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Influence of *Ipomoea muricata* (L)Jacq. Weed Manure on The Aerial Biomass of Maize Crop

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Abstract:*In India agriculture was traditionally organic till the 1950. The green revolution was ushered in country during sixty and transformed the stage of food deficiency to self-sufficiency. Fertilizers no doubt increased the quantity of yield and reduced diseases but continuous use of chemical fertilizers causes several side effects on soil. Soil becomes hard and impervious to water. Maintenance of soil fertility is now prerequisite. Organic farming is the solution. There are several organic components which are the good source of organic manure. Weed biomass available abundantly. Weeds are considered as unwanted plants and are competitors to the crop plants. There are several methods to control the weed. The best way to control weed is to make use of it. Ipomoea muricata (L). Jacq. is large herbaceous twiner commonly called as Bhowari in Marathi. It is common weed grow luxuriously on waste land. Present investigation deals with utilization of Ipomoea muricata weed as a source of organic manure and its influence on the aerial biomass of maize. various types of Ipomoea muricata weed manures like Compost, Dry Leaf manure, Green Leaf manure, Mixed manure (equal amount of Ipomoea muricata +Euphorbia prunifolia+Trianthema portulacastrum) are prepared and compared with NPK and Control treatment to maize crop field. Crop was harvested after 87 days of sowing. Samples from each treated plots collected and analysed as total aerial biomass, Dry weight, Reducing Sugar, Nitrogen, Crude protein and nitrogen efficiency ratio. All the nutrient contents show high amounts in weed manure amended samples of Maize as compared to NPK and control treatment.*

Keywords: Weed Manure, *Ippomoea Muricata*, Maize, Soil Fertility, etc.

I. Introduction

Ipomoea muricata (L)Jacq. is common weed grow luxuriously on waste land. Huge biomass available in rainy can be used to prepare manure by various way. In this investigation attempts have been made to study the effect of various types of *Ipomoea muricata* manure and compared the fresh vegetation of *Ipomoea muricata* as green manure, dry leaf manure, compost, mixed manure (with equal amount of *Ipomoea muricata(L) Jacq. + Euphorbia prunifolia Jacq. +Trianthema portulacastrum L.*) with NPK and CON treatments on yield and nutrient uptake of maize as a test crop.

II. Materials And Methods

Field Experimental Design-

The field experiment design was a randomized block design (RBD) with six treatments and four replicates viz. Compost(COM), Mixed Compost(MIX), Dry Leaf Manure(DLM),Green Manure(GM),NPK, Control(CON).

Treatments, Composting Process and Plot Size-

The fresh vegetation of *Ipomoea* was collected from different sites early hours of the day at 10-20% flowering stage and brought to laboratory, cut into small pieces by the cutter (wili). The weed plant material was incorporated into the plots at the rate of 13333 kg/ha-1 about 15cm deep in the soil as green manure (GM). The same amount of vegetation was used for the preparation of compost (COM) and Dry leaf manure (DLM). For mixed (MIX) compost treatment three weeds i.e.,*Ipomoea muricata + Trianthema portulacastrum + Euphorbia prunifolia* (with 1:1:1 proportion) were used. The known weight of plant material was evenly spread in the pits for compost and mixed compost of about 5cm thickness. Alternate layers of soil and dung was added along with water was sprinkled in order to maintain the optimal

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moisture (50-70%) over the material. after 60 days manure was weighed and were applied to appropriate plots including fertilizers (100% NPK) and unfertilized control. The manure samples (100g) of each treatment were collected in duplicate before materials were applied to the plots and kept in oven at 900C (for 48 hr.) for dry weight and nutrient analyses.

Application of Mineral Fertilizers-

The fertilizers were supplied as nitrogen (N), phosphorus (P) and potassium (K) through urea, single super phosphate (SSP) and muriate of potash at the rate of 120, 80 and 40 kg ha-1 to all the treatments except absolute Control (CON). Whole amount of P2O5 and K2O was applied as a basal dose at the time of cultivation for all the plots and N was applied in two equal splits at 35 and 57 days after sowing (DAS) to fertilizer treatment.

The results of organic amendments are summarized in (table 1 and 2). The Maize (Zea mays L. cv. African Tall) produced by Mahendra hybrid Seeds Co. Ltd.; Jalna was sown at the rate of 100 kg ha-1. Plots consisted of nine rows spaced 3o cm apart and with the size of the plot was 3 x 3 m2. In order to ensure uniform population density and plant to plant spacing within a row per plot was maintained either transplanting extra seedlings or thinning in the dense population area.

Plant Sampling-

The crop was harvested during the early hours of the day at 10-20% flowering stage. At the time of harvest, total yield of maize crop per plot was recorded Davys and pirie, (1969) and samples (100g) from each plot were randomly collected. The samples were oven dried at 900C for 2 days and dry matter (DM) was determined. The dried samples were grinded passed through 0.5 mm sieve and packed for analyses of nutrient uptake.

