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Influence of Composts Made from Locally Available Aquatic Weeds on Growth, Yield Attributes and Yield of Rice (Oryza sativa L)

Key words : Aquatic weeds, Composts, Growth, Yield

The low efficiency of nitrogen utilization by cereals, especially rice is a matter of great concern, since rice alone accounts for nearly 40 per cent of total fertilizer N consumption in India. However, present estimates indicated that fertilizer can provide only a portion of total quantity of nutrients removed by the crops and roughly 75 to 80 per cent of the nitrogen requirement will have to be met from the sources other than the fertilizers. In view of the deteriorating soil health, there is an imperative need to maintain the soil organic matter. Aquatic weeds contain higher percentage of nutrients than FYM (Geetha, 2009). Thus, these weeds can be used as substitute of inorganic nutrients by proper composting in rice crop. In this context, weeds become alternative source wherein, they can be composted and applied to the soil for maintenance of soil organic matter and improved productivity. The aquatic weeds such as *Ipomoea* and water hyacinth have greater fertilizer potential in tropical countries. They are large straggling shrubs growing luxuriantly in ponds, lakes and covering waste area throughout our country. Utilization of *Ipomoea* and water hyacinth from these places is an integrated management strategy, permitting at the same time reclamation of water body, free flowing water in drainage and irrigation channels and fertilization of the rice crop as organic manure. Composting is the best technique, which serves dual purpose. It yields good organic manure for sustainable agriculture and simultaneously reduced weed menace.

COMPOST PREPARATION

Locally available weeds *Ipomoea aquatic* and water hyacinth were collected from canals, and spread on the ground for two days. Later they were cut into small bits and pieces before they were filled in the pit. Two pits of 2 m x 2 m x 1m dimensions were prepared for composting. These pits were filled layer by layer with weed biomass material. Cow dung slurry was used to sprinkle between the layers to hasten up decomposition process. The trench was filled with weed material to a height of 1.6 to 2.0 ft (45-60 cm) above ground level. The top of heap was plastered with earth mixed cow dung. A turning was given once in two months in order to hasten decomposition. The composted material is ready for use within four months. Nutrient content of the compost samples were calculated using standard analytical methods.

A field experiment entitled "Effect of composts prepared from weeds on growth and yield of rice (*Oryza sativa* L.)" was conducted during *kharif* 2011-2012 at Agricultural College Farm, Bapatla. The experiment was laid out in a randomized block design with tree replications. Soil of the experiment site was clay loam in texture, slightly alkaline in reaction(pH 7.05),with 0.42% and 210,17.0 and 382.0 kg ha^{-1} N, P and K. *Ipomoea aquatica* and waterhyacinth compost used in the experiment contained 2.64% and 20.8% N respectively. The experiment was laid out in a randomized block design with eight treatments *viz*., (T1), Recommended dose of nitrogen (120 kg ha^{-1}) (T2), 75% RDN + 25% N through waterhyacinth compost (T3), 75% RDN + 25% N through *Ipomoea* compost (T4), 50% RDN + 50% N through waterhyacinth compost (T5), 50% RDN + 50% N through *Ipomoea* compost (T6), RDN + waterhyacinth compost @ 5 t ha^{-1} and (T7), RDN + *Ipomoea* compost @ 5 t ha^{-1} (T8), RDN + FYM @ 5 t ha^{-1}. Recommended dose of 60 kg P_20_5 and 40 kg K_20 ha^{-1} was applied uniformly to all plots. A very popular variety BPT 5204 (Sambamahsuri) was used for the study. It was released by Acharya N G Ranga Agricultural University in 1986. Half of potassium was applied basally through murate of potash and remaining half was applied at maximum tillering stage. Entire dose of phosphorus was applied basally through single super phosphate. While applying composts prepared from weeds, the

nitrogen content was taken into account and remaining nitrogen was applied through urea as per the treatments. Combination of urea and weed composts was applied as per the treatments in three splits, 1/2 as basal, 1/4 at maximum tillering and 1/4 at panicle initiation stage.

