SBSI 2022 FINAL PROJECT REPORT

Approach towards Green environment and Community awareness

Submitted by

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Under the guidance of

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2021-2022

DECLARATION

We have carried out the SBSI 2022 Internship under the guidance of-

Dr. Rupali Bhandari

Assistant Professor

Botany Program, School of Biological Sciences and Biotechnology, Goa University

The contents of this report are original and are reporting the 100 hours of our work carried out by us during this Internship

Roll No, Name and Signature of SBSI 2020 Interns:

21PO48007 Veda Dessai 

21PO48011 Prachi Gaunkar 

21PO48029 Surbhi Karapurkar 

CERTIFICATE

This is to certify that the following SBSI 2022 Interns –

21PO48007 Veda Dessai

21PO48011 Prachi Gaunkar

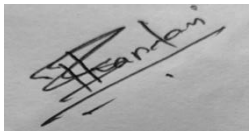
21PO48029 Surbhi Karapurkar

have satisfactorily completed 100 hours of activities related to Swachhata.

During this internship period, it was noticed that the interns acquired and enhanced the following skills –

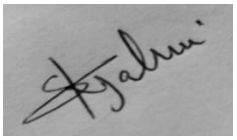
1. To prepare biofertilizers *viz.*, organic manure, vermicompost.
2. Skill of collecting and identifying seeds.
3. Raising of nursery using collected seeds.
4. Developed teamwork and management skills.
5. Inculcated Communication and organizational skills.

This report is being submitted to SBSI 2022 University Nodal Officer in partial fulfilment for the completion of the SBSI Course during the academic year 2021-2022.



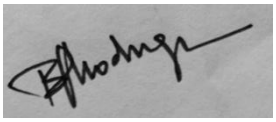
Dr. Rupali Bhandari, Assiatant Professor, Department of Botany

Name and Signature of SBSI Mentor



Dr. Siddhi K. Jalmi, Assiatant Professor, Department of Botany

Name and Signature of SBSI Coordinator



Prof. Bernard F. Rodrigues, Senior Professor, Department of Botany

Name and Signature of SBSI Chairperson

ACKNOWLEDGEMENTS

We take this opportunity to sincerely thank all the people who helped to make this project a success.

Special thanks to our respected Chairperson Prof. Bernard F. Rodrigues, Botany Program, School of Biological Sciences and Biotechnology, Goa University, for his valuable suggestions and guidance.

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We would like to extend our sincere gratitude to Dr. Rupali Bhandari, Botany Program, School of Biological Sciences and Biotechnology, Goa University. She was a constant source of inspiration and provided crucial support, and gave valuable suggestions during our work.

We immensely appreciate the help provided to us by Mr. Chudu, gardener at Botany department, Goa University.

We extend gratitude to Shri Mohan Tendulkar's vermicompost training centre, for guidance and for providing necessary support.

We would also like to thank Arpit, a self- help group from Chimbel, Goa, for permitting us to organize a demonstration on 'preparation of organic compost' and a talk on the importance of organic farming.

A sincere gratitude to St. Michael High School ,Taleigao, Auxilium High School, Caranzalem, and Government High School Dona-Paula, Goa, for permitting and extending support to organize demonstration on 'preparation of organic compost' and a talk on importance of organic farming for the benefit of students faculty.

We take this opportunity to acknowledge all our friends and family for their selfless support.

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INTRODUCTION

Swachhata/Cleanliness is next to Godliness. We've heard this phrase many times. Even though we should respect and follow this, we hardly do. Some of us don't even respect the people who clean the trash. There are a lot of cons for not maintaining cleanliness.

Talking about cleanliness one should be clear with thoughts that it should include cleanliness of surrounding, own self and inner thoughts. It should aim towards maintaining clean, healthy surrounding, to avoid the spreading of dirt and contaminants to oneself and others .With the help of cleanliness, we can keep our physical and mental health clean, which will make us feel good. Cleanliness gives rise to a good character by keeping body, mind, and soul clean and peaceful. Maintaining cleanliness is the essential part of healthy living because it is the cleanliness only which helps to improve our personality by keeping clean externally and internally.

It is everybody's responsibility and one should keep themselves and their surroundings clean and hygienic. It also brings good and positive thoughts in the mind which slows down the occurrence of diseases.

We selected to work on the theme Greenery, and the sole reason behind it is that 'Clean and Green' goes hand in hand. To encourage these thoughts we decided to work on following objectives which will help us to achieve cleanliness by spreading greenery in a clean way.

OBJECTIVES:-

1) Preparation of biofertilizers - Organic compost and vermicompost.
2) Collection of seeds of wild and cultivated plants.
3) Raising of nursery from the collected seed material.
4) Effect of biofertilizer application on seedling growth.
5) Distribution of prepared biofertilizer.
6) Organization of demonstration and talks.
7) Organization of competitions.

We discussed and settled on the above, mentioned objectives, considering the time available with us. The objectives could help us to gain knowledge, in field experience and team spirit. As well as, we can be motivators and helping hand to others by encouraging them to be competitive while learning.

Organizing demonstration and distribution of biofertilizers would be helpful to locals and youths.

