

Parvatibai Chowgule College of Arts and Science
Autonomous

*7.1.3 Facilities in the Institution for the management of the following types of degradable
and non-degradable waste*

Additional Information

Contents	Page no.s
A. Skill enhancement course on ‘Waste Management Techniques’.....	2 – 4
B. Generic Elective course on ‘Vermicomposting Technology’	5
C. Activities conducted on Waste management.....	6 – 8
D. Student’s projects on Waste management.....	9 – 16

A. SKILL ENHANCEMENT COURSE ON WASTE MANAGEMENT TECHNIQUES

WASTE MANAGEMENT TECHNIQUES - SYLLABUS

COURSE OBJECTIVES

- To familiarize students with the techniques of waste management
- To encourage students to get hands on experience on techniques of managing waste
- To help students understand the importance of reducing, reusing and recycling

COURSE OUTCOME

CO1: Understand concept of types of waste, its transport and disposal.

CO2: Perform composting techniques / procedures.

CO3: Identify means of reducing waste production.

CO4: Plan and conduct research in areas of waste management

MODULE 1: Introduction to waste management

UNIT 1: Overview of types of waste, collection, transport, treatment and disposal of waste.

UNIT 2: Waste generated- sources, and management, Storage and collection of different kinds of wastes.

UNIT 3: Need for Waste management and effect on the community.

UNIT 4: Waste treatment methods: Physicochemical Treatment of Solid and Hazardous Waste, Chemical treatment processes, Biological Treatment of Solid and Hazardous Waste, 3 Rs- Reuse Reduce and Recycle.

MODULE 2: Composting Techniques

UNIT 5: Soil structure and its maintenance.

UNIT 6: Organic composting- Methods, Procedure - Microorganisms, materials used, design and maintenance, Biogas.

UNIT 7: Vermicomposting- Earthworms – biology- life cycle and feeding. Types – morphological and ecological grouping – Epigeic, Anecic and Endogeic species,

Nutrient value of worm cast/vermicompost, requirements of vermicomposting, Maintenance of composting – Collection of vermicompost Small Scale Earthworm

farming for home gardens. Marketing the products of vermiculture, Predator/pathogen control

MODULE 3: Waste management Techniques and Rules

UNIT 8: Sewage disposal; Medical waste management. Sources, measures and health effects; disposal options

UNIT 9: Bioremediation, ground water contamination and remediation Landfill designing and Incineration.

UNIT 10: Radioactive and E- waste management-Sources, measures and health effects.

UNIT 11: Relevant Regulations-

- Municipal solid waste (management and handling) rules (SWM 2000 and amendments of 2016: SO.1357 (E) Sec. 3(II).
- Hazardous waste (management and handling) rules 2015(Chapter II and IV; Schedule I, II, III and IV).
- Biomedical waste handling rules 2016 (GSPCB – Schedule I and II).
- Plastic waste management rules 2016 (Part-II, Section-3, Sub-section (i))

MODULE 4: PRACTICE BASED

Practice of the following: The students of this course are expected to work on these different waste management practice activities:

- 1) Leaf composting on campus
- 2) Vermicomposting
- 3) Awareness on waste segregation.
- 4) Waste collection Drives.
- 5) Research on waste management.
- 6) Case studies/ mini projects.

The report of the same will be submitted as portfolio.

REFERENCE BOOKS:

1. Edwards CA, Hendrix P and AranconN (2014) Biology and Ecology of Earthworms, Springer Publishers.
2. Karaca A (2011) Soil Biology: Biology of Earthworms. Springer Publishers.
3. Edwards CA, Arancon NQ and Sherman RL (2011) Vermiculture Technology: Earthworms, Organic Wastes, and Environmental Management, CRC Press, USA.

4. Ranganathan LS (2006) Vermibiotechnology– From Soil Health to HumanHealth. Agrobios, India.
5. Ismail SA (2005) The Earthworm Book. Edition, Other India Press, Apusa, Goa, India.
6. Ismail SA (1997) Vermicology: The Biology of Earthworms. Orient Longman, India.
7. A. D.Bhide and B.B.Sundaresan, “Solid Waste Management –Collection, Processing and disposal” Mudrashilpa Offset Printers, Nagpur, 2001.
8. Biomedical waste (Management and Handling) Rules, 1998.

B. GENERIC ELECTIVE COURSE ON VERMICOMPOSTING TECHNOLOGY

COURSE OBJECTIVE

This paper provides an insight to create awareness among students on mushroom cultivation and organic vermicompost production from biodegradable wastes using earthworms.