III. ANALYSIS

Chemical Analyses-

The chemical analyses were done by adopting standard analytical methods. Ash values were obtained by burning the moisture-free samples in a muffle furnace at 600oC for 2 hours and calcium (Ca) content was analyzed by titrating the sample against 0.01 N KMno4 solution (AOAC, 1995). Nitrogen (N) was estimated by micro-kjeldahl method after digesting the sample according to Bailey (1967) and crude protein (CP) calculated by multiplying N value with 6.25 as specified by AOAC, (1995).

Reducing sugar (RS) was determined by reacting the sample with phosphomolybdic acid and the color intensity was read at 420 nm (Oser, 1979) and phosphorus (P) was analyzed by reacting the sample with ammonium molybdate solution at 660nm following by Fiske and Subba Rau (1925) as described by Oser (1979). Potassium (K) content was determined on a flame photometer (model Mediflame-127) as suggested by Jackson, (1973).

Statistical Analysis-

All the results were statistically analyzed using analysis of variance (ANOVA) test and treatments means were compared using the least significant difference (CD, $P \leq 0.05$) which allowed determination of significance between different applications (Mungikar, 1997, 2003).

IV. RESULT AND DISCUSSION

Analyses of Organic Amendments:

A) Analysis of Weed

Table 1. Shows the analysis of *Ipomoea muricata* weed and mixed weeds (*Ipomoea muricata* + *Euphorbia prunifolia* + *Trianthema portulacastrum*). The Dry matter of *Ipomoea* weed was more 1771 kg/ha and Mixed weed was with less Dry matter 1529 kg/ha. Nitrogen was more in *Ipomoea muricata* weed (44 kg/ha), while mixed weed shows 32kg/ha. Percentage of Ash, P, K and Carbon was more in *Ipomoea* weed than mixed weeds while C: N ratio was more in Mix weeds.

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Table 1: Analysis of Weeds

Treatments	Fresh wt.kg/ha		Dry Matter		Nitrogen		Percentage				C/N Ratio
	kg/plot.	kg/ha	%	kg/ha	%	kg/ha	Ash	P	K	Carbon	
Ipomoea muricata	12.000	13333	13.29	1771	2.50	44	15.50	0.53	0.54	8.99	3.60
MIX (IPO+EUP+TRI)	12.000	13333	11.47	1529	2.12	32	13.65	0.48	0.47	7.92	3.80

B) Analysis of Weed Manures

Table 2. shows the analysis of various manures prepared from *Ipomoea*. The fresh amount of weed used for different manure preparation was same. Dry matter (kg/ha) was found more in the MIX (6029.97) followed by COMP (5444.43 kg/ha), DLM (1879.95 kg/ha) and less in GM (1771.95 kg/ha). Nitrogen kg/ha was more in MIX compost and DLM with similar values (45 kg/ha) followed by GM (44 kg/ha) and less in COM (41 kg/ha). Nitrogen gets reduced during the compost process. The lignin and cellulose in organic material is insoluble and nitrogen present in lignin humus complexes, formed by microbial activity in the composting process is not available unless lignin breakdown that result in nitrogen loss (Crowford, 1985).

Ash and Carbon percent was more in COM followed by MIX, DLM and less in GM. Percentage of P was more in GM followed by DLM, COM and less in MIX compost. K percent was more in GM followed by DLM and less in COM and MIX compost. Various organic feed stocks have been successfully composted with C:N ratios varying from about 17 to 78 (Mc Gaughey and Gotass, 1953) a much narrower range of ratio between 25 to 35 is considered desirable (Hamoda *et al.,* 1998; Schulze, 1962b). The concern at low C: N ratios is the loss of ammonia (NH3) (Morisaki *et al.,* 1989) but at higher levels slow rates of decomposition can be anticipated (Finstein and Morrris, 1974). In this experiment C:N ratio was more 37.85 in COMP, followed by MIX 35.76, DLM 4.22 and less in GM treatment.

Table 2: Analysis of *Ipomoea muricata* Weed Manure

Treatments	Fresh wt.kg/ha		Dry Matter		Nitrogen		Percentage				C/N Ratio
	kg/plot.	kg/ha	%	kg/ha	%	kg/ha	Ash	P	K	Carbon	
COM	7.00	7778	70.00	5444.43	0.75	41	48.95	0.13	0.11	28.39	37.85
MIX	7.50	8333	72.36	6029.97	0.75	45	46.25	0.07	0.11	26.82	35.76
GM	12.00	13333	13.29	1771.95	2.49	44	15.50	0.53	0.54	8.99	3.60
DLM	12.00	13333	14.10	1879.95	2.42	45	17.60	0.34	0.52	10.21	4.22

