REPORT OF INTERNSHIP AT

BITS PILANI GOA CAMPUS

1ST DECEMBER 2021 – 30TH JANUARY 2022

SUBMITTED BY

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SECOND YEAR MSc MARINE BIOTECHNOLOGY STUDENT

SCHOOL OF BIOLOGICAL SCIENCES

GOA UNIVERSITY

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BITS PILANI-K.K. BIRLA GOA CAMPUS

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BITS Pilani
K K Birla Goa Campus

WINTER INTERNSHIP

DEPARTMENT OF BIOLOGICAL SCIENCES

Certificate Of Completion

We Proudly Present This To

Ms. Geetanjali Sahu

For actively completing a 1 month internship at BITS Pilani, K K Birla Goa Campus from 1st December to 31st December 2022

Judith Braganca 13/01/2023

Prof. Judith Braganca
Associate Professor
Dept. of Biological Sciences
BITS Goa

13/01/2023

Prof. Dibakar Chakrabarty
HOD Biological Sciences

Geetanjali

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I would like to thank Dr. Judith Braganza for giving me the chance to work in the institute.

My special thanks to Prajakta and Devika (PhD Scholars at BITS) for explaining both theory and practical work in detail with lots of patience. Thanks a lot for your career guidance tips. It will definitely help me in choosing the best path.

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Sophisticated techniques: -

1. XRD

A potent non-destructive method for characterizing crystalline materials is X-ray diffraction (XRD). It offers details on crystal textures, optimum orientations for crystals, and other structural factors like average grain size, crystallinity, strain, and crystal defects. It also offers details on structures and phases. By constructively interfering with an X-ray beam from each set of lattice planes in a sample at specified angles, X-ray diffraction peaks are created. The distribution of atoms within the lattice controls the peak intensities. As a result, the x-ray diffraction pattern represents a material's unique signature of periodic atomic groupings.

Principle-
When the conditions of Bragg's Law are met, X-ray diffraction or constructive interference between elastically dispersed X-ray beams can be seen at particular angles 2θ when an X-ray beam of comparable wavelength is incident upon a crystal with an interplanar spacing d (crystal lattice constant)

$n\lambda = 2d\sin\theta$

where any integer n is used, since the diffraction angle is determined by a goniometer in the majority of diffractometers and the X-ray wavelength is fixed, the equation above can be used to determine the crystal lattice constants.

We used this technique to study the structure of tellurium nanoparticles, which turn out to have a crystalline structure. These particles were isolated from biological samples.

2. SEM

One of the most useful and well-known analytical methods is scanning electron microscopy (SEM). An electron microscope has benefits over a traditional optical microscope, such as higher magnification, a deeper field of view, better resolution, and simpler sample preparation and observation. Many low-energy secondary electrons are produced when electrons fired from an electron cannon enter a sample's surface. The sample's surface topography controls how intense these secondary electrons are. By monitoring secondary electron intensity as a function of the position of the scanning primary electron beam, an image of the sample surface may then be created.

We used SEM to visualize the topography of the tellurium nanoparticle.

3. DLS particle size and Zeta potential analyser

An easy-to-use system for characterizing colloidal, nanoparticulate, and macromolecules is the DLS Particle Size and Zeta Potential Analyzer. Large polymeric compounds distributed in water can have their molecular weight, particle size distribution, and particle zeta potential (which is related to the strength of the electrical charge at the particle surface) determined. Zeta potential is significant because its value can be connected to the stability of colloidal dispersions (e.g., a multivitamin syrup). The zeta potential shows the strength of attraction between neighbouring, similarly charged particles in dispersion, such as the vitamins. For sufficiently small molecules and particles, a high zeta potential will impart stability, which means that the solution or dispersion will fend off aggregation. A low potential causes attraction to outweigh repulsion, which causes dispersion.

We used this technique to analyse the nanoparticle: the particle size, molecular size, and zeta potential.

4. NMR

One could argue that the most potent analytical technique in contemporary research is nuclear magnetic resonance (NMR). NMR technology has been the subject of seven Nobel prizes, revolutionized biochemistry (complete protein structure determination) and medicine (most notably through the development of magnetic resonance imaging), and is essential for routine structure determination as well as a wide range of research in the chemical and physical sciences. Since almost all elements in the periodic table are somewhat visible by NMR, almost all matrices—both inorganic and organic—can be investigated using NMR spectroscopy. Since all naturally existing nuclei (hydrogen, carbon, nitrogen, and phosphorus) give rather narrow NMR signals, NMR is particularly helpful for organic structures. The nuclei of a molecule resonate at particular frequencies that are unique to their chemical surroundings when they are exposed to a magnetic field. The "chemical shift" is a particular frequency that can distinguish between the many chemical groups that make up a molecule and the environments in which they interact. In a properly collected spectrum, the peak area is also entirely quantitative. Thus, one-dimensional (1D) NMR's most fundamental function is to determine the types of nuclei present (through chemical shift) and how many of each type are present (via peak intensity). On the other hand, multidimensional NMR can be used to find correlations that show how nuclei are related to building a full structure.

