

Organic Waste valorization through bioenzymes



Eco-Sustainability Training Session
BCM Arya Model Sr. Sec. School, Shastri Nagar, Ludhiana
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By

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HOW TO MANAGE POLLUTION?



Organic wastes for bioenzymes production

Fruit waste

Pineapple, Mosambi , Mix fruit Pulp,
Orange, Peach
Unripened mango

Vegetable waste

Cauliflower, Potato and pumpkin
Mix vegetables

Leafy waste

Neem leaves, Neem raw fruits, Curry
leaves , Moringa leaves

Lignocellulosic waste

Paddy straw, Biodigested slurry
Cattle dung (jersey cow)
Cattle dung (desi cow)

WHAT ARE BIO-ENZYMES?...

- Bio-enzymes are organic solutions produced through fermentation of organic waste including various fruits, vegetable peels and flowers, by mixing in sugar, jaggery/molasses and water.
- Cost effective and ecofriendly alternative to lead chemical free life.

BIOENZYMES (Multipurpose Biosolution)

- Ecoenzymes , Garbage enzymes
- Organic formulation produced by natural fermentation process of fruit and vegetable wastes
- Composed of various enzymes, proteins, mineral salts and microbes which helps in the reduction of organic waste.
- Bioenzyme is totally natural fermented solution that can be used as a multipurpose cleaner.

ORGANIC MATERIALS USED FOR BIOENZYMES

- Citrus peels, pomace
- Kinnow Droppings
- Neem leaves
- Neem fruits
- Moronga leaves
- Curry patta
- Flowers like Rose, Marigold
- Fruit Peels
- Vegetable leftovers
- Pulp of fruit juice



HOW TO PREPARE BIOENZYMES?



+



+





Bioenzyme production in Plastic drums



Initial phase



In-making process

Final phase

From Dragon fruits



Microbiological richness, quality and safety of Bioenzyme

S.No.	Bacterial composition of Bioenzyme	Bacterial count (Log ₁₀ CFU/ml)
8	<i>Escherichia coli</i>	Absent
9	Total coliforms	Absent
10	Faecal coliforms	Absent
11	<i>Staphylococcus aureus</i>	Absent
12	<i>Proteus mirabilis</i>	Absent
13	<i>Klebsiella pneumoniae</i>	Absent

