SBSI 2023 FINAL PROJECT REPORT

Approach towards Green environment and Community awareness

Submitted by

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Under the Guidance of

Dr. Rupali Bhandari

Assistant Professor

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

2022-2023

DECLARATION

We have carried out the SBSI 2023 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 2023 Interns:

21P048016 Apoorva Abhay Lolyekar

21P048020 Dikshita Devdatt Naik

21P048030 Vanessa Angelica Fernandes

21P048026 Andrea Monica Rodrigues

21P048021 Mahanta Anil Naik

21P048010 Tanvi Dilip Gaonkar

CERTIFICATE

This is to certify that the following SBSI 2023 Interns –

21P048016 Apoorva Abhay Lolyekar

21P048020 Dikshita Devdatt Naik

21P048030 Vanessa Angelica Fernandes

21P048026 Andrea Monica Rodrigues

21P048021 Mahanta Anil Naik

21P048010 Tanvi Dilip Gaonkar

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. Awareness of Organic Gardening and it's benefits.
2. Home Gardening using organic methods.
3. Maintenance of plants and it's surroundings in department premises.

This report is being submitted to SBSI 2023 University Nodal Officer in partial fulfillment for the completion of the SBSI Course during the academic year 2022-2023.

Dr. Rupali Bhandari, Assistant Professor
Department of Botany
Name and Signature of SBSI Mentor

Prof. Bernard F. Rodrigues, Senior Professor,
Department of Botany,
Name and Signature of SBSI Coordinator

ACKNOWLEDGEMENTS

We would like to express our gratitude to all the people who have helped us to successfully complete our project.

Firstly we would like to take the opportunity to express our special gratitude to our project guide Dr. Rupali Bhandari for her constant support and help. Without her guidance, help, cooperation and encouragement this project would not be successful.

We extend our sincere gratitude to our respected chairperson Prof. Bernard F. Rodrigues for his valuable advice and guidance during the tenure of our project.

We are thankful to the coordinator, Dr. Siddhi K. Jalmi, Botany Program, School of Biological Sciences and Biotechnology, Goa University for her timely support and guidance.

We would also like to thank our family and friends for their constant encouragement during the project which we could not have completed without their support and continuous encouragement.

CONTENTS

INTRODUCTION

The unsustainable use of chemicals in the agriculture and the fear/concern of food contamination from agrochemical and contamination of environment, soil, and water have led us to consider other forms of agriculture to produce disease free food. Furthermore in the era of global warming and climate change, needs to be more environment friendly. So there is need to focus on developing long term sustainable production techniques. Organic agriculture is one of a wide range of production methods that support the environment and limit the use of synthetic resources.

A key goal of organic vegetable production is to optimize the health and productivity of interdependent soil, plant, and animal and human communities. With growing awareness of food safety and quality, the long term sustainability of organic farming has made is as attractive source of income as well as providing a lucrative livelihood option.

Organic gardening system rely on soil organic matter management to improve soil chemical, biological and physical properties. One of main principles of soil fertility and management in organic systems is that plant nutrition relies on nutrients of biological origin and not the use of nutrients in readily soluble forms. The use of organic inputs has proven more profitable than pesticides in condition of soil limitation and climate change. This slurry adequately meets the nutritional needs of the crops and promotes beneficial micro-flora and macro flora activity within the soil. Additionally you can use a liquid fertilizers made by fermenting leaves or available resources. Cover crops, organic fertilizers and food waste are some of the potential sources of nutrients in organic farming.

OBJECTIVES:

4. Awareness of Organic Gardening and it's benefits.
5. Home Gardening using organic methods.
6. Maintenance of plants and it's surroundings in department premises.

All the above objectives were discussed and selected by the group members in view of increasing our knowledge, skills and awareness about organic gardening as a step towards greenery.

Many activities were planned and carried out in the view of the same. Alongside to create awareness about our learning's the same was published on social media accounts.

DISTRIBUTION OF TIME

❖ Total work outline

Sr. No.	Date	Work Done	Total hours
1.	25/1/23	Meeting and Instruction of project by Guide	--
2.	26/1/23	Discussion and meeting	--
3.	14/2/23	Writing of Proposal	--
4.	18/2/23	Finalizing and Uploading of Proposal	--
5.	16/2/23 to 12/4/23	Regular based	102
6.	19/2/23 to 25/5/23	Date based	70
7.	--	Total	172

❖ Work done Regular basis:

Sr. No.	Work done	Time in hours	Frequency of work	Total hours
1.	Campus cleaning	2 per week	2 × 10 weeks	20
2.	Cleaning and watering of Department vases	2 per week	2 × 10 weeks	20
3.	Mulch preparation	2 per month	2 × 2 months	4
4.	Mulching in Department vases	2 per month	2 × 2 months	4
5.	Preparation of liquid fertilizers	1 per week	1 × 12 weeks	12
6.	Adding fertilizer and compost to Department vases	1 per week	1 × 5 weeks	5
7.	Maintenance of Home garden plants	2 per week	2 × 14 weeks	28
8.	Online competitions (3)	3 per competition	3 × 3	9
9.	---	---	Total	102

❖ Work done on date basis:

Sr. No.	Date	Work done	Time in hours
1.	19/2/23 - 24/2/23	Preparation for Homegardening by each member	8
2.	21/2/23	Preparation of vases for Department	3
3.	21/2/23	Neem extraction in oil for pesticide (1 Litre)	3
4.	26/2/23	Collecting and potting of plants in Department	3
5.	28/2/23	Preparation for microgreens	2
6.	5/3/23	Instagram page work (3 videos and 8 poster + templates)	2 and 1/2
7.	7/3/23	Recording and uploading of 2 videos on Instagram	2
8.	8/3/23 - 9/3/23	Planting of new plants in Department	4
9.	14/3/23	Competition poster preparation	2
10.	21/323	Transplanting of Homegardening plants	2 and 1/2
11.	24/3/23	Posters making for Awareness	5
12.	28/3/23	Transplanting of Homegardening plants	2
13.	29/3/23	Neem extraction in oil for pesticide (1 Litre)	3
14.	30/3/23	Posters making for Awareness	5
15.	3/4/23	Pitcher plant cleaning and re-potting in Department	3
16.	3/4/23	Growing microgreens + video recording	2
17.	17/4/23	Department vases painting	6
17.	16/5/23 - 25/5/23	Repeat Microgreens growing	6
18.	19/5/23	Liquid pesticides making	3
19.	23/5/23	Liquid pesticides making	3
20.	--	Total	70

1. AWARENESS ABOUT ORGANIC GARDENING AND ITS BENEFITS

Organic gardening refers to growing plants, vegetables, and fruits in the best natural way without the use of pesticides or synthetic chemical fertilizers. It emphasized on creating an ecosystem that nourishes and sustains soil microbes and plants, also benefiting insects. There are three major objectives to maintain a organic garden. These include soil management which is dealt with by using organic fertilizer .The second is weed management which is managed by manual labor and use of organic ground covering and lastly pest control which is dealt with by promoting beneficial insects and companion planting and use of organic insecticides and pesticides . The soil is the most important thing and it is maintained by the continuous addition of organic matter to the soil .The use of chemical soil treatments not only destroy the soil composition but also harm the important microorganisms, worms, and bacteria in the soil.

Benefits of Organic gardening

- Main benefit of having a organic garden is that it provides us with fresh and organic vegetables throughout the year.
- It provide us with clean air and create habitat for plants and animals and it is good for physical and mental health.
- It is a great way to save money, improve your health, and enjoy nature.

2. HOME GARDENING USING ORGANIC METHODS

i. HOME GARDENING/ KITCHEN GARDENING

Home gardening/kitchen gardening is a diverse practices where herbs and vegetables are grown around the houses for household use to meet the requirement of vegetables. It is the practice of growing vegetables organically by providing natural compost and fertilizer without any use of harmful Chemicals. It involves the use of only natural products to grow plants in your garden. A good home gardening plan may include selecting the right location, determining the size of the garden, deciding upon the types and varieties of vegetables to plant.

Kitchen gardening is gardening from seeds which are easily available in our kitchen. Kitchen gardening provide us with fresh and healthy vegetables that are produced organically without any use of chemicals. Home Gardening is a practical activity, as

well as we can bring our own organically cultivated vegetables, fruits, flowers, and medicinal herbs to our table. A vegetable garden can be grown in spaces ranging from a small balcony to a huge backyard. The versatility of this type of garden is what makes it extremely user-friendly. It's essential to know where you would like to set up your garden, as it helps you understand space consumption, the availability of sunlight and watering your plants.