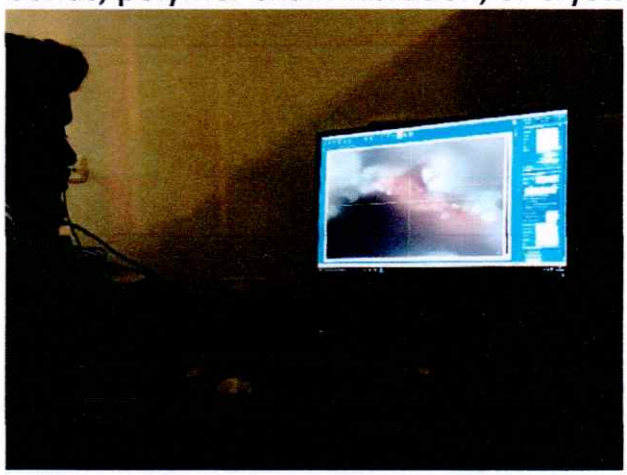
We performed 1D NMR to determine the types of nuclei present in the nanoparticle samples and used DMSO as a locking agent.

5. Raman spectroscopy

During a typical Raman spectroscopy procedure, a test sample scatters intense laser light as a result of the molecules in the sample vibrating. The majority of the dispersed light has the same wavelength as the laser light, therefore it provides no meaningful information. A minor amount of scattered light, nevertheless, is at various wavelengths. This Raman Scatter is indicative of the chemical composition of the material.

Raman scattering may be observed in almost all materials; the primary exception is pure metals since they reflect laser light.

We got a Raman spectrum of the nanoparticle sample which is a graph that shows the intensity (y-axis) and wavelengths (x-axis) of all the Raman scattered light from the sample. The spectrum has several "peaks" at various wavelengths, with each peak being associated with a molecular bond, group of bonds, polymer chain vibration, or crystal lattice mode.



Microbiological techniques

1- Sample collection

Garden soil was collected from the campus in a Petri dish and was serially diluted.

2- Media preparation

CMC Agar media was prepared with the pH of 7. Plates were poured and kept for solidification. Spread platting was done by using 10^{-7} ,10^{-8},10^{-9} dilutions.

3- Selection of colonies

Colonies were picked and streaked on the CMC Agar plates.
Four pure cultures were obtained.

4- Gram staining

All the cultures were Gram stained. The results obtained was all the four cultureswere Gram positive. Except for one culture all were bacilli spp. One culture was diplococci.

5- Congo red assay for cellulase producing bacteria

Spot inoculation of the four cultures were done on the CMC agar plates with the incubation period of 48hrs. After that the plates were flooded with 0.1% Congo red solution and kept for 15 mins.After that it was washed with 1M NaCl solution. Clear zones of cellulose degradation were obtained.

6- Maintenance of pure cultures

All the pure cultures obtained were streaked on NA slants.