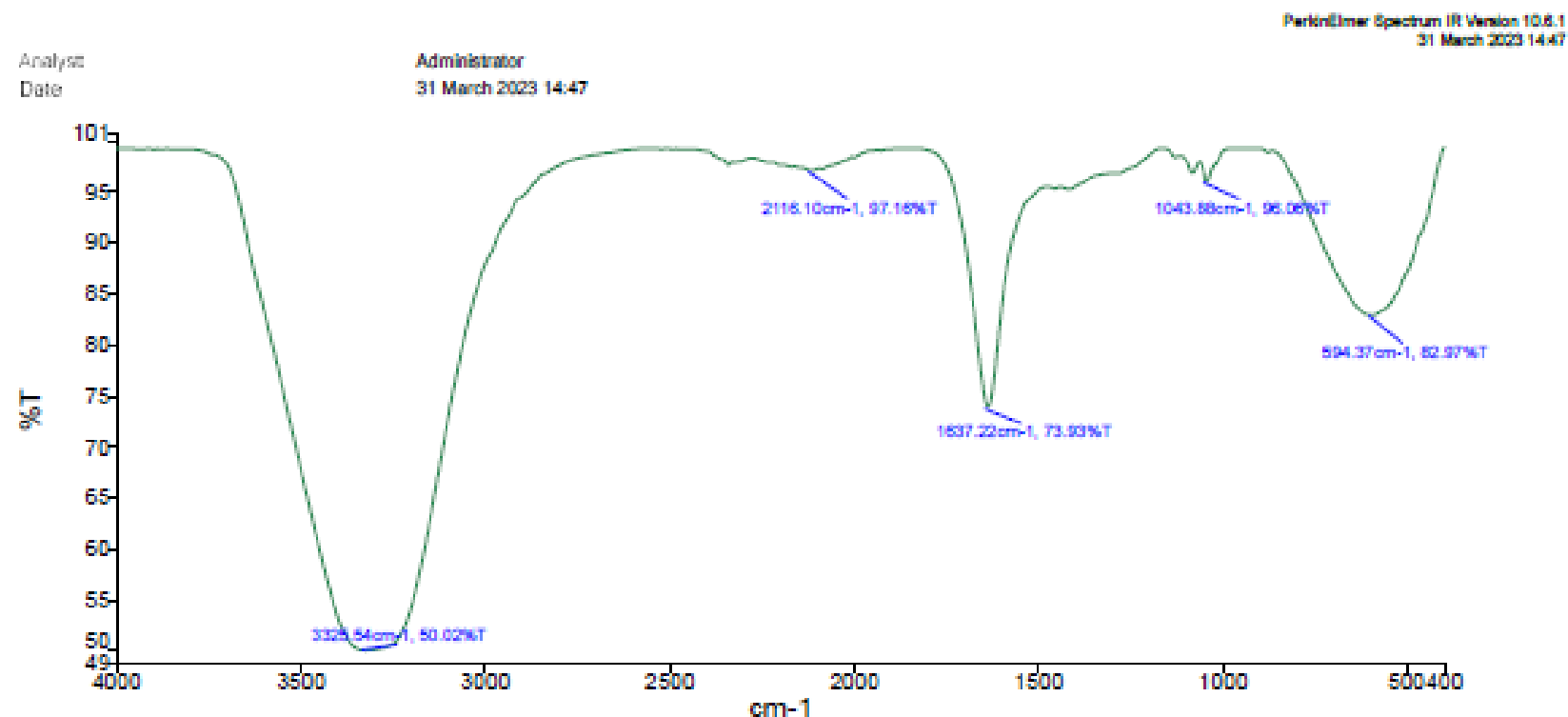
Fungal growth inhibition

Fungal Cultures	Microbial Growth Inhibition Zone Diameter (mm) as influenced by concentration of Bioenzyme			
	Control	0.1ml	0.5ml	1ml
<i>Sclerotinia sclerotiorum</i>	34±2.56	15±1.13	No growth	No growth
<i>Fusarium oxysporum</i>	27±2.04	12±0.91	12±0.70	No growth
<i>Sclerotium</i>	56±4.22	41±3.09	36±2.72	No growth
<i>Rhizoctonia solani</i>	80±6.03	30±2.26	30±2.26	No growth

Fungal growth inhibition

Fungal Cultures	Microbial Growth Inhibition Zone Diameter (mm) as influenced by concentration of Bioenzyme			