GROWTH PARAMETERS

Plant height, number of tillers and dry matter accumulation was significantly increased with application of 5 t ha^{-1} of weed compost over and above the 100% RDN compared to other treatments. 25% replacement of RDN by weed composts (T2 and T3) and 50% replacement of RDN by *Ipomoea* compost (T5) treatments. The combined use of weed biomass along with urea maintained the nitrogen status in soil throughout the crop growth period because of the availability of N during vegetative phase of crop through urea and during the lateral stages of crop growth through organic sources which in turn, might have facilitated fast vegetative growth and finally more plant height. These results are in agreement with the findings of Ahmed *et al.* (1990), Budhar *et al.,* (1991) and Raju *et al*.(2001). The maximum number of productive tillers in compost treated plots might be due to the combined application of weed composts along with fertilizer N, which might have increased the nitrogen use efficiency and ultimately showed the maximum influence on the yield attributing characters, as evident in the present study and is in agreement with the findings of Krishna Murthy (2011). This might have created favourable conditions for vigorous and luxuriant vegetative growth which may resulted in higher drymatter accumulation. Similar increase in drymatter with combined application of weed compost and chemical fertilizers were also reported by Rahman *et al.* (2006).

YIELD:

The higher grain yield (5419 kg ha^{-1}) straw yield (6351 kg ha^{-1}) was obtained with the application of 100% RDN through fertilizer + *Ipomoea* compost @ 5 t ha^{-1} through organic sources (T7), which however was comparable to that of combination of 100% RDN through fertilizer + waterhyacinth compost @ 5 t ha^{-1} through organic sources (T6), but proved significantly superior to rest of the treatments, however, comparable to that of combination of 100% RDN through urea + waterhyacinth compost @ 5 t ha^{-1}. Additional yield obtained might not be only due to nutrients supplied by the organic wastes but also due to the effect on better utilization of N applied through inorganic sources on account of improved micro environmental conditions in the rhizosphere. These results are in tune with the findings reported by Ray and Mukherjee (1982) and Singh and Thakur (1990). Reason for increase in straw yield with increase in organic sources and inorganic N-source over RDN might be attributed due to higher plant

Table 1. Influence of compost on growth characteristics of rice as influenced by different treatments at maturity.

Treatments	Plant height (cm)	Total number of tillers m^{-2}	Drymatter accumulation (kg ha^{-1})
Recommended dose of nitrogen (120 kg ha^{-1})	76.8	360	9400
75% RDN + 25% N through waterhyacinth compost	83.9	392	10462
75% RDN + 25% N through *Ipomoea* compost	84.5	411	10609
50% RDN + 50% N through waterhyacinth compost	82.8	365	9915
50% RDN + 50% N through *Ipomoea* compost	83.1	381	10298
RDN + waterhyacinth compost @ 5 t ha^{-1}	92.3	467	11968
RDN + *Ipomoea* compost @ 5 t ha^{-1}	96.8	488	12275
RDN + FYM @ 5 t ha^{-1}	85.1	419	10824
SEm (±)	3.5	23	452
CD (P=0.05)	10.7	69	1370
CV (%)	7.2	9.6	7.3

Table 2. Influence of compost on growth characteristics of rice as influenced by different treatments at maturity.

Treatments	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})
Recommended dose of nitrogen (120 kg ha^{-1})	3998	5026
75% RDN + 25% N through waterhyacinth compost	4563	5489
75% RDN + 25% N through *Ipomoea* compost	4614	5572
50% RDN + 50% N through waterhyacinth compost	4300	5300
50% RDN + 50% N through *Ipomoea* compost	4456	5486
RDN + waterhyacinth compost @ 5 t ha^{-1}	5238	6240
RDN + *Ipomoea* compost @ 5 t ha^{-1}	5419	6351
RDN + FYM @ 5 t ha^{-1}	4782	5592
SEm (±)	208	240
CD (P=0.05)	632	728
CV (%)	7.7	7.4

height ,higher drymatter accumulation and increased number of tillers per unit area. Similar results were also reported by Alam and Azmi (1990) and Rajput and Warsi (1991).

Influence of compost made from locally available aquatic weeds on rice revealed thet application of RDN through fertilizer+Ipomea compost @5 t ha^{-1} as organic source is best for higher growth, yield attributes and yield of rice over application of 120 kg N ha^{-1} though urea alone.

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Department of Agronomy,
Agricultural College,
Bapatla 522101
Andhra Pradesh

G Neelambar
K Mosha
K Chandra Sekhar
Y Ashoka Rani

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