LEARNING OUTCOME

On completion of this module, students will be able to understand the importance of vermicompost production for sustainable environment management.

VERMICOMPOSTING TECHNOLOGY - Syllabus

Introduction to Vermicomposting

Meaning, history, economic importance, value in maintenance of soil structure, role in recycling of organic wastes

Selection of the worms

Choosing the right worm; Useful species of earthworms; Local species of earthworms; Exotic species of earthworms; working with worms: bedding; food source; moisture, aeration; protection against predators

Vermicomposting technology

Requirements for vermicompost production- site selection, selection of suitable earth worm, selection of food, selection of bedding material

Methods of vermicomposting- Pit or pot method- Heap method, Bin or tray method, Windrow method, Wedge system, Vermi-reactor system

Harvesting - Manual methods, Self-Harvesting (migration) methods, Mechanical methods

Nutritive value of vermicompost, Overview of Potential Benefits and Constraints

Vermi-wash collection, composition & Use

General problems in vermicomposting, Prospects of vermicomposting as self-employment venture.

References

1. R.K. Bhatnagar & R.K. Palta, Earthworm Vermiculture and Vermicomposting. Kalyani Publishers, Chennai.
2. P.K. Gupta, Vermi Composting for Sustainable Agriculture. Agrobios (India), Jodhpur.

C. ACTIVITIES CONDUCTED ON WASTE MANAGEMENT

Year	Particulars
2019-2020	<p>The Dept of Zoology conducted an awareness on ‘Sewage Disposal and Medical Waste Management’ on 12.10.2019. The students used posters to create awareness on ‘Sewage disposal and medical waste management’. Different methods of waste segregation were explained to the college students. They also informed as to how waste can be segregated at home, as proper segregation is the best way to manage waste.</p>
2019-2020	<p>The Dept of Zoology conducted awareness on ‘Organic Compositing and Biogas’ on 03.10.2019. Awareness on different composting techniques such as direct composting, vermicomposting, composting and farm yard manure was explained to our students with the help of posters. The students encouraged the use of vermicomposting and also gave a brief introduction on biogas and its benefits.</p> <div data-bbox="823 750 1442 1176" data-label="Image"> </div> <p style="text-align: center;"><i>Poster on Biogas and Organic composting</i></p>
2019-2020	<p>The Dept of Zoology conducted awareness on ‘Importance of Vermicomposting’ on 27.09.2019. The students used posters to explain the importance of vermin-composting. The aim was to educate students on the process and techniques of vermin-composting. They encouraged other students to practice it, as vermin-composting not only helps in eliminating waste but also produces compost that can be used as an organic fertilizer.</p> <div data-bbox="416 1568 916 1906" data-label="Image"> </div> <div data-bbox="927 1568 1426 1912" data-label="Image"> </div> <p style="text-align: center;"><i>Poster on Vermicomposting</i></p>

2018-2019	Andrea D'Souza and Gautami Manakikar, Asst Prof, Department of Zoology attended seminar on 'Working towards a Zero Waste Goa' on 01.11.2018 organized by: Foundation for Environment Research and Conservation in association with Murgaon Education Society.
2017-18	Six students of SYBSc Biotechnology - Jayashree Sanzgiri, Myron Rebello, Sakshi Ahluwalia, Eldon Gomes, Maclaez Vas and Kay Lemos – collaborated with students at ISA Lille University, Paris, France on a project which aimed at coming up with a low technology cost efficient treatment plan for recycling canteen water, also classified as "grey water" for gardening.
2016-17	Department of Analytical Chemistry organized a guest lecture on 'Waste Management of Petroleum Industries in India' by Dr. S. K. Chattopadhyay, Ex-DGM, Head Environment, ONGC, Betul- Goa on 14 th January 2017.

Report of talk on ‘E-Waste Management’

NSS unit of Parvatibai Chowgule college of Arts and Science, Autonomous organised a talk on “E-Waste, its hazardous effect and the importance of recycling your electronic waste” on 8th February 2019. The talk was delivered by Mr. Soham Prabhu, Founder and CEO of Global E-Waste Management System, a collection and dismantling centre of Goa authorized by Goa State Pollution Control Board (GSPCB). Total 86 NSS volunteers and college staff participated in this activity. Mr. Kumaresh, Faculty of computer science department introduced the resource person and also informed students about the e-waste collection activity to be carried out in the upcoming week in the college. Mr. Soham spoke on the importance of e-wastes, composition of electronic gadgets and their hazardous effects on human health which can be prevented if proper disposal of e-waste is done. He also screened a video in which an inappropriate disposal of e-waste including burning by the workers without proper safety gears was shown which ultimately leads to several diseases including cancer.



