



# KIRORI MAL COLLEGE

(University of Delhi, ) Delhi-110007

## किरोड़ीमल महाविद्यालय

(दिल्ली विश्वविद्यालय) दिल्ली-११०००७

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Date: 28.2.2012

To,  
The Dean,  
Research  
University of Delhi,  
Delhi

Subject—Submission of Innovation projects from Kirori Mal College.

Dear Sir,

Please refer to your letter No. Dean (R) 2012/423 dated January 23.2012, wherein University of Delhi had invited proposals for funding of Innovation Projects from joint teams of Teachers and Students. I am forwarding the project entitled, **“A comparative study of phytoremediation of stagnant water by free floating plants and making it potable with the use of various plant sources”**. The project has been jointly submitted by the three teachers of the college, Dr. Manju A.Lal and Dr. Renu Kathpalia from the Department of Botany and Dr. Tazeen Mahmood from the Department of Chemistry.

The college shall submit a final utilization certificate to the registrar, University of Delhi at the completion of first and second (final) phases, stating that the funds have been duly utilized for the purposes that they were sanctioned for and have been audited. I ensure that the project will be housed in the college and all the equipments purchased during the running of the project shall revert to the college for use within the premises of the college by the students of the college.

Thanking you,

Yours sincerely

Principal

Kirori Mal College  
University of Delhi

## **Subject – Proposal for Innovation projects from colleges**

**Name of the college—Kirori Mal College**

**Name of the teachers—**

**Department of Chemistry - Dr. Tazeen Mahmood**

**Department of Botany - Dr. Manju A. Lal, Dr. Renu Kathpalia,**

**Title of the project- A comparative study of phytoremediation of stagnant water by free floating plants and making it potable with the use of various plant sources.**

### **Introduction**

There is no dearth of water, but clean potable water is in scarcity. Natural water is getting contaminated because of industrial and sewage disposal in it. In metropolitan cities, there are civic agencies, which are responsible for the supply of clean water to be used for household purpose. However, in villages, people still have to largely depend on local water sources. Besides wells, one of the major sources is the pond water, which is mainly due to collection of rainwater. Since the water is the stagnant water, it is unhealthy for human consumption and even for the animals.

Phytoremediation by the aquatic plants has a great potential. A number of plants have been reported to be very effective in removing pollutants (such as nitrates, phosphates, heavy metals) from the water. Simultaneously, there will be increase in dissolved oxygen content in the water due to photosynthetic activity of the plants, making water more suitable even for the other aquatic life. Besides, the unpleasant smell of water is also reduced.

Reports are available to make the water clean and potable by using various plant materials also, such as treating the water with seeds of *Moringaoleifera*, or with leaves of mint family.

The objective of this study is to demonstrate purification of stagnant water i) by growing free floating plants in the water in the lab and ii) then treating the water with various plant materials to make the stagnant water suitable for consumption for house hold purposes. Studies will concentrate on comparative effectiveness of the techniques which can be easily and most suitably employed by the locals to get the potable water.

Experimental planning:-

We propose to conduct experiment in two phases: -

- i) Phase 1: - Pond water will be collected.

Aquatic plants will be allowed to grow in pond water in containers. Due to presence of biological wastes, nitrate and phosphates would be accumulated in the pond water, which will be taken up by the growing aquatic plants. Growth of the plants in the polluted water is an index of the nutrients present in water.

For the present study, free-floating plants have been chosen, since these can be easily grown in the lab.

The plants have been chosen on the basis of: -

- 1) Their small size.
- 2) Their fast growth rate because faster the growth is, more will be removal of contaminants from the water.
- 3) Their ability to grow in wider range of growth conditions.
- 4) Their known potential for phytoremediation.

The plants chosen for the present study include the following: -

- a) Lemna sp. (commonly known as duckweeds)- A number of reports are available for duckweeds commonly being used for phytoremediation of water. We would like to carry out a similar study in the lab and make the students aware of the same.
- b) SalviniaSp. (floating fern):-Reports are available about their capacity to remove heavy metals from the water, in oil remediation and also about their ability to grow in waste laundry water. Very less work has been done in this. Phytoremediation of Yamuna water will be tried by this plant.
- c) Azollasp.(mosquito fern):- Cultivation of azolla in domestic waste water has been done to demonstrate their capacity to remove COD, nitrogen and phosphorus.

The above said plants have been chosen because of their known water cleansing properties and also because of their fast growth rate. Faster the growth rate, faster will be cleaning of water. Growth of the plants can also be measured by measurement of increase in fresh weight /time and it can also be correlated with the depletion of nitrogen and phosphorus salts from the water, which will be monitored using various ion selective electrodes.

Changes in following parameters will be monitored for checking the change in the quality of water: -

- i) **Nitrates**
- ii) **Phosphates**
- iii) **Ammonium**
- iv) **BOD**
- v) **TDS**
- vi) **pH**
- vii) **Turbidity**
- viii) **Temperature**

ii) Phase II: - The second step is treatment of water obtained after phytoremediation (i.e., after Phase I)

Water will be treated with various plant sources to make it clear and clean so that it can be used for drinking and cooking purposes. Plant sources to be used:

- i) Moringa seed
- ii) Lotus leaves
- iii) Khuskhus roots
- iv) Tulsi leaves
- v) Plants from mint family, etc.,

Pond water will be taken in the containers of similar sizes. After initial measurement of nitrate, phosphates, dissolved oxygen, pH, aquatic plants will be grown alone and also in combination with each other. After every fourth day, growth of the plants will be monitored along with changes in chemical composition of water. Overcrowding will be controlled by removing excess plants so that the dead senescent plants do not contribute to changes in chemistry of water. Plants removed will also be monitored for the measurement of the overall growth. At the time, when there are no further changes in nitrate and phosphate ions, plants will be removed. After that water will be treated with various plant sources, to make it potable.

**Objective** of the present study will be: -

- i) To compare the effectiveness of the above said aquatic plants in phytoremediation, alone and in combination of each other.
- ii) Comparing the use of various plant materials in cleansing water to be used for drinking and cooking purposes.

## Materials Required :-

- i) Water testing kit and ion selective electrodes.
- ii) Computer so that the data can be collected and analyzed
- iii) Containers for growing aquatic plants
- iv) Miscellaneous

## Budget

<b>A. Equipments (estimated cost)</b>	<b>3,00,000</b>
<ul style="list-style-type: none"><li>• <b>Multi-parameter meter with Ion selective electrodes to measure nitrates, ammonium, phosphates, BOD, TDS and turbidity</b></li><li>• Spectrophotometer (visible)</li></ul>	1,50,000/-
B. Computer with printer-	60,000/-
<b>Honorarium</b>	<b>25,000/-</b>
<b>Seminar/Final presentation</b>	<b>1,00,000/-</b>
<b>Stipend for students-</b>	<b>1,20,000/-</b>
<b>Stationary cost-</b>	<b>1,00,000/-</b>
<b>Miscellaneous (local travel cost for students to collect water sample etc.)-</b>	<b>1,00,000/-</b>
<b>Contingency expenses-</b>	<b>1,00,000/-</b>

The project is interdisciplinary. Students of Botany department and Chemistry department will be involved. There will be total of 10 students, 5 students from each department. Five groups will be made. In each group there will be one student from each of the department.

**Department of Chemistry - Dr. Tazeen Mahmood**



**Department of Botany - Dr. Manju A. Lal,**



**Dr. Renu Kathpalia,**