	Control	0.1ml	0.5ml	1ml
<i>Pleurotus ostreatus</i>	46±3.47	No growth	No growth	No growth
<i>Aspergillus oryzae</i>	Profuse growth	Less growth	Poor growth	Limited growth
<i>Aspergillus sp.</i>	Profuse growth	Good growth	Less growth	Poor growth
<i>Alternaria gosypium</i>	Profuse growth	Less growth	Poor growth	Limited growth

FTIR SPECTRUM OF KINNOW BIOENZYME

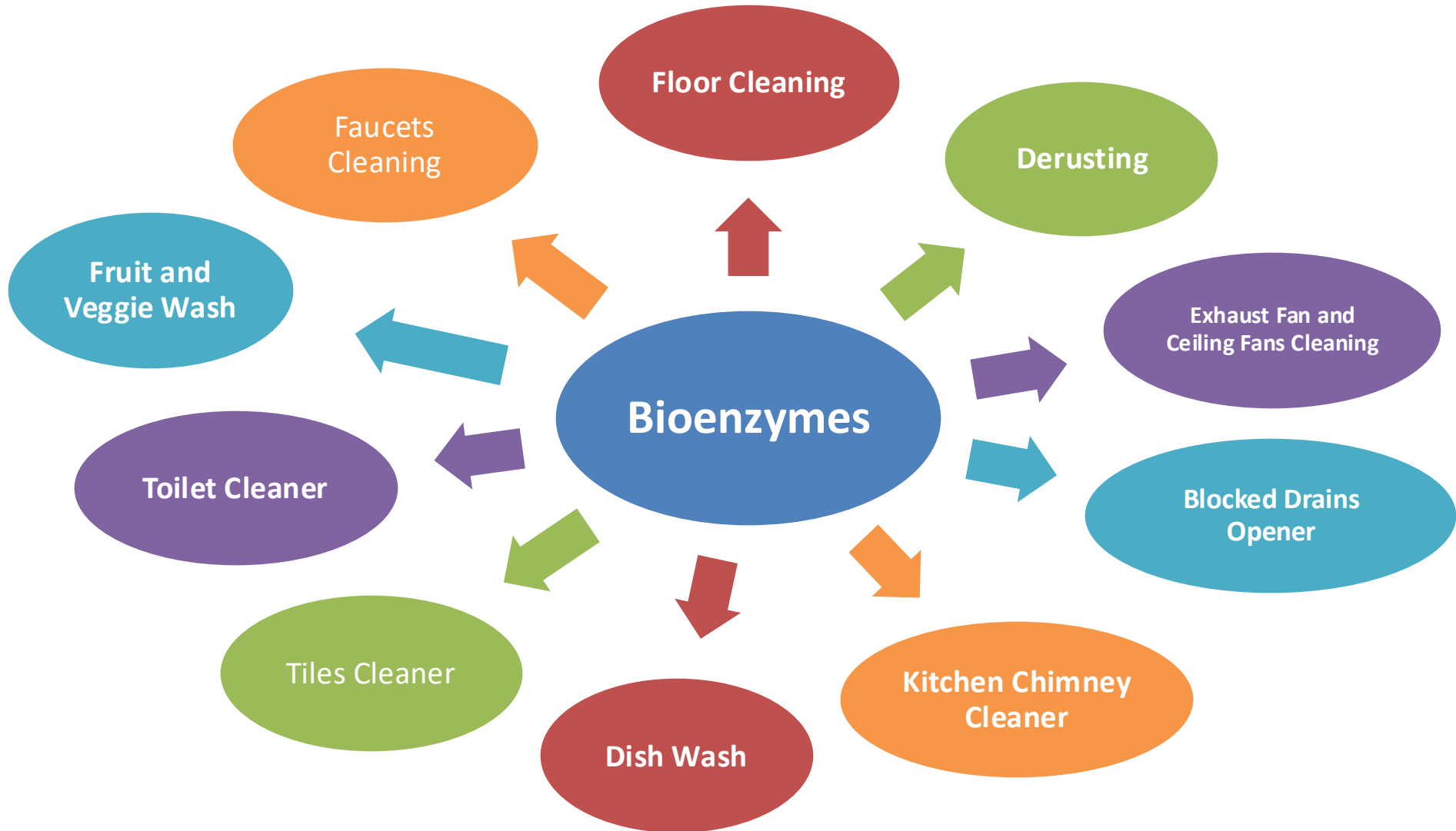


Sample Name	Description	Quality Checks
3	Sample 959 By Administrator Date Friday, March 31 2023	The Quality Checks do not report any warnings for the sample.