Home Gardening should be done in a proper manner as there are some important factors which you should consider before you plan for home gardening such as :

a. **Site selection** : You must select a place where the soil is loose, rich, and well-drained. Never choose low areas where water gets collected or the soil remains wet. Your vegetables will not grow in poorly drained areas. Also, take care that vegetables need proper sunlight to grow well so do not plant it at a place where there is shade or shadow. Most of the vegetables need at least 6 hours of sunlight each day. Make sure there is a water supply nearby, if possible. Water is not required every time but is needed after long dry periods or when planting seeds.

b. **Size of the Garden** : One of the most common mistakes made by new gardeners is making the garden too big. It is important to mention that a garden that is too big in size will have too much work to do. And if the garden is small, you will easily manage it.

c. **Deciding on what to grow** : Select the plant which can be grown easily and which is suitable for your garden. The seeds which are easily available in your kitchen can be selected for home-gardening. Depending upon the type of garden the plant should be selected. You can grow different kinds of vegetables to put more variety into your diet.

d. **Location of vegetables in the garden** : You need to arrange vegetables in a way that makes the most efficient use of the space as well as light. Tall vegetables like okra, corn, and tomatoes can be grown on one side (preferably at the north) of the garden where they won't shade short-length vegetables like bush beans. You can also divide vegetables according to maturity. You should also plant small, fast-maturing vegetables between the big ones. If possible plant vine crops near a fence.

ii. MICROGREENS

Microgreens are young vegetable greens that are approximately 1–3 inches (2.5–7.5 cm) tall. They have an aromatic flavor and concentrated nutrient content and come in a variety of colors and textures. Microgreens are considered baby plants, falling somewhere between a sprout and baby green. It shouldn't be confused with sprouts, which do not have leaves. Sprouts also have a much shorter growing cycle of 2–7 days, whereas microgreens are usually harvested 7–21 days after germination, once the plant's first true leaves have emerged.

- **Different types of Microgreens**

Microgreens can be grown from many different types of seeds. The most popular varieties are produced using seeds from the following plant families such as:

- ✓ Brassicaceae family: Cauliflower, broccoli, cabbage and radish.
- ✓ Asteraceae family: Lettuce
- ✓ Apiaceae family: Carrot and fennel
- ✓ Amaryllidaceae family: Garlic and onion
- ✓ Amaranthaceae family: Amaranth, beet and spinach
- ✓ Cucurbitaceae family: Melon, cucumber and squash

Cereals such as rice, oats, wheat, corn and barley, as well as legumes like chickpeas, beans and lentils, are also sometimes grown into microgreens.

- **Importance of Microgreens**

- ✓ Microgreens are packed with nutrients, while their nutrient contents vary slightly, most varieties tend to be rich in potassium, iron, zinc, magnesium and copper.
- ✓ Microgreens are also a great source of beneficial plant compounds like antioxidants.
- ✓ They often contain higher vitamin, mineral and antioxidant levels than the same quantity of mature greens.
- ✓ In fact, research comparing microgreens to more mature greens reports that nutrient levels in microgreens can be up to nine times higher than those found in mature greens.

iii. LIQUID FERTILIZERS

Liquid organic fertilizers are concentrated liquids, rich in nutrients that are added to water and applied to the soil and/ or foliage. Liquid organic fertilizers provides soluble and easily available nutrient to the crop giving plant nutrients in a faster acting form than solid fertilizer. For all vegetables & flowers it works like a liquid meal which increases the uptake of nutrients in them and provides guaranteed visible results in 7 days.

Any organic farmers struggle to find natural ways of enhancing their soil. While organic fertilizers are readily available, it makes more sense to produce them as only then can one be sure of the components used. When produced appropriately, homemade organic liquid fertilizers can be as good as their commercially made ones.

A huge percentage of organic fertilizers are made from kitchen waste. However, there are many more things one can convert into potent fertilizer for use in their organic garden rather than disposing them off. Organic farmers can make their own organic liquid fertilizer by infusing their components of choice in water for some days. The soluble nutrients then drain in the water solution.

- **<u>Importance of liquid fertilizer</u>**

  1. Easy and uniform Application

  Liquid fertilizers can seep into the soil and spread more uniformly, thus giving your fields an even consistent coating so that all plants receive the same nutrients regardless of location. It's an easy process to apply the liquid fertilizer, and it is worked into the soil in more uniform ways.

  2. Fast Acting

  One of the benefits of liquid fertilizer is that because the liquid penetrates the soil immediately, plants are given faster access to the nutrients. Some plants will see results from this application almost immediately. In fact, many farmers use this type of fertilizer early in the season to ensure quick root growth so plants take hold when it is essential for them to do so.

  3. Diversity in application options

  If blended with crop protection products, liquid fertilizers potentially work in a single pass for a season. These are perfectly acceptable ways to apply the fertilizer, all of which can prove easier and less time-consuming than granular fertilizer application.

4. **Healthier Plants**

Liquid fertilizers are better at balancing the pH of the soil based on the chemicals they are delivering. Nitrogen, for example, can be incredibly helpful in the right amounts but also can kill plants if over-applied. Potassium-based fertilizers can be helpful, too, but only in the right amount. Liquid options can make for healthier plants, which is another reason why they often are a smart option for crops.

- **<u>Types of Liquid Fertilizers</u>**

1. **Orange peel liquid fertilizer:**

Orange peels liquid fertilizer are used to fertilize plants and improve the soil structure. They also provide essential nutrients like potassium, iron, calcium, and citric acid.

2. **Onion peel liquid fertilizer**

Onion peel is a rich source of potassium. They are also rich in calcium, iron, magnesium, and copper. As this fertilizer is rich in potassium, so it will mainly enhance branching, blooming, size, and quality of the fruit. You can apply once after every 7 to 10 days. Application of this liquid fertilizer also enhances disease and pest resistance of the plant.

3. **Banana Peels liquid fertilizer**

Banana peels come with loads of potassium. Fertilizers that are rich in potassium are good for flowers and fruit plants. This, however, may not be appropriate for foliage plants such as spinach and lettuce but works well on other fruit crops

4. **Potato peel liquid fertilizer**

Potato peels are rich in nutrients such as potassium, magnesium, phosphorus and many vitamins. All these nutrients increase the growth of the plants.

iv. LIQUID PESTICIDE

Organic pesticides are natural substances that kill pests naturally which is friendly as well. They work by breaking down into harmless compounds when exposed to sunlight. These pesticides from natural sources don't contain toxic chemicals and are good for human health, and animal health as well. Aphids, spider mites, and other pests can cause serious damage to flowers, fruits, and vegetables. Many chemical pesticides, like those containing glyphosate, can prove unsafe and the environment or may make fruits and

vegetables unsafe for consumption due to which homemade organic pesticide are preferred.

- **Types of pesticides**

1. **Garlic pesticides**
   - ✓ Garlic contain irritating and disorienting sulfur compounds which can repel most flying and crawling insects.
   - ✓ It's especially helpful against annoying aphids, worms, beetles, caterpillars, cutworms, mites, mosquitoes, and flies.
   - ✓ Garlic repels many larger pests as well.
2. **Ginger pesticide**
   - ✓ It is one of the homemade pesticides made to repel most insects including aphids, leaf miners, mealybugs, and other common harmful garden insects.
   - ✓ It is made by fermenting small slices of ginger.
3. **Onion pesticide**
   - ✓ Onion pesticide are considered to be one of the effective ingredient to eliminate pest, which has a strong odor offensive to many pests.
4. **Vinegar Pesticide**
   - ✓ The acetic acid in the vinegar will treat a wide range of garden pests such as whitefly eggs.
   - ✓ Furthermore, white vinegar has a strong odor which has been reported to repel ants and other scent driven pests.
5. **Neem pesticide**
   - ✓ Neem contains an active ingredient called Azadirachtin, which acts as a natural pesticide.
   - ✓ It is effective pesticides against the aphids, mites, caterpillar, mealybugs etc.
   - ✓ It works as a fungicide against diseases like black spots, anthracnose, scab, rust, leaf spots.

3. MAINTENANCE OF PLANTS AND IT'S SURROUNDINGS

Maintaining a clean environment at houses, workplace, institutions by frequently taking cleaning steps and will probably be helpful maintaining hygiene for everyone living around. The cleanliness and with a healthy environment are significantly more beneficial for a healthier learning environment. We have maintained few areas of campus for cleanliness (eg.

Canteen surrounding, department area). Plastic, paper and other items were collected separated in bin bags for segregated disposal. This activities were conducted for twice a week for 3 months.