D. STUDENT'S PROJECT ON WASTE MANAGEMENT

2019-2020

1. AN INVESTIGATION INTO DIFFERENT APPROACHES OF ORGANIC FARMING

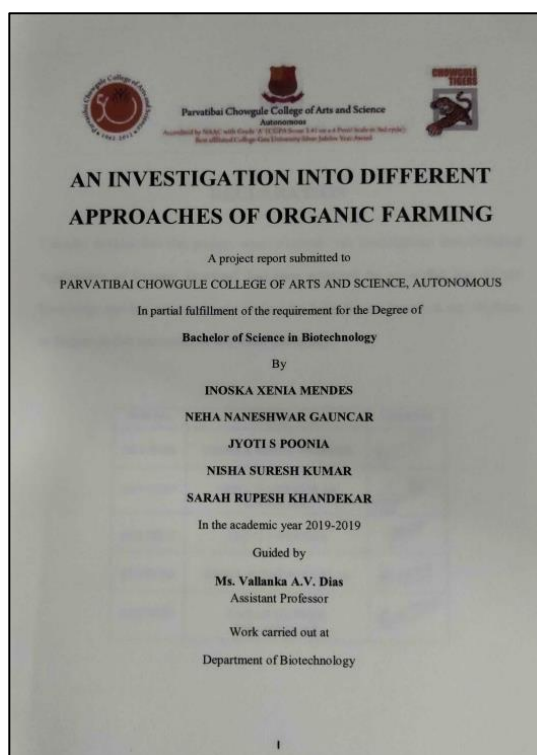
Organic farming techniques like Aquaponics and Vermicomposting are environmentally friendly ways of promoting the sustainable use of the natural resources and the production of healthy organic vegetables. This research aimed at setting up an Aquaponics system and growing a variety of plants while monitoring the process. Analysis of the water samples from the system was done to determine the Concentration of Nitrates, Nitrites and Ammonia levels. This study concluded that Aquaponics is an effective way of growing plants like Chillies, Ladyfingers and Moong while using vermicompost and gravel as the grow bed medium. Further studies can be done to grow plants like Papaya and Bananas using the techniques of aquaponics.