DISTRIBUTION OF TIME

Sr.no	Dates	Work done	Time in hours
1.	March 30th	Registration	
2.	April 4th	Discussion and planning	4 hours
3.	April 5th	Collection of required material for organic compost	2 hours
4.	April 6th	Composting procedure bin 1	10 hours
5.	April 8th to 30th	Follow up on bin 1	
6.	May 4th	Decanting and drying	
7.	May 7th	Collection and storing of compost	
8.	April 11th	Composting procedure bin 2	12 hours
9.	April 13th to June 4th	Follow up on bin 2	
10.	June 6th	Decanting and drying	
11.	June 8th	Collection and storing of compost	
12.	April 17th	Visit to vermicompost training center and collection of worms	2 hours
13.	April 18th	Collection of required materials and vermicomposting procedure	15 hours
14.	April 23rd to June 4th	Follow up	
15.	June 9th	Vermicompost harvesting	
16.		Collection of seeds from campus	10 hours
17.	May 7th and 13th	Soil collection for planting, filling of polybags, germinating seeds and sowing seeds	12 hours
18.		Applying biofertilizers, watering and weeding	
19.	June 8th	Packaging of compost and distribution to local farmers	6 hours
20.	June 7th to 11th June	Online competitions (planning and organizing)	20 hours
21.	June 9th to 11th	Planning and Visiting schools (3), self-help group and giving talks and demonstrations	15 hours

1. PREPARATION OF BIOFERTILIZER- ORGANIC COMPOST AND VERMICOMPOST

Modern agriculture emphasizes in using hybrid seeds and high yielding varieties that are highly responsive to large doses of chemical fertilizers and irrigation. Indiscriminate use of synthetic fertilizers has led to pollution and contamination of soil and water basins. This has resulted in soil being deprived of essential plant nutrients and organic matter. It has also resulted in depletion of beneficial micro-organisms and insects indirectly reducing soil fertility and making crops more prone to diseases. To overcome this catastrophic situation, a more natural and sustainable alternative is required.

Biofertilizers: Biofertilizer is the need of the hour for this danger and contribute to the well-being of the ecosystem. They are natural fertilizes which are living microbial inoculants of bacteria, algae, fungi alone or in combination and they augment the availability of nutrients to the plants. The role of biofertilizers in agriculture assumes special significance, particularly in the present context of increased cost of chemical fertilizer and their hazardous effects on soil health. Bio-fertilizers are an environmentally friendly and cost-effective renewable source of fertilizer. Though they do not show immediate results, but the results shown over time are spectacular. The long term use of bio-fertilizers proves to be economical, more efficient, productive and accessible to marginal and small farmers over chemical fertilizers. The need for the use of biofertilizer thus arises primarily for two reasons. First, because increase in the use of fertilizers leads to increased crop productivity, and second, because increased usage of chemical fertilizer leads to damage in soil texture and raises other environmental problems.

Organic Manure: Organic manures are natural products used by farmers to provide food (plant nutrients) for the crop plants. There are a number of organic manures like farmyard manure, green manures, compost prepared from crop residues and other farm wastes, vermicompost, oil cakes, and biological wastes – animal bones, slaughter house refuse. Organic manures increase the organic matter in the soil. Organic matter in turn releases the plant food in available form for the use of crops. However, organic manures should not be seen only as carriers of plant food. These manures also enable a soil to hold more water and also help to improve the drainage in clay soils. They provide organic acids that help to dissolve soil nutrients and make them available for the plants. Just as different fertilizers contain different amounts of plant nutrients, organic manures are also not alike. Average quality of farmyard manure provides 12 kg nutrients per ton and compost provides 40 kg per ton. Most of the legume green manures provide 20 kg of nitrogen per ton. Each ton of sorghum/rice/maize straw can be expected to add 26 kg of nutrients. Being extremely beneficial to the plants and crops, organic fertilizers are available in the number of varieties as per the targeted crops, unique requirement of farms, soil conditions, etc. It can be produced from natural waste, biomass products, fish emulsion, manure teas, sea-weed extract, etc. There are various types of organic manures, they are

1) **Farm yard manure:** is prepared basically using cow dung, cow urine, waste straw and other dairy wastes. It is highly useful and some of its properties are rich in nutrients. When cow dung and urine are mixed, a balanced nutrition is made available to the plants. Availability of Potassium and Phosphorus from FYM is similar to that from inorganic sources. Application of FYM improves soil fertility.

2) **Green manure:** Many countries have changed from a region of food scarcity to food sufficiency by increased fertilizer use with subsidized prices, but use of organic manures including green manure, declined substantially. Inorganic fertilizers are becoming more expensive, therefore sustainability of soil productivity has become a question. Hence, alternate sources to supplement inorganic fertilizers are thought. Green manuring is low cost and effective technology in minimizing cost of fertilizers and safeguarding productivity.

3) **Compost:** Compost is a rich source of organic matter. Soil organic matter plays an important role in sustaining soil fertility, and hence in sustainable agricultural production. In addition to being a source of plant nutrient, it improves the physico-chemical and biological properties of the soil. Final weight of compost is very less. Composting temperature kill pathogen, weed seeds and seeds. It improves manure handling, reduces the risk of pollution and volume reduction of waste. During composting number of wastes from several sources are blended together. Matured compost comes into equilibrium with the soil and as an excellent soil conditioner.

