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Effect of supplementation of *Eichhornia crassipes* biomass manure on efficacy of other organic manures on the growth of *Triticum aestivum*

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ABSTRACT

The aquatic weed *E. crassipes* was taken for investigation as a potential source for production of organic fertilizer. It was initially supplemented with organic manures viz. cow dung and poultry manure to study the efficacy of prepared manure. The comparative studies were performed on different types of soils. Different physicochemical and physical parameters of plant growth were determined. Results with saline soil showed an interesting effect on growth of wheat plants. The results were highly promising and proved to show better effects on the growth of wheat plants. The addition of *E.crassipes* organic manure increases the organic content of red soil to the extent of 20.7%, black soil to the extent of 20.5% and saline soil to the extent of 15.5%. The aquatic weed water hyacinth may be a low cost alternative source of organic fertilizer in plenty full supply. The possible ways of combating its proliferation and the various methods of eradicating this weed not proved much. Then its utilization may become an eary way of its management. The results also signify the use of *E. crassipes* as the organic manure. The study of water hyacinth as biofertilizer revealed that the incorporation of water hyacinth into soil crops system increased the performance of the wheat plant. Since water hyacinth is locally available, plentiful and cost free, its effective use as organic soil amendment would be an interesting method for soil restoration. Its use for manure preparation will help get rid of this notorious weed which causes aquatic environmental pollution problems.

***Key words**: Organic manure, Eichornia crassipes, Cow dung manure, soil*

Introduction

Eichhornia crassipes (Mart.) Solms-Lau bach commonly known as water hyacinth belonging to the family Pontederiaceae is listed as one of the most productive plants on the earth and is considered the world's worst aquatic weed

The socalled"menace and nuisance" has tremendous potentiality of high rates of vegetative growth (Penfound *et al.*, 1948). This macrophyte is one of the most invasive aquatic weeds in the world. (Maine *et al.*, 1999) causing a serious hindrance to nations development activities. The plant is now considered as a serious threat to biodiversity. Cow dung provides high levels of organic materials and rich in nutrients. It contains about 3 percent nitrogen, 2 percent phosphorous, and 1 percent potassium (3-2-1 npk). In addition, one of the other advantages is that it is very useful for the farmers to use for preparationof cow dung manure because it contains high levels of ammonia which is potentially dangerous for pathogens. Poultry manure is the organic waste material from poultry consisting of animal feces and urine. Poultry manure is an excellent fertilizer material

because of its high nutrient content, especially for nitrogen (N), phosphorus (P), and potassium (K). In addition to supplying nutrients, poultry manure or litter serves as a soil amendment increasing the soil organic matter content. Thus, the present study was aimed to study the effect of supplementation of Water Hyacinth *(Eichornia crassipes)* biomass manure on efficacy of other organic manures on the growth of wheat plant *(Triticum aestivum)*

Materials and Methods

Sample Collection

Eichhornia crassipes was collected from the Rankala lake (Kolhapur Maharashtra, India) brought to the laboratory for further processesing. Poultry manure and cow dung manure was collected from Shahu poultry farm Warananagar (Kolhapur Maharashtra, India) and local farm nearby Karad (Satara, Maharashtra, India).

Processing and preparation of water hyacinth manure

E. crassipes plant material was cut into small pieces by mechanical grinding. The supplementation of other organic manure with *E.crassipes* for composting was done in the following combinations in triplicates.

1. 400 g of soil added with 200 g of *E. crassipes* biomass and 200 gm of poultry manure.
2. 400 g soil added with 200 g of *E. crassipes* biomass and 200 g cow dung manure.
3. 400 g soil added with 400 g of *E. crassipes* biomass. These pots were kept for composting for thirty days under shade. Water was sprinkled every day in order to retain moisture content.

Production of Organic manure

The plastic pots of equal sizes (13 cmx 11cm) were taken and were divided equally for control as well as experimental sets. The water hyacinth manure, the water hyacinth and poultry manure, the water hyacinth and cow dung manure was mixed with red soil, black soil and saline soil in 1:2 ratios and filled in the pots. Fifty wheat per pot seeds were sown in these pots and were allowed to germinate for fifteen days. A control set without manure was also maintained. The experiment was conducted in triplicate and average values were recorded for thirty days.

