EFFECT OF IDOL IMMERSION IN WADALI LAKE, AMRAVATI (MS) INDIA ON GROWTH, CHLOROPHYLL AND ANATOMY OF *HYDRILLA VERTICELLATA*

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ABSTRACT

Hydrilla verticellata (L.) were collected from the Sectional Botanical Garden tanks of GVISH, Amravati. Plants were grown in controlled environmental chambers in laboratory. Growth rates expressed as length of stem was measured over a one month period. Concomitantly; chlorophyll content and anatomy was studied. Polluted lake water collected from Wadali Lake, Amravati at the time of Ganesh festival. Idols of lord Ganesh prepared by various materials, it immersed into nearby water body, which is hazardous to environment, it directly affect on lake water. Quality of water has been investigated with respect to important physicochemical parameters pH, dissolved O_2, alkalinity, chlorides, Na, K, etc. Pollution of lake water is controlled by various methods by using certain plants and microbes. Aquatic microphyte has ability to control and measure the amount of pollution. Due to favorable conditions for growth of leaves of *Hydrilla verticellata* (L.) plants has recorded higher total chlorophyll amount in lake water (0.47 mg chl,/g) than control (0.32 mg chl./g). However, relation between chlorophyll a and chlorophyll b content in samples from lake water Chl. a = 0.31 mg chl./g; Chl. b =0.16 mg chl./g and control Chl.a = 0.21 mg chl./g; Chl.b = 0.10 mg chl./g. T.S. of stem showed accumulation of certain pollutants from polluted lake water in the form of blackish deposits in cortical and vascular tissue. Secondly increase in size of arenchymatous cells and shrinkage of cortical cells. All recorded differences in morphological, anatomical and chlorophyll content of plants were caused by differences of cumulative environmental conditions with dominant effects of the contamination degree of locations, water type and microclimate.

Key words: *Hydrilla verticellata*, chlorophyll, Ganesh idol, pollutant, physiochemical parameters.

INTRODUCTION

Hydrilla verticellata (L.) is submerged fresh water angiosperms in the family Hydrocharitaceae. *Hydrilla sp*. was found in Florida in 1960; this species has proved to be extremely competitive and has become the most troublesome aquatic weed in the state. The rapid rate with which *Hydrilla* spreads and dominates the vascular flora in many water bodies is probably related to its very efficient utilization of light (Van *et al.* 1976) and it`s prolific asexual reproduction by subterranean propagules or tubers (Haller and Sutton 1975). Haller and Sutton (1975) also noted that the growth habit of *Hydrilla* in forming a canopy near the water surface reduces light penetration and enables it to out compete with certain desirable, native aquatic plants such as *Vallisneria*. Moreover, *Hydrilla* can adapt effectively to shade environments (Bowes *et al.* 1977), such as may be found in deeper parts of a lake. Ganesh festival is celebrated traditionally in the state of Maharashtra all in a big way as a social and community activity. When it started by "Lokmanya Tilak" in 1896 at Pune.The objectives of festival was mainly to bring people together and promote freedom movement. The city of Amravati was categorized as class – I city on the basis of population. Its population is near about 6, 50,000. Available water sources from Upperwardha dam, tube wells, lakes and various rivers. Ganesh festival celebrates every year in month of August or September.Near about 3000-5000 idols of Lord Ganesh of various shapes and sizes were immersed in Wadali Lake located outskirt of Amravati city (CPCB 2007-08).

The present investigation is concerned with the study of various physicochemical parameters of wadali lake water, Amravati at the time of Ganesh festival. The effect of polluted lake water on *Hydrilla verticillata*. The aim of this study was to compare chlorophyll content, growth performance and anatomical features in different localities which exposed to water pollutants sourced by the polluted lake water at the time of Ganesh festival.

In India, about 70% of the available water is polluted, out of which 8-16 % water is polluted by industrial pollution and 84-92 % by sewage pollution (Chaudhary 1982). The Naik Lake of Nagpur has been surveyed before and after immersion of Ganesh idols and it was found that there is sudden increment of some chemical pollutants after idol immersion. By comparing values of chemical pollutants they found that the concentration of calcium had increased significantly in the lake water after idol immersion. Magnesium and silicon

concentration had also increased (Khapekar and Nandkar 2009).

MATERIALS AND METHODS

Selection of site: Wadali Lake is situated near village Wadali, outskirt of Amravati city, Amravati (Plate 1&2). For physicochemical and experimental analysis, 10 lit. of water samples was collected in plastic bottle during evening hours in triplicates. Physiochemical parameters viz. temperature, pH, dissolved oxygen mg/lit, dissolved CO_2 mg/lit, alkalinity due to HCO_2 mg/lit, chlorides mg/lit, sodium mg/lit, potassium mg/lit.were made following the method of Arora and Pathak 1989 and APHA 1992; Gupta 2001.