4) **Vermicompost:** Vermicompost is an organic manure (bio-fertilizer) produced as the vermicast by earth worm feeding on biological waste material i.e. plant residues. This compost is an odourless, clean, organic material containing adequate quantities of N, P, K and several micronutrients essential for plant growth. It is a preferred nutrient source for organic farming. It is eco-friendly, non-toxic, consumes low energy input for composting and is a recycled biological product. The process allows for the safe conversion of waste into a valuable nutrient rich humus fertilizer. Vermicompost is earthworm excrement, called castings, which can improve biological, chemical, and physical properties of the soil. The chemical secretions in the earthworm's digestive tract help break down soil and organic matter, so the castings contain more nutrients that are immediately available to plants. The worm cast is rich in NPK which are in readily available form and are released within a month of application. It is known to enhance plant growth, suppresses diseases in plants, increases porosity and microbial activity in soil, and improves water retention and aeration. Thus it benefits the environment by reducing the need for chemical fertilizers and decreasing the amount of waste going to landfills.

5) **Concentrated organic manures:** It consists of edible oil cakes which can be safely fed to livestock; e.g.: Groundnut cake, Coconut cake etc., and non edible oil cakes which are not fit for feeding livestock; e.g.: Castor cake, Neem cake, Mahua cake, etc. Both edible and non-edible oil cakes can be used as manures. However, edible oil cakes are fed to cattle and non-edible oil cakes are used as manures especially for horticultural crops. The nutrients present in oil cakes, after mineralization, are made available to crops 7 to 10 days after application.

The increased consumer demand appears to be driven primarily by the perception that organically grown produce was safer and more nutrients to eat than produce grown conventionally. Similarly, the use of inorganic fertilizer has been observed to cause the destruction of soil texture and structure, which often leads to soil erosion and acidity as a result of the leaching effect of nutrients. All these give rise to reduced crop yields as a result of soil degradation and nutrients imbalance. It has been concluded that manured soil had higher organic matter levels, lower bulk density, higher porosity and hydraulic conductivity, and greater aggregate stability than soils fertilized conventionally. Improvements in all of these soil quality indicators would optimize crop growth. Thus, one of the most significant benefits of manure as an organic nutrient source was the potential to maintain or increase soil organic matter levels. Microbial biomass and labile organic matter pools were often greater in organic than conventionally managed soils. Higher organic matter content, N mineralization potential, and microbial biomass were observed in organically farmed plots than in those receiving commercial fertilizers. It found greater total C and N, microbial biomass, soil respiration, and mineralizable N in organically managed farms than in conventional farms. In general, tissue dry matter content was reported to be higher in organically grown leafy vegetables, but not in fruit. Similarly, dry matter produce from organic systems was higher than in conventionally grown produce. High rates of K fertilization have been reported to reduce dry matter content in some crops.

Role of Organic manure: Organic manure binds soil particles into structural units called aggregates. These aggregates help to maintain a loose, open, granular condition. Water infiltrates and percolates more readily. The granular condition of soil maintains favourable condition of aeration and permeability. The water-holding capacity is increased by organic matter. Organic matter definitely increases the amount of available water in sandy and loamy soils. Further, the granular soil resulting from organic matter additions, supplies more water than sticky and impervious soil. Surface run off and erosion are reduced by organic matter as there is good infiltration. Organic matter or organic manure on the soil surface reduces losses of soil by wind erosion. Surface mulching with coarse organic matter lowers soil temperatures in the summer and keeps soil warmer in winter. The organic matter serves as a source of energy for the growth of soil microorganisms. Organic matter serves as a reservoir of chemical elements that are essential for plant growth. Most of the soil nitrogen occurs in organic combination. Also a considerable quantity of phosphorus and sulphur exist in organic forms upon decomposition, organic matter supplies the nutrients needed by growing plants, as well as many hormones and antibiotics. Fresh organic matter has a special function in making soil phosphorus more readily available in acid soils. Organic acids released from decomposing organic matter help to reduce alkalinity in soils. Fresh organic matter supplies food for such soil life as earthworms, ants and rodents. These macro-organisms improve drainage and aeration. Earthworms can flourish only in soils that are well provided with organic matter. Organic matter upon decomposition produces organic acids and carbon dioxide which help to dissolve minerals such as potassium and make them more available to growing plants. Humus (highly decomposed organic matter) provides a storehouse for the exchangeable and available cations. Ammonium fertilizers are also prevented from leaching because humus holds ammonium in an exchangeable and available form. Some of the special use of organic manure is that manure helps in enriching the soil areas denuded by erosion or land levelling for irrigation. Secondly, special cases of micronutrient deficiency can be ameliorated with manure application. Thirdly, the water holding capacity of sandy soils is increased with heavy manure applications. Manure application also increases tilth of heavy-textured clay soils. Fourthly, manures are also applied to the trees and shrubs.

Manures have very long term effect on the soil because nutrients are released very slowly. Only one-fifth of the nutrients supplied by animal manures are recovered by the first-crop following the application. Much of the remainder is held in humus-like compounds subject to very slow decomposition. In these forms, the elements are released only very slowly, rates of 2-4% per year being common. Thus, the humus-like compounds in manure will have continuing effects on soils years after their application. Organic farming aspires to a combine mixture of organic, environmental, social and ethic objectives.