The supplemented organic manures with *E. crassipes* were tested for its efficacy on the growth of wheat plant with different concentrations of organic manure in different set of soils (red soil, black soil & saline soil). The preliminary parameters were studied on wheat plant as percentage germination, average root length, shoot length, root shoot ratio, fresh weight and dry weight of seedlings. The physiological parameters analyzed were reducing sugar and protein content of leaves according to standard protocols of Benedict's reagent (qualitative) and (Lowry *et al.*, 1950). Soil analysis was done for the parameters of pH, moisture content and organic matter content.

Results and Discussion

The results showing the effect of supplementation of *E. Crassipes* with the organic manure and its effect on the various parameters of growth of wheat plant are shown in Table 1.

It can be seen from Table 1, that addition of *E. crassipes t*o red soil enhances root length but has no effect on shoot length, *E. crassipes* to black soil enhances shoot length and reduce to some extent the root length or almost no effect on root length. It can be seen from the Table that addition of *E. crassipes* to saline soil shows equal root and shoot length.

The results of physico-chemical parameters on the soil is given in the Table 2.

The results showing the protein and sugar content of the organic compost are shown in Table 3.

It can be seen from Table 2, 3 and Fig. 2 that addition of *E. crassipes* organic manure increases the organic content of red soil to the extent of 20.7%, black soil to the extent of 20.5%. The protein content and reducing sugar content of the plants gave no significant variation. This indicates that there is no reduction in the nutritive value of the test plant. The comparative studies were performed on different types of soils. The results were highly promising and proved to show better effects on the growth of

Photograph 1. Showing the effect of produced organic manures on thegrowth of wheat plants.

wheat plants. Different physicochemical and physical parameters of plant growth were determined. Results with saline soil showed an increase in root / shoot length and germination % of the seedlings. The organic content of soil was also enhanced. The aquatic weed water hyacinth may be a low-cost alternative source oforganic fertilizer in plentyfull supply. The present study revealed that the application of water hyacinth manure had significance influence on the growth attributes and yield of the wheat plant when compared to control. There was a significant increase in the percentage of germination, average fresh weight, dry weight, and biomass, root and shoot length when compared to control. All parameters had higher values as compared to control in case of wheat plants as well as soil. The simi-

Table 1. Results of effect of various types of manures on wheat plant growth (physical parameters after 30 days of experiment)

Sr. No.	Sample pot	% Germination	Average Fresh wt(g) seedling	Average Dry wt(g) seedling	Average Shoot lengh (cm) seedling	Average Root-length (cm) seedling	Root/ shoot ratio seedling
1	Contro l black	100%	6.250	1.050	17	10	0.588
2	Poultry manure +cow *dung*+*E. crassipes* + saline soil	100%	22.900	2.850	23	6	0.260
3	Cow dung+black soil	100%	14.00	1.700	22	6	0.272
4	Poultry manure+red soil	100%	16.00	1.400	22	5	0.227
5	Poultrymanure+cowdung+*E.crassipes* +black soil	100%	24.850	2.500	25	10	0.4
6	Control saline	96%	7.850	0.850	15	5	0.333
7	*E. crassipes* +black soil	100%	19.250	2.100	23	9	0.391
8	*E. crassipes* +saline soil	98%	10.200	1.500	15	6	0.4
9	Cow dung+red soil	100%	15.00	1.400	21.5	7.5	0.348
10	Poultry manure+saline soil	100%	12.950	2.250	18.5	7.2	0.389
11	Poultry manure +cow dung + *E. crassipes* + red soil	100%	23.500	2.850	27	2.5	0.092
12	*E. crassipes* + red soil	100%	17.150	1.900	20.6	7.6	0.368
13	Cow dung + saline soil	100%	17.550	1.450	22.3	10.3	0.461
14	Poultry manure+black soil	100%	18.950	1.850	22.6	7.3	0.323
15	Control red soil	100%	15.200	4.450	20.6	5	0.242