Aquaponics setup at laboratory scale



Growth of plants

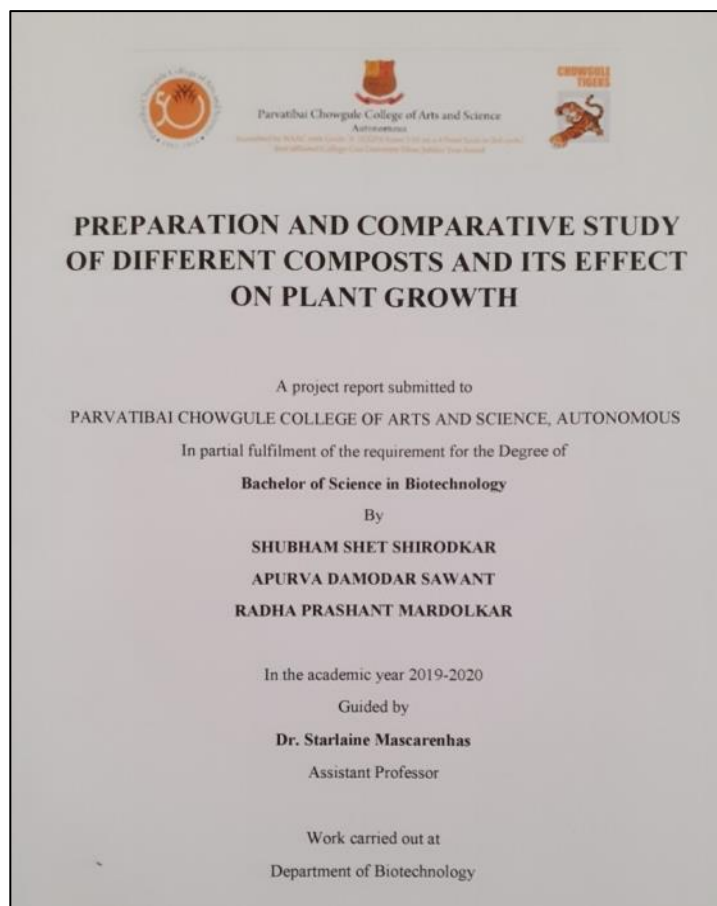


2. PREPARATION AND COMPARATIVE STUDY OF DIFFERENT COMPOSTS AND ITS EFFECT ON PLANT GROWTH

This work focussed on waste management. Nowadays, organic wastes like vegetable and kitchen wastes are dumped in the garbage providing no benefit to mankind. However, biodegradable potential of these wastes can be harvested for production of useful products like organic fertilizers that can boost up agricultural productivity. Domestic food waste tops charts of total organic wastes disposed globally. Hence without management, these wastes create several environmental problem Organic greenhouse emissions resulting in global warming which calls for the need to understand benefits of waste management. Therefore, composting is best low-cost solution to overcome this problem. Composting is an eco-friendly way of waste management that reduces organic waste. Derived product is used as a manure for plant growth. We looked for assisted ways to fasten and nutritionally enriching the process, hence we used cow dung as base material (since its enriched in faecal microbiotic decomposers). Cow's urine (Gomutra) and effective microorganisms (EM) solution was added as nutritional enhancing additives to composting. Additionally, we implemented vermicomposting strategy to check whether it enriched compost better than Gomutra and EM solution. Our study proved Gomutra based compost to be better soil nutrient enrichment additive as evident from enhanced plant growth.