REVIEW OF LITERATURE

EFFECTS OF ORGANIC FERTILIZERS ON SOIL PROPERTIES

Soil is a living, highly complex and dynamic ecosystem that harbors and support extremely rich diversity of micro and macroflora which in turn influence its properties. It primarily consists of inorganic mineral nutrients and organic matter along with huge number of living forms and maintains a balance between physical, chemical and biological factors (Doran and Safley, 1997). Soil is the basis of agriculture and thus the universal food producer. Apart from its most widely known role as a medium for plant growth soil performs many other vital functions such as mediating the exchange of gases, flow of energy, nutrients and water, detoxification of pollutants and many other (Larson and Pierce, 1994). Hence, management of soil health is crucial for ensuring sustainable agricultural productions and maintenance of soil biodiversity including microbial diversity. Soils are not only responsible for providing most of the food items consumed by mankind but are also vital in maintaining environmental quality at various levels. Hence, looking at the growing food requirements of the world it is necessary to analyze and maintain soil health. The term soil health has importance considering the development of sustainable agriculture. In contrast, soil quality is not limited to the degree of soil pollution, but is commonly defined much more broadly as "the capacity of a soil to function within ecosystem and land-use boundaries to sustain biological productivity, maintain environmental quality, and promote plant and animal health" (Doran and Parkin, 1994; Doran and Parkin, 1996). Organic farming's main aims, is to stimulate soil fertility by avoiding the use of synthetic fertilizer inputs, relying instead on locally available natural resources. It is regarded by many as a sustainable alternative to conventional farming because it ensures higher biodiversity, restricts environmental pollution, prevents land degradation and is easy to apply for smallholder and subsistence farmers. Term Biofertilizer refers to substances containing effective strains of living microorganisms such as fungi, algae, bacteria that can expedite soil microbial activities to enhance the active supply of nutrients in a way that plants can easily incorporate (Mahdi *et al.*, 2010)

EFFECT OF BIOFERTILIZERS ON PLANTS AND SOIL MICROFLORA.

According to Stoffella *et al.,* (1997), compost and other organic fertilizers have been reported to improve soil nutrient levels, as fertilizers provide a ready source of carbon and nitrogen for soil microorganisms, improve soil structure, reduce erosion, lower soil temperatures, facilitate seed germination and increase soil water retention capacity. Fertilizers stabilize soil pH, increase soil organic matter, and ultimately improve the growth and yields of plants (Roe *et al.,* 1997). Application of organic manure increases organic elements' availability in soil, thereby improving the nutrient use efficiency (NUE) of crops and alleviating the harmful impact of climate change on crop production. Moreover, fertilization regimes have pronounced effects on the community structure of total bacteria of agriculture soil.

Wu *et al.,* (2012) recorded a shift in structural diversity and the dominant bacterial groups of agriculture soils due to long term treatment with inorganic fertilizer of different types like N, NP or organic manures as well as different growing stages of the crop. Another aspect of chemical fertilization is that it leads to generation of nutrient channels or patches thus creating nutrient gradient in the soil that affects the microbial population. (Li *et al.,* 2013) studied the effect of N- gradient created by chemical fertilizers like ammonia sulfateor urea on nitrogen transformation, soil microbial biomass and microbial functional diversity.

IMPORTANCE OF CURD IN BIOFERTILIZER

Curd compost plays an important role in the sustainable development of soil health. It is totally organic fertilizer that provides nitrogen and phosphorous dose to plants. The organic dose of curd compost based on the principle i.e., balance the soil ecosystem. Organic fertilizers does not leave any artificial compound in the soil when it is applied on the soil surface. Curd compost prepared easily and low-cost input on it. It is easily used by the marginal farmers. The production of these organic compost and products is reviewed with regard to sustainable agriculture in northern India. Curd is soft white substance formed when milk coagulates. Curd mainly used for the meal purpose of every person in the world. But, in our research we use the curd compost for nitrogen dose and phosphorous dose purpose to plants. 2kg curd compost provides 25% N in the form of soil application. Curd compost increases the soil fertility rate and increases the microbial rate in soil. Curd compost increase 25-30% yield of wheat, rice, fruits and vegetables.

