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Cellulase Enzyme Activity in Sewage, Dairy, Aluminum , Tannery Industry Effluents Flooded Soils in Warangal city, District, Telangana , India.

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ABSTRACT

The cellulose activity in different polluted and control soils in Warangal city are analyzed during June 2013 to May, 2014. The minimum and maximum cellulase enzyme levels were 10.13 mg/L to 26.32 mg/L in the near nayeem nagar sewage canal, while this range was 13.17mg/L to 29.12 mg/L in the soils amended with dairy industry waste water flooded soil. The minimum and maximum range of cellulose activity was 13.9 mg/L to 24.84 mg/L in aluminum industry waste water flooded soil. The cellulose enzyme activity range in soil amended with tannery industry waste water flooded soil was 10.91 mg/L to 16.5 mg/L, while the range of activity was 14.3 mg/L to 31.21 mg/L in control soils.

Key words: Cellulose, Aluminum, Tannery Industry, Warangal.

INTRODUCTION

Enzyme activity of soil results on the activity of accumulated enzymes and enzymatic activity of proliferating micro-organisms. Accumulated enzymes are regarded as enzymes present and active in soil, in which no microbial proliferation takes place.

Degradation of cell wall by enzymes secreted by micro -organisms in soil has been on of the major thrust area in recent past. Cellulase, a major structural component of cell wall, is the most abundant substance found in the soil atmosphere. Chemically cellulose is made up of long chains of 1,4 linked D-Glucopyranose. In the process of production of cellulase enzyme in soils, firtly cellulose is converted into disaccharide, cellobiose by an enzyme cellulase and then to glucose by cellabiose by an enzyme cellulose and then to glucose by cellabiose. Getgin and Rosefield (1971) in their studies on partical purification and properties of cellulose reported its existence has a stable and cell pre-soil enzyme. They further reported the cellulose, an excellent enzyme for investigating biological transformations in soil. Information on existence and properties of stable, exo –cellular enzymes in soil sparce because it is difficult to extract active enzymes. However , recent reports (Preece, 1992 and Baize,1993) suggest that cellulose is to contribute the breakdown of some hazardous and toxic insecticides.

MATERIALS AND METHODS

Study Area:

Warangal, historically known as Orugallu, is a historic city the capital of erstwhile Kakatiya Dynasty Ganapathi Deva ruled this area in 12th century to 14thcentury. It is about 140 km away from Hyderabad city, well connected by rail and road from all major cities in Telangana. It lies between Latitude 170.58’8.04”N, Longitude 79035’8.04”E.

Soils have been often damaged when used for on –site land disposal of waste chemicals and unwanted materials. Most soils are capable to some degree of adsorbing and neutralizing many pollutants to the ability of a soil to accept wastes without some negative effect on the environment. In soil pollution, there are three basic urban land uses names residual, commercial and industrial, which are positively correlated with pollution.

The following sites were selected for the study:
Site 1. The soil sample collected from sewage canal near Nayeem nagar.
Site 2. The soil sample collected from near dairy industry flooded soil.
Site 3. The soil sample collected from near aluminum industry effluents flooded soil.
Site 4.The soil sample collected from near tannery industry effluents flooded soils.
Site 5. Control soil sample collected from near place.

Preparation of soil enzyme

The soil solutions (1:5 soil and water) were made and filtered through Whatmann No. 42 filter paper and clear solution was used as soil enzyme extract.

The cellulose enzyme in soil sample was estimated as procedure suggested by Zantua and Bremner, (1975).One ml of soil enzyme was taken in a test tube and added with 3.5ml CMC followed by one ml of citrate buffer (pH 5.5) and 2 drops of toluene. The above contents were kept for 6 hours of incubation period, take one ml of reaction mixture from above solution and added with three ml DNS reagent and heated in water bath for 15 minutes during which the test tubes were closed with aluminum foil. After that the content were added with 2ml of Rochalle salt solution and cooled under running tap water. The developed color was measured at 575 nm. Reference blank was prepared with distilled water and the C1 enzyme activity was expressed as the increase in mg of reducing groups as (glucose/ml) liberated in 6 hours.