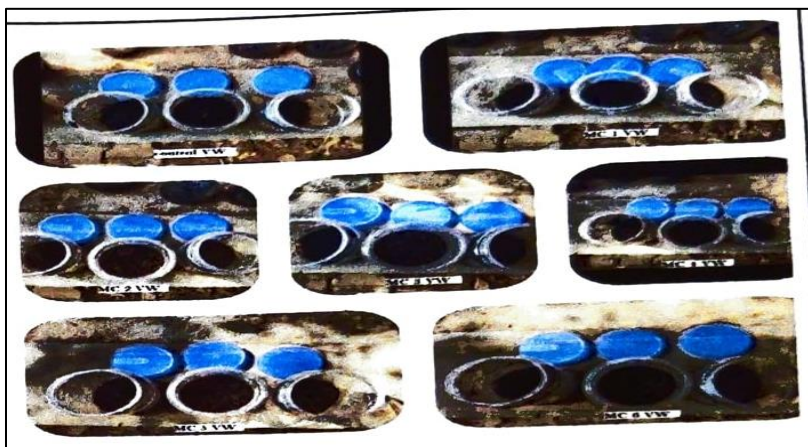
Growth of pea plant on compost



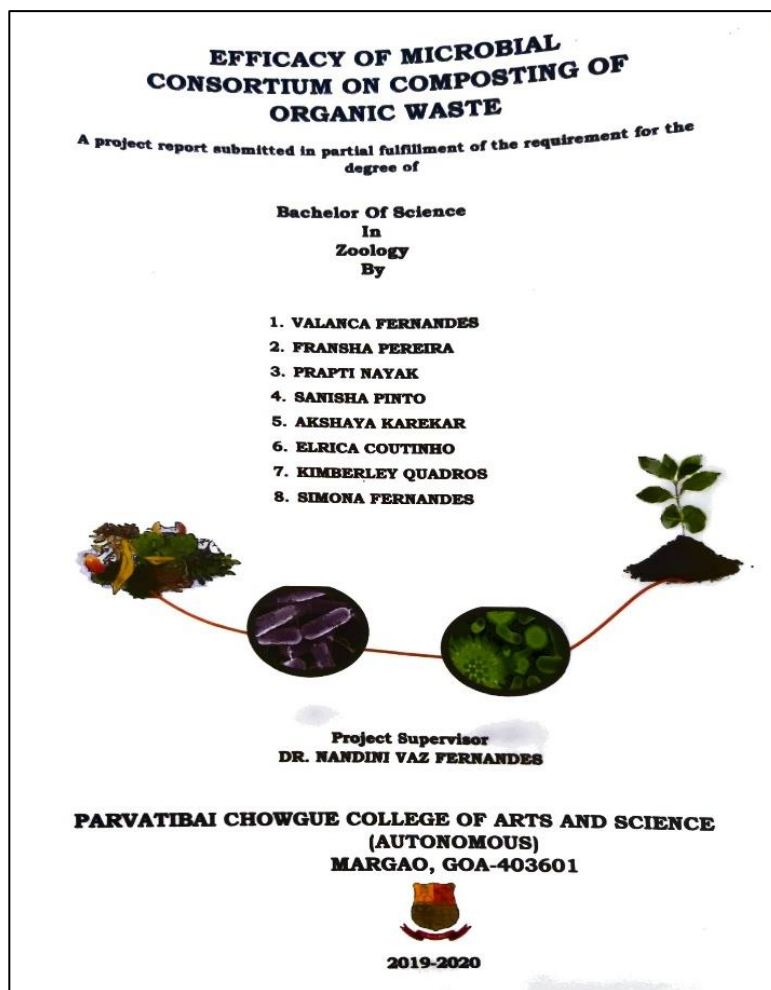
Project cover page

3. EFFICACY OF MICROBIAL CONSORTIUM ON COMPOSTING OF ORGANIC WASTE

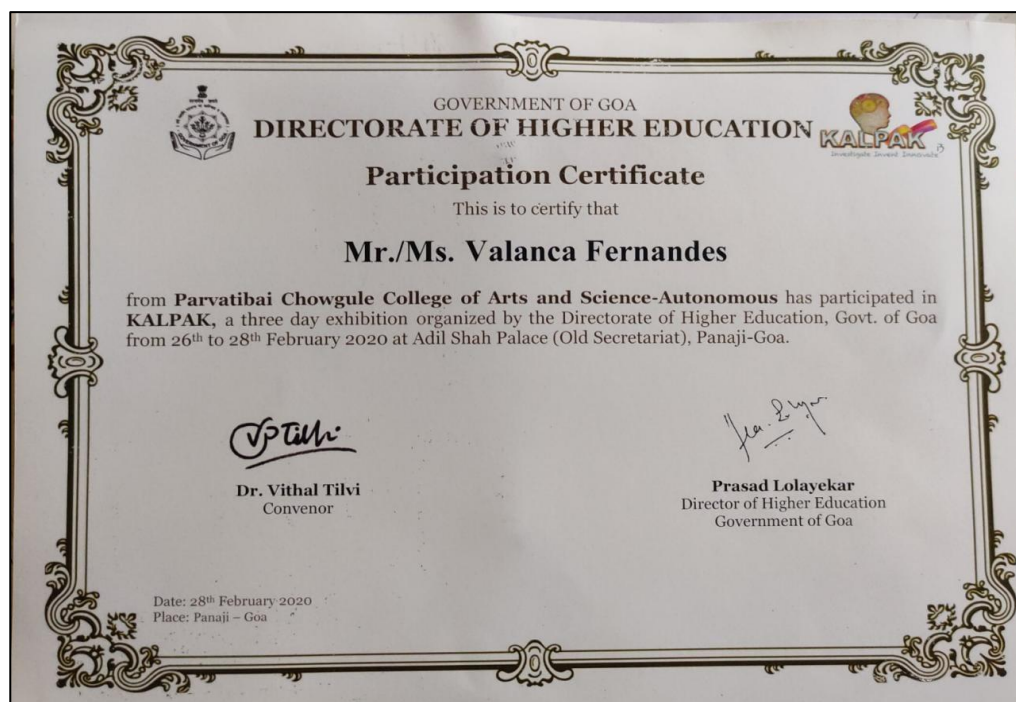
The study focused on decomposing organic household waste using commercially available microbial consortiums. Commonly available consortiums were classified into different ratios in order to check the efficiency of composting process. The waste was segregated and aerobic composting was adopted for 500gm of waste with addition of microbial consortiums added according to the nature of raw material. The compost was monitored for 30 days with frequent parameter check like temperature, pH etc. MC 5 and MC 6 were the most effective in degrading wastes.



Compost jars



Project cover page



Certificate for Poster presentation at DHE, Goa

2018-2019

1. COMPOSTING: AN EFFECTIVE APPROACH TOWARDS WASTE MANAGEMENT

As the sizes of garbage heaps in the urban dump yards are growing at an alarming rate hence an attempt was made of opting for composting that can be offered as a viable solution to the urban waste problems. This investigatory study aimed the use of kitchen waste to produce compost and monitor the process. Also, microbial analysis was carried out as it's crucial to determine the presence of pathogenic micro-organisms if any wherein, the study showed composting with EM solution enhanced the process, however, certain pathogenic organisms were discovered that implied that the produced compost would only have to be used after certain precautionary measures.



