

Executive Summary of the Final Report

of a major research project supported by

**University Grants Commission
New Delhi – 110 002**

1. Title of the Project

Control of the amphibious weed *Ipomoea carnea* by a novel process of total utilization and disposal: an environment – friendly and global warming ameliorating technology.

2. Name and address of the Principal Investigator

Dr Tasneem Abbasi, Assistant Professor,
Centre for Pollution Control & Environmental Engineering, Pondicherry University,
Puducherry 605 014.

3. Name and address of the institution

Centre for Pollution Control & Environmental Engineering, Pondicherry University,
Puducherry 605 014.

4. **UGC approval letter no. and date:** No. F. 41-1104/2012 (SR) dated 26.07.2012

5. **Date of implementation:** 01.09.2013

6. **Tenure of the project:** 2 years 4 months (September 2013-December 2015)

7. **Total grant allocated:** Rs. 7,26,000/-

8. **Total grant received:** Rs. 5,16,000/-

9. **Final expenditure:** Rs. 6,60,321/-

10. Title of the project:

Control of the amphibious weed *Ipomoea carnea* by a novel process of total utilization and disposal: an environment – friendly and global warming ameliorating technology.

11. Objectives of the project

The main objective of the project was to control ipomoea (*Ipomoea carnea*, called *bes Haram*) which is a dreadful weed and is responsible for harming a large number of irrigation projects, agricultural lands, and water-bodies to the tune of hundreds of crores of rupees every year. The Project had aimed to develop ways to achieve the control by clean-green, energy-generating, and fertilizer-producing process. The designated objectives (as specified in the proposal) were:

1. To expedite VFA extraction, vermicomposting and termigradation to enhance process efficiency, hence process economics, of ipomoea utilization
2. To assess how good is the ipomoea vermicompost as a soil conditioner and fertilizer.

12. Whether objectives were achieved

Yes. The objectives have been **fully realized** as may be seen from the *Summary*, below, and detailed report which follows. The work has led to **seven papers** in standard indexed journals besides other output. **In addition**, over and above the designated objectives, we **accomplished extra work** of which the gist is presented in Sections 2.2 and 3 of the detailed report.

13. Achievements from the project

- i) **Seven papers** in journals indexed on Thomson Reuter's Web of Science, of which two have 5-year average impact factor of 5.3 and 2.6.
- ii) Manpower training at the level of **two competed PhD theses** and four MTech theses.
- iii) A clean-green scheme of processes which have the potential of turning the dreaded weed ipomoea into a precious resource, thereby not only saving billions of rupees per year but potentially *generating* revenue.

14. Summary of the findings

Ipomoea (*Ipomoea carnea*), colloquially called *besharam* (*shamelss* in Hindi) is one of the most widespread and dominant of the weeds in India. It is also a scourge of most of the other parts of the tropical and sub-tropical world. An amphibious plant capable of thriving in very diverse habitats, it is responsible for harming a large number of irrigation projects, agricultural lands, and water-bodies to the tune of hundreds of crores of rupees every year.

In the project under discussion we had aimed at finding ways to control ipomoea by utilizing it in clean-green eco-friendly manner so that the weed gets extensively harvested and is put to gainful use. This would prevent the dead parts of the ipomoea stands from rotting in the open which not only harms water and soil quality but also generates global warming gases. It would also check the presently uncontrolled (and uncontrollable) spread of ipomoea. These objectives have been fulfilled and processes have been developed in which i) energy precursors are extracted in the form of volatile fatty acids (VFAs) from ipomoea leaves; ii) these VFAs are converted to clean energy in the form of CNG-like biogas in conventional anaerobic digesters; iii) the 'spent' ipomoea leaves (i.e biomass left after VFA extraction) are vermicomposted into highly potent organic fertilizer, and iv) the woody parts of ipomoea are assimilatively disposed by termigradation. Each of the steps is eco-friendly as it is done at ambient temperature and pressure, with very frugal use of energy and materials, and with minimal of emissions which are non-hazardous.