Various activities were undertaken to ensure cleanliness in campus and department premises such as potting and repotting, cutting and pruning, watering of plants along with mulching and fertilizing, cleaning and painting of vases and cleaning of areas for plastic wastes.

i. **POTTING/ REPOTTING** :

- ✓ Potting means pot culture for cultivation of plants in pot. High and deep pots are required for potting of plants.
- ✓ A hole is very essential at the bottom of pot for convenient of water removed.
- ✓ Repotting is carried out if the plants have overgrown branches or roots. It gives a growing plant roots more aeration.
- ✓ Repotting will allow to locate cases of root rot and remove unhealthy roots, helping new, healthy ones to grow in their place.
- ✓ Repotting also allows you to remove offshoots of your plant and place them in new containers of their own, leaving you with multiple plants

ii. **APPLICATION OF LIQUID FERTILIZER TO PLANTS**

- ✓ In organic gardening, often slow-release fertilizers like compost, well-rotted manure, and other organic matter is used.
- ✓ However, sometimes, plants may require a boost of nutrients in a short term. Organic liquid fertilizer delivers particular nutrients to specific plants at a particular time.
- ✓ The liquid organic fertilizers are concentrated liquids, rich in nutrients that are added to water and applied to the soil and/ or foliage. The nutrients in the liquid fertilizer will be available to plants more quickly.
- ✓ Liquid fertilizers can be used every 2-3 weeks throughout the growing season. There are different types of organic liquid fertilizers, such as orange peel liquid fertilizer, mix vegetable liquid fertilizer, banana peel liquid fertilizer, potato peel liquid fertilizer etc.

iii. APPLICATION OF COMPOST

- ✓ Compost is defined as a carbon-rich fertilizer derived from organic materials, including livestock manures, and other organic materials or mixed materials used to supply nutrients to soils.
- ✓ Compost is used to improve soil structure through the addition of carbon and provide plant nutrients.
- ✓ In addition to being a source of plant nutrients such as nitrogen (N), phosphorus (P) and potassium (K), it improves the physio-chemical biological properties of the soil.
- ✓ It also improves the structure and health of soil by adding organic matter, helps the soil retain moisture and nutrients, attracts beneficial organisms to the soil and reduces the need for pesticides and fertilizers, and reduces the potential for soil erosion.

iv. MULCHING

- ✓ Mulching is an eco-friendly technique which could potentially serve the purpose by reducing soil evaporation, conserving moisture, controlling soil temperature, reducing weed growth, and improving microbial activities.
- ✓ The process of covering the open surface of the ground by a layer of some external material is called Mulching and the material used is called as 'Mulch'.
- ✓ Mulching is usually practiced when cultivating commercially important crops, fruit trees, vegetables, flowers, and nursery saplings.
- ✓ Mulching creates a micro-climate for the plant to grow and perform better in an area that has regulated moisture content, suitable temperature, humidity, carbon dioxide, and proper microbial activity within the soil.
- ✓ It can be done throughout the year and it is either done organically or inorganically.

REVIEW OF LITERATURE

ORGANIC FARMING IN INDIA : BENEFITS AND CHALLENGES

According to Mendon et al, (2020) the farming of organic products is a unique practice which balances the environmental sustainability and also controls the detrimental effect both on customer's safety by creating a positive notion in the minds of the customers. Varkey, (2020) contends that countries, developing as well as developed are emphasizing environment sustainability of agricultural production, methods and practices. The work of Magnaye, (2018) examines the relationship between smallholder organic farming and entrepreneurship taking into account the environmental conservation approach of organic farming and the economic enhancement features of entrepreneurship. Furthermore, it intends to determine, through qualitative analysis using case studies, how smallholder organic farming can be planned, and the competencies needed by an organic farmer when venturing into an organic farm enterprise. On the other hand Giovannucci, (2007) assert that there is significant evidence that organic methods could be favorable for small farmers. Yadav, et al, (2013) stated that in the post independence period, the most important challenge in India has been to produce enough food for the growing population.

IMPACT OF ORGANIC NUTRITION MANAGEMENT ON CROP QUALITY,YIELD AND SOIL HEALTH

Organic nutrients are proven things that improving crop productivity, quality and yield which in turn enhance the quality and richness of the soil properties and make way for the healthier environment for the beneficial soil microorganism. According to Natarajan, (2008) the liquid organic manures contains small amount of nutrients and growth boosters. When it applied to the crops it removes the imbalances in terms of physical, chemical and physiological aspects and harmonizes the basic element which revitalizes the growth process. Sampath Kumar et al., (2012) reported the antifungal and antibiotic activity of peel and pulp of fully ripe bananas and a fungicide in the peel and pulp of green fruits is active against a fungus disease of tomato plants.

NUTRITIONAL QUALITY AND HEALTH BENEFITS OF MICROGREENS, A CROP OF MODERN AGRICULTURE

Microgreens are young tender leaves, tender leaves of the green plants used to enhance the colour, texture and flavour of salads and entrees. It is widely used in agriculture in controlled

environments because it can be grown in a small scale and indoors. Indoor farming practices are particularly important for feeding the growing urban population. Additionally microgreens are gaining Increase attention from Consumers due to their high nutritional value and unique sensory properties. This review focuses on nutritional quality, sensory evaluation, pre and post harvest intervention and health benefits of microgreens. Microgreens are rich in vitamins, minerals and phytochemicals such as carotenoids and phenolic compounds that act as antioxidants in the human body. Pre harvest interventions such as lighting, salinity stress, fortification and natural substrate have been shown to affect photosynthetic and metabolic activity of microgreens and improve nutrient quality, although their effects vary by species.

Post harvest packing method and storage temperature can affect nutrient retention in microgreens. Both in vitro and in vivo studies have shown that microgreens have anti-inflammatory, anti-cancer, antibacterial and anti-glycemic effects, making them a new functional food that is beneficial to human health. It is the sensory properties, general accessibility and taste of microgreens are primarily influenced by their phytochemical content. Microgreens have gained popularity in recent decades, and research into microgreens is still in it's early stages. Further research is needed to optimize pre and post harvest practices for nutrient fortification and storage and to explore the potential health benefits of different microgreens preventing and treating chronic diseases.

SPROUTS AND MICROGREENS: TRENDS, OPPORTUNITIES, AND HORIZONS FOR NOVEL RESEARCH

Sprout and microgreens are of great interest in various fields. In a particular report they have reported on plant science, nutrient, health and animals husbandry in unstudied or understudied species, such as wild plants and fruits logs. Abiotic and biotic factors and bio stimulants for triggering strategies and metabolism. Disinfection and processing technology to produce quality product, digestive system fate and impact of bioactive elements, anti-nutrients and allergens on human nutrition. Experimental challenges in studying health benefits. The ability to create a natural product library : drug development. Sprout in animal feed to improve both animal health and nutrition. The value of animal products for human consumption. Fusion of different subjects the interdisciplinary competence of advocates for attractive research activities such as : metabolic variants generating a natural product collection for identification and selection of bioactive compound chemical substances severed as dietary supplements, main ingredients of functional foods or interacting partners of functional foods specific drugs.

MATERIAL, METHODS AND RESULTS

1. AWARENESS ABOUT ORGANIC GARDENING AND ITS BENEFITS

The following activities were carried out to create awareness about organic gardening

- Preparation of poster and videos using Canva and Inshot
  a. Neem oil and it's benefits.
  b. Liquid fertilizers and it's benefits.
  c. Microgreens and it's benefits.
- Organized Online competition for awareness
  a. Selfie with your garden buddy
  b. Garden memes
  c. Reel your garden tips

All the above activities were carried out online by creating an Instagram account and by posting on personal Instagram and Whatsapp accounts.

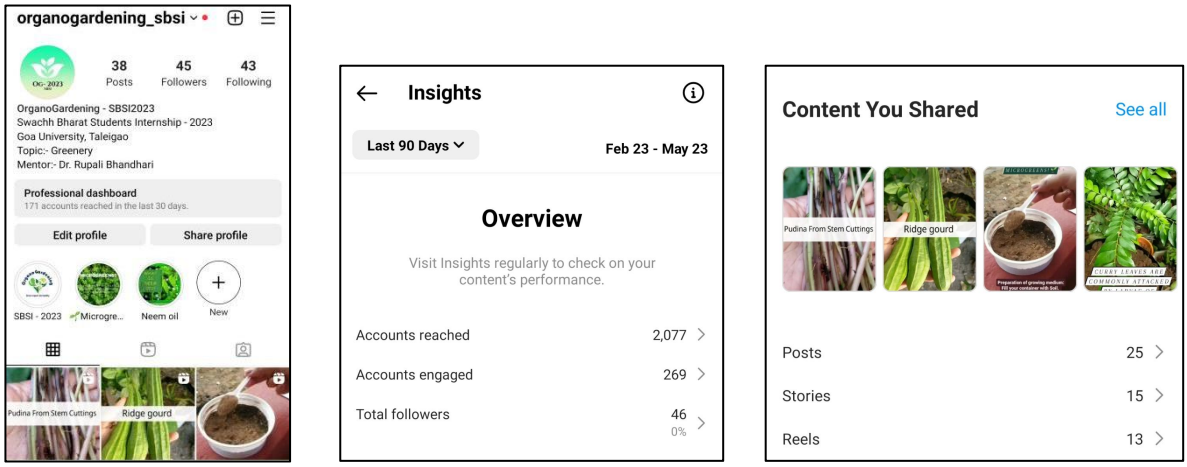


Fig: Instagram ID - organogardening_sbsi

a) Preparation of poster to create awareness about organic gardening:

Requirements:

Laptop , Internet connection, Canva app , Instagram , WhatsApp

Methodology:

1. Collection of data/resources from internet sources.
2. Using various tools like Canva and small-e-tools to prepare posters. (https://play.google.com/store/apps/details?id=com.canva.editor)