C) Analyses of Maize Crop

The average yield (kg/ha) of fresh aerial biomass of maize was highest in the plots received with COM (22361 kg/ha) amendments (Table 3) followed in order by MIX (20417 kg/ha), DLM (19028kg/ha), GM (18889 kg/ha), NPK (17778 kg/ha) and lowest in unfertilized treatments (8611 kg/ha) (Table 4). Similar trend was observed with respect to dry matter (Table 3) where COM (5203 kg/ha) amendments followed in order by MIX (4913 kg/ha), GM (4272 kg/ha), DLM (4075 kg/ha), NPK (3730 kg/ha) and lowest in unfertilized treatments (1479 kg/ha) (Table 3). Better yield performance of maize grown on plots amended with weed compost might related to sufficient availability of nutrients in soil added by weed biomass. N. setyowati et al., (2015) recorded highest yield in *Brassica sinensis* L. amended with weed organic manure. Reducing Sugar was superior in COM (363 kg/ha), MIX (350 kg/ha), GM (301 kg/ha), DLM (265 kg/ha), NPK (211 kg/ha) and CON (81 kg/ha) (Table 3).

Nitrogen kg/ha was maximum in COM (93.09 kg/ha), MIX (79.76 kg/ha), GM (64.06 kg/ha), DLM (63.51 kg/ha), NPK (62.15 kg/ha) and CON (16.65 kg/ha). Similar trend was observed in Crude protein (Table 3).

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Similar results were recorded by Naikwade *et al*., (2011) in the maize crop amended with *Ipomoea muricata* manure prepared by various methods of compost.The Percentage of Ca (Table.4) was more in COM followed by MIX and DLM with similar value, GM, NPK and less in CON. K was more in COM and GM with similar value followed by NPK, DLM and MIX with similar value and less in CON. The P was greater for DLM based application followed in order by COM, MIX, NPK, GM and least in control plots.Patra *et al*. (2000) proved that organic manure contains high content of Nitrogen and phosphorus. Slow and sustainable availability of the nutrients can occur in various crops. Same results were obtained by Chand *et al*. (2001).

Table 3: Analysis of Total Aerial Biomass of Maize Plants (Age of crop:87 DAS)

Treatment	Fresh wt.		Dry wt.		Reducing Sugar		Nitrogen		Crude Protein
	kg/plot	kg/ha	%	kg/ha	%	kg/ha	%	kg/ha	kg/ha
COM	20.13	22361	23.29	5203	6.98	363	1.77	93.09	582
MIX	18.38	20417	23.99	4913	7.11	350	1.62	79.76	498
GM	17.00	18889	22.64	4272	6.94	301	1.49	64.06	400
DLM	17.13	19028	21.29	4075	6.49	265	1.56	63.51	397
NPK	16.00	17778	20.75	3730	5.63	211	1.67	62.15	388
CON	7.75	8611	18.03	1479	5.37	81	1.15	16.65	104
SE	1.76	1956		541		42.80		10.55	65.91
CD (P=0.05)	4.52	5027		1389		110.01		27.10	169.40

Table. 4: Analysis of Total Aerial Biomass of Maize Plants (Age of crop:87 DAS)

TREATMENT	Percentage		
	Ca	P	K
COM	0.42	0.17	0.22
MIX	0.33	0.13	0.17
GM	0.31	0.11	0.22
DLM	0.33	0.18	0.17
NPK	0.26	0.12	0.21
CON	0.22	0.11	0.15

On the basis of statistical analysis all the values of Fresh yield kg/ha, Dry matter kg/ha, reducing sugar kg/ha, Nitrogen kg/ha and Crude kg/ha are significant over control ($p > 0.05$).

Percent Increase Over Control

The percent increase over control for fresh weight kg/ha was maximum with the amendment of COM (160) (Figure1) followed in order by MIX (137), DLM (121), GM (119) treatments and minimum in NPK (106) applied plots. Dry matter was highest in COM (252) treatment followed by MIX (232), GM (189) DLM (176) and observed lowest in NPK (152) treated plots (Figure1). Similar trend was recorded in N yield (Figure1).