Mixing of substrates for composting



Compost after 60 days


Parvatibai Chowgale College of Arts and Science
Autonomous
Approved by the Board of Secondary Education, Maharashtra
B-10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100

CERTIFICATE BY SUPERVISOR

This is to certify that the project report entitled "Composting: An Effective Approach towards Waste Management" is a record of work done by the candidate during her studies under my guidance and supervision to the best of my knowledge. This work has not previously formed the basis of the award of any other Diploma or Degree by this university or any other university.


Ms. Vallanka A.V. Dias
(Project Guide/Supervisor)


9/4/19
Dr. Sunita Beikar
(External Examiner)

IV

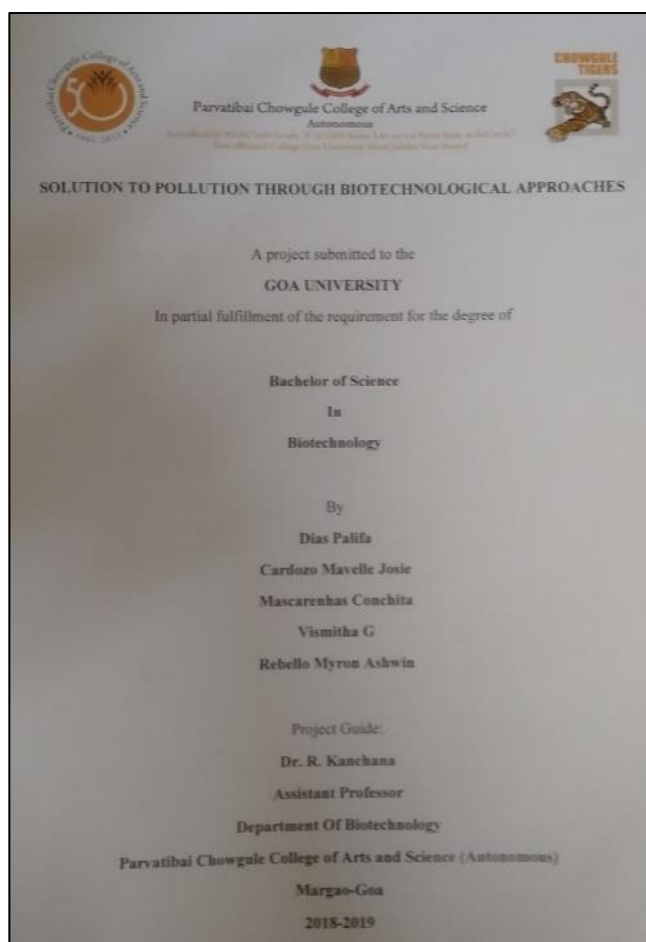
Project cover page

2. SOLUTION TO POLLUTION THROUGH BIOTECHNOLOGICAL APPROACH

The project aimed at protecting the environment from hazardous impact of improper disposal of non –bio-degradable wastes. Through this project, production of bio-degradable edible cups was tried at the pilot scale level as an alternative to their counterpart non-degradable plastic cups, aimed to develop a novel approach towards flower waste management through formulation of liquid hand-wash leading to environmental sustainability. The project got selected at state level ‘Anveshan: Student Research Convention’ held at Goa University on 12th December, 2018, and further participated in the West Zone Convention held on 10th and 11th January, 2019 at Pacific Academy of Higher Education and Research University, Udaipur, India.



Edible thermo stable bio-degradable cups



Project cover page

2017 – 2018

LOW TECHNOLOGY COST EFFICIENT TREATMENT PLAN FOR RECYCLING CANTEEN WATER

Six students of Biotechnology collaborated with students at ISA Lille University, Paris, France on a project which aimed at coming up with a low technology cost efficient treatment plan for recycling canteen water (also classified as “grey water”) for gardening. Initially, the plan was a 5-tank system for grey water treatment, which included a settling tank, an aeration tank, a flocculation tank, a reed/water hyacinth bed and a storage tank. The removal of soap and dye from soap by the use of chitosan powder was suggested by the French students as it is cheap and easily available in Goa. The canteen water (both soapy and non-soapy) was analysed for BOD, COD, TDS, TSS, TS and pH. The values obtained were shared with the students of university. A small model of the treatment plant was in the process of being constructed. Regular Skype calls were scheduled with the French students to exchange new information.