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α-Amylaze Enzyme Activity in Sewages, Dairy and Dying Industry Effluents Flooded Soils in Khammam City District, Telangana, India

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Abstract

The amylase enzyme activity in different polluted and control soils in Khammam city were analyzed during 2014-2015. The minimum and maximum amylase levels were 0.46 to 1.10mg\L in the near munneru vagu sewage canal, while this range was 0.32 to 1.11 mg\L in the soils near grain market waste water flooded soil. The minimum and maximum range of amylase enzyme activity was 0.48 to 1.15 mg\L in dairy industry waste water flooded soil. The amylase activity range in soil amended with the range of activity was 0.28 to 0.84mg\L in control sols.

Key words: Munneru, alpha-amylase, dairy, dying industry, flooded soils, Khammam

INTRODUCTION

The enzyme activity of soils results from the activity of accumulated enzymes and from those in proliferating microorganisms. As defined by Kiss et al. (1975) accumulated enzymes in soils are regarded as enzymes present and active in a soil in which no microbial biomass, although they can also originate from plant and animal residues. Enzyme activities in soils are derived from free enzymes, such as exo-enzymes released from living cells, endo-enzymes released from disintegrating cells and enzymes bound to cell constituents.

Amylase is an exo-enzyme that hydrolases starch, a polysaccharide into disaccharide and some monosaccharide such as glucose. These disaccharide and monosaccharide enter into the cytoplasm of the bacterial cells through the semi-permeable membrane and there be used the endo-enzymes. Starch is complex carbohydrate composed of glucose molecules linked together by glucoside bonds. The ability to degrade starch is used as the criteria for determination of amylase production by a microbe.

The study on amylase activities has developed considerably [Cortez, 1972; Ross et al; 1973; Frankenberger and Dick (1983), Behera and Mishra, 1989; Lovelle and Martin 1992, Goyal et al 1993, Webb and Burgham, 1994] in recent years because of their potential importance for indicating levels of general biological activity of a particular biochemical processes. Amylase production in soil is involved in the decomposition of organic matter and mineral cycling and are responsible for the rate and course of decomposition of plant and animal tissue. On many occasions amylase activities are considered as indicators of soil metabolism.

MATERIALS AND METHODS

Study Area:

Khammam town, historically known as Khammam mettu. It is historic city Kakatiya dynasty 12 and 13 Century. In 19 Century ruled by Nizam Nawab in under Hyderabad state. Now it is capital city of Telangana. It is situated between Hyderabad and Rajamundry state highway. It is about 200Kms away from Hyderabad capital city of Telangana state. It lies between latitude 17058.04'' N, longitude 79035'8.04'' E. The Liquid solid wastes and industrial effluents generated from Khammam city area are mostly dumped in open land fill in low lying areas. This is creating an important source of soil pollution. Today, in Khammam town, the accelerated pace of development, rapid industrialization and

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growing human population are responsible for enormous amounts of sewage and industrial effluents every year and these waste materials are increasing tremendously.

The following sites were selected for the study:

1. The soil sample collected from sewage near munneru.
2. The soil sample collected from near grain market.
3. The soil sample collected from near dairy industry.
4. The soil sample collected from near dying Industry
5. Control soil collected from near place.

Preparation of soil enzyme

The soil solution 1:5 and distilled water were made and filtered through whatmann no.42 filter paper and clear solution was used soil enzyme extract. Amylase Ross and Nelly 1973.

Amylase is a starch degrading enzyme, universally distributed and act as glycogen and related to polysaccharides and amylase causes endo-cleavages of substrates and hydrolyses a 1-4 link ages in random manner. It has the ability to bypass and it branch points.

One ml of of soil enzyme five ml of buffered starch, one ml of calcium chloride were taken in a conical flask and kept in 40 0 C water bath for ten minutes. Then two ml of1n hydrochloric acid and 0.1 ml of iodine solution and developed blue color was observed at 620nm. Blank was prepared with soil enzyme and with the help of standard graph the amylase content was measured and expressed in terms of decrease in Optical Density at 620 nm/gm of dry soil/ unit time.

RESULTS AND DISCUSSION

A detailed investigation an amylase of four polluted soils and one control soil in Khammam town during 2015- 2016. The obtained data presented in figures 1-3. From the figures 1-3 it was evident that the amylase activity in different soil varied differently during the study period. The minimum and maximum amounts of amylase also fluctuated depending on the climatic conditions, microbial proliferation and nature of soil etc. The amylase activity varied in between o.o9 to 0.59 units (activity expressed in terms of decrease in optical density at 620 nm per gram of oven dry soil / unit time) in the soils amended with sewage soil site 1The soil samples collected from waste water flooded soils near sewage canals and analyzed during in the month of july2015 to June 2016. This variation was between 0.02 to 1.19 units in the soils amended with sewage site 2. The range of activity in the soils fluctuated in between 0.02 to 1.20 in the soils with dairy industry effluents flooded soil in site-3. The control soil enzyme range of activity in between 0.02 to1.01 units during the same period of time. The accumulation of amylase enzyme was maximum during October to January with few exception the amylase activities were similar during months January to March abnormal increase in amylase accumulation. The increased activity of the microbes, more accumulation of decomposed materials may be the causative factor for this abnormal reports. Winter months could support for the maximum enzyme activities.

Figure-1. Amylase enzyme activity in polluted and control soils in Khammam (Sewage 1)

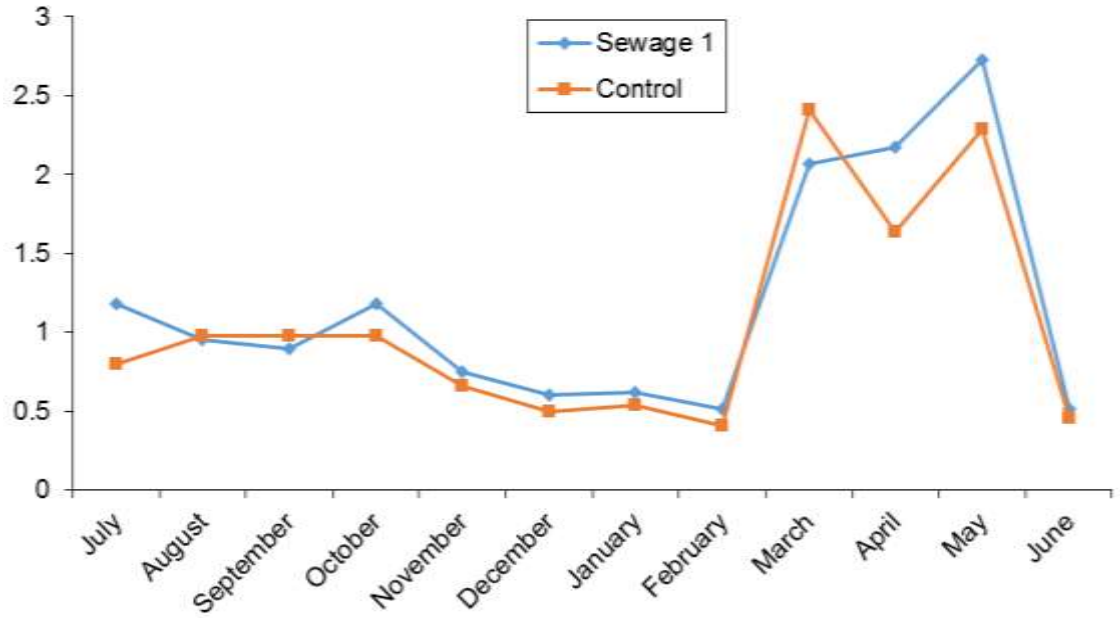


Figure-2. Amylase enzyme activity in polluted and control soils in Khammam (Sewage 2)