COW DUNG AND SOIL PRODUCTIVITY

Soil provides numerous essential ecosystem services such as primary production (including agricultural and forestry products); regulation of biogeochemical cycle (with consequences of the climate); water filtration, resistance to diseases and pests and regulation of above ground biodiversity (Jhariya and Raj, 2014). Soil fertility depletion is the single most important constraint to food security. Manure is an important input for maintaining and enhancing soil fertility. According to Fulhage (2000) manure contains the three major plant nutrients, N, P and K, as well as many essential nutrients such as Ca, Mg, S, Zn, B, Cu, Mn, etc. That, in addition to supplying plant nutrients, manure generally improves soil tilth, aeration, and water holding capacity of the soil and promotes growth of beneficial soil organisms. The application of cowdung manure and vermicompost increases soil organic matter content, and this leads to improved water infiltration and water holding capacity as well as an increased cation exchange capacity. According to Mandal *et al.,* (2013) integration of inorganic, organics and biofertilizers can produce 50-92% more yield in Aonla. According to Adegunloye *et al.,* (2007) C: N ratio in cowdung manure is an indication that it could be a good source of protein for the microbes which involved in decomposition of organic matter. Manure and urine raise the pH level and accelerate the decomposition of organic matter and termite activity (Brouwer and Powell, 1995, 1998). If inorganic fertilizer, especially nitrogen, is combined with manure, the manure reduces soil acidification and improves the nutrient buffering capacity and the release of nutrients (Williams et al., 1995). The soil productivity is also related to available nutrient source in either through manures (dung) or chemical fertilizers (superphosphate etc). Dung increased pH, CEC, total N, organic C, loss on ignition, and exchangeable Mg and Ca. It decreased sulphate sorption. Moreover, cowdung manure plays a significant role in maintaining the nutrient status of the plant. Vermicomposting of cow manure using earthworm species *E. andrei* (Atiyeh *et al.,* 2000b) and *E. foetida* (Hand *et al.,* 1988) favored nitrification, resulting in the rapid conversion of ammonium-nitrogen to nitrate-nitrogen. Therefore, it improves the nutrient cycling and helping to convert unavailable nitrogen in available forms to plants. The soil biological attributes are also responsible for determination & maintenance of physical properties of soil. The physical properties of soil in its own turn control not only the quantum of chemical properties, but also the rate of their release and availability to plants essential for metabolic processes. Thus, it may be said that soil biology is the door to maintenance of soil health (Kumari *et al.* 2014). As per Dinesh *et al.,* (2000) there is a positive rrelationship between relevant soil properties and enzyme activities and suggested that addition of organic matter increased microbial activity/ diversity and turnover, which subsequently leads to greater enzyme synthesis and accumulation in the soil matrix. The effects of cattle dung on soil microbial biomass are also studied and compared to controlled condition of soil (no any dung application). When dung was mixed with grassland

soil under controlled conditions the size of the SMB increased ($P < 0.001$). Respiration rate also increased ($P < 0.001$) and specific respiration was higher ($P < 0.05$) in soil treated with beef cattle dung than in that treated with dairy cow dung (Lovell and Jarvis, 1996).

IMPORTANCE OF EARTHWORM/REDWORM

Biodiversity is responsible for the provision of many ecosystem services; human well being is based on these services, and consequently on biodiversity. In soil, earthworms represent the largest component of the animal biomass and are commonly termed 'ecosystem engineers. Earthworms are one of the most important soil animals; they have the capability to maintain the fertility of the soil and therefore play a key role in sustainability. They are also known as farmer's friend, ploughman of the field, intestines of the earth, ecological engineers, and biological indicators. Earthworms are considered as ecosystem engineers that play an important role in shaping soil structure and cycling nutrients (Blouin *et al.*, 2013).Earthworms promote litter decomposition, nitrogen (N) mineralisation and water infiltration, as a result of their feeding and burrowing habits (Baker, 2007), and therefore deeply affect soil properties (Hättenschwiler and Gasser, 2005). They also play a crucial role in the provision of soil ecosystem services (Lavelle *et al.*, 2016). When earthworms are to be introduced, a suite of adapted species, at sustainable numbers and biomass, must be added to ensure a stable population which will induce favourable soil properties and enhanced plant production. Vermicomposting is generally defined as the solid phase decomposition of organic residues in the aerobic environment by exploiting the optimum biological activity of earthworms and microorganisms (Garg and Gupta, 2009).

Materials and Methods for preparation of biofertilizers

A] EXPERIMENTAL SITE

Goa University is situated in Tiswadi taluka of North Goa district about5km away from Panaji the capital of Goa and is one of the major education hub for Goan students. This area has plateau, fringes of forest and human habitation. The project area focuses at Block A, Department of Botany area of Goa University.

B] PREPARATION OF BIOFERTILIZER

1.Method of preparation of organic compost

1. **Collection of soil sample**

Soil required for biofertilizer preparation was collected from near canteen area. This area is surrounded by many trees, and the soil is rich in humus. In order to dig and collect soil from the field equipment's namely spade, khurpi were used. Around 10kg of soil was collected from the site.

2. **Collection of dry leaves**

Dry organic waste materials were available around university campus such as fallen leaves, dried grass, and woody material from pruning. Hard woody material was crushed before using. Material composts best when it is 1.25-3.75 cm in size. Soft, succulent tissues did not need chopping into very small pieces because they decompose rapidly. The harder or woodier the tissues, the smaller they need to be in order to decompose rapidly.

3. **Collection of kitchen waste**

Kitchen waste was collected from home and university canteen. The green material such as grass clippings, old flowers, green pruning, weeds, and fruit and vegetable wastes was being collected.

4. **Materials needed**

1. Composting bin
2. Garden soil
3. Dry leaves
4. Kitchen waste
5. Curd
6. Water

5. **Mode of preparation**

- For preparing organic fertilizer take a wide mouthed Mud pot or plastic can (avoid metal container because bio fertilizer is acidic) at least 20 inch deep.
- Make holes to the container for drainage of excess water and aeration (at bottom and side of bin).
- Add garden soil to it approximately 3kg.
- Add thick layer of dry leaves.