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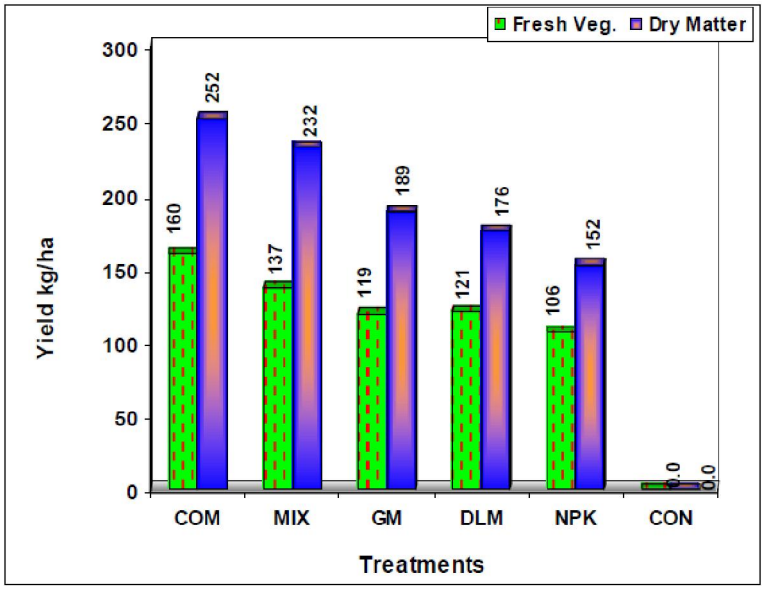

Figure 1: Percent Increase Over Control

Nitrogen Efficiency Ratio

The nitrogen efficiency ratio was highest in the plots treated with COM (335kg/ha) followed by MIX (262kg/ha), GM (234kg/ha), DLM (231kg/ha) amendment and lowest in NPK (76kg/ha) treatment (Figure 2) where N was supplied through urea. The nitrogen efficiency ratio for Dry matter was highest in the plots treated with COM (90.84kg/ha) followed by MIX (76.31kg/ha), GM (63.48kg/ha), DLM (57.70kg/ha) amendment and lowest in NPK (18.76 kg/ha) treatment where N was supplied through urea (Figure 2).

The amount of Nitrogen mineralized from organic sources in the cropping season provides a major portion of the plant Nitrogen need. Appropriate timing of nutrient release from the soil manure system to meet crop demand will therefore ensure sufficient nutrient supply and avoid loss of nutrients to the environment (Ofosu Anim *et al.* 2009).

All the results are calculated on the dry matter basis and the values are the means of four replicates. These results are statistically significant over the control.

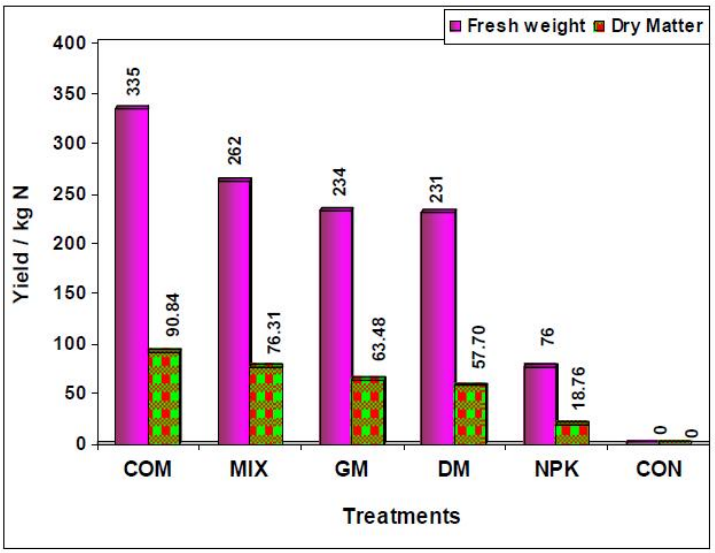

Figure 2: Nitrogen Efficiency Ratio

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V. CONCLUSION

Different types of manure prepared from the weed *Ipomoea muricata* shows their efficiency more comparing to chemical fertilizer (NPK) and the control treatments.The data in this experiment reveals that the yield of maize crop increased significantly due to the amendments of *Ipomoea muricata* manures. Among various *Ipomoea* weed manure applications Compost (COM) is the most efficient as it shows superior results in all nutrient uptakes followed by mixed compost gives better yield of Maize crop after 87 days. Composting, Mixed composting working with high efficiency and increase the Fresh yield, Dry matter, Reducing sugar, Nitrogen and Crude protein yield kg/ha. Manures result in a slow release of nitrogen from soil due to its specific nutrient supplying properties. A reason for the superiority of manures is due to balance plant nutrition to meet the need of crops good quality. It improved the nitrogen supplying property to avoid negative effect of excessive use of N on the quality.

Ipomoea manure enhance the nutrient uptake in maize crop, without any adverse effect. Composition of various weeds for manure preparation proved good source as mix weed compost. Dry leaf manuring is the easier, convenient and safer method of manuring the weeds are available in large quantity at that time they may not be required or used but it can be utilized in future by drying it whenever they are available in plenty amount. All weeds may not be recommended for green manure but *Ipomoea* green manure proves better option for synthetic fertilizer.

Hence the practice of *Ipomoea* manuring i.e., composting, mix composting and application of Dry leaf manure followed by green manure will certainly helpful to reduce the use of chemical fertilizers and increase the organic area.

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