3. Preparing carousel posts with information related to the topics.

4. Sharing these on Instagram and whatsapp to create awareness.

5. Instagram ID: organogardening_sbsi
(https://instagram.com/organogardening_sbsi?igshid=NTc4MTIwNjQ2YQ=)

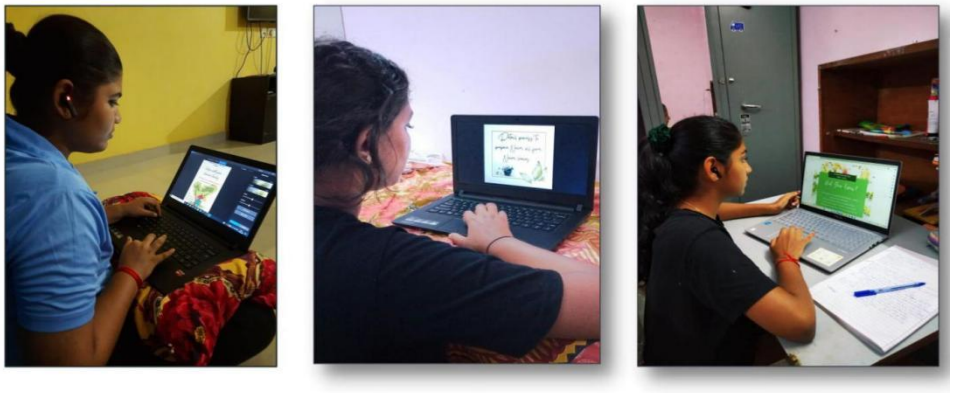


Fig: Preparation of poster by various members on the laptop

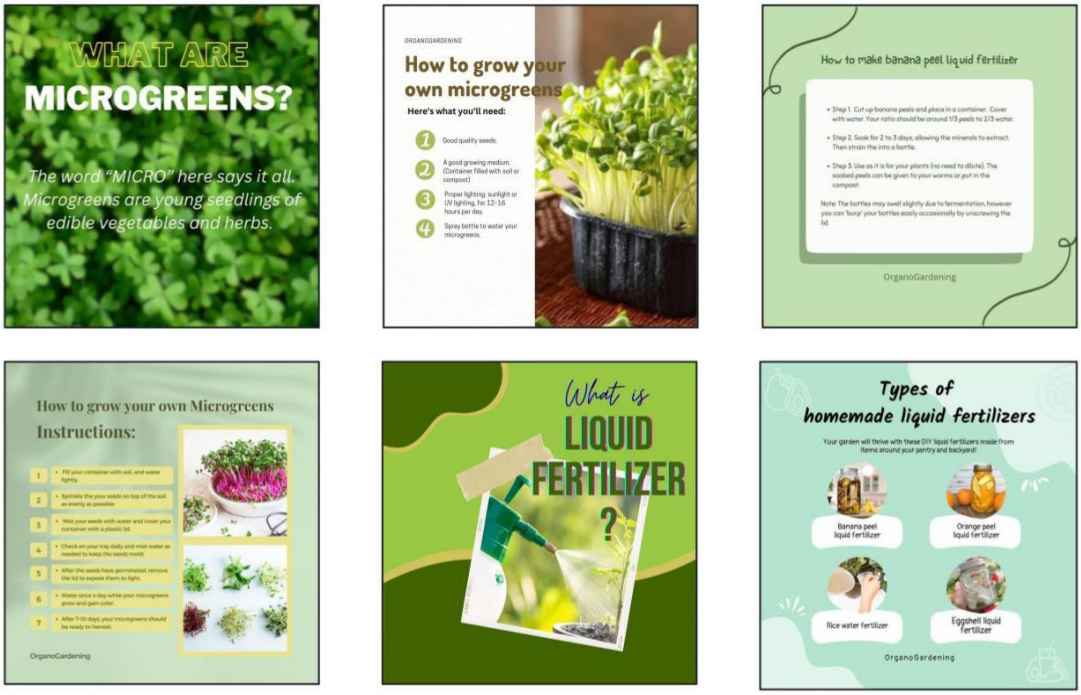


Fig: Posters prepared using the Canva and Small-e-tools app

Fig: Posters prepared using the Canva and Small-e-tools app

b) Preparation of videos to create awareness about organic gardening:

Requirements:

Laptop , Internet connection, VN editor or Inshot app , Instagram , WhatsApp

Methodology:

1. Collection of data/resources from internet.
2. Recording video clips related to the topic.
3. Editing the videos using Apps like VN editor or Inshot.
   (https://play.google.com/store/apps/details?id=com.camerasideas.instashot)
4. Sharing these on Instagram and Whatsapp to create awareness.
5. Instagram ID: organogardening_sbsi.
   (https://instagram.com/organogardening_sbsi?igshid=NTc4MTIwNjQ2YQ=)

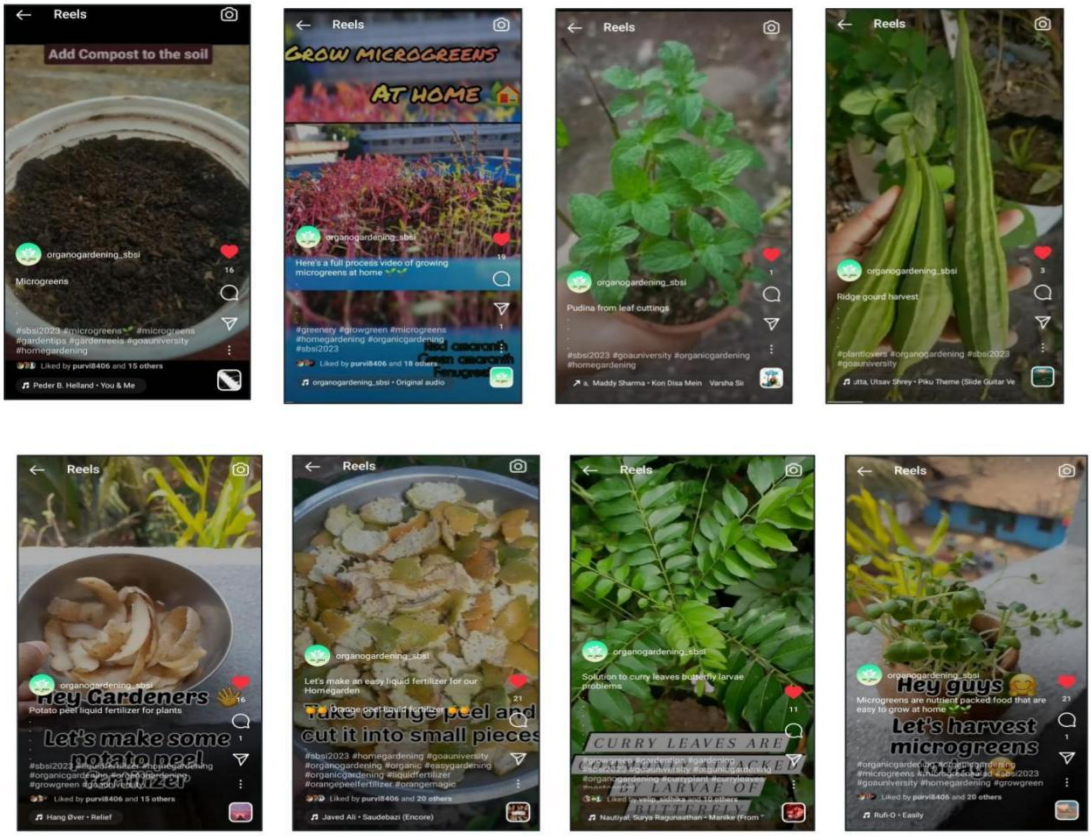


Fig: Videos prepared using VN and Inshot App

c) To organize competition to create awareness about organic gardening:

Requirements:

Laptop , Internet connection, Canva app , Instagram , WhatsApp

Methodology:

1.Creating posters for each competition using online website Small-e-tools and Canva .

(https://play.google.com/store/apps/details?id=com.canva.editor)

2.Posting on Instagram and Whatsapp.

3.Collection and posting of obtained entries on Instagram.

4.Winners were finalized on basis of likes.

5.Instagram ID: organogardening_sbsi.

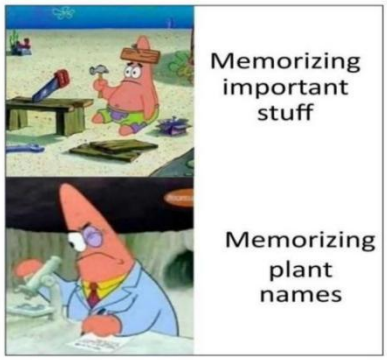
(https://instagram.com/organogardening_sbsi?igshid=NTc4MTIwNjQ2YQ=)

Fig: Posters prepared of the online competition

Winners of the online competition

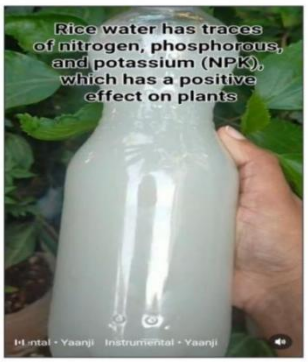
- **SELFIE WITH YOUR GARDEN BUDDY**
  - Number of entries received: 6
  - Best 2 were selected on basis of likes obtained on our instagram account.

- **GARDEN MEMES**
  - Number of entries received: 7
  - Best 2 were selected on basis of likes obtained on our instagram account.



❖ **REEL YOUR GARDEN TIPS**

- Number of entries received: 4
- Best 2 were selected on basis of likes obtained on our instagram account.



2. HOMEGARDENING USING ORGANIC METHODS

The following activities were carried under home gardening section

- Practicing of home gardening:
  a. Garden plants like vegetables
  b. Microgreens
- Preparation and use of
  a. Liquid fertilizers
  b. Liquid pesticides

All the above activities were carried out at house levels and its process and results were documented using pictures and videos.

a) Practicing of home gardening using garden plants

i. Type of gardens

✓ **Backyard garden**

The front yard or the backyard is a best location to set home garden, the only thing to consider is whether plants are exposed to sunlight throughout the day.