- Add layer of kitchen waste.
- Add 250g of curd.
- Add layer of dry leaves.
- Continue adding kitchen waste at least for three days in a week. Simultaneously add dry leaves.
- Stir the mixture well every week with help of wooden stick.
- Whenever required, sprinkle small amount of water to keep it moist.

2. Method of preparation of Vermicompost

1. Collection of Redworm

Eisenia fetida, also known as manure worm, red worm, or tiger worm is a species of earthworm adapted to decaying organic material.

Redworm were given to us by Mohan Tendulkar's Vermicompost Training Centre Malkarnem, Sanguem-Goa.

2. Materials needed

1. Composting bin
2. Coconut husk
3. Dry cow dung
4. Wet cow dung
5. Dry leaves
6. Red worms
7. Water

3. Mode of preparation

- For preparing vermicompost take a wide mouthed Mud pot or plastic can (avoid metal container because bio fertilizer is acidic) at least 20 inch deep.
- Make a hole to container for drainage of excess water and air ration (at bottom and side of bin).
- Add layer (4 inch) of coconut husk.
- Add thick layer (4 inch) of dry cow dung.
- Add thick layer (5 inch) of dry leaves.
- Repeat step of adding dry cow dung and dry leaves for 2 times.
- Sprinkle some water to keep it moisture.
- Add red worm.
- Cover the bin to prevent from houseflies.

- Add thin layer of finely chopped kitchen waste in bin once in a week. (If by chance you overfeed your worms, stop feeding and wait up to 2 weeks before feeding again. You'll know you have overfed your worms if you find untouched food 2 to 3 weeks after you've added it. Observation and learn).
- Prepared bin should be kept in dark condition.





4. **Harvesting the compost**

- When to harvest Vermicompost

Vermicompost is a mixture of worm and decomposed organic matter. It mostly takes 3 to 4 months to completely form Vermicompost. It will be wet in texture, need to sun dry it for 2-3 days. The vermicompost is ready to harvest if it looks like crumbly chocolate cake of black colour. It is normally done during the daytime for easy separation of Redworm.

- How to harvest Vermicompost

Harvesting means removal of finished compost from the bin and separating it from the worm.

1. **Gradual, Manual Harvesting of Vermicompost**
   This method is usually used where a gardener wishes to collect small amounts of vermicompost. Harvesting involves hand-sorting, or picking the worms directly from the compost by hand.
2. **Bulk Harvesting by Pyramidal Heap**

The vermicompost is transferred onto a flat surface in the open sun over a plastic sheet or sack or some other substitute is spread. The worms are sensitivity to light and heat. As the pyramid is exposed to bright light, the worms will tend to move deep into the pyramid. Collect the compost from sides and top surface. Wait for some time, and again collect the compost from sides and top.

3. **Screening or Sieving**
   This method of harvesting vermicompost done anytime of the day or even at night. The tool required for this is sieve (consists of mesh wire nailed on wood stick). A small portion of the pile is first transferred onto sieve and shake. As a result, a fine vermicompost falls on the ground.
4. **Self-Harvesting (Migration)** Methods
   These methods are based on the worms' tendency to migrate to new regions, either to find new food or to avoid undesirable conditions, such as dryness or light.

RESULTS

- **Organic compost**
  Organic compost was successfully prepared.

- **Vermicompost**

2] COLLECTION OF WILD AND CULTIVATED TYPE OF SEEDS.

Goa University houses large number of wild and cultivated plants. Seeds of these various plants were collected by hand after identification of the plant. Seeds were collected by various ways:

- Dispersed seeds were collected from the ground.
- Fruits were collected and seeds were manually removed and dried.
- Pods were collected, broken to remove seeds and then seeds were dried if needed.

Seeds collected from the Goa University campus during the project period.

Table 1: Details and photos of collected seeds.

Sr.no.	Scientific name	Common name	Family	Picture
1.	*Anacardium occidentale*	Cashew	Anacardiaceae	
2.	*Artocarpus heterophyllus*	Jackfruit	Moraceae	
3.	*Cassia fistula*	Golden shower	Fabaceae	
4.	*Delonix regia*	Royal poinciana /Gulmohar	Fabaceae	
5.	*Mangifera indica*	Mango	Anacardiaceae	

Sr.no.	Scientific name	Common name	Family	Picture
6.	*Peltophorum pterocarpum*	Copperpod/Yellow flame	Fabaceae	
7.	*Pithecellobium dulce*	Madras thorn	Fabaceae	
8.	*Syzygium cumini*	Jamun / java plum	Myrtaceae	
9.	*Ziziphus mauritiana*	Indian jujube	Rhamnaceae	
10.	*Ziziphus rugosa*	Zunna berry	Rhamnaceae	

3] RAISING OF NURSERY FROM THE COLLECTED SEEDS.

- Polybags were filled with soil.
- Half of the bags were used to sow selected seeds and were observed further as control.
- Remaining half bags were sown with same type of selected seeds but here prepared organic compost was added (treatment).
- Seeds and later seedlings were timely hydrated.
- Weeding was done occasionally.