FTIR spectrum of Kinnow Bioenzyme

Functional Group	Citrus Bioenzyme Absorption (cm-1)	Compound Class	Significance
CO-O-CO stretching	1043.88	Anhydride	Due to their antimicrobial properties , anhydrides are used as disinfectants and preservatives, sterilizing agents in hospitals, laboratories, and food processing industries. Efficient against a wide range of microorganisms, such as bacteria, viruses, and fungi.
C-H bending	594.37	Benzene derivative	Benzene derivatives have antimicrobial properties , inhibit the growth of bacterial and fungal pathogens , making them potential candidates for the development of novel antibiotics or antifungal agents .

APPLICATIONS



HOME CARE BIOENZYME FORMULATIONS

**Shampoo and
soaps (after
adding amla,
shikakayi,
soapnut)**

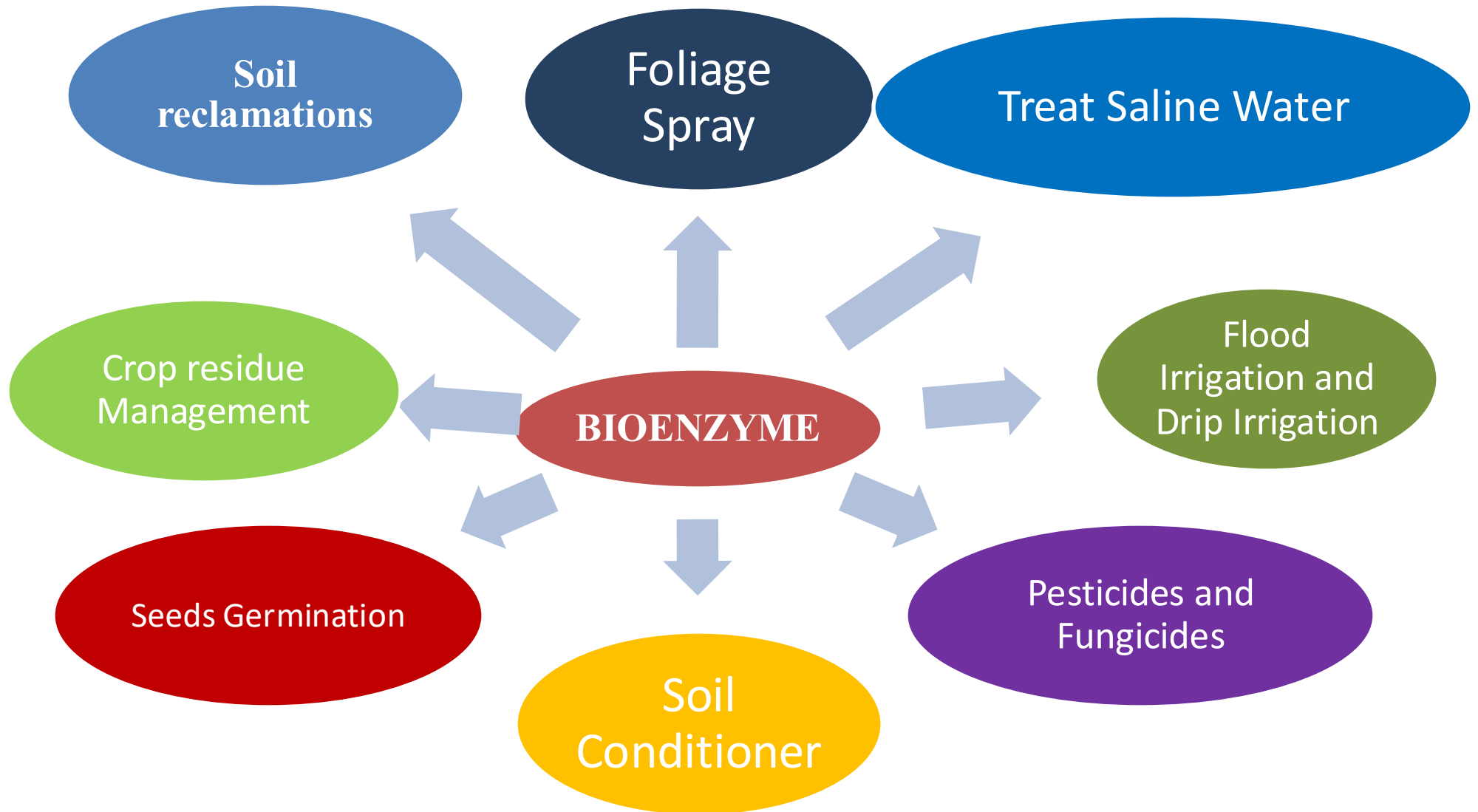
**Handwash (after
adding essential
oils, tulsi-neem
extract)**

**Liquid
Detergents**

**Disinfectants
and
mosquitos,
Flies
repellents**

**Car, dish wash
(after adding
soapnut/reetha**

KITCHEN GARDEN AND AGRICULTURE



Environment

- Treatment of Home Effluent
- Overhead Water Tank cleaning
- STP(Sewage Treatment)
- City Drains Management
- Bad Odor Removal
- Rejuvenation of Lakes
- Cleaning of Rivers

FRUIT AND VEGGIE WASH

Soak vegetables/fruits into water together with 2 spoon of bioenzyme for 30 mins, it will remove Microbes from vegetables. It will enhance the taste of food.



