



## RESPONSES OF *TRAPA NATANS* AGAINST THE SOARING CONCENTRATIONS OF NITRATE AND PHOSPHATE IN A TROPICAL RIVER GOMTI IN LUCKNOW CITY, INDIA

SAMEER CHANDRA<sup>a</sup>, S.K. RAWAT<sup>b</sup>, SANJAY K. GARG<sup>a</sup> AND RANA P. SINGH<sup>b\*</sup>

<sup>a</sup>Department of Plant Sciences, M.J.P. Rohilkhand University, Bareilly, India

<sup>b</sup>Department of Environmental Science, Babasaheb Bhimrao Ambedkar University, Lucknow-226025, U.P., India

\*Corresponding author e-mail: [ranapsingh1@hotmail.com](mailto:ranapsingh1@hotmail.com)

### ABSTRACT

The amount of nitrate and phosphate, considered as major inorganic nutrients-cum-pollutants of municipal waste pipes were monitored in the water of a tropical river Gomti in Lucknow city during summer, rainy and winter seasons during 2009. All the samples from the 6 selected sites of Gomti river in the vicinity of this mega city showed the levels of nitrate and phosphate ranged between 14.02-49.13 and 0.16-4.32 mg L<sup>-1</sup> respectively, which were beyond the permissible limits (10 mg L<sup>-1</sup> NO<sub>3</sub><sup>-</sup> and 0.1 mg L<sup>-1</sup> PO<sub>4</sub><sup>3-</sup>) in all the seasons. The maximum values of nitrate and phosphate were recorded during rainy season possibly due to excess runoff of the effluent mixed water through waste pipe lines. *Trapa natans* (Water chestnut) commonly cultivated aquatic crop in the region was cultured in the 20 L plastic tubs containing Gomti river water, under simulated net house conditions, for 3 weeks. *Trapa natans* removed nitrate and phosphate upto 71.34 and 74.64% respectively which was significant. Increase of 8.29, 14.59, 70.44 and 24.07% was recorded in the fresh wt., lamina length, protein in fruit and chlorophyll in leaves of *Trapa natans* respectively.

**KEY WORDS** Gomti river, Nitrate, Phosphate, *Trapa natans*

### INTRODUCTION

Water is one of the most important natural resources and clean water supply is very important for the survival of humans. Introduction of chemicals and nutrients at high concentration contributed to poor water quality. Increasing population, expand of industrialization, urbanization and disposing of the pollutants and waste material in the water bodies adversely affect the aquatic ecosystem and result in eutrophication, hypoxia etc [1]. Critical plant nutrients such as nitrate and phosphate have been frequently observed at high levels within aquatic systems [2]. Impact of high nitrate polluted water can include toxicity to humans and animals via ingestion, intestinal disorder, cancer etc [3]. Phosphate is generally considered as the limiting nutrient ion and this may also lead to excessive aquatic plant growth in the water bodies, resulting in accelerated eutrophication [4]. Sources of these nutrients are municipal sewage, livestock waste, chemical fertilizers, effluent discharge, industrial, urban and agricultural run-off, as well as airborne depositions etc [5].

For the supply of water for domestic use, activated sludge or chemical precipitations are required consistently. However, these processes are expensive in terms of requirement of energy and skilled operators. This approach is considered technically and financially inappropriate at small scale now and hence often not in practise in most of

the potable water supply systems of Indian cities and towns [6]. The cost per gram of nitrate and

phosphate removed is much higher for domestic waste water treatment plants serving small communities [7].

Phytoremediation is assumed to be very useful, and it is an innovative, eco-friendly and efficient technology in which natural potential of plants can be utilized in water treatment systems to remediate inorganic pollutants from sewage or domestic waste water supply [8]. It is cost effective and useful for developing countries [2]. *Trapa natans* is a common aquatic macrophyte cultivated in surface water bodies for its fruit commonly known as water chestnut [9]. This aquatic plant is important in water purification as it reduces current velocity and allows deposition of sediment and inorganic pollutants (nitrate, phosphate etc) removal. Hoseinzadeh et al. [10] reported that among 3 aquatic plants viz. *Typha latifolia*, *Trapa natans* and *Hydrocotyle vulgaris*, highest inorganic pollutants removal was attained by *Trapa natans* and *Hydrocotyle vulgaris*.

In this perspective, the present study was planned with multiple objectives 1) to determine the levels of nitrate and phosphate in Gomti river during various seasons, 2) role of *Trapa natans* in removal of nitrate and phosphate from the river water in simulated net house condition and 3) effect of Gomti water on growth; protein and chlorophyll content of *Trapa natans*.