Journal of Experimental Sciences 2012, 3(5): 48-50
ISSN: 2218-1768
Available Online: http://jexpsciences.com/

journal of experimental sciences

Study on growth, potential utility and N.P.P. of a submerged aquatic plant *Hydrilla verticillata* Casp.

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Abstract

Hydrilla verticillata Casp is a rooted submerged aquatic plant belonging to the family Hydrocharitaceae. It is distributed in aquatic bodies over the world. *Hydrilla verticillata* Casp affect the aquatic system positively or by negatively based on their density in aquatic bodies. Specific growth pattern, Physiology and mode of vegetative propagation etc. help *Hydrilla verticillata* Casp to adopt in various types of fresh water environment. Aquatic plants are important for maintaining life system in water bodies and also useful for nutrient recycling. A wide ecological impact of aquatic plants in water has been recorded by the researchers in the world. The aim of the present study was to examine the growth and estimation of NPP of *Hydrilla verticillata* Casp in an artificial water tank and plastic tubs respectively. Findings of the experiments are discussed furthermore.

Keywords: Aquatic plant, Growth, *Hydrilla verticillata* Casp, N.P.P.

INTRODUCTION

Aquatic ecosystem is affected, regulated by the presence and population of varied group of the aquatic vegetation. The aquatic plants affects the water environment as Temperature, Light penetration etc. Many of the physic-chemical characteristics are also affected by the available aquatic plants in the water bodies (Brix, 1997, Madsen et. al. 2001, Van et. al. 1999, Barko et. al. 1981).

Vegetation in the aquatic ecosystem interacts with other aquatic plants and also by the aquatic animals inhibiting in water bodies. Aquatic plants not only maintain oxygen level but also provide aquatic animals Food, Shelter and a suitable environment to survive and for their reproduction. (Posey et. al. 1993, Chick and Melver 1997, Finguerola et. al. 2003, Pelicice et. al.2005).

When many aquatic plants inhibits in a water body they form a complex aquatic vegetation. It may be harmful or beneficial both based on the species composition. Despite of the importance of *Hydrilla verticilata* Casp its growth/multiplication was planned. A review on *Hydrilla verticilata* Casp for its problem to fresh water was recorded by Sousa, 2011.

Hydrilla verticilata Casp is a rooted submerged prolific, perennial aquatic plant and is native to Asia and Australia which now distributed in fresh water bodies over the world (Cook and Luond 1982). Roots are long, unbranched, cylindrical and inside of mud. Stem long with node and internodes bears leaves. Leaf arranged in a whorls at nodular part of the stem are Small, Pointed, Opposite, Serrate. Flowers are small and white in colour appears on long stalks. Tubers are near 0.5 inches long, White-crème in colour. Rhizome grows horizontal in mud, colourless with many tubers.

Received: June 10, 2012; Revised: July 18, 2012; Accepted: Aug 30, 2012.

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In a large density it creates problem to water body and also for the aquatic animals inhibiting it. After death and decay aquatic plants become reason for eutrophication a prime stage of fresh water pollution identified by rich nutrients level, low oxygen, unhygienic to use, foul smelling and dangerous for aquatic life.

Hydrilla verticillata Casp showed as an efficient aquatic plant for phyto-remediation of waste water as well as variable tendency in their growth and of generation of biomass. Environmental impact on the growth pattern was noticed as the aquatic plant showed their maximum growth in summer season when most of the free floating aquatic plants registered minimum production rate due to high Temperature aerial parts of the plant damaged and leading to low productivity. Temperature range 27.3 – 33.5 ^{0}C was found to be suitable for successful growth of the aquatic plants.

Current research paper describes the growth behavior and N.P.P. determination of the *Hydrilla verticillata* Casp. The aquatic plant registered their presence in variable fresh water condition, as example it is found in low to high nutrient condition as Oligotrophic to Eutrophic water resources – Cook and Luond 1982. Around 7.00 pH it grows better (Steward, 1991). *Hydrilla verticillata* Casp is also adapted to multiply in low light condition as recorded by Van et. al., 1976. The plant is propagated by fragmentation, Tubers, Turions etc. Mostly fragmentation is applied for rapid multiplication (Langeland and Sutton, 1980). Rhizomes are a source of resting phase of the plant capable to develop in to new individuals of *Hydrilla verticillata* Casp. Mature stem when break from mother plant of the *Hydrilla verticillata* Casp it develops into new plant by forming new roots and shoot system in water.

Terminal side of rhizome turions develops and is also develop in leaf axis reffered as axillary Turions (Sutton et. al. 1992). Complex community of the aquatic plants required for clarity of water (Canfield and Hoyer, 1992). Growth of *Hydrilla verticillata* Casp under controlled condition was reported by Bianchini et. al. 1010. Productivity of the major aquatic macrophytes was studied by Saha, 1986. In lakes seasonal variation of Hydrophytes are reported by Bowes, G. et. al., 1979.

