

Experiment

Results of an Experiment of Preparing Compost from Invasive Water hyacinth (*Eichhornia crassipes*) in Rupa Lake Area, Nepal

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Abstract

Water hyacinth *Eichhornia crassipes* (*Jalakumbhi* in Nepali) is an alien invasive species and now creating great environmental and economic problems covering major wetlands of the world. Nepal's wetlands are also greatly invaded by this obnoxious weed from which the social, economic and environmental sectors are facing serious problems for many years. In this context, Wetland Friends of Nepal (WFN) has carried out an experiment on making compost from this invasive weed in Begnas and Rupa Lake areas of Pokhara, Nepal with funding support from Toyota Environmental Activities Grant Program of Toyota Motor Corporation, Japan. This paper provides an overview of the findings of the experiment of preparing compost from Water hyacinth.

Key words: Water hyacinth, compost, experiment, Nepal

Introduction

The water hyacinth (*Eichhornia crassipes*) is a floating "obligate" (requiring a wet habitat) plant belonging to the family Pontederiaceae. This alien species grows in all types of freshwater ecosystems. Water hyacinth varies in size from a few inches to over three feet tall with showy lavender flowers. Its leaves are rounded and leathery, attached to spongy and sometimes inflated stalks. The plant has dark feathery roots¹. Water hyacinth is one of the worst weeds in the world--aquatic or terrestrial (Holm et al. 1977). Water hyacinth is a problem in water bodies because of its dense strands and rapid proliferation. It is very efficient in utilizing aquatic nutrients and solar energy for profuse biomass production. In many other places in the world, Water hyacinth continues to present creating great environmental and economic problems.

Depending on the time of the year and location, the plants double in number and biomass every 6 to 15 days. Between 400 and 1700 tones fresh weight are produced per hectare per year. Given that the dry weight is about 5-7% of fresh weight, one hectare yields between 20 and 120 tons of dry Water hyacinth per year, containing nitrogen (N), phosphorus (P) and potassium (K) as well as other plant nutrients. It makes sound economic sense

¹ <http://plants.ifas.ufl.edu>

to utilize this species as an organic input to soils. Water hyacinth waste provides mulch that assists in both water retention and weed suppression (Amoding *et al.* 1999). Till recently water hyacinth was considered to be a terrible environmental hazard is now considered a golden weed. The council of Scientific and Industrial Research, Government of India, at Johart and Hyderabad has made varieties of high quality paper out of the stalk of the weed. The Agricultural University at Trivandrum, India, makes cattle feed out of the leaves and Ryan Foundation has taught villagers to crush the roots and make briquettes for their cook stoves².

If we see the utilization aspect of the Water hyacinth from over the world, it can be very helpful in meeting some of the most urgent needs such as in food production; as leaf protein concentrate; as a substrate for mushroom cultivation; by purifying water; through the production of silage; through vermiculture; in regenerating degraded soils; as mulch; as compost; as fertilizer; in energy production; as biogas; as briquettes; in providing employment and income. Therefore Water hyacinth supports not only in the socio-economic aspects of the local people but also in reducing the environmental problems.

Water hyacinth is one of the major invasive species in lakes and major wetlands of Nepal. Every year a large sum of money has to be spent to remove this invasive plant species from the lakes of Nepal. Large quantity of removed water hyacinth is useless as no any effort is done for its potential use. In this context, Wetland Friends of Nepal (WFN) carried out an experiment on making compost from invasive Water hyacinth in Sundaridanda area of Pokhara valley alongside the Rupa and Begnas lakes with funding support from Toyota Environmental Activities Grant Program of Toyota Motor Corporation, Japan.

Methodology

Heap/Pile was used for composting of Water hyacinth. The accessories used for making compost in these methods were: Black colored plastic sheet, Black Plastic Drum, small wooden stick and some stones to press the covered plastic sheet. 1.2 meter wide and 2 meter long heap was prepared in the experiment.

- Water hyacinth was chopped in small pieces and sun-dried for about 8 hours.
- The chopped leaves were piled in 2 inch in the base layer.
- Semi liquid farmyard manure was sprayed on about 0.5 inch thick layer uniformly above the base layer.
- Dust of mustard cake, ash and lime was layered above the layer of semi liquid farmyard manure.
- The chopped leaves of water hyacinth and green leaves of *Jatropha* were then put on about 6 inch thick layer.

Table 1: Composition of different materials used for composting from Water hyacinth

S.N.	Material	Quantity (Kg)	Material %
1	Water hyacinth	85	70
2	Farm yard manure	10	8
3	Mustard cake	10	8
4	Agricultural lime	1.5	1
5	Dry leaf/forage	5	4
6	Green leaf of <i>Jatropha</i>	10	8
7	Wood ash	0.5	0.4

- The materials were again piled layer by layer in the abovementioned order repeatedly for about one meter height.
- Upper layer was covered with dry leaves of herbs/forage, farm yard manure, mustard cake & lime.
- The heap was covered with dry mud and then with black plastic sheet.
- For the purpose of better aeration within the heap, a small hole was made in the center of the heap and a small stick was erected after the heap got heated after 24-28 hours. The aeration was maintained by moving the stick in every two days. Heat was gained up to 50°C, and the heap was turned over in every 15 days. Turning over the pile provides adequate aeration, and evens up the rate of decomposition

² <http://www.anamed.org>

throughout the pile. The temperature of the substrates of the pile dropped to 33-35°C or approximately air temperature, after the second turning.

- By one month, plant materials piled in the heap were seen light brown, leaves were partially decomposed and stems & roots were more-or-less intact.
- After another month, the material was found dark brown, shoots were decomposed and the stems & roots were also detached and partially decomposed.
- By two and half months in total, the heap was uncovered. The compost was sun-dried. After drying, the dark colored compost was ready for application to farmland. The produced compost did not emit foul odor.
- The sample of compost was then carried to laboratory for nutrient analysis.

Results and Discussion

The compost from the Water hyacinth was tested in the laboratory and following results were obtained:

Table 2: Nutrient composition in the compost from Water hyacinth

S.N.	Nutrient Elements	Amount in %
1	Nitrogen (N)	1.78
2	Phosphorus (P)	0.93
3	Potassium (K)	0.75

- The PH value of the compost was found 8.4.

Conclusion and Recommendations

The N, P, K content in common compost type is generally 1.0 %, 0.5 % and 1.0 % respectively. Likewise the N, P, K values in the farmyard manure falls under 0.5-1.0 %, 0.5 % & 0.5-1.0 % ranges respectively (pers. Comm. regional soil test laboratory of Pokhara Nepal). Laboratory test results show that the compost obtained from Water hyacinth has acceptable composition of N, P, K and pH; and can be used in agricultural land for crop production.

Further experiment on composting from Water hyacinth under more controlled conditions is recommended. Laboratory tests of the compost for toxic elements are also highly recommended. Periodic laboratory tests of raw compost in certain time intervals of the experiment are highly recommended to determine the appropriate stage of composting. Identification of Carbon to Hydrogen ratio in the compost is crucial for agricultural application.

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