Removal of scaling from granite surface and Metal cleaner

BEFORE



AFTER



WASHING OF CLOTHES





Waste water treatment with Bioenzyme



CLEANING OF PONDS AND SEWAGE WATER

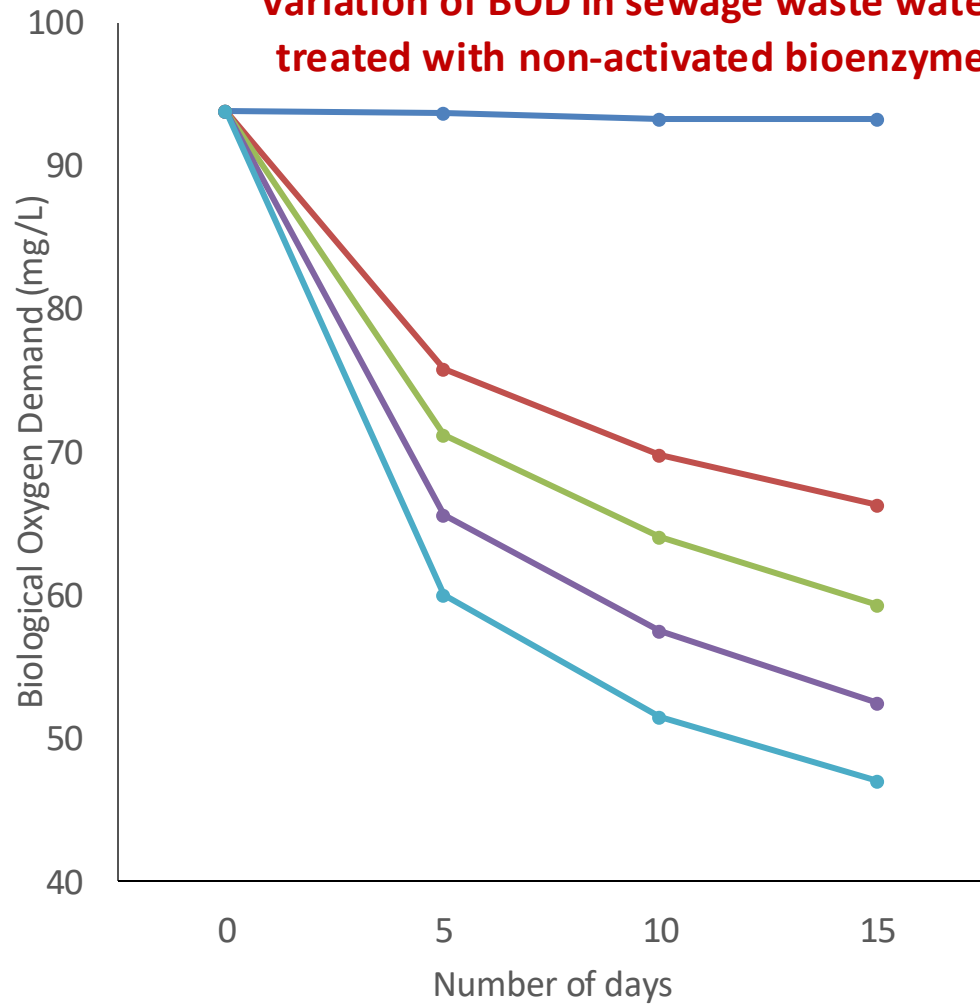


PAU oxidation pond
capacity : 1.5 MLD
Dimensions: 440 ft x 141 x
4 ft

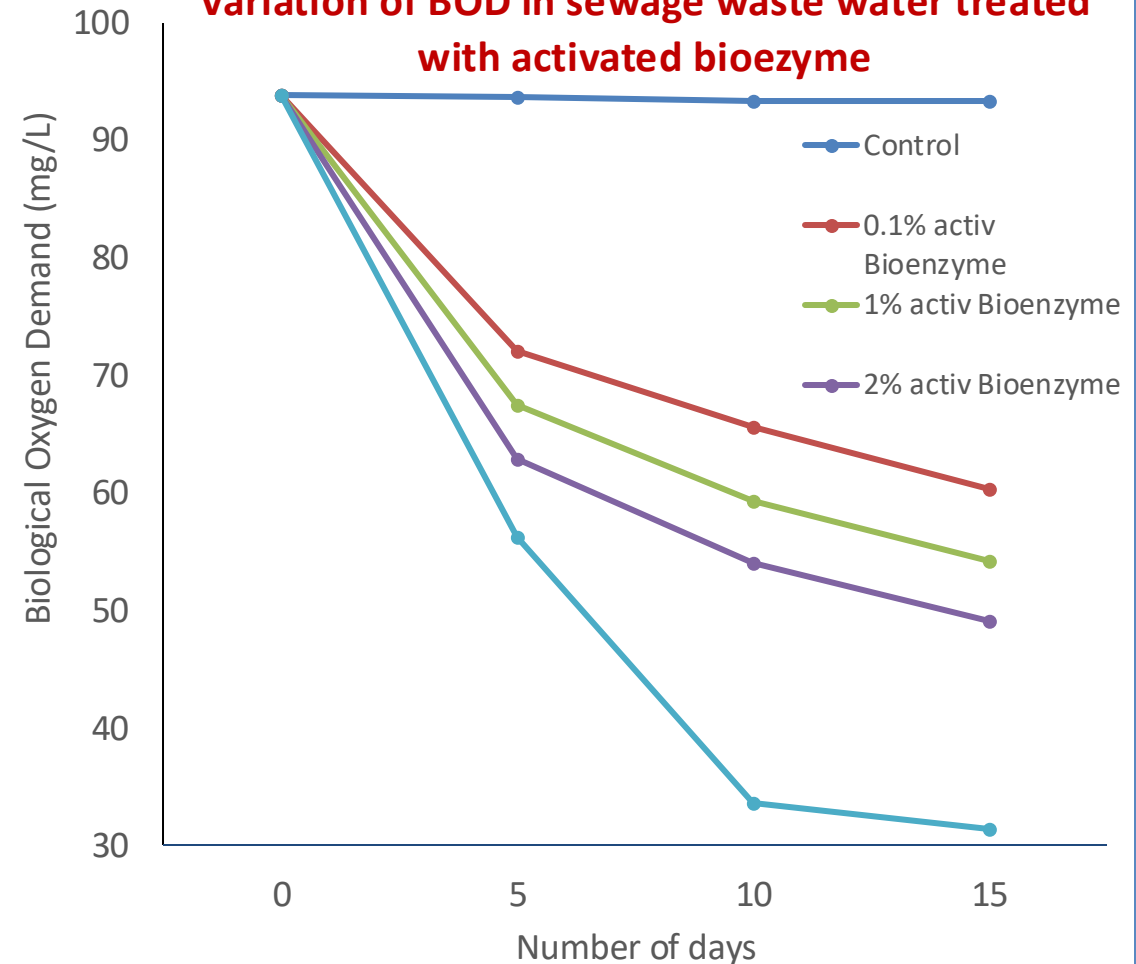
A represents wastewater
algal bloom before
treatment;
B and C represents
treatment with
bioenzyme using gun
spray;
D is reduction in algal

