Winter Internship Report

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Acknowledgments:

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Manas Upadhyay

For having actively completed a 1 month Internship at BITS Pilani, KK Birla Goa Campus from 01-12-2022 to 31-12-2022

Dr. Srikanth Mutnuri
Professor,
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Week 1:
First couple of days were spent getting acclimated to the labs- Faecal Sludge Management (FSM), Water Sanitation & Hygiene (WSH), Applied and Environmental Biotechnology (AEB). A lab tour by Mrs Rajashree Yaragal gave us a glimpse of the work that's currently undergoing in the labs and the common instruments being used. Mrs Rajashree and Mr Guruprasad Talekar demonstrated Helminth ova analysis from dried sludge and Chemical oxygen demand analysis, respectively.
Helminth analysis involved separating the ova from the sample by the help of various sieves, later centrifuged with $ZnSO_4$ solution and separated from debris based on specific gravity. Later 1-2 drops of this processed sample were visualised under a microscope. Ova's morphology and presence was noted, and using a reference chart their particular stage in the life cycle is identified

By the end of the week we performed Chemical Oxygen Demand (COD) analysis on a sludge sample

Week 2:
The week started with us performing COD analysis on a different set of samples. Spread plating on differential media (EMB, MacConkey) was done to check different sample parameters like Total coliforms, Faecal coliforms, and the presence of *E.coli*, *Salmonella* and *Shigella.* Different sample dilutions were used for the purpose. Later demonstration of Total nitrogen estimation by Kjeldahl block digestion was there, which involved digestion of sample with excess of acid under high temperature in a closed system

Week 3:
Phosphorus estimation of solid sludge sample was performed. Two demonstrations by Guruprasad sir on Flame Photometry and Atomic Absorption Spectroscopy. Both these analysis methods are used in metal ions detection. Flame Photometry is used for estimation of sodium, potassium, lithium and calcium ions. While AAS on the other

hand, is mainly used for and estimation of heavy metals. Analysis of different samples for helminth ova were performed.

Week 4:

Our week began with estimation of BOD5 and COD of 6 different samples, along with this simultaneous estimation of Phosphorus(orthophosphates) content was also made. Once more BOD and COD analysis was performed on 2 different samples, a couple of days later. Till this point most samples that we've had analysed were received from external sources. But on 28th Dec. 2022, full battery of analytical tests were performed. And these samples belonged to the in-house wastewater treatment system present in the BITS Pilani Goa campus. The parameters quantified were COD, BOD, pH,Total suspended solids(TSS), Total Organic Carbon(TOC), Total Carbon(TC), Inorganic Carbon(IC), Total Nitrogen(NH4-N) and phosphorus estimation.

Rajashree ma'am very efficiently walked us down through the various stages of each type of analysis. For Total nitrogen(NH4-N), photometric analysis using Spectroquant kits, manufactured by Merck, were used. For TOC, TC and IC, liquid module as well as solid module of TOC analyser were employed. Both the modules performed similar functions and the major difference lies in the type of sample(solid or liquid) they handle and also in the method of quantification.

Our internship concluded with a field visit to the previously-mentioned wastewater processing unit. This unit collects waste from various sources like staff quarters, hostels, etc., which reaches the unit by gravity. Wastewater is initially stored in a large septic tank and from there it's passed on to the two-stage vertical flow constructed wetland system. In Stage 1, removal of solid waste from the wastewater occurs. Stage 2 involves greater adsorption of waste on sand beds, along with major conversion of pollutants into different less-harmful compounds. Capacity of this system is 1 cubic metre and various plant species such as *Canna* were used to help treat the water along with the help of local bacterial communities present in the sand beds. Using these wetlands systems, there was a visible decrease in most water quality parameters. Food waste generated from mess and canteen is treated in a different site using PFRs and Fixed-dome digesters.