✓ **Balcony garden**

Balcony gardens are a great way to beautify your homes and can be set vertically or horizontally. It will be the perfect spot too as the plants will get exposed to sunlight.

ii. Site selection

- ✓ Near the house or balcony area.
- ✓ Well lighted area receiving about 6 hours of sunlight daily.
- ✓ Area to avoid clogging of water.

iii. Types of containers used

- ✓ Reusable plastic growing pots with proper drainage holes (size: 12”x12”).
- ✓ Reusable plastic grow bags with proper drainage hole (size: 12”x12”).
- ✓ Reused plastic takeaway containers.

iv. Soil composition

- ✓ For germination = 90% garden soil + 10% Compost
- ✓ For growth = 80% garden soil + 20% Compost
- ✓ Soil was exposed to 5 hours of sunlight before use.

v. Selection of plants

- ✓ Locally cultivated plants were selected.
- ✓ Seeds which are easily available in kitchen were used.
- ✓ Seeds from local nursery were purchased.
- ✓ Plant cuttings were used.
- ✓ Seeds of bigger size were soaked in water for 2 hours prior to sowing.
- ✓ Seeds of small size were directly sowed in soil.
- ✓ Plants selected: Coriander, Okra, Chilli, Amaranth, Cucumber, Ridge gourd, Bitter gourd, Brinjal, Cowpea, Pudina (Mint), Spinach, Pumpkin and Papaya.

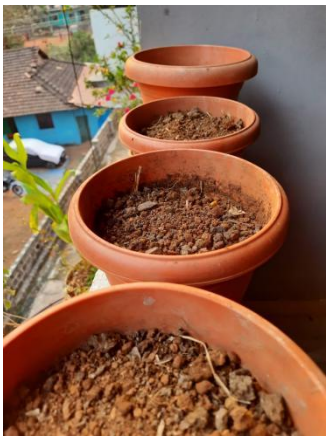
vi. Maintenance of plants

- ✓ Watering: Watering garden with a sufficient amount of water was done whenever soil was found dry. Over-watering or under-watering was avoided to reduce the risk of root rot or drying out of plants.
- ✓ Transplanting: 2-3 week old seedlings were transplanted according to the type of plant.
- ✓ Trimming: Trimming the dead or overgrown branches was carried out to avoid possible infections.
- ✓ Weeding: It is essential to put out any weed growing in garden to avoid suffocation of roots and competition of nutrients of plants. It was done using hand picking method.
- ✓ Fertilizing: Use of different types of Liquid Fertilizers prepared at home using kitchen waste. Application was carried out as needed after every 1-2 weeks.
- ✓ Insect and pest Management: Treatment of any insect or disease observed was carried out using home made liquid pesticides. Application was done by diluting 5 ml of home made liquid pesticides in 500 ml of water along with 4-5 drops of soap

solution and spray on affected area. This was repeated after every 15 days for effective results.

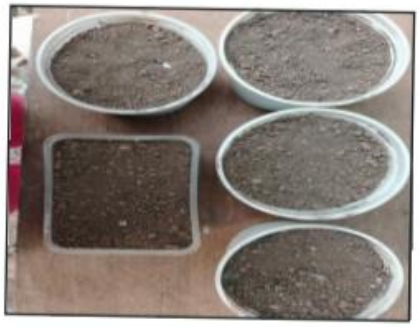
RESULTS

❖ Preparation of soil for pots


❖ Containers used





❖ Different types of seeds

❖ Stages of plants growth development selected for kitchen gardening

Fig: Growth stages of Coriander

Fig: Growth stages of Okra

Fig: Growth stages of Chilli

Fig: Growth stages of Amaranth

Fig: Growth stages of Cucumber

Fig: Growth stages of Ridge Gourd

Fig: Growth stages of Bottle Gourd

Fig: Growth stages of Brinjal

Fig: Growth stages of Cowpea

Fig: Growth stages of Pudina

Fig: Growth stages of Spinach

Fig: Growth stages of Pumpkin

Fig: Growth stages of Papaya

❖ **Diseases and pest encountered**

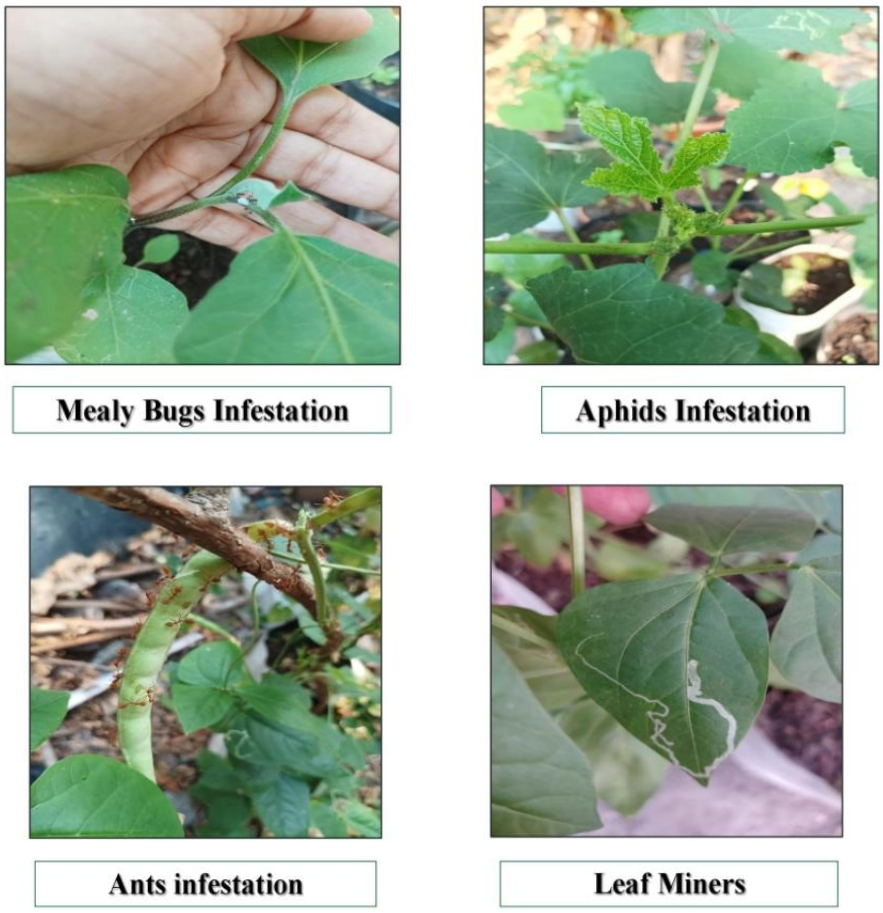


Fig: Pests encountered at growth stages of plants

b) Practicing of home gardening using microgreens

i. Containers used:

✓ Reusable plastic containers, plastic pots, plastic trays and earthern matkas were used.

ii. Soil Composition:

✓ 90% Garden soil + 10% compost was used.

iii. Seeds used:

✓ Seeds which are easily available in kitchen were used.

✓ Seeds from local nursery were purchased.

✓ Seeds of bigger size were soaked in water for 2 hours prior to sowing

✓ Seeds of small size were directly sowed in soil

iv. Watering:

✓ After every 2 days or whenever soil was found dry.

v. Growth period:

✓ 1-3 weeks depending on the type of seeds used.

vi. Harvesting period:

✓ After 7-21 days depending on type of seedling.