RESULTS AND DISCUSSIONS

The current research undertaken the quantification of bio-accumulated cellulose in four polluted soils. Un- contaminated soil was served as control for comparison. The data obtained presented in figures 1-4.

Figure-1. Cellulase enzyme activity among the soil sample collected from sewage canal near Nayeem nagar.

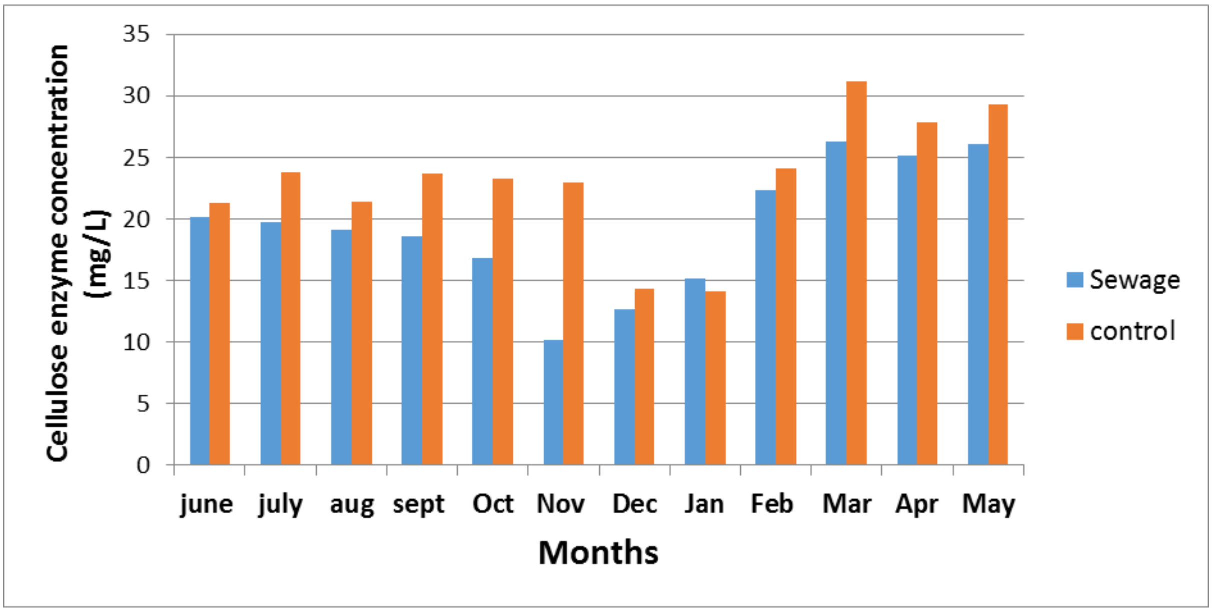


Figure -2: Cellulase enzyme activity among the soil sample collected near Dairy Industry flooded soil.