Over and above fulfilling the designated project objectives – which have focused on VFA extraction, vermicomposting, and termigradation of ipomoea, we have completed extra work as follows:

- i) We have developed 3 methods with which gold, silver, and bimetallic gold-silver nanoparticles can be generated using ipomoea;
- ii) We have established that *ipomoea aquatica* can be successfully used as a bioagent in treating wastewaters.

The project has led to:

- a) **Seven papers in standard journals indexed on Thomson Reuter's SCI Web of Science.** Of these the *Journal of Cleaner Production* and *Process Safety and Environmental Protection* have 5-year average impact factors of 5.3 and 2.6 respectively. Other papers are in journals of impact factor <1.
- b) Parts of **PhD theses of two students** (M. A. Bhat and N. Hussain) who both have been awarded degrees recently, and 4 completed MTech theses.
- c) A **system of processes** which have the potential of turning the dreaded weed ipomoea into a precious resource, thereby not only saving billions of rupees per year but potentially *generating* revenue.

15. Contribution to the society

Ipomoea is a source of great harm to the environment and a drain to the society. The present work has the potential of saving billions of rupees that are lost by way of hampering agricultural production and degradation of wetlands caused by ipomoea. More significantly, the work has the potential of transforming ipomoea into a resource — a means of earning for the society.

16. Whether any Ph.D. enrolled/produced out of the project: Yes, as under:-

- *Manpower trained: PhD level*

The work contributed substantial parts in **Two PhDs**. A substantial part of the work was in the PhD thesis of N. Hussain who qualified for the award of PhD on 12.08.2016. Another part of the work was in the PhD thesis of M. A. Bhat who qualified for the award of PhD on 16.09.2016.

- *Manpower trained: MTech level*

The project contributed to the 1-year thesis work of 4 students, Mr Om Prakesh, Ms Sminu, Mr Rahul Verma, and Ms Shruti Ravindran.

17. No. of publications out of the project: Yes, as under:-

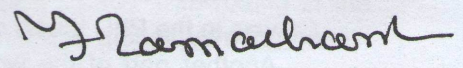
The work has led to **7 papers** by the PI (Dr Tasneem Abbasi) and the Co-PI (Prof S. A. Abbasi) in standard indexed journals as listed below; the support of the UGC in the form of MRP has been acknowledged in each of these:

1. Vermicomposting of phytomass: limitations of the past approaches and the emerging directions. *Journal of Cleaner Production. (Elsevier)*, 93, 103-114, 2015 (with M. Nayeem-Shah). Five year average impact factor: **5.3**.

2. Biomimetic synthesis of silver nanoparticles using the amphibious weed ipomoea and their application in pollution control. *Journal of King Saud University – Science, (Elsevier), 26,222-229, 2014* (with S. U. Ganaie and J. Anuradha).
3. Control of amphibious weed ipomoea (ipomoea carnea) by utilizing it for the extraction of volatile fatty acids as energy precursors. *Journal of Advanced Research, (Elsevier), 6, 73-78, 2014* (with M. Rafiq Kumar and S. M. Tauseef).
4. Vermicomposting-mediated conversion of the toxic and allelopathic weed ipomoea into a potent fertilizer, *Process Safety and Environmental Protection, (Elsevier), 103, 97-106, 2016* (with N. Hussain). Five year average impact factor: **2.6**.
5. Gainful utilization of the highly intransigent weed ipomoea in the synthesis of gold nanoparticles. *Journal of King Saud University-Science (Elsevier), 27, 15-22, 2015* (with J. Anuradha and S. U. Ganaie). Five year average impact factor: **0.6**.
6. Rapid and clean biomimetic synthesis of bimetallic Au-Ag nanoparticles using an otherwise worthless and noxious weed ipomoea (*Ipomoea carnea*), *Journal of Nano Research, 31, 1-14, 2015* (with S. U. Ganaie and S. Ravindran).
7. Green Synthesis of silver nanoparticles using an otherwise worthless weed mimosa (*Mimosa pudica*): Feasibility and Process Development Toward shape/size control, *Particulate Science and Technology, (Taylor & Francis), 33, 638-644, 2015* (with S. U. Ganaie). Five year average impact factor: **0.7**.