BOD REDUCTION PROFILE (After treatment)

Variation of BOD in sewage waste water treated with non-activated bioenzyme

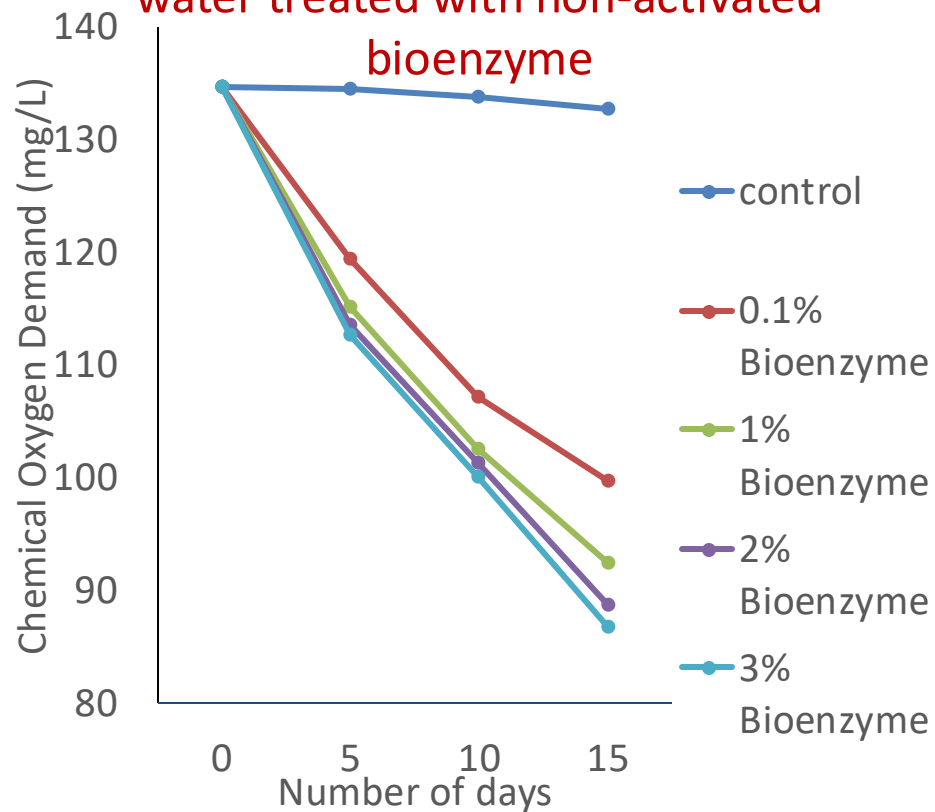


Variation of BOD in sewage waste water treated with activated bioenzyme