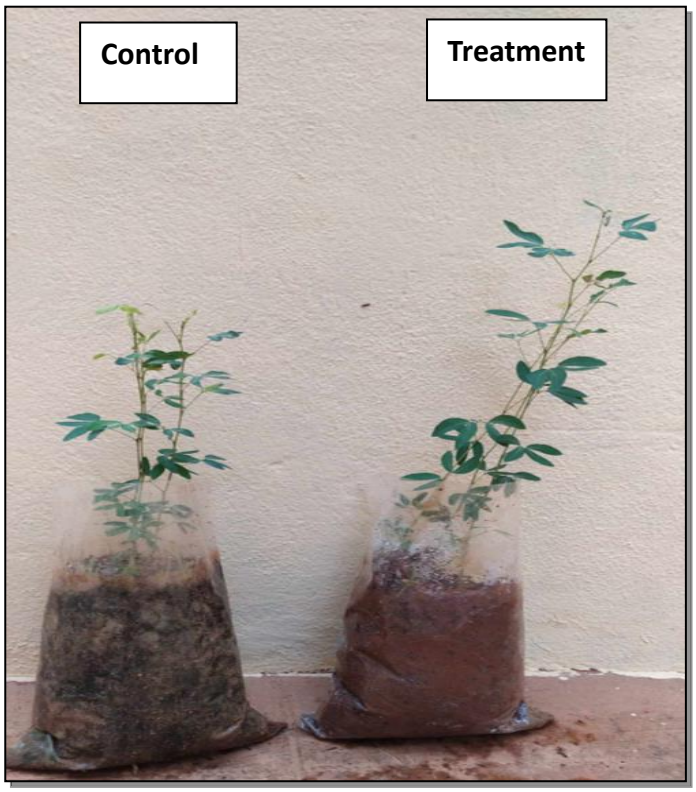
Nursery raised from collected seeds.

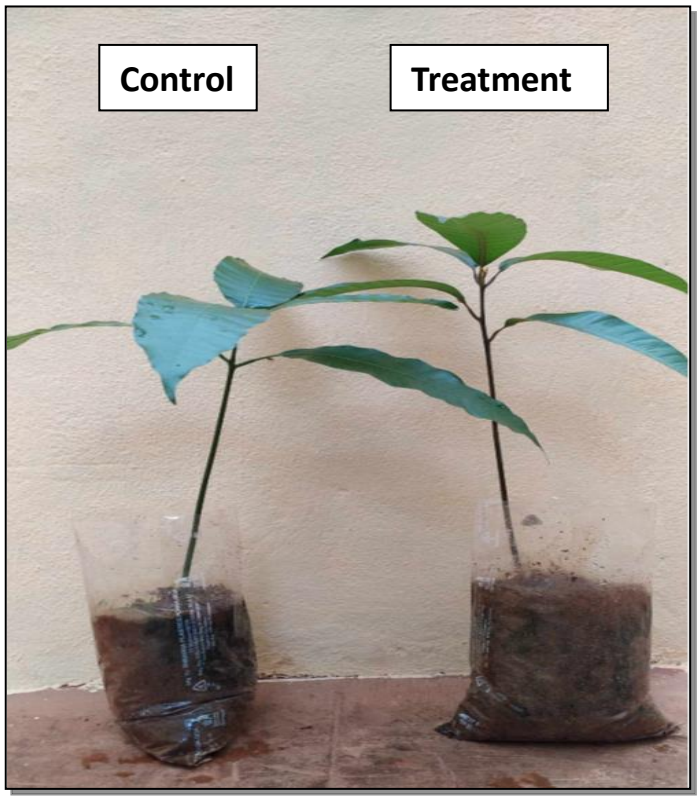
- Polybags were filled with soil collected from Goa university campus to germinate seeds.

- Selected seeds were sown in polybags as an initial step of raising nursery.

4] EFFECT OF PREPARED BIOFERTILIZERS ON SAPLINGS.

Effect of prepared organic compost and vermicompost was observed on raised plant saplings. This helped us confirm its effectiveness, thus letting us gain confidence over its use and distribution.





5] DISTRIBUTION OF PREPARED ORGANIC FERTILIZER TO THE LOCAL FARMERS.

Prepared biofertilizer was distributed amongst the local farmers of Amdai Sanguem Goa, with the motive to create awareness about the use and advantages of it.

6] ORGANIZATION OF TALKS AND DEMONSTRATIONS FOR SCHOOL STUDENTS AND SELF-HELP GROUP.

Informative talk sessions were organized in different schools to impart the knowledge of organic manure and its pros to the environment. The talk included the cons of chemical fertilizer usage and its impact on the ecosystem, also a demo session on compost preparation was carried out where the students actively participated. The session was followed by a quiz competition and prize distribution for the winners selected.

Various activities were carried out to spread awareness on the need for, “Clean and Green environment”, and importance of organic manure in today’s world of massive chemical fertilizer usage.

These activities helped us nurture young minds and women for taking a step towards sustainable environment.