RESULTS

❖ Containers used

Fig: Types of containers used

❖ Preparation for microgreens

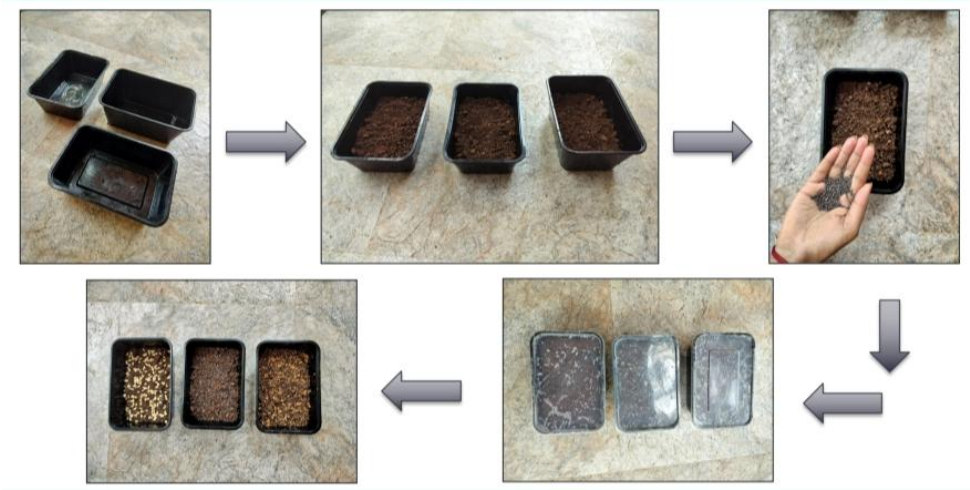


Fig: Preparation for growing microgreens

❖ Types of seeds

Fig: Types of seeds used

❖ Microgreens grown

Fig: Mustard microgreens

Fig: Fenugreek microgreens

Fig: Moong microgreens

Fig: Cowpea microgreens

Fig: Coriander microgreens

Fig: Ragi microgreens

Fig: Radish microgreens

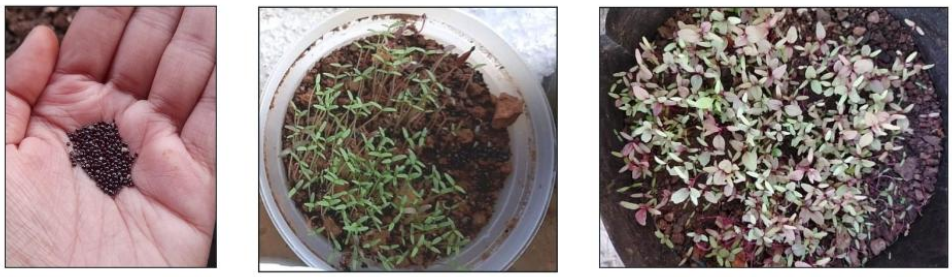


Fig: Amaranth microgreens

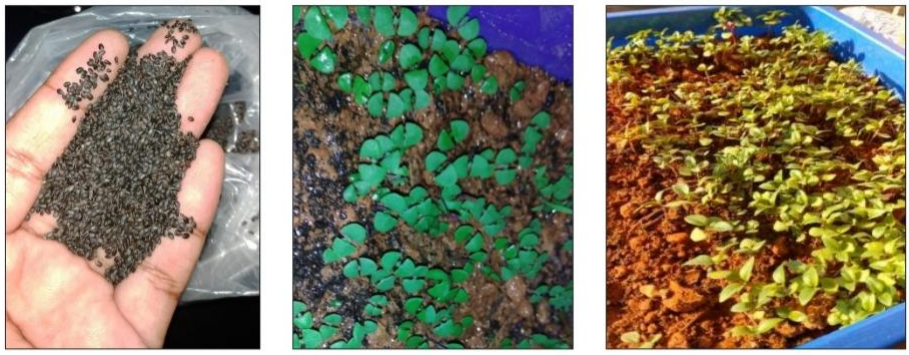


Fig: Chia microgreens

c) Preparation and use of Liquid fertilizers

i. Types of fertilizers was prepared :

- ✓ Orange peel liquid fertilizer
- ✓ Onion peel liquid fertilizer
- ✓ Banana Peel liquid fertilizer
- ✓ Potato Peel liquid fertilizer
- ✓ Mix vegetable liquid fertilizer
- ✓ Tea extract liquid fertilizer

ii. Method of preparation:

- ✓ Take kitchen waste generated from kitchen.
- ✓ Add this to a container and fill it with water.
- ✓ Soak it in water for 2 days.
- ✓ After 2 days nutrient rich liquid fertilizer is ready.
- ✓ Dilute it with water and give it to the plants.

iii. Preparation time:

- ✓ 2 days of incubation in water until any color change is observed

iv. Method of application:

- ✓ Dilute 1 litre of solution in 5 liters of water.

RESULTS

Fig: Orange peel liquid fertilizer

Fig: Mix Vegetable and Onion peel liquid fertilizer

Fig: Banana and Potato peel liquid fertilizer

Fig: Tea extract liquid fertilizer

d) Preparation and use of Liquid pesticides

i. Different types of pesticides was prepared :

- ✓ Ginger extract liquid pesticide
- ✓ Garlic extract liquid pesticide
- ✓ Onion extract liquid pesticide
- ✓ Vinegar liquid pesticide
- ✓ Neem extract in oil as liquid pesticide

ii. Method of application:

- ✓ Dilute in 1 litre and spray on affected area.

❖ **Method of preparation:**

1. Ginger extract liquid pesticide
   - ✓ Take ginger and cut small pieces of ginger
   - ✓ Add this directly to water for 2 days or grind it into a fine paste.
   - ✓ Squeeze the liquid out of the paste.
   - ✓ Mix this with one litre of water.
   - ✓ Spray on the infected places
   - ✓ **Note:** Do not use more than 4-5 drops of the liquid in 1 litre of water as overdose can cause inflammation in the plant leaves

2. Garlic extract liquid pesticide
    - ✓ Take Garlic cloves.
    - ✓ Cut the cloves into small pieces or grind into paste.
    - ✓ Add it in to the water containing little soap solution (mild).
    - ✓ After two days the colour of the water will change.
    - ✓ Filter the mixture and transfer it in bottle to store.
    - ✓ **Note:** Before applying on plants, dilute it with water
3. Onion extract liquid pesticide
    - ✓ Collect peels of 3-4 large onions.
    - ✓ Take a pan and add the collected onion peels and 1 litre of water.
    - ✓ Bring this to a boil for 3-5 minutes and turn off the flame.
    - ✓ Allow it to cool down and strain.
    - ✓ The solution can be stored in a container at room temperature.
    - ✓ This spray is concentrated and should be diluted before use.
    - ✓ For attacked plants it should be diluted in the ratio 1:2 (1 onion liquid : 2 water).
    - ✓ For prevention of pests it should be diluted in the ratio 1:4 (1 onion liquid : 4 water).
    - ✓ This should be sprayed on the leaves and stems of the plants.
    - ✓ Spray once or twice a week as needed.
4. Vinegar liquid pesticide
    - ✓ Take half cup of vinegar and mix in two cup of water.
    - ✓ Add half a teaspoon of dish-wash soap to help the solution adhere.
    - ✓ Shake thoroughly and apply to the affected areas.
5. Neem extract in oil
    - ✓ Detach your neem leaves from the stems.
    - ✓ Wash the leaves thoroughly with clean water to get rid of any dirt.
    - ✓ Allow the leaves to drain water or spread on a flat surface.
    - ✓ Add the leaves to a container filled with oil.
    - ✓ Place the container into a water bath.
    - ✓ Heat the water bath for about 2-3 hours.
    - ✓ When color changes to dark, remove from water bath.
    - ✓ Store in an air tight container.

RESULTS

Fig: Ginger extract liquid pesticide

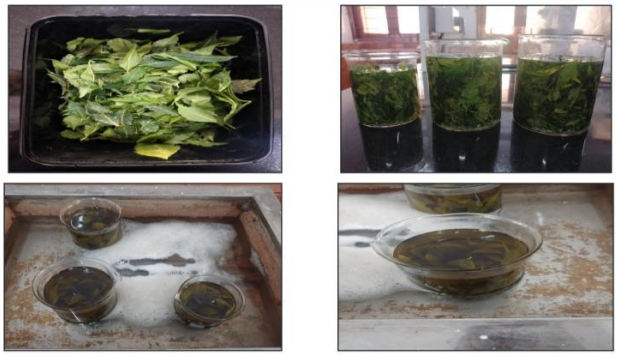
Fig: Garlic extract liquid pesticide

Fig: Onion extract liquid pesticide

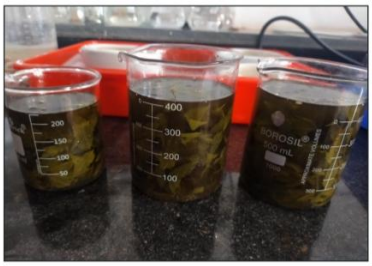
Fig: Vinegar liquid pesticide

Step 1: Seperation and cleaning of Neem leaves

Step 2 : After separation of leaves transfer it in oil and keep on water bath



Step 3 : Remove from the waterbath once decolouration of leaves take place



Step 4 : Strain well and transfer into container

- Filter the oil using a muslin cloth.
- Press the residue to squeeze out excess oil.
- Store the neem oil in an air tight container for future use

Fig: Neem extract in Oil Preparation

Fig: Neem extract in Oil

3. MAINTAINENCE OF PLANTS AND IT'S SURROUNDINGS

The following activities were carried under home gardening section

- Maintenance of vases in Department premises
  a. Potting and repotting of plants.
  b. Watering of Plants.
  c. Mulching and fertilizing.
  d. Cleaning and painting of vases

- Cleaning of areas for plastic wastes

Cleaning of selected area was carried out successfully which included canteen areas and departmental areas. Segregation of waste plastic and paper for proper disposal was done. This activities were conducted once in a week for period of three months. This activity undertaken to spread awareness regarding hygiene at work place and it's surroundings.

a. Maintenance of vases in Department premises

i. Potting and repotting of plants.

❖ Potting of plants:

- ✓ Collection of plant (stem cuttings or small sampling)
- ✓ Collection of potting material (eg .vases)
- ✓ Preparation of soil mixture (soil and compost)
- ✓ Potting plants in vases

❖ Repotting:

- ✓ The departmental vases were undertaken for maintenance.
- ✓ Pots for repotting were selected depending of appearance of plants (eg. Overgrown plant).
- ✓ Using repotting method plants were carefully separated from the vases.
- ✓ Pruning of twigs, leaves, overgrown roots was done.

ii. Mulching

❖ Collection of dry leaves:

- ✓ Dry leaves were used to prepare the mulch.
- ✓ The leaves were collected from the university campus from area near the canteen and near the parking lot.
- ✓ The dry leaves were collected in a polythene bag by segregating them from other organic materials and plastic wastes.