Copies of all these papers are attached (please see pages 14-76 of this report).


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PG & RESEARCH DEPARTMENT OF ENVIRONMENTAL SCIENCES

BISHOP HEBER COLLEGE (Autonomous)



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Nationally Reaccredited with 'A' Grade by NAAC with a CGPA 3.58 out of 4
Recognized by UGC as "College of Excellence"
TIRUCHIRAPPALLI - 620 017



Prof. A. Alagappa Moses

Associate Professor & Head

To,

January 5, 2018

Dr Suresh Rani,
Under Secretary
University Grants Commission
Bahadur Shah Zafar Marg -
New Delhi - 110 002
E-mail: <srani.ugc@nic.in>

Sir,

Sub: Evaluation of the First Report of the UGC Project entitled "Control of the Amphibious weed Ipomoea carnea by a novel process of total utilization and disposal: an Environment - Friendly and Global Warming Ameliorating Technology", with Dr. Tasneem Abbasi as the PI

Ref: F. No. 41-1104/2012(SR) dt: 07.12.2017

The project under review had aimed at finding ways to control ipomoea by utilizing it in clean-green eco-friendly manner so that the weed gets extensively harvested and is put to gainful use. A deep study of the report indicates that the project has been successfully completed fulfilling the designated objectives with even extra work.

The achievement of the project include publication of seven papers in journals indexed in Thomson Reuter's Web of Science and capacity building at the level of completing two Ph. D and four M. Tech. theses. As part of the contribution to the society the processes developed in the project has greater potential of saving billions of rupees that are lost by way of hampering agricultural production and degradation of wetlands caused by ipomoea. More significantly, the work has the potential of transforming ipomoea into a resource and a means of earning for the society. It, thus, serves as an effective and feasible global warming ameliorating technology.

The efforts and contributions of the Principal Investigator in the systematic and meticulous execution and successful completion of the project are highly appreciated.



Sincerely,

(Prof A. Alagappa Moses)

Cc The Registrar, Pondicherry University <registrar@pondiuni.edu.in>
The PI (Dr. Tasneem Abbasi) <tasneem.abbasi@gmail.com>

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To
Dr. Suresh Rani
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Jan. 11, 2018

Sir,

Sub: Referee's evaluation of the completion report of the UGC Project entitled "Control of the amphibious weed, *Ipomoea carnea*, by a novel process of total utilization and disposal: an environment-friendly and global warming ameliorating technology", (PI: Dr. TasneemAbbasi) - regarding

Ref: F. No. 41-1104/2012(SR), December 2017

The evaluation of the completion report of the UGC project referred above is given below:

The main objective of the project was to control *Ipomoea (Ipomoeacarnea)* which is a highly problematic weed and is responsible for harming a large number of irrigation projects, agricultural lands, and water-bodies. Hundreds of crores of rupees every year are wasted due to this weed. Specifically, the project had aimed to:

1. To expedite VFA extraction, vermicomposting and termigradation to enhance process efficiency, hence process economics, of ipomoea utilization.
2. To assess how good is the ipomoea vermicompost as a soil conditioner and fertilizer.

A perusal of the completion report of the project shows that all the designated objections have been fulfilled. The outcome of the work has been published in the form of several papers in standard journals indexed at Thomson RetuersSCI-WoS. These include papers in journals of impact factors 5.3, 2.6, 0.7 and 0.6, which testify to the originality and usefulness of the work done in the eyes of global scientific fraternity. The work has also led to manpower training in the form of contribution to 2 PhDs and 4 MTechs.

A noteworthy aspect of the Project is that the PI and the co-PI have even done relevant extra work in developing a bioagent for treating waste water utilizing *Ipomoea*, besides fulfilling the originally planned work.

In view of the above it may be concluded that the said project has been completed successfully, with well above average output, including extra work.

Sincerely,



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2) The PI (Dr. TasneemAbbasi) <tasneem.abbasi@gmail.com>