



A BRIEF STUDY AND ANALYSIS OF BIO-ENZYME BASED ON NATURAL PRODUCT

D. D. Lakshmi Tulasi*, Tallapudi Durga Prasad, Guduri Venkata Ramana, Nelli Pranusha and Kolli Lavanya

India.



*Corresponding Author: D. D. Lakshmi Tulasi

India.

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ABSTRACT

The enzymes are biological catalysts (also known as biocatalysts) that speed up reactions in the living organisms, and which can be pulled out from cells and then used to catalyse a wide range of commercially important processes. Bio Enzymes are organic compounds produced by fermentation of fresh vegetable/fruit waste in the presence of water and jaggery. It is proving that the bio enzyme is the best solution for domestic and agricultural applications. It is a natural, non-toxic, non-flammable, noncorrosive liquid enzyme formulation fermented from vegetable extracts that improve the engineering qualities of soil, facilitates higher soil compaction densities and increases stability. Improvement and stabilization of soils are widely used as an alternative to substitute the lack of suitable material on site. Soils may be stabilized to increase strength and durability or to prevent erosion and dust generation. The use of non-traditional chemical stabilizers in soil improvement is growing daily. A bio enzyme was developed to improve the mechanical performance and applicability of clayey soils. Enzymes increase the rates of reactions allowing them to occur within a biologically useful time scale. The waste generated from fruits and vegetables are organic and supply a major share in pollution of air, water, and soil. Enzyme Bio-cleaners are an organic compound including enzymes produced by the simple fermentation of fresh vegetable wastes, fruit wastes with the addition of brown sugar and water by using the selective microorganisms like Yeast and Bacteria. This anaerobic fermentation generates natural chains of the capacity to breakdown, modify, create and catalyse functions that make it an astonishing cleaning support in a household as well as other applications. This paper reviews the investigations and significant work done on the bio enzymes. It helps to reduce some waste & turn into a useful substance to the society which is economical and cheaply available and the end product can be completely useful.

KEYWORDS: Bio-enzyme, Fermentation, bio-chemical test, anti- microbial properties, bio-compost, contaminated water.

I. INTRODUCTION

Indian culture being multi-linguistic is also having the uniqueness of rich tradition of implementing natural products in daily usage. Present era with the advancement of technology and science many inventions have been made for our convenience and to improve the standard of living which in turn made us to forget the essence of natural products. Our likening for artificial products is due to convenience and ease of availability along with attractive packaging. We are un ware that most of these artificial products are prepared with the chemicals which are harmful to the eco-system. News emanating such as frothing lake catching fire, low immunity and skin diseases, and sudden death of person can all be related to the harmful effects of excessive chemicals usage in our daily life. The most prominent usage in our household is the cleaning agent which is containing many toxic and harmful elements. In this article the bio-enzyme based cleaning agent is discussed

along with the preparation methodology. Further the effectiveness of the same having anti-bacterial and anti fungal properties is validated with the lab based investigation which clearly demonstrates that bio-enzyme slows down the progression of bacterial growth.

II. PREPARATION METHOD

Materials required

Citrus peels
Jiggery
Water
Yeast
1:3:10 ratio of (jiggery: citrus peels: water)

Steps to Make Bio-Enzyme Liquid

- Collect fruit/vegetable peels; Chop the waste into small pieces.
- Take an empty plastic container

- Add the citrus peels and water in the container in equal parts.
- Add some jaggery to the solution (approx 50 grams in a 2-liter bottle). Jaggery acts as a catalyst and gas is produced from the process of fermentation.
- Leave 20% part of the bottle or container empty. This is important as gas is produced inside the container and it needs space.
- Mix the solution properly and cover the container loosely with a lid.
- Store the container in a dark place at room temperature. Do not keep it in sunlight.
- During the first 30 days, open the lid every day to release the gases that are formed inside it. There are

many gases produced during the initial stage called a catalyst.

- Leave the container aside for the next two months.
- After approx 3 months, your bio enzyme will be ready. If you see the peels and waste material settled at the bottom and clear liquid on the top, it's the confirmation that the bio enzyme is ready for use.
- Strain the liquid and transfer it to a clean container.
- Dilute it with water. The ratio should be 10% bio enzyme liquid and 90% water.
- Your bio-enzyme liquid is ready.



Citrus Peels



Dry Peels



Preparation of bio enzyme



Mixing of Bioenzyme



Fermentation Process

III. IMPLEMENTATION

Test for treated water

- The tests that have been conducted for the institutional waste water and the effluent after treatment are
- pH- (power of hydrogen) It specifies how acidic or basic a liquid solution is.
- Alkalinity-This test is done to measure how much acid can be neutralized by the liquid sample.
- Biological Oxygen Demand (BOD)-It gives the amount of oxygen consumed by microorganisms and bacteria.
- Chemical Oxygen Demand (COD)-It is a measure of oxygen needed for oxidizing soluble organic matter in water.

- Total Dissolved Solids (TDS)-It gives the concentration of dissolved substances in the water sample.
- Dissolved Oxygen (DO) - This is the amount of oxygen that is present in water. Water bodies receive oxygen from the atmosphere and from aquatic plants.

1) PH

pH is the negative logarithm of hydrogen ion concentration. The scale of pH is from 0 to 14. pH 7 is neutral. Solution pH below 7 is considered as acidic and above 7 is basic in nature. pH of a solution is determined by pH meter.