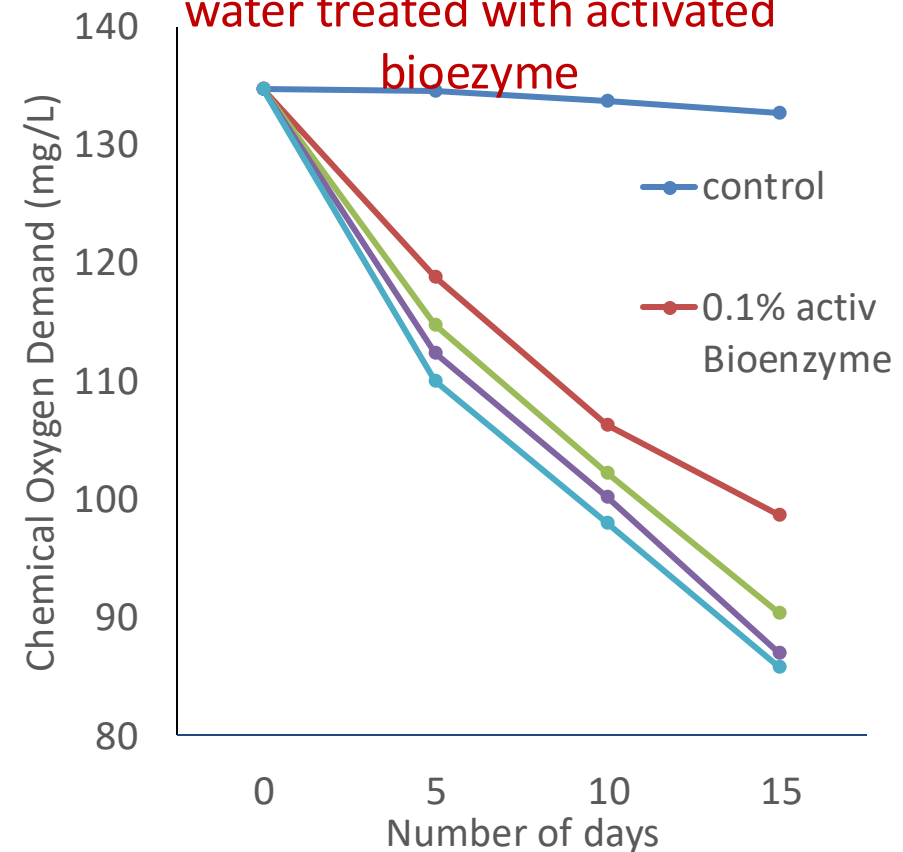


REDUCTION IN COD WITH NON-ACTIVE AND ACTIVE BIOENZYME

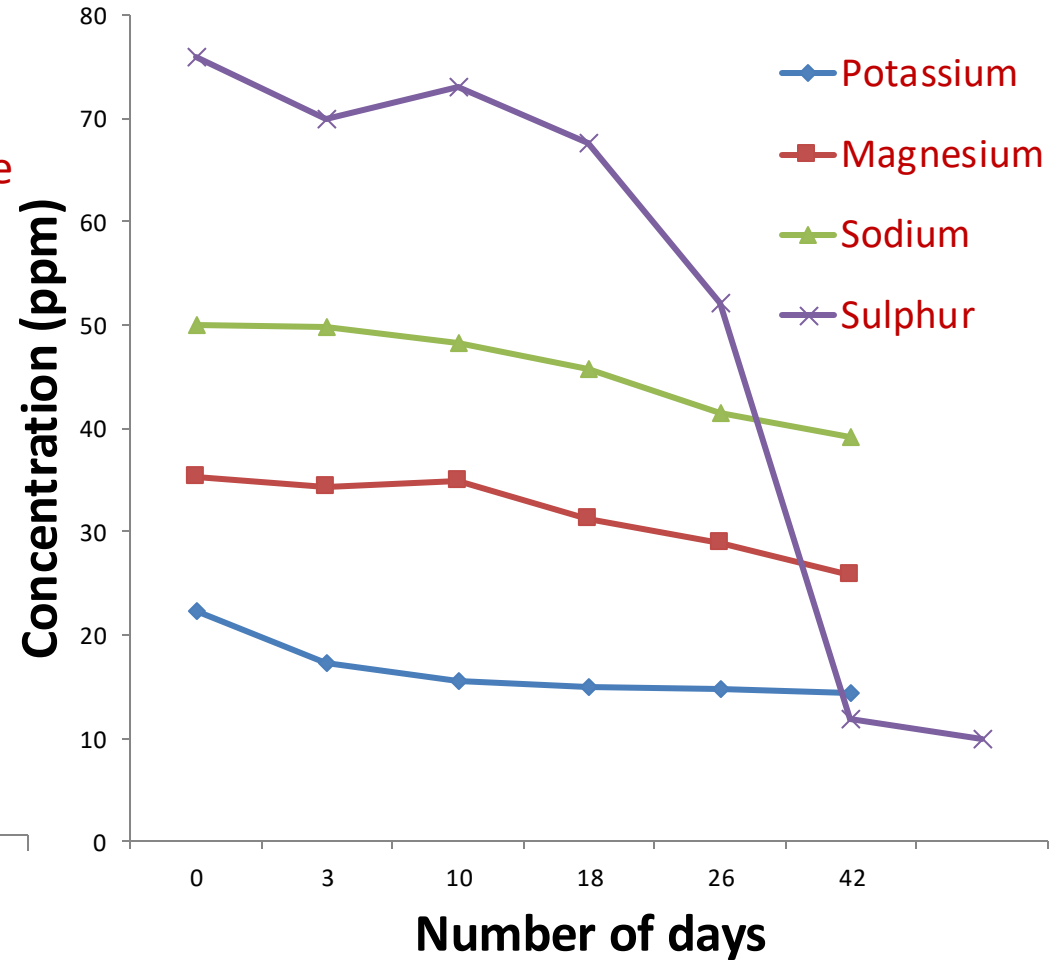
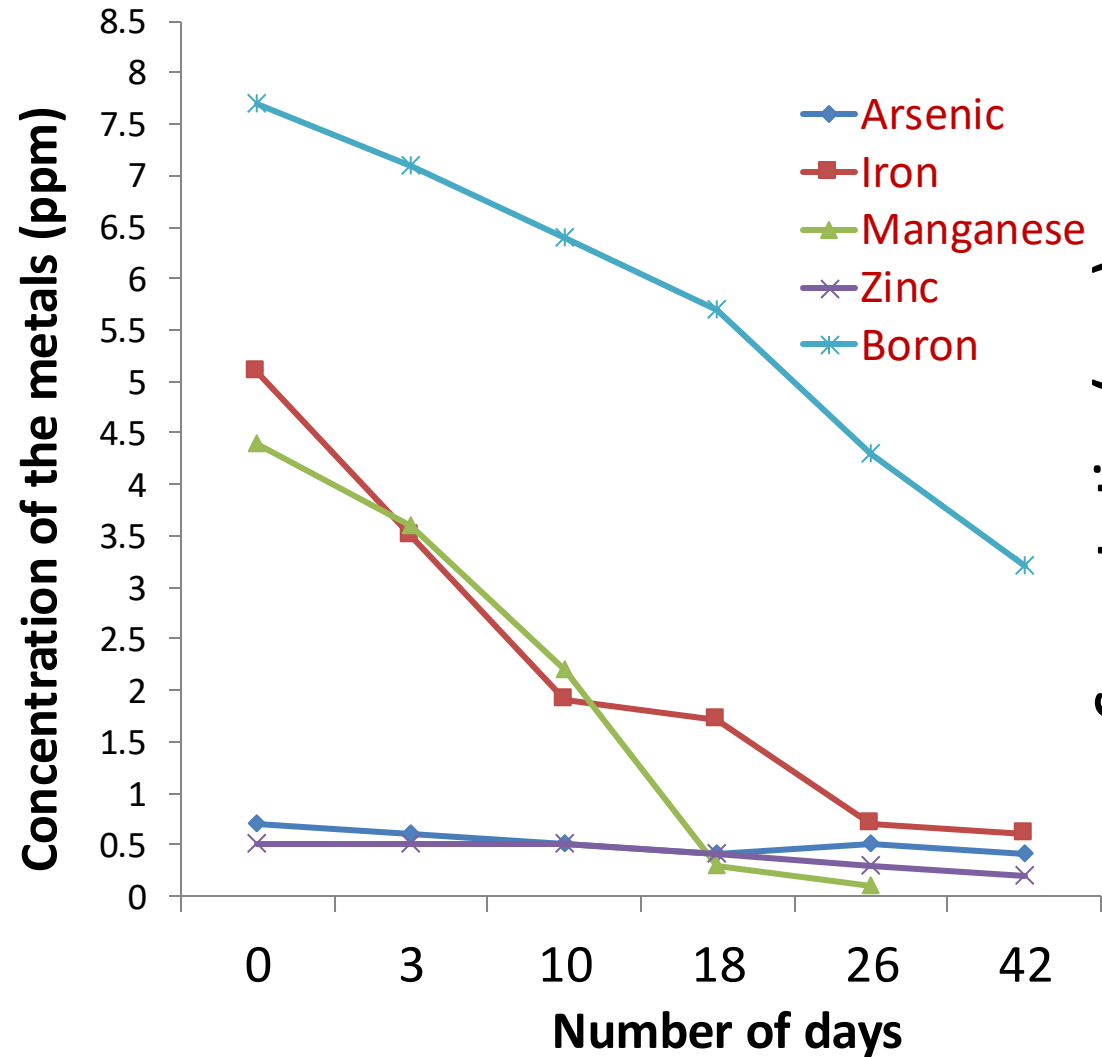
Variation of COD in sewage waste water treated with non-activated bioenzyme



