

**QUALITY ASSESSMENT OF
ORGANIC FERTILIZERS BASED ON
WATER HYACINTH AND RICE STRAW**

PhD (DISSERTATION)

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ABSTRACT

On the basis of a field work two kinds of organic fertilizers composed of water hyacinth and one with rice straw, both loaded with rice bran and inoculated with a microbial inoculant were produced.

The microbial inoculant used as bacterial seeding in the composting was a mixed culture of beneficial microorganisms. Microbial identification was able to show that the microbial inoculant consists of large populations of propagated *Bacillus subtilis*, *Pseudomonas aeruginosa*, *Mycobacterium* spp., *Aspergillus* (fungus) and *Lactobacillus* spp.

In the field work study, to affect rapid composting, the optimum conditions were found to be: the length of raw materials, about (1"), the rice bran content, 4% for water hyacinth and 5% for rice straw, moisture content, 40% and the bacterial seeding size was about 0.015%. The prepared water hyacinth based fertilizer (WHF) showing a pH of 8 was composed of the following composition: moisture content (31.09%), nitrogen content (2.80%), carbon content (32.04%); C/N (11.4), potassium content (2.19%), phosphorous content (0.8%) and N:P:K ratio of 3.5:1.0:2.7. The prepared rice straw based fertilizer (RSF) which showed a pH of 7.6 was found to be comprised of moisture content (33.47%), nitrogen content (1.60%), carbon content (39.01%), C/N (24.4), potassium content (1.80%), phosphorous content (0.8%) and N:P:K ratio of 2.0:1.0:2.3. These facts revealed that WHF is a better organic nitrogen source for plant than RSF. Concentrations of other mineral nutrients in WHF and RSF were: magnesium (%), (0.91 and 0.92), sulphur (%), 4.54 and 4.32, iron (%), 0.54 and 0.35, zinc (ppm), (130 and 120), respectively. The heavy metal contents were: lead (ppm), (38 and 20), and cadmium (ppm), (<0.01 and 1), respectively.

Humic acid and fulvic acid contents were higher in WHF (1313, 320 mg/kg) than RSF (776, 167 mg/kg) revealing the superior quality of WHF over

RSF. FT-IR and elemental analysis revealed that humic acid isolated from WHF has more functional groups indicating higher chelating power than humic acid of RSF. Growth response and nitrogen uptake of papaya (*Carica papaya* L., *Caricaceae*) and roselle (*Hibiscus sabdariffa* L., *Malvaceae*) showed that both organic fertilizers enhanced the plant growth and increased the nitrogen uptake when compared to control (without fertilizer treatment). It is evident that WHF is a more effective organic fertilizer than RSF.

Keywords : Organic fertilizers (Water Hyacinth Fertilizer, Rice Straw Fertilizer), Microbial Inoculant Microorganisms, Composting, Optimum Conditions, Growth Response, Nitrogen Uptake