PH Test For water bodies



PH Test For Bio enzyme



PH Test For Bio enzyme + Water

2) Effectiveness of the bio-enzyme

The sample is provided to the lab and the generation of the report clearly shows that bio-enzyme based product stops the growth of the bacteria. The microscopic examinations show that the samples with bio-enzyme are having the properties of effectively removing bacteria.



The effectiveness of bio-enzyme for antifungal properties is validated by having simple experiment of putting it on the bread and exposing it in the open environment. The results clearly show that after 2 weeks the growths of parasitic are minimal.



Test for Micro organisms with Bioenzyme

Anti fungal properties

All the samples were found to show antimicrobial properties as seen a week later of its application. It resists the growth of fungus in moderate to high degree where it was applied. All the samples showed resistance to fungus but Bio-enzymes from Orange peels showed the best results and pineapple bio-enzyme was least resistant to fungus. All the samples had no growth till day 3, after that the fungus started growing. The order that was observed for the antifungal resistivity is as follows-

3>5>6>1>2>4 or
Orange>Raddish>Turnip>Banana>Beetroot>Pineapple
Orange showed best resistance to fungus, they may be because of the fact that citrus fruits have a sharp flavour which keeps the fungus away

Test for anti bacterial properties

All the samples showed antibacterial properties till 10-2 dilution of samples in water and showed resistance towards both Gram positive and Gram negative bacteria.



All samples have shown formation of a ring around the disc clearly showing the zone of inhibition. The diameter of the circle around the disc provided information about the degree of inhibition of growth by the bio-enzymes.

3) Chloride content

Chlorine is most often found in natural water bodies as a component of sodium or potassium salt (sodium chloride) or in some times as calcium salt. Water contain chloride ion (Cl⁻) in form of soluble salts. Estimation of Chloride ion can be done by Mohr's method. Various anthropogenic as well as natural sources, such as, the soil weathering, deposition of salt, salt spray used for road deicing, waste water, contamination of fresh ground water by salty ocean water in the coastal areas are found to be common reasons for the presence of chloride ion in the natural bodies. The sample water containing chloride is titrated against silver nitrate solution using potassium chromate as an indicator. The end point of the titration is characterized by the change from yellow to brick red.



Limit test for chlorides

IV. RESULT

Effluent characteristics before treatment of institutional waste water			
S. no.	Tests conducted on waste water	Unit	Test result
1	Ph	-	10
2	Alkalinity	Mg/l	800
3	Turbidity	Ntu	8

Effluent characteristics before treatment of institutional waste water

Effluent characteristics after treatment of institutional waste water 2% bio enzyme			
S. no.	Tests conducted on waste water	Unit	Test result
1	Ph	-	8.3
2	Alkalinity	Mg/l	407
3	Turbidity	Ntu	4.07

Effluent characteristics after treatment of institutional waste water 2% bio enzyme

Effluent characteristics after treatment of institutional waste water using 4% bio enzyme			
S. no.	Tests conducted on waste water	Unit	Test result
1	Ph	-	6.99
2	Alkalinity	Mg/l	388
3	Turbidity	Ntu	3.17

Effluent characteristics after treatment of institutional waste water using 4% bio enzyme

V. BIO-ENZYME APPLICATIONS

Most of the chemicals cannot be removed by sewage treatment and remain in the water.

Bio-enzyme is a natural product and cleaning agent made from bio-enzyme is mixture of concentrated vinegar or alcohol along with other organic compound.

The same can be made from the citrus food. The main applications of bio-enzyme based products are:

- Useful for cleaning floor, toilet
- Useful for laundry wash
- Useful for personal care
- Useful for anti-bacterial and anti-viral so for refrigeration, storage etc
- Useful for pest control
- Useful for neutralization of pesticide on fruits

VI. CONCLUSION

It is concluded that the bio-enzymes are biological catalysts and are made up of proteins, they also contain metabolites, lipids and carbohydrates. In the present study, all the samples of bio-enzymes found to be cost effective, anti-microbial and eco-friendly. All the bio-enzymes showed acidic character and high TDS values due to the presence of high amounts of organic content. They can be used in household purposes due to their acidic character and has the potential of replacing harsh chemical cleaning agents used in our households. Bio-enzymes can act as good soil stabilizers. The results showed that only 1% bio-enzymes was sufficient to change the pH of soil solution There are various applications of bio-enzymes such as to improve the

consistency and binding property of soil. They can treat wastewater very easily as the results showed that only 1 ml of bio-enzymes was sufficient to increase the pH and decrease the TDS of the 20 ml contaminated water sample. Anyone can follow simple methodology for the preparation of the bio-enzymes and can very easily make at their homes. Bio-enzymes can be useful in making compost from the solid residue of the mixture bio-enzymes. The compost is capable of stabilising the pH of alkaline soils as it is acidic in nature. Thus, the bio-enzymes can be used for various purposes since it is organic and it does not have any side effects. Bio-enzymes helps to reduction of some waste and turn into a useful substance to the society which is economical and cheaply available and the end product can be completely useful and enhances the quality of life as a whole.^[11] More investigations could be done in order to find out the action of bio-enzymes on treatment of wastewater by using other methods like D.O, C.O.D, B.O.D, amounts of phosphates, chlorides and alkalinity. Enzymes concentration and activity of different enzymes can be carried out on growth of microbes. We can also check the effect of bio-enzymes on plant's growth by adding them to the soil and their time of maturity and health. Bio-enzymes from different sources could be used to check different applicability in multiple sectors and can be helpful removal of usage of harsh chemicals from the market.

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