❖ Materials required:

- ✓ Dry leaves
- ✓ Polythene bags
- ✓ Scissors

❖ Procedure of mulch preparation:

- ✓ The collected leaves were spread evenly and left to dry thoroughly in the sunlight.

- ✓ After the leaves were completely dried they were shredded into smaller pieces using scissors and bare hands.
- ✓ The mulch was then collected in bags and applied to the plant vases in the Botany department, near the office and near the laboratories.
- ✓ First, all the current weeds around the plants were removed.
- ✓ A thick layer of mulch 2 cm to 6 cm was applied near the bottom of the stem.
- ✓ The mulch was kept about 2-3 cm away from the plant stem as it can cause them to rot.

iii. Fertilizing

❖ Application of liquid fertilizer to plants:

- ✓ Several organic liquid fertilizers were prepared such as orange peel liquid fertilizer, mix vegetable liquid fertilizer, onion peel liquid fertilizer, banana peel liquid fertilizer, potato peel liquid fertilizer.
- ✓ These fertilizers were used in the home garden and also to fertilize the plants in the department.
- ✓ The liquid fertilizers were applied to the plant vases in department in every 2-3 weeks to provide nutrients and enhance the growth of the plants.

❖ Application of compost:

- ✓ The plant pots were cleaned and any current weeds were removed.
- ✓ Store bought compost and vermicompost was added to the plants in our home garden and was also applied to the plants in the department.
- ✓ Compost was added to the newly planted and repotted plants in the department as a part of potting mixture.
- ✓ Compost was also added to the existing plants in the department as top dressing.
- ✓ The compost was applied every month to the plants.

iv. Cleaning and painting of vases

- ✓ All the vases in the Botany department that is vases near office and near the laboratories were properly cleaned.
- ✓ All the vases were painted to give a uniform look and to enhance the visual appearance of the area.
- ✓ The surroundings of the vases were also cleaned.

b. Cleaning of area for plastic waste

- Cleaning sites:
  - ✓ The project area mainly focuses at Block A, Departments of Botany area and the surroundings of the Canteen of Goa University.
- Materials needed:
  - ✓ Collection bags
  - ✓ Gloves
- Procedure:
  - ✓ The selected areas of campus were cleaned and all the litter and waste was collected in polythene collection bags.
  - ✓ Tissue paper, plastic, straws, paper, wrappers and other items were collected during the cleaning.
  - ✓ The collected waste was separated in bins for segregated disposal.
  - ✓ The cleaning activity was conducted twice a week for 3 months.

RESULTS

Fig: Soil preparation for potting and repotting

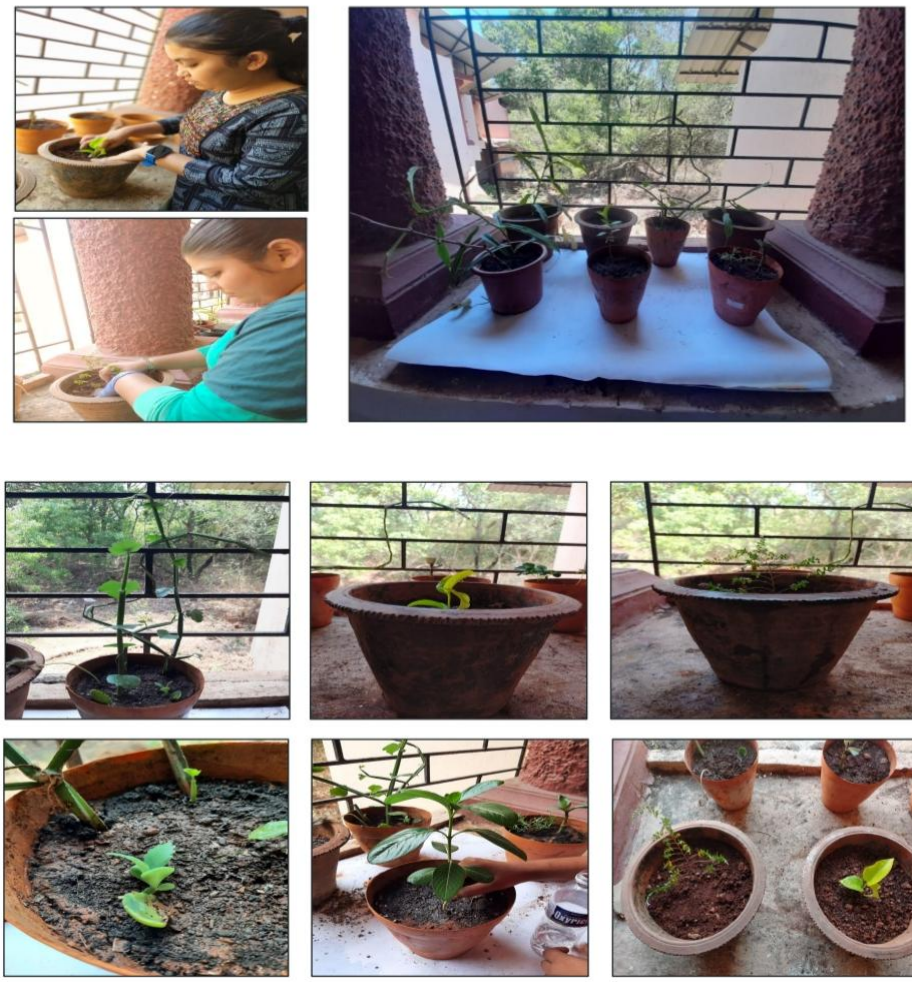


Fig: Potting of new plants for department

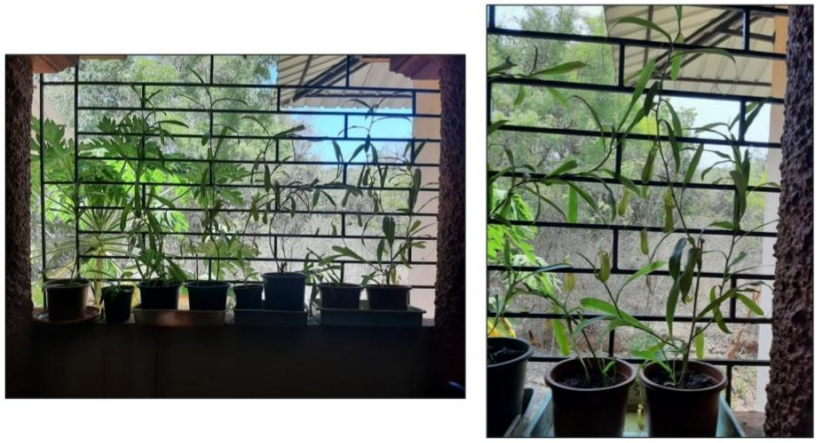


Fig: Repotting of pitcher plants in department

Fig: Watering of plants in campus

Fig: Preparation and application of mulch in campus

Fig: Application of liquid fertilizer in campus

Fig: Application of compost in campus

Fig: Cleaning and painting of vases in campus

Fig: Cleaning of campus area for plastic waste

DISCUSSION AND CONCLUDING REMARK

Organic agriculture is the only solution to nurture the land and to regenerate the soil by going back to our traditional method of farming that is free from chemicals, pesticides and fertilizers. This is a possible step for sustainable development by choosing not to use chemicals, synthetic materials, pesticides and growth hormones to produce high nutritional quality food and in adequate quantities so here our objective focuses on promoting healthy lifestyle through organic gardening/homegardening where you just not consume the organic produce but also start growing at your houses too. Organizing online competitions focused on encouraging people to develop interest in homegardening along with enhancing their knowledge on homegardening. Gardening activities create social capital through social interactions among family members and people within communities, through sharing which was carried out through gardening.

Gardening organically encompasses supporting the health of the entire gardening system naturally. It means working in harmony with the natural systems including the soil, water supply, people, and even insects with an ultimate aim of minimizing destruction to living and non-living things in the natural environment while constantly replenishing any resources utilized during gardening. It involves the use of only natural products to grow plants in your garden and how organic gardening replenishes natural resources as it uses them. Homegardening can be called the process of growing plants and taking care of them in your house. Practising homegardening focused on creating awareness towards healthy way of living, also it focused on developing interest amongst people along with highlighting the value of home gardening nowadays.

Objective of our project also focused on maintaining campus cleanliness as maintaining a clean environment at houses, workplace, institutions by frequently taking cleaning steps and will probably be helpful maintaining hygiene for everyone living around. The cleanliness and with a healthy environment are significantly more beneficial for a healthier learning environment.
Through this project we mainly focused on creating awareness about organic gardening, the methods to perform it organically using liquid fertilizer from kitchen waste and preparation of liquid pesticides naturally. Also we tried to highlight the concept microgreens and it's importance through posters by growing as well. Along with homegardening we also focused on maintaining cleanliness of our surroundings which followed by campus cleaning, mulching,

potting and repotting of vases along with painting of old vases with watering them daily and composting once in week.