Variation of COD in sewage waste water treated with activated bioenzyme



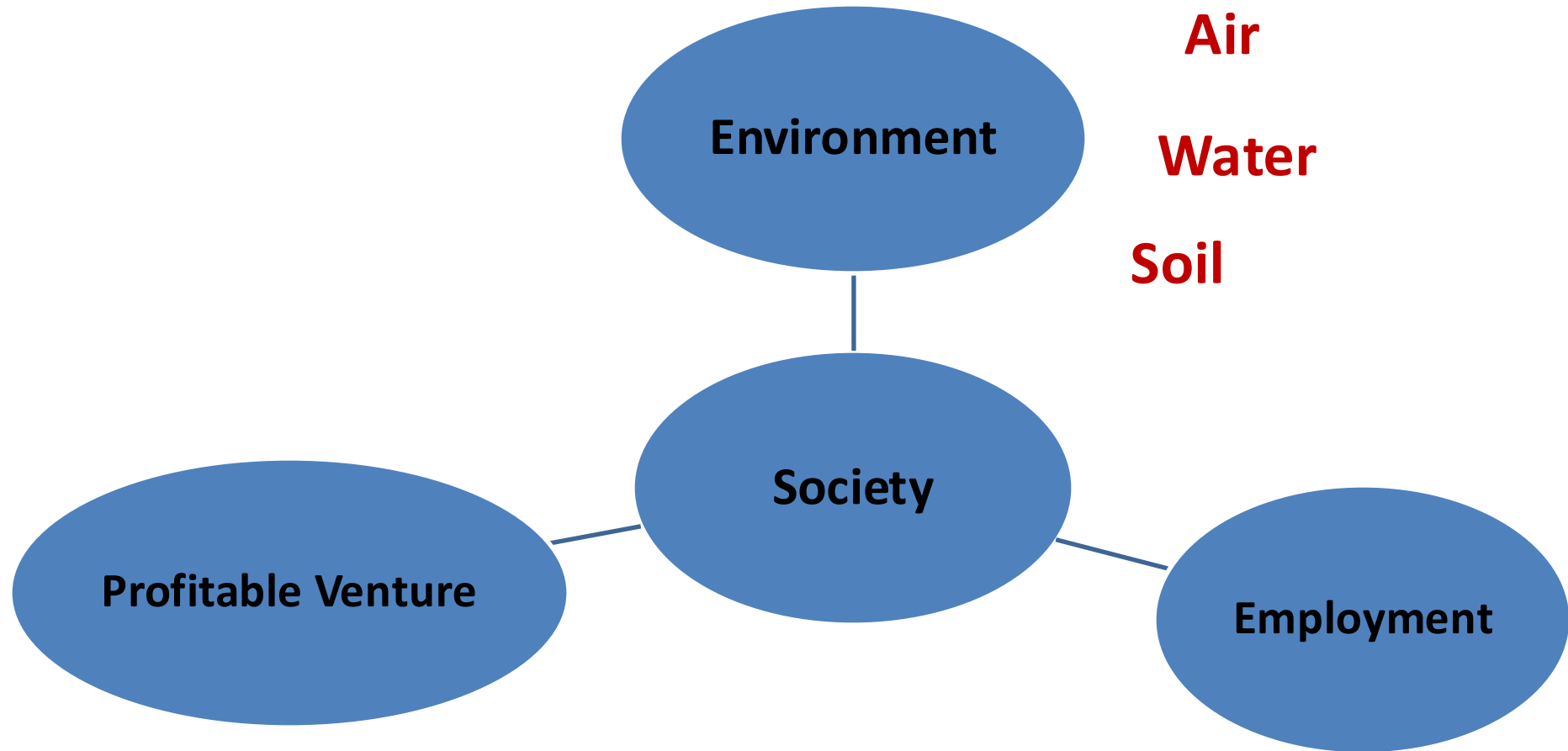
HEAVY METAL REDUCTION PROFILE



Village Majri , Mullanpur , Ludhiana



IMPACT OF BIOENZYMES



COST COMPARISON

Cost of Kinnow bioenzyme /litre	Rs. 19.30/-
Cost of Harpic / litre (Inorganic cleanser)	Rs. 200/litre
Cost of Satopardhan Bioenzyme cleanser (280/700ml)	Rs. 400/litre
Cost of Relive Nature Bioenzyme cleanser (159/500ml)	Rs. 318 / litre



Problems with Synthetic Cleaners

- Toxic chemical based room cleaners
- Cost very high
- Adverse impact on human health
- Indirectly harms environment by polluting water
- Continuous use of these synthetic cleaners also damage the floors and tiles

So instead of using these hazardous cleaners we can simply use homemade Bioenzyme.

Bioenzyme based home care products: production technology and characterization 309th REC meeting held on 8.10.2025)



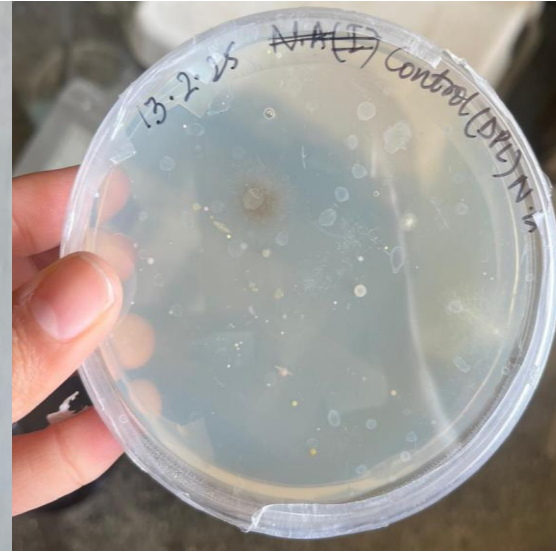
Evaluation of the products for cleaning application



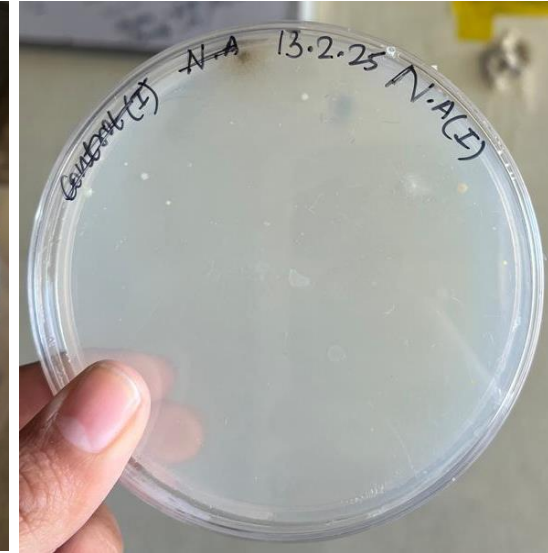
Before (On GYE)



After (On GYE)



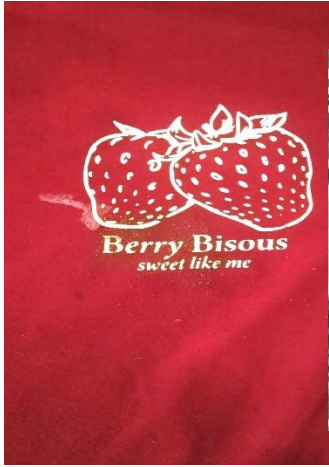
Before (On Nutrient Agar)



After (On Nutrient Agar)

Fig: Evaluation of handwash for contamination on hands before and after using the product (Swab test)

Evaluation of the products for cleaning application



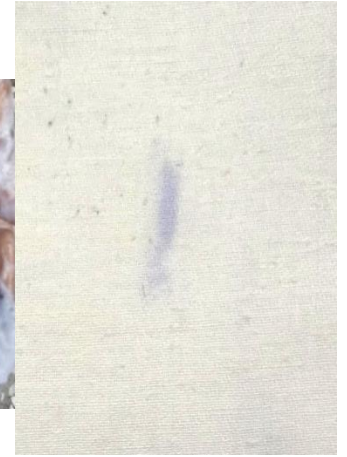
Before wash



After wash



Before wash



After wash



Before wash



After wash



Fig: Evaluation of bioenzyme-based developed laundrywash for cleaning of clothes

Acknowledgement



Gratitude and Special Thanks to Dr Rosukon Poompanvong from Thailand who has developed Bio Enzymes and dedicated her life for advancement of Bio Enzymes.

In the last 50 years, she has shown the world that we can live a Chemical Free Life and live with the nature without disturbing the Ecology.

Thanks to biogas lab members and all the scientists who always motivates and supports me

- ❑ TRUST Your Gut Feelings
- ❑ Experiment and Learn
- ❑ Manifest what ever you want in your life

Thanks