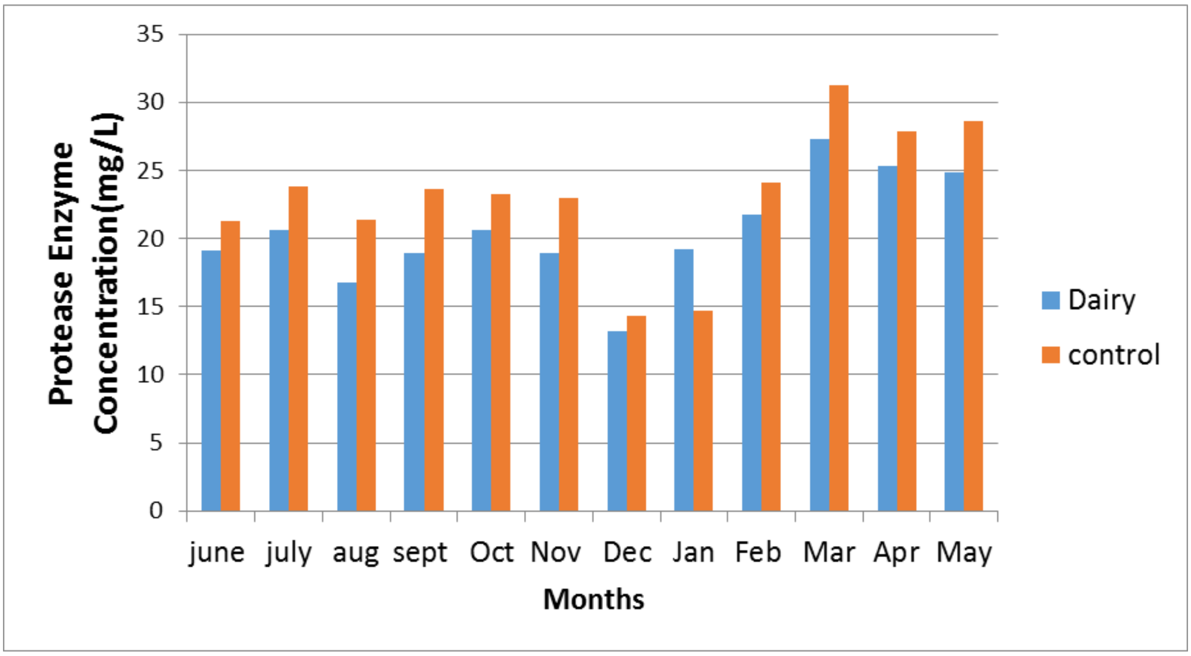
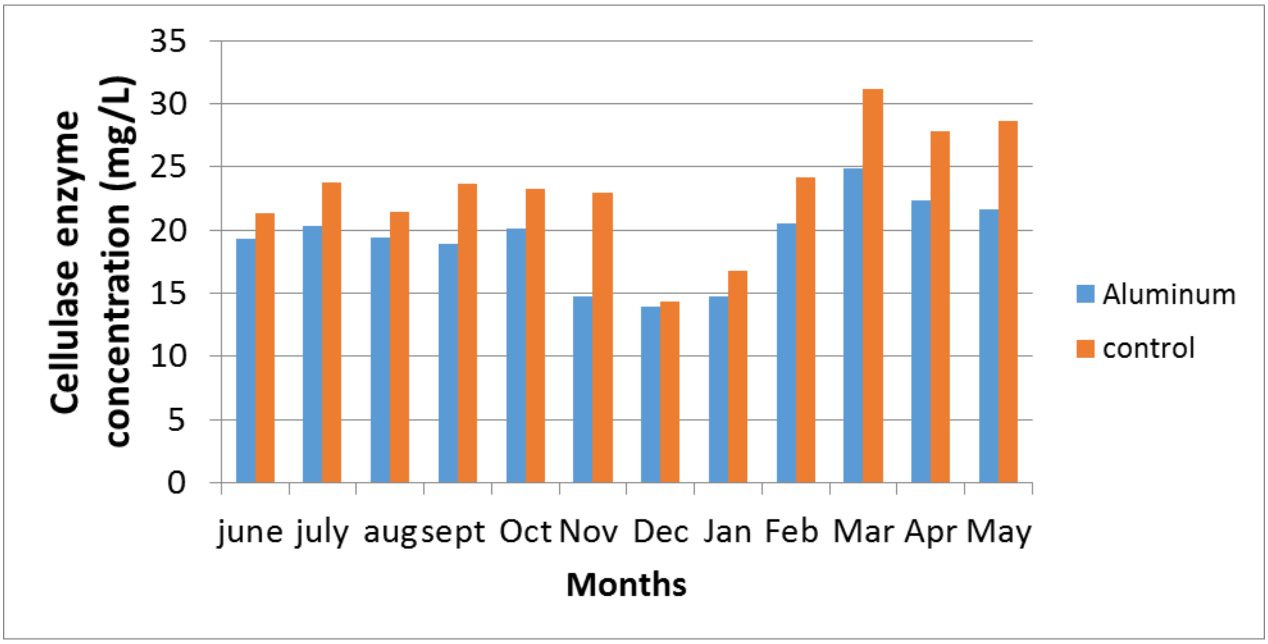