Plant material: *Hydrilla verticillata* plants were collected from surface water of garden tank, Amravati. Plants having 25 cm to 35 cm branches were planted in chambers. Each chamber contains 3 Lit.water

Anatomy: Different parts of plant (leaf, stem, and root) were fixed in FAA (formalin-acetic acid-absolute alcohol), dehydrated in a graded ethanol series, sections were stained with saffranin and light green. These sections were examined under the microscope for to observe the effect of lake water and control water.

Chlorophyll content:

The chlorophyll content was assayed with a UV-Visible spectrophotometer (Elico SL 164). Leaves samples with control and treatments were estimated following the procedure of Whatley and Arnon 1963.The chlorophyll content of the samples was determined spectrophotometrically according to Arnon (1949) and results were calculated as mg chl./g leaf.

RESULTS AND DISSCUSSION

Physiochemical analysis: The result of physicochemical analysis of Wadali Lake during in month of August and September 2009 are summarized in Table I. Water temperature of the lake was 21.16^0C, it is slightly higher than control (tap water 21^0C).The depth of lake water varies at different places, the maximum being 4.5 meters recorded during monsoon season. The colour of lake water is yellowish green which is result of dense algal population accompanied with high concentration of solids. The pH of lake water was found to be alkaline 7.9, reflecting higher concentration of metallic ions imparting alkaline pH. Alkalinity of lake water was higher 280.6 mg/lit. as compared to control 195.2 mg/lit. The DO of lake water was found to be 5.63 mg/lit. it is slightly lower than control (Tap water 6.88 mg/lit). The low DO of a water body is indicator of presence of organic matter. Though carbon dioxide is radically soluble in water very little carbon dioxide occurs in control water 0.88 mg/lit., as compared to lake water 1.46 mg/lit. Apart from this, decomposition of organic matter and the respiration of aquatic plants and animals contribute to free CO_2 present. Chloride content was found to be 47.3 mg/lit in lake water, it much lower than control (tap water) 113.6 mg/lit. Among the cations, the concentration of potassium was the lowest. The presence of these nutrients is favorable for plant growth as it lowers the negative effect of salinity. The pH of the sample was found to tend towards salinity, which necessitated the evaluation of sodium is an element closely related with potassium. It was noticed in a higher amount than potassium. It was noticed in a higher amount than potassium, in both lake water and control.

Table 1: Physiochemical analysis of water sample of Wadali lake during August and September, 2009.

S. No.	Parameters	Control (Tap water)	Sample 1 of lake	Sample 2 of lake	Sample 3 of lake	Mean
1	Temperature	21^0C	21.5^0C	21^0C	21^0C	21.16^0C
2	pH	7.74	8.27	7.40	8.03	7.9
3	Dissolved Oxygen mg/lit.	6.88	5.26	4.86	6.48	5.63
4	Dissolved CO_2 mg/lit.	0.88	2.2	1.32	0.88	1.46
5	Alkalinity due to HCO_2 mg/lit.	195.2	439.2	207.4	195.2	280.6
6	Chlorides mg/lit.	113.6	42.6	49.7	49.6	47.3
7	Sodium mg/lit.	1.50	1.28	1.24	1.24	1.25
8	Potassium mg/lit.	0.025	0.21	0.12	0.13	0.15

Growth performance: *Hydrilla verticillata* is a slender, submerged, perennial aquatic herb. Stem is much branched rooting at nodes; leaves are about 1.5 cm long in whorl of 3-8 together. The chambers are filled with different water 3 lit water/chambers. Mature 25-35 cm branches were planted to a chamber at least 5 branches in each chamber (Plate 3&4). Results were recorded after 15 and 30 days. After 15 days & 30 days the length of branches grown in polluted lake water higher than control (tap water) and natural placed of *Hydrilla* grown in garden tank. Number of primary, secondary and tertiary branches grown highly in lake water than control.

Table 2:- Growth performance of *Hydrilla verticillata* in polluted Lake Water in laboratory condition.

Sr. No.	Initial length of *Hydrilla verticillata*(cm)	Growth of *Hydrilla verticillata*after 15 Days (cm)			Growth of *Hydrilla verticillata*after 30 Days (cm)		
		A	B	C	A	B	C
1	30	39	33	56	44	49.5	60.5
2	35	51	43.5	64	51	70	82
3	35	45	35.0	56	47	63	83
4	24.5	32	28	39	38.7	33.5	48.5
5	26	29	32.2	42	36	53	50

A: Control water (Tap water), **B:** Natural condition (Botanical Garden tank water) and C**:** Pollutedwater (Wadali Lake).

