphorous (as P)			
P_0	0	0	0
P_1	4	4	3
P_2	15	15	12
P_3	25	25	20
P_4	35	35	28
P_5	46	46	37
Potassium (as K)			
K_0	0	0	0
K_1	6	6	3
K_2	24	24	12
K_3	40	40	20
K_4	56	56	28
K_5	74	74	27

Table 2. NR*, α* and β* for rice, groundnut and black gram

Nutrient and P Parameters	Rice	Groundnut	Black gram
Nitrogen			
NR	30.55	0.0682	0.04
α	0.05	0.9998	0.22
β	0.64	0.9613	0.21
Phosphorous			
NR	7.63	0.0093	0.004
α	0.95	0.9125	0.39
β	0.52	0.6308	0.02
Potassium			
NR	31.20	0.0459	0.013
α	0.41	0.6557	0.08
β	0.59	0.2813	0.08

* NR = Nutrient requirement α = Soil nutrient efficiency factor β = Fertilizer nutrient efficency factor.