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RECYCLING OF AN AQUATIC WEED WATER HYCINTH BY COMPOSTING METHOD

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ABSTRACT :

Water hyacinth is considered as a nuisance aquatic weed which spreads over the aquatic body and is an indicator species of pollution. Sambhaji tank is located in the heart of the Solapur city and is a site of recreation and the migratory birds regularly visit this water body. Because of urbanisation, the nearby colonies illegally discharge their effluents into the tank which results in the pollution of the lake. Because of enrichment of lake there is an enormous increase in the water hyacinth. It is essential to understand and recycle this aquatic weed by using appropriate decomposition method. In the present study an attempt has been made to understand the chemical composition of water hyacinth (Eichhornia crassipes) so that this aquatic weed waste can be recycled and reutilised properly.

KEYWORDS : *Sambhaji tank, Water hyacinth, Cow dung, Nutrient status.*

INTRODUCTION

Due to industrialisation and urbanisationpeople are migrating towards the headquarters of the district places and metropolitancities for better amenities and future prospective of jobs and education to their children. All these things are adding extra load to the pollution of the nearby areas. Due to natural run offs and also due to influx of the rain water the natural aquatic bodies are in great threat of pollution because of human interventions. The wetlands are treasures for human civilization. It is each and everyone's responsibility to protect the wetlands and nearby water bodies. Due to encroachment and in the name of beautification of the urban areas we are losing major water bodies in the big cities. Sambhaji tank is one of the natural water tank which is located in the Solapur city is presently at the great risk of sinking because of enrichment of nutrients in the tank resulted a mat of water hyacinth on the surface of this fresh water body. Various workers have studied the nutrient status of this aquatic weed to know the physical and chemical composition like pH, electrical conductivity, organic carbon, C: N ratio, nitrogen, phosphorous, potash, sodium, chloride, calcium and magnesium.

Emren Hossain *etal*., (2015) [7] studied the nutrient value of water hyacinth from Bangladesh. They further stated that the nutritional capacity of *Eichhorniacrassipes* is sufficiently good for using as a dietary supplement during drought conditions for livestock. NetaiMukuratirwa*et al*., (2016) [13] studied surface composition and surface properties of water hyacinth (*Eichhorniacrassipes*) root biomass and the effect of mineral acid and organic solvent treatment. Bhuvaneswary and Sangeeta (2015) [4] analysed physicochemical and structural composition of*Eichhorniacrassipes*fiber by using SEM and FTIR. The main objective of our study is to understand the nutritional composition of

Eichhorniacrassipes from Solapur region as this aquatic weed is growing in an uncontrolled manner from the fresh water tank. Our study is mainly directed to understand the role of cow dung as a natural decomposer and to observe the variations between original raw material and composted *Eichhorniacrassipes.*

MATERIALS AND METHODS

1.Study area: Sambhaji tank, Solapur. The surface of this tank remains always surrounded by water hyacinth.

2. Collection of sample: Water hyacinth plants from Sambhaji tank were removed manually and collected. Fresh urine free cow dung was collected from nearby livestock farm.

3. Preparation of sample: Collected water hyacinth plants were chopped into small pieces and allowed to sundry for about 15 days. These dried water hyacinth plants were crushed into small powder by using mechanical pulveriser.

4. Experimental set up: Decomposition were carried out by pot and heap method. Six pots of 5 kg capacity were taken for the experiments out of which 3 pots were filled with water hyacinth powder and it is subjected to decomposition.Another 3 pots were filled with mixture of water hyacinth powder and cow dung. Three heaps of 2x1x0.5meter size were prepared. For the preparation of heap, pebbles, cow dung and water hyacinth powder were used. In heap method starting from bottom the layers of pebbles, water hyacinth powder and cow dung were made. The dried powder of water hyacinth (Original Raw Material) served as control. The pots and heaps containing organic waste (mixture of water hyacinth powder and cowdung) were covered with gunny bags and moisture was maintained by sprinkling water after every four days. The experiments were performed in triplicates. Different experimental groups were made as follows.

Pot A- Original raw material (ORM- dried powder of water hyacinth).

Pot B- Decomposed ORM (dried entire water hyacinth plants after duration of three months).

Pot C- 50% Original raw material of water hyacinth + 50% cow dung by pot method.

Heap D- 50% Original raw material of water hyacinth + 50% cow dung by heap method.

These mixtures were allowed to decompose for three months and after three months some samples were taken out from control, pot and heap. These four samples were analysed for physicochemical parameters.

5. Physicochemical analysis: Total organic carbon was estimated by wet oxidation redoxtitration method (Jackson, 1962). Nitrogen was determined by Microkjeldhal method (Jackson, 1975). Percentage of phosphorous was calculated by (Olsen *et al*.,1954) and read on blue filter paper by spectrophotometer. Potassium and sodium were estimated by flame photometric neutral ammonium acetate method (APHA,1998) [3]. Magnesium was determined by DTPA (Diethylenetriaminepenta acetic acid) extraction and estimated by Atomic absorption spectroscopy (Shimadzu AA 7000). Chloride was estimated by Argentometric titration method. pH was recorded by using pH meter (Cyberscan 300). After recording of pH the suspension was kept as it is for one hour and electrical conductivity was measured after settling of suspension at the bottom of flask (Elico, CM-183EC-TDS). For determination of moisture weighed sample was placed in oven at 105^0C for 24 hours and after heating it was weighed again. The difference between weight of sample before and after drying gave the percent moisture. All the readings were taken in three recordings for confirmation and standardization of results (AnkaramS. R.,2013) [2].