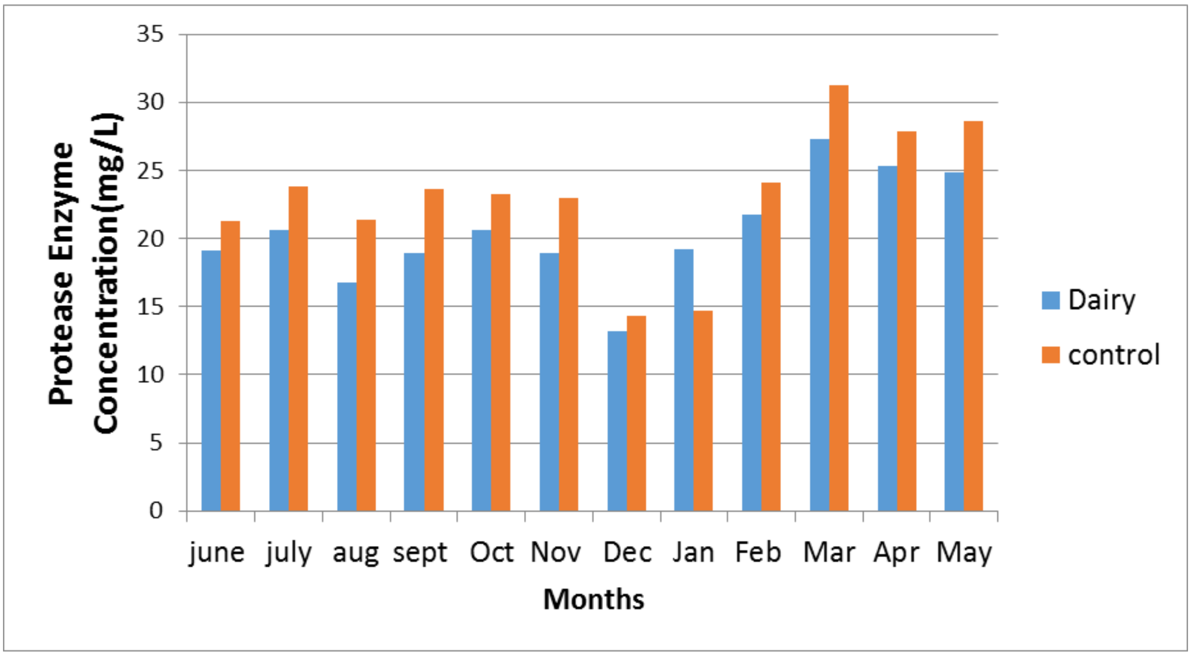
Figure-3: Cellulase enzyme activity among the soil collected from near Aluminum Industry.