Chlorophyll content: *Hydrilla* in polluted lake water had significantly higher chlorophyll content than control and naturally grown in garden tank water. Relation of total chlorophyll amount in lake water (0.47 mg chl,/g) and control (0.32 mg chl./g).(Table 3). However relation between chlorophyll a and chlorophyll b content in samples from lake water recorded as Chl. a = 0.31 mg chl,/g; Chl. b =0.16 mg chl,/g and control Chl. a= 0.21 mg chl,/g; Chl.b =0.10 mg chl,/g. Knudson *et al.* (1977) suggest that chlorophyll content could be a useful indicator for the evaluation of injury induced by pollutants. Therefore, the variation in chlorophyll content has been used in many studies in order to investigate the effects of pollutants on plants (Della *et al*. 1998).

Table 3:- Effect of polluted water on Chlorophyll content of *Hydrilla verticillata.*

Sr.No.	Type of water samples	Chl. a mg/g tissue	Chl. b mg/g tissues	Total chl. mg/g tissues
1	Initial chlorophyll content of *Hydrilla* leaves	0.10	0.05	0.15
2	Control(Tap water)	0.21	0.10	0.32
3	Water collect from *Hydrilla* grown in garden tank	0.18	0.10	0.27
4	Polluted water from Wadali lake site	0.31	0.16	0.47

Plate 1: Wadalilake

Plate 2: Idol Immerssion in Wadalilake

Plate 3: *Hydilla verticillata* (0 days)

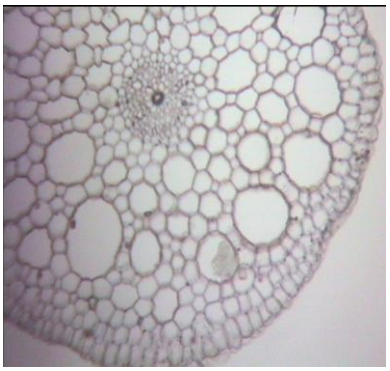

Fig. Anatomy of Hydrilla (control)

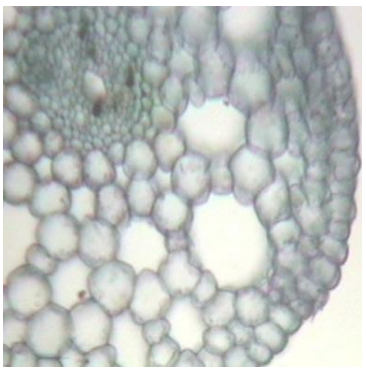

Fig.B. Grown in natural condition

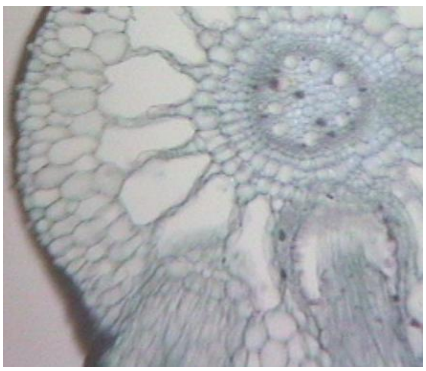

Fig: C *G*rown in polluted lake water

ANATOMICAL CHARACTERISTICS

Transverse section of the stem: A transverse section from the middle part of the stem of plants from both polluted and unpolluted water showed round shape. There are some specific anatomical changes were observed from the samples of stem from both treatment. Stem consist of single layer epidermis, 8-9 layer cortex and central vascular system surrounded by endodermis pericycle. Epidermal cells slightly compressed on one another observed in polluted lake water. Cortex contains numbers 20-30 of air spaces, i.e. arenchyma. Arenchymatous cells consist of different shape, size and thin cell walls and chloroplasts. Large number of chloroplast observed in lake water grown plant. Endodermis single layered consists of isodimetric cells and pericycle also single layered. Xylem is surrounded by phloem. Phloem 3-5 layered. Anatomy of T.S. of stem showed accumulation of certain pollutants from polluted lake water in the form of blackish deposits in cortical and vascular tissue (Plate-5). Secondly increase in size of arenchymatous and shrinkage of cortical cells. Kovacic and Nikolic 2005; Pandey *et al*. 2006 reported that the specific morpho-anatomical and physiological- biochemical characteristics are the result of plants adaption on environmental conditions. Stress condition can disturb the formation of sclerenchymatic fibers in leaves of Poaceae (Gielwanowska *et al*. 2005).The result obtained in the present investigation clearly indicates that the polluted water increase chlorophyll and physiochemical parameters for plant development whereas, the result obtained from natural and tap water treatment are almost normal. These facts conclude that *Hydrilla verticillata* plants have potential absorb certain elements from the polluted water which have the potential to degrade certain pollutants and enable to serve as a basis of phytoremediation to efficient control of certain metal ions or pollutants.

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