Hydrilla verticillata Casp has been used for treatment of wastewater by Dings, 1978, Goal et al., 1985, Brix and Schirup, 1989, Chandra et al, 1993, Aoi and hayashi, 1996, Saha and Jana,2002 and for the purpose of heavy metal removal from wastewater it is found suitable as recorded by Delgado, 1993, Rai et al, 1995

MATERIAL AND METHODS

The fresh *Hydrilla verticillata* Casp was safely removed from fresh water pond and initially grown in an artificially made water tank filled with fresh water. After one week plants become stable and starts to grow gradually develops new leaf, Stem with bud and also developing new rhizomes inside of mud.

For assessment of the Physico-chemical changes by the aquatic plant an experiment was conducted in two plastic tubs of capacity of 20 liter and 6 inches deep. One tub was used as culture tub and second one was used as control experiment. 100 gms. Increased biomass of aquatic plant was noticed for determination of the NPP listed in Table – 01.

Healthy plants in a fixed amount (100 gms) were used for study of NPP determination in plastic tubs of twenty liter water capacity and six inches deep. After seven days biomass estimation was carried out during each month of the year. Secondly the *Hydrilla verticillata* Casp was properly monitored for the examination of growth. After thirty days the plants forming dense group and inhibit the growth of other aquatic plants.

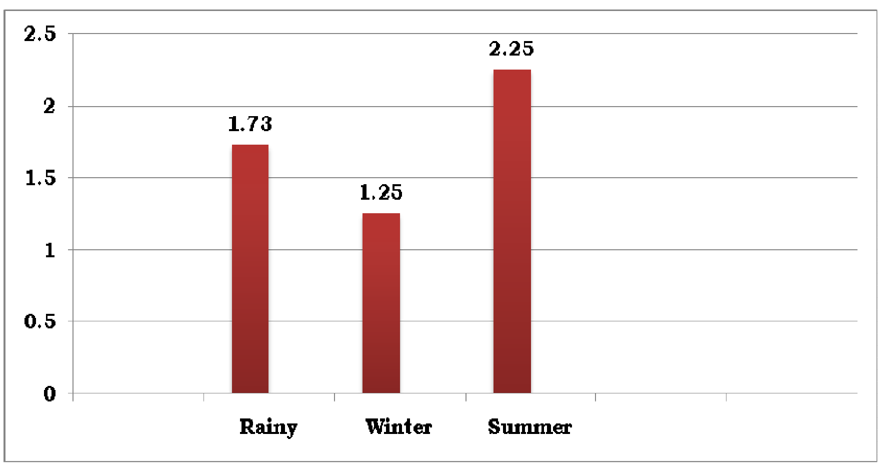
RESULT AND DISCUSSION

Findings of the present study shown in Table - 01. Growth behavior of the *Hydrilla verticillata* Casp is changeable according to the change in environmental condition, So seasonal variation on NPP was recorded. Results are summarized based on season like Rainy, winter and summer.

Hydrilla verticillata Casp having excellent capacity to remove nutrients from domestic wastewater, as indicating by changes in Table – 02. Significant amount of the nutrients were reduced by the experimental aquatic plant whereas remarkable amount of the oxygen is increased over the tenure of the research. During of winter season the aquatic plant showed its minimum growth rate and intermediate growth tendency recorded during rainy season. High growth recorded during summer season in the experiment. The value of many Physico-chemical parameters has been reduced by the *Hydrilla verticillata* Casp whereas the amount of the Dissolved Oxygen after experimentation significantly increased.

Table 1.Seasonal variation in Growth and N. P. P. of *Hydrilla verticillata* Casp.

S. No.	Season	N.P.P. Range	Total N.P.P.	Average/Month N.P.P. - gm.m^{-2}.day^{-1}
1	Rainy	1.29 – 2.08	6.91	1.73
2	Winter	0.51 – 1.81	4.99	1.25
3	Summer	1.90 – 2.51	8.99	2.25



Graph. Average/Month N.P.P. of *Hydrilla verticillata* Casp.

Table 2. Effect of *Hydrilla verticillata* Casp on Physico-chemical papameters of wastewater.

S. No.	Physico-chemical papameters	Initial Value Range	Annual Percentage Reduction
1	Electrical conductivity – micromhos/cm	588.60 - 961.60	15.66 – 25.69
2	Total Dissolved Solids - ppm	319.90 - 620.30	15.80 – 22.33
3	Total CO2 – mg/L	239.22 - 436.56	36.91 – 51.58
4	Dissolved oxygen – ppm	1.4 - 5.5	112.9 – 261.1 (Increased)
5	Chemical Oxygen Demand – mg/L	57.6 - 223.2	32. 60 – 62.50
6	Calcium – mg/L	49.20 - 89.67	24.39 – 32.26
7	Magnisium – mg/L	12.45 - 37.43	37.16 – 67.79
8	No3 – N – mg/L	39.90 - 61.32	50.36 – 69.35
9	Total Phosphate – mg/L	1.200 - 1.742	44.69 – 48.83

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