IMPACT OF UREA INTEGRATION WITH DIFFERENT ORGANIC MANURES ON C:N RATIO IN SANDY REGOSOL

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Introduction

Sandy regosol is one of the soil groups existing in Eastern province of Sri Lanka. They are sandy in nature and require intensive nutrient management for cultivation. The over use of chemical fertilizer destroys the soil structure, turn the soil acidic and bring nutrient imbalances resulting in nutrient interactions (Ariyaratne, 2008).

Application of organic manures to the field as sources of nitrogen can play a major role in maintaining fertility of the soil. Availability of nitrogen from organic sources is mainly influenced by the rate of mineralization. Nitrogen mineralization is a microbiological process in which C:N ratio is an important factor affecting the rate of mineralization (Mueller *et al.*, 1998). Soil microorganisms decompose and metabolize organic substances, contribute to storage and supply of important nutrients such as nitrogen and phosphorous, for crop production.

The present study was undertaken to ascertain the effect of organic amendments and combination of organic amendments with inorganic fertilizers on C:N ratio in Sandy Regosol.

Methodology

The laboratory incubation study was conducted at Eastern University, Sri Lanka which is located in the low country, dry zone of Sri Lanka. The soil used in this study was sandy regosol (pH 6.9, C 0.47%, N 0.0356%). In sole treatment, different rates of organic materials: farmyard manure (45.5g), compost (109.69g), and paddy straw (51.64g) were selected to supply N equivalent of nitrogen from 10 tons/ha of farmyard manure, and their C:N ratio was 26:1, 19:1 and 63:1 respectively. And those organic manures combined with urea to maintain the C: N ratio to the level of 15:1. These seven treatments including control were replicated three times in a completely randomized design.

Incubation experiment: Ten Kg of sieved (2mm) and air dried soil was mixed with respective treatment materials and filled in black polythene bags. They were incubated for 10 weeks and kept moist during the incubation. The soil analysis was carried out at 2weeks intervals to measure total N and organic carbon content by Kjeldhal method (Jackson, 1973) and chromic acid wet digestion method (Black and Walkly, 1934) respectively. Data were analyzed using SAS statistical package and treatments means were separated in Duncan's multiple range test (DMRT).

Discussion and Conclusion

The results indicated that there was significant influence of nitrogen sources on carbon to nitrogen ratio of soil at 2nd, 6th and 10th weeks of incubation as P value is less than 0.05.

The results revealed (Table:1) that at 2nd week of incubation the soil C:N ratio was higher in sole organic manures and its combination with urea than control. This may be due to the different carbon content and decomposition rates of applied organic materials. This may be

due to higher organic carbon and total nitrogen % in soil due to organic amendment addition. This was supported by Singh *et. al.*, (1981).

Table 1: Effect of nitrogen sources on soil C:N ratio

Nitrogen sources	**C:N ratio**		
	2nd week	**6th week**	**10th week**
Farmyard manure	37.5[b]	14.0[b]	7.0[b]
Compost	15.0[f]	9.3[c]	7.0[b]
Paddy straw	76.3[a]	48.3[a]	16.7[a]
Farmyard manure + urea	13.3[f]	6.0[d]	4.0[d]
Compost + urea	10.3[g]	5.0[d]	4.0[d]
Paddy straw + urea	18.7[d]	7.3[dc]	5.0[c]
Control	9.0[g]	7.3[dc]	7.0[b]

Means followed by the same letter within the column are not significantly different according to the DMRT at 5% level.

Among the treatments, soil amended with paddy straw registered significantly highest value of C:N ratio. This may be due to the slow decomposition rate of paddy straw, because of its high lignin and cellulose and low protein content (FAO, 1977). It may be also resulted due to more unhydrolyzable carbon content of paddy straw (Nicolardot *et al.*, 2001). FYM amended soil recorded higher values of C:N ratio due to their slow decomposition rate (supported by Singh *et al.*, 1981) than compost amended soil. Similar trend was observed in 6th week of incubation also. In 10th week of incubation, the C:N ratio was 7 in sole farmyard manure and compost treatments and was comparable with the control. This may be due to the stabilization of C:N ratio of soil to a constant value (Dilip Kumar das, 1996).

Among the treatments combining urea with organic manure, significantly highest C:N ratio was recorded in paddy straw + urea combination at initial stage (2nd week) of incubation. This indicates that the straw has the potential to slowdown the microbial activity even though additional nitrogen is added along with them. This may due to its high recalcitrant carbon content and lower moisture content. At all three stages of incubation combining urea with FYM, straw and compost the C:N ratio was maintained within the narrow range (< 20:1). This may be due to addition of urea which enhances the nitrogen content of the soil. At 6th week of incubation similar trend was observed, but there was no significant difference. At 10th week of incubation, lower C: N ratio was recorded; this may be due to increased C and N mineralization. This was supported by (Goyal *et al.*, 1999).

The results revealed that the C:N ratio of soil received sole organic manures was significantly lower than the soil received manure and urea combination, this may be due to addition of urea which enhances the soil nitrogen content. This was supported by Ariyaratne, (2008).

The results revealed that among the organic sources, C:N ratio was higher in paddy straw in all stages of incubation whereas compost recorded least value. Among the organic manure urea combinations, C:N ratio was higher in paddy straw urea combination in all stages. The results also indicated that the integration of organic manures along with inorganic fertilizer reduced the C:N ratio than their sole application.

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