Organogardening provided us with the opportunity to practice homegardening which increased our knowledge towards growing organically and to tackle the problems occurring organically using organic methods. It was the great opportunity for us to come together and create awareness amongst people to develop their interest in growing their own vegetables at home organically as it high time to go organic by prioritizing your health first than anything.

FUTURE SCOPE OF THE PROJECT

- Preparation of compost from kitchen waste can be encouraged among more people through the organic home gardening method which is healthier.
- The homemade fertilizers can be analyzed or tested to find out the amount of particular nutrient.
- The effects of each fertilizer or pesticide can be studied.
- It is the small initiative to spread awareness regarding homegardening in households.
- To spread awareness regarding the importance of organic produce.
- To make people aware about the concept of liquid fertilizers and it's importance

LIMITATIONS OF THE PROJECT

- Low yield due to less space.
- Time consuming and costly during initial stages of gardening.
- Poor seed quality can yield poor harvest.
- Difficulty in pest management.
- Physical injury to plants by domestic animals.

BIBLIOGRAPHY

- Elayaraja, M. (2020).Organic farming in India: Benefits and Challenges. https://www.researchgate.net/publication/348351753_Organic_farming_in_India_Benefits_and_Challenges
- Onte, S. (2019, April 4). Impact of organic nutrient management on crop quality, yield and soil . https://www.researchgate.net/publication/333593323_Impact_of_Organic_Nutrient_Management_on_Crop_Quality_Yield_and_Soil_Health_A_Review
- Dr. Suresh Patidar, H. P. (2015, March 3). *A study of perception of farmers towards organic farming*. International Journal of Application or Innovation in Engineering & Management. https://www.ijaiem.org/pabstract.php?vol=Volume4Issue3&pid=IJAIEM-2015-03-31-91
- Jagran, K. (2022, April 19). *Home Gardening for beginners*. Agriculture News, latest news updates on Agriculture, Farming, Food Processing, Farm Tools & Machinery. Latest updates on Agriculture Events and Seminars. Live update on Educational and Employment alerts. https://krishijagran.com/agripedia/home-gardening-for-beginners/?amp=1
- S. Z. (2021, July 29). *7 easy ways to make organic liquid fertilizer*. EcoMENA. https://www.ecomena.org/liquid-organic-fertilizer/
- Pleasant, B. (n.d.). *Free, homemade liquid fertilizers – mother earth news*. Mother Earth News – The Original Guide To Living Wisely. https://www.motherearthnews.com/organic-gardening/liquid-fertilizers-zm0z11zhun/
- Petre, A. (2018, March 6). *Microgreens: Health benefits, nutrition and how to grow them*. Healthline. https://www.healthline.com/nutrition/microgreens
- C Buhl, & D, K. S. (n.d.). *Neem oil*. National Pesticide Information Center. http://npic.orst.edu/factsheets/neemgen.html
- Wikimedia Foundation. (2023, February 22). *Mulch*. Wikipedia.. https://en.m.wikipedia.org/wiki/Mulch
- *Kitchen gardening*. Share and Discover Knowledge on SlideShare. (n.d.). https://www.slideshare.net/PALLAVIPS2/kitchen-gardening
- How to use neem oil to protect plants from pests | Iffco Bazar . (n.d.). https://www.iffcobazar.in/en/blog/how-to-use-neem-oil-to-protect-plants-from-pests

- *Neem oil*. National Pesticide Information Center. (n.d.). http://npic.orst.edu/factsheets/neemgen.html
- Jagdish. (2021, September 12). *Home Gardening in India, how to start, Tips, ideas* . Agri Farming. https://www.agrifarming.in/home-gardening-in-india-how-to-start-tips-ideas
- Keerthi. (2023, April 3). *Home gardening: 9 different types of Home Gardens List*. Styles At Life. https://stylesatlife.com/articles/types-of-home-gardens/
- *Importance of gardening*. UrbanMali. (2022, July). https://www.urbanmali.com/blogs/wisdom/importance-of-gardening#:~:text=Gardens%20provide%20us%20with%20fresh,can%20benefit%20our%20health%20too
- Abhishek, A. (2022, August 4). *Onion peel fertilizer: How to prepare and use*. Agriculture Review. https://agriculturereview.com/onion-peel-fertilizer-preparation-and-usage
- *The benefits of using liquid fertilizer for your farm: Morton, IL*. Bottom Line Solutions. (2018, April 13). https://bottomline-solutions.net/blog/benefits-using-liquid-fertilizer-farm/
- Krishnamurthy, Dr. V. (2022, April 20). *Organic pesticides*. UrbanMali. https://www.urbanmali.com/blogs/wisdom/organic-pesticides#:~:text=Organic%20pesticides%20are%20natural%20substances,%2C%20weeds%2C%20and%20other%20pests
- Reaney, H. (2022, March 12). *Homemade bug sprays – 6 recipes to keep pests away from plants*. homesandgardens.com. https://www.homesandgardens.com/gardens/homemade-bug-sprays#:~:text=One%20of%20the%20easiest%20homemade,apply%20to%20the%20affected%20areas
- Merriam-Webster. (n.d.). Cleanliness definition & meaning. Merriam-Webster. https://www.merriam-webster.com/dictionary/cleanliness
- An explorative study of psychological and social factors impacting ... (n.d.). https://research-repository.griffith.edu.au/bitstream/handle/10072/420645/Pang4728974-Published.pdf?sequence=2
- Ecgardens: Methodology. ΕΛΛΗΝΙΚΑ. (n.d.). https://www.ecgardens.com/en/methodology

- Transit-induced gentrification and neighborhood ... - sage journals. (n.d.-c). https://journals.sagepub.com/doi/abs/10.1177/0739456X231173326
- Poindexter, J., & Jennifer PoindexterJennifer is a full-time homesteader who started her journey in the foothills of North Carolina in 2010. Currently. (2020, September 5). 18 gardening methods to choose from to maximize your space. Morning Chores. https://morningchores.com/gardening-methods/
- Sawant, A., A, R. C. T., R, G. J., Kumar, A., & Zala, D. B. (2023, April 10). Mulching guide - improve your crop yield. AGRICULTURE GURUJI. https://agricultureguruji.com/mulching/
- Iqbal, R., Raza, M. A. S., Valipour, M., Saleem, M. F., Zaheer, M. S., Ahmad, S., Toleikiene, M., Haider, I., Aslam, M. U., & Nazar, M. A. (2020, May 18). *Potential agricultural and environmental benefits of mulches-A review - bulletin of the National Research Centre*. SpringerOpen. https://bnrc.springeropen.com/articles/10.1186/s42269-020-00290-3
- Admin. (2016, September 14). *Understanding mulching: The protector of soil*. Ugaoo. https://www.ugaoo.com/blogs/garden-maintenance/understanding-mulching
- *Types of mulching, advantages of mulching in farming*. Agri Farming. https://www.agrifarming.in/types-of-mulching-advantages-of-mulching
- Vens. (2021, October 5). *What is mulching & their benefits in agriculture*. TIMES OF AGRICULTURE. https://timesofagriculture.com/mulching-agriculture-types-benefits-uses-of-mulching/
- *Organic mulching materials for weed management*. eOrganic. (n.d.). https://eorganic.org/node/4871
- *Organic Mulch vs. inorganic mulch*. BrightView. (n.d.). https://www.brightview.com/resources/article/organic-mulch-vs-inorganic-mulch
- Encyclopædia Britannica, inc. (n.d.). *Feeding: Fertilizing and watering*. Encyclopædia Britannica. https://www.britannica.com/science/gardening/Feeding-fertilizing-and-watering
- Waddington, E. (2021, May 7). *Organic liquid fertilizers I make for my plants*. Treehugger. https://www.treehugger.com/organic-liquid-fertilizers-make-for-plants-5183892

- *Fao.org*. The benefits of composting | Land & Water | Food and Agriculture Organization of the United Nations | Land & Water | Food and Agriculture Organization of the United Nations. (n.d.). https://www.fao.org/land-water/overview/covid19/composting/en/
- Environmental Protection Agency. (n.d.). EPA. https://www.epa.gov/recycle/composting-home
- How to use compost - earth matter. (n.d.). https://earthmatter.org/wp-content/uploads/2016/08/tip-sheet-how-to-use-compost-cpts-htuc-f.pdf
- Admin. (2017, April 12). *How to use vermicompost?*. Ugaoo. https://www.ugaoo.com/blogs/gardening-basics/how-to-use-vermicompost
- Staff, Trees. com. (2022, December 22). *10 types of Organic & Inorganic mulch you can use in the garden*. Trees.com. https://www.trees.com/gardening-and-landscaping/types-of-mulch
- Nationaljanitorialsolutions. (2022, July 15). *The importance of keeping college campuses clean: NJS*. National Janitorial Solutions. https://natjan.com/blog/the-importance-of-keeping-college-campuses-clean /
- Broadhurst, W. (2023, May 22). *Campus and school cleaning: 3 reasons to hire commercial cleaners*. Foreman Pro Cleaning. https://www.foremanpro.com/campus-and-school-cleaning-reasons-to-hire-commercial-cleaners/
- Horticulture :: Landscaping ::Roof Gardens. (n.d.). https://agritech.tnau.ac.in/horticulture/horti_Landscaping_kitchengarden.html