Table 2. Results of physico – chemical analysis of soil

Sr. No.	Sample pot	pH	Moisture content(%)	Organic matter (%)
1	Control black	7.0	28.5	20.8
2	Poultry manure+ cow dung + *E. crassipes* + saline soil	9.0	22.2	12.1
3	Cow dung + black soil	8.0	31	20.8
4	Poultry manure+red soil	8.0	26.1	10.3
5	Poultry manure+cow dung+ *E. crassipes* + black soil	7.0	30	10.3
6	Control saline	7.0	25.7	9.8
7	*E. crassipes* + black soil	9.0	28.1	41.3
8	*E. crassipes* + saline soil	7.0	26.9	10.3
9	Cow dung + red soil	8.0	33.1	31.0
10	Poultry manure + saline soil	8.0	22.8	41.3
11	Poultry manure + cow dung+ *E. crassipes* +red soil	7.0	24.4	10.3
12	*E. crassipes* + red soil	9.0	27.1	31.0
13	Cow dung + saline soil	7.0	29.6	20.8
14	Poultry manure + black soil	8.0	25.6	10.3
15	Control red soil	8.0	31.8	10.3

Table 3. Results of protein and sugar contents of shoot of wheat plant grown in different pots.

Sr.No.	Sample Pot	Protein Content	Sugar Content
1	Contro l black	0.3	1.0%
2	Poultry manure +cow dung + *E. crassipes* + saline soil	0.3	1.0%
3	Cow dung +black soil	0.3	1.0%
4	Poultry manure +red soil	0.3	1.0%
5	Poultry manure + cowdung + *E. crassipes* + black soil	0.3	1.0%
6	Control saline	0.3	1.0%
7	E.crassipes+black soil	0.3	1.0%
8	E.crassipes+saline soil	0.3	1.0%
9	Cow dung+red soil	0.3	1.0%
10	Poultry manure+saline soil	0.3	1.0%
11	Poultry manure+cowdung+E.crassipes+red soil	0.3	1.0%
12	E.crassipes+red soil	0.3	1.0%
13	Cow dung+saline soil	0.3	1.0%
14	Poultry manure+black soil	0.3	1.0%
15	Control red soil	0.3	1.0%

lar results were obtained in the average weight of the largest fresh taro produced dose of organic fertilizer water hyacinth 20 tons/ha, which amounted to 2.77 kg but not significantly different with treatment dose of organic fertilizer water hyacinth 15 tons/ha, in the amount of 2.69 kg. (8) Water hyacinth can be processed into compost, animal feed and the production of biogas (7) The statistical analysis of the data showed that both the allelopathic plants (water hyacinth and water lettuce) water extracts have affected the test species i.e. wheat, wild oat, and the milk thistle. Wheat and milk thistle has been greatly affected while wild oat has been less affected by the both allelopathic plants comparatively (10). These results show a near similarity to our results. Also the effect of the compost shows significant effect of growth on various kinds of soils used as test.

Increase in plant growth as a result of application

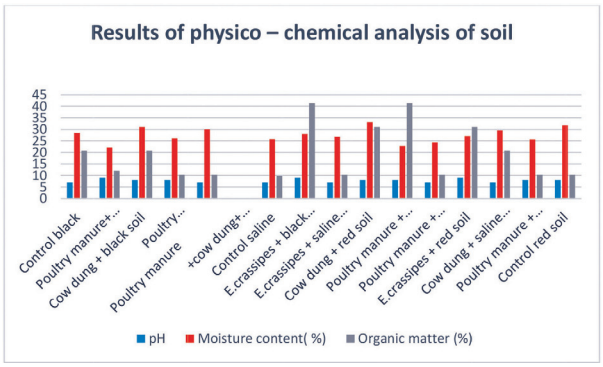

Fig. 2. Results of physico – chemical analysis of soil

of water hyacinth manure is expected in that manure contained and released considerable amount organic carbon for plant use during the process of mineralization. Composted water hyacinth material could serve as quality manure for improving soil fertility conditions and thus crop yields on the whole which is similar to the results shown by the present study (10).

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Conflicts of Interest

The authors declare that they have no conflicts of interest

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