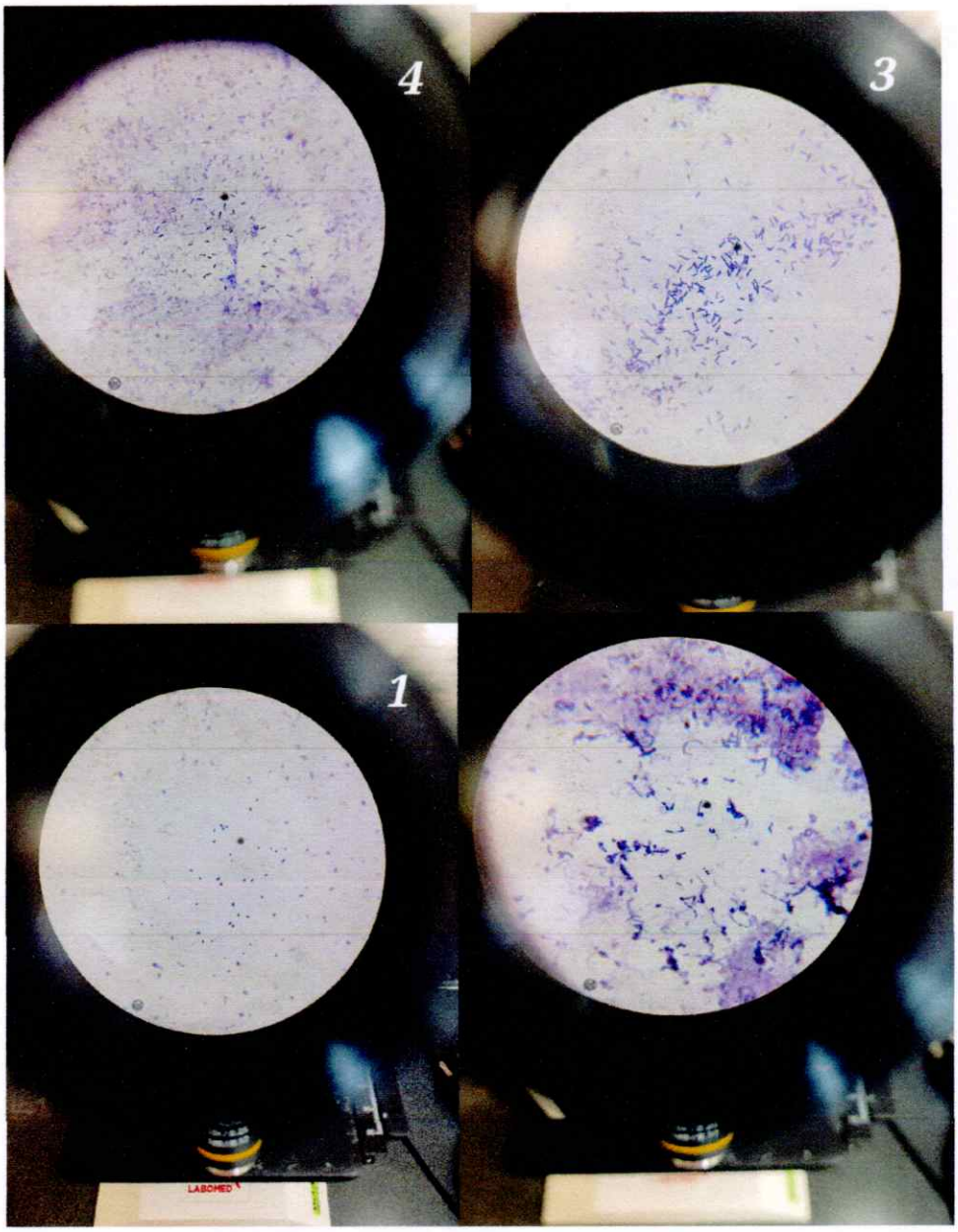
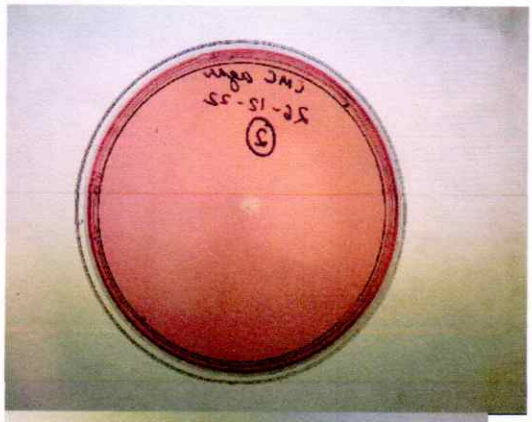


Figure ?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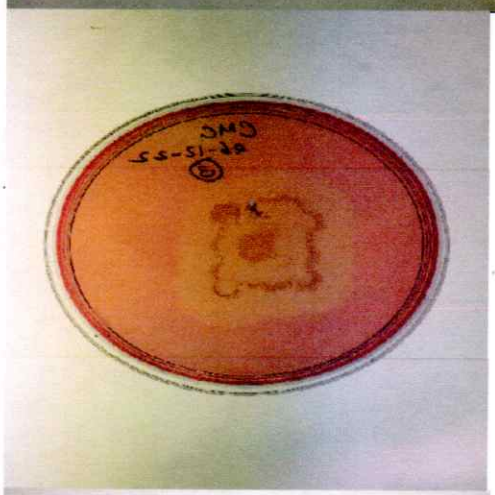
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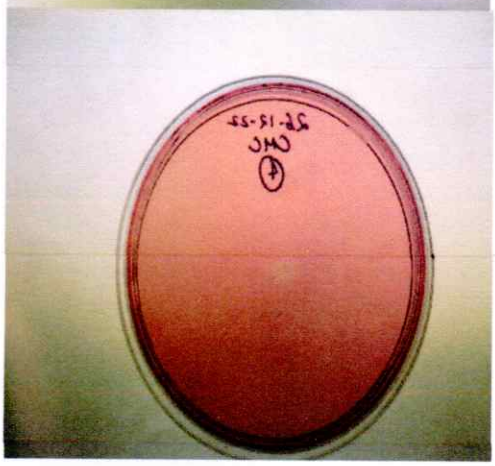
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CONCLUSION

From my internship at BITS, I gained hands on experience in Microbiological techniques and Biochemical and Analytical techniques.

I gained practical exposure to various instruments used in research laboratory.

I got a clear view of what it meant to be in the research world.

I got a better understanding of how the scientific research work goes on and how effective it is.

I gained a lot more interest in research after completing the internship.

Overall, I found the winter internship experience to be positive, and I'm sure I will be able to use the skills I learned in my career later.