Photo 1and 2:Sambhaji tank, Solapur covered with mat of water hyacinth.

RESULT

Table 1:Physico-chemical parameters from sets of experiments after duration of three months.

Parameters	Pot A -Control	Pot B	Pot C	Heap D
Moisture %	7.33 ± 0.87	8.62 ± 0.86	8.7 ± 1.044	7.92 ± 1.029
Electrical Conductivity (mmhos/cm)	4.18 ± 0.45	5.78 ± 0.63	1.80 ± 0.216	1.44 ± 0.187
pH	6.90 ± 0.69	8.01 ± 0.88	7.32 ± 0.732	7.62 ± 0.762
Organic Carbon %	21.15 ± 2.58	20.9 ± 2.508	1.18 ± 2.37	17.9 ± 2.506
C:N Ratio	21.5 ± 2.15	18.82 ± 2.070	15.37 ± 1.998	14.56 ± 1.747
Nitrogen %	1.10 ± 0.143	1.11 ± 0.1221	1.19 ± 0.144	1.23 ± 0.172
Phosphorous %	0.43 ± 0.0559	0.54 ± 0.0756	0.75 ± 0.0727	0.79 ± 0.102
Potassium %	0.68 ± 0.095	0.71 ± 0.092	0.92 ± 0.1288	1.01 ± 0.101
Sodium %	4.4 ± 0.484	3.1 ± 0.372	0.96 ± 0.134	0.77 ± 0.0924
Chloride %	3.55 ± 0.426	2.19 ± 0.328	0.27 ± 0.037	0.15 ± 0.0225
Calcium %	4.75 ± 0.662	6.45 ± 0.838	5.05 ± 0.707	5.4 ± 0.648
Magnesium %	1.0 ± 0.13	1.33 ± 01596	1.58± 0.221	1.36 ± 0.1496

From our results it was observed that the nutrients value of water hyacinth is varied depending upon the different samples. The moisture showed increasing trends from pot B, pot C and heap D when compared with pot A. Organic carbon and C: N ratio showed decreasing trends when compared with pot A whereas pH was remained little bit alkaline from pot B, C and heap D. Nitrogen, phosphorous and potassium showed increasing trends from pot B, C and heap D when compared with pot A. Calcium and magnesium showed increasing trends from pot B, C and heap D. Sodium and chloride showed decreasing trends from pot B, C and heap D. The electrical conductivity showed different results. Pot B showed increasing trends whereas pot C and heap D showed decreasing trends. From our results it is noted that nutrients enhanced after application of cow dung from both the methods.

DISCUSSION

Water hyacinth is rapidly growing, perennial aquatic plant which has ability to grow in highly polluted water (Mary Lissy and Madhu 2011) [12]. Water hyacinth cause damage by spreading itself on the surface of water enormously and interfere with sun light penetration. This interference affects the

photosynthesis and cause reduction in the oxygen level in the water which ultimately affects the aquatic animals. In our experiments we have analysed the nutrient status of water hyacinth after composting with cow dung. The water hyacinth after decomposing with cow dung showed increase in the level of pH.Kannadasan*etal*., (2013) [9] made similar observation. Nitrogen, Phosphorous and potassium content increased in our compost. Blessy and Lakshmi Prabha (2014) [5] observed increased in the level of N, P and K after decomposition of water hyacinth with cow dung. Increase in the level of calcium and magnesium observed in our experiment. Similar observations were also made by Sasidharan*et al*., (2013) [17]. Decrease in the C: N value, organic carbon and electrical conductivity observed in our study.HemenDeka*et al*., (2013) [8] observedsimilar results.

Mako*et al*., (2011) [10] studied the use of water hyacinth as an animal feed collected from various sources by evaluating nutritive capacity. Patrick Moran (2006) [14] studied the nutrient present in the water and plant and their impact on biological control of water hyacinth. Aboud*et al*., (2005) [1]studied the chemical composition of water hyacinth and stated that water hyacinth can be used as nutritious feed for ruminants. Margaret Greenway (1997) [11] studied the nutrient content of variety of macrophyte from wetlands of Australia receiving flow of municipal waste water. Rao *et al*., (2011) [15] studied the solid waste management of water hyacinth from Sambhaji tank, Solapur by Vermibiotechnology. Emmanuel *et al*., (2015) [6] studied physicochemical analysis of water hyacinth and water quality from river from Nigeria. They also observed the capacity of water hyacinth for using as animal feed and also for purification of water. Reddy and Tucker (1983) [16] studied the productivity, nutrient uptake and effect of nitrogen source on nitrogen uptake of water hyacinth.

CONCLUSION

The compost formed by mixture of water hyacinth and cow dung is good enough to use as a soil fertiliser because it contains the nutrients which can improve the soil quality. Thus addition of cow dung to water hyacinth makes changes in the physicochemical parameters and this compost acts as efficient fertilizer if applied to agricultural crops. Further experiments are underway to confirm field trials by using commercial crops, to know the nutrient viability of water hyacinth.

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