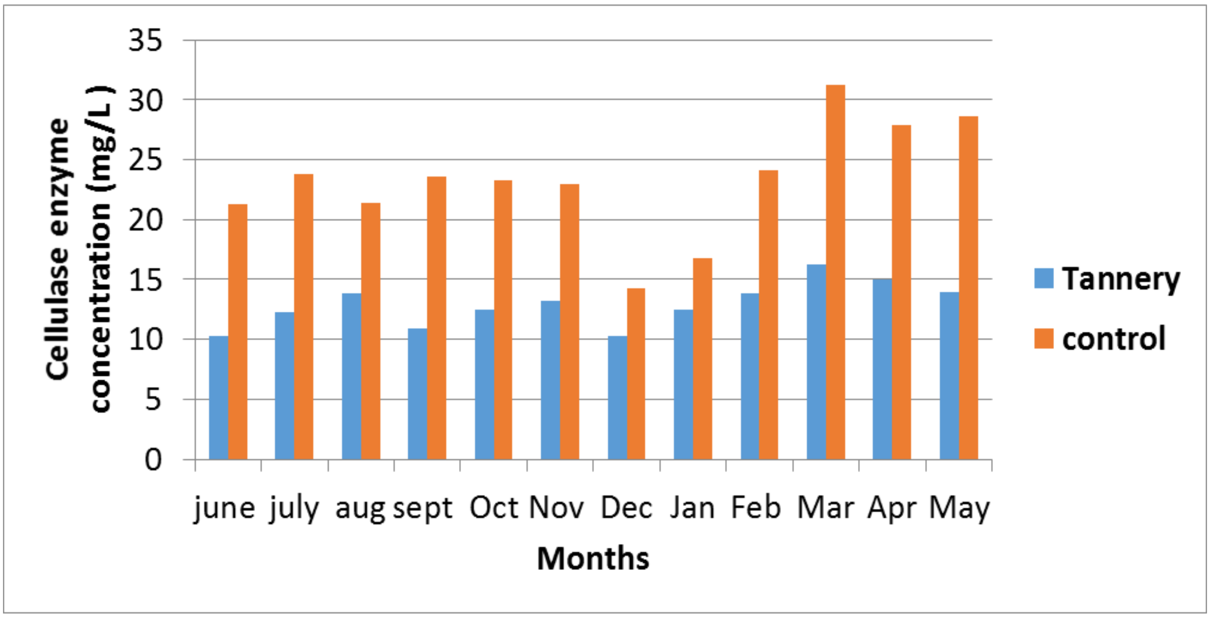
From the figures, it was concluded that the enzyme cellulose varied in different soils with different activities. No remarkable variations were observed in the accumulated cellulases enzyme in polluted and control soils.

The Cellulase enzyme was estimated in different industrial polluted and control soils during the year June 2013 to May 2014 (Figures 1 to 4). From the figures, it was concluded that the enzyme cellulose varied in different soils with different activities. No remarkable variations were observed in the accumulated cellulases in polluted and control soils. The sewage flooded soils could record the moderate cellulase enzyme activity range was (10.13mg/L

Figure -3: Cellulase enzyme activity among the soil sample collected near Dairy Industry flooded soil.



Figuree-4. Cellulose ezyme activity among the soil sample collected from near Tannery Industry effluents flooded soil.



to 26.32 mg/L). The range of enzyme activity in dairy effluent amended soils varied from 13.17mg/L to 29.12mg/L while it was in between 14.31mg/L to 30.21mg/L in control soils. The aluminum industry waste water flooded soil showed the range of activity in between 13.92mg/L to 24.84mg/L. This was followed by the soils amended with tannery industry effluents where the minimum and maximum enzyme activities were110.91mg/L and 16.5mg/L. Rai et al (1970), Venkatraman and Rajyalakshmi (1971) also reviewed the relative enzyme activity of cellulose while explaining the interactions between pesticides and soil micro-organisms. Mishra et al (1979) recorded the kinetics of cellulose enzyme in sub

tropic surface soils under pasture. Gianinazzi et al (1991), Evans (1990) compared cellulose enzyme activity in uncontaminated soils and observed smaller amounts of reducing sugars in uncontaminated soils, indicating that the proliferating micro- organisms consumed a part of sugars. A similar comparison was made by Shukla et al (2000), Jones and Schwab (1993), but the soils used were contaminated by the other types of effluents. Skujins (1967), Guar (1980)could not demonstrate any cellulase enzyme activity in soils treated with toluene related chemical industries. Contrary to the present observations different workers (Former, 1982; Johnson 1990; Kozak et al, 1993) failed to detect cellulose activity in the soils contaminated with tannery and paper mill effluents.

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