St. Michael High School Taleigao, Goa

Auxilium High School Caranzalem, Goa

Government High School Dona-Paula, Goa

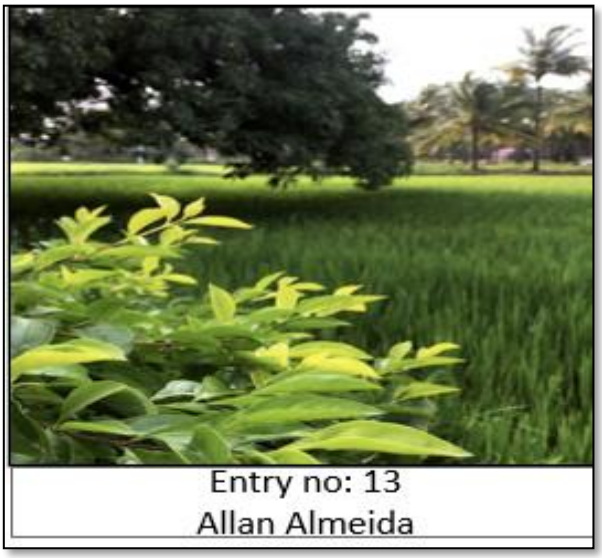
Winners of the Quiz Competition along with Faculty

Arpit Self Help Group (Village: - Chimbel, Goa)

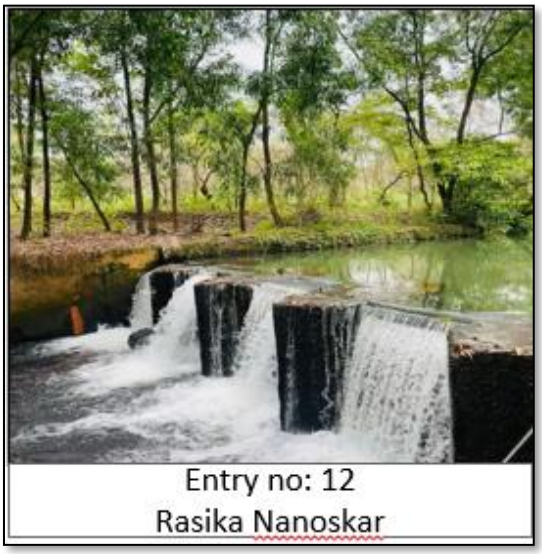
7] ORGANIZED THREE COMPETITIONS ON THE THEME GREENERY, AND WE RECEIVED AN IMMENSE RESPONSE FOR THE SAME.

(http://instagram.com/_earth_lings_?igshid=YmMyMTA2M2Y=)
User name: __earth_lings__

- Competition no: 1 MY FAVOURITE GREEN SPOT
  Received total 15 entries. Best 2 were selected by judges based on photo and caption.



Entry no: 13
Allan Almeida



Entry no: 12
Rasika Nanoskar

- Competition no: 2 REEL YOUR GREENS
  Received total 6 entries. Best 2 were selected by judges based on concept, clarity, time and number oof vegetables present.

Entry no: 4
Prince Faldessai

Entry no: 3
Harshad Gaunkar

- Competition no: 3 #One_selfie_with_my_new_plant
  Received total 9 entries. Best 2 were selected by judges

Entry no: 2
Mrunal Kelkar

Entry no: 9
Bablo Mavlankar

DISCUSSION AND CONCLUDING REMARK

In today's world the use of organic fertilizer forms the basic necessity of a farmer. The chemical fertilizer disturbs the soil fertility, making it unsuitable for raising plants, also they are costly. The prepared organic compost and vermicompost involves the use of organic substances which enhances maximum productivity in sustainable way with better soil health. For the preparation raw materials are put in containers and mixed at regular intervals. The mixture is left to decompose and then dried for suitable time period. During the process of decomposition, various natural processes occur inside the fertilizer such as solubilization of phosphorus, synthesis of growth promoting substances, etc. organic fertilizers don't upset the balance in the soil because they don't leave behind any artificial compounds, they deliver nutrients in slow, sustainable way and prevent over fertilization.

Collection of seeds is an initial step in the process of bringing new plant materials to address individual resource concerns. It helps in identifying superior plants, and continues the cycle of growing new plants to participate in enhancing green environment. Germinating the collected seeds and using prepared biofertilizers on them, helped in concluding the positive effect of biofertilizers as compared to plants grown in controlled conditions by showing healthy and visibly better growth.

As student interns, working on this project helped us gain vast theoretical and practical experience on our perseverance towards Greenery. It also gave us the opportunity to reach out to the community to spread our word. Internships provides us a platform to showcase and exhibit our thoughts, creativity and enthusiasm, thus enabling us develop all-round personality.

Spreading greenery by planting more and more plants is definitely a great option but, growing plants in sustainable and organic manner will help in spreading and maintaining greenery for years to come.

It is a responsibility of every individual to choose wisely the path they want to follow for green, clean and healthy future.

FUTURE SCOPE OF THE PROJECT

1. The field work through such projects gives firsthand experience of preparing fertilizers with the available resources.
2. Raised saplings can be transplanted and raised further.
3. Preparation of compost can be done on large scale, and benefits can be raised from the same.
4. If more and more people are made aware then, kitchen waste can be wisely used rather than throwing or heaping it in various areas which contributes to pollution.

LIMITATIONS FACED DURING PROJECT

1. Project time period was short and hence it has limited the number of activities.
2. More time for preparation of compost would possibly yield better results.
3. Saplings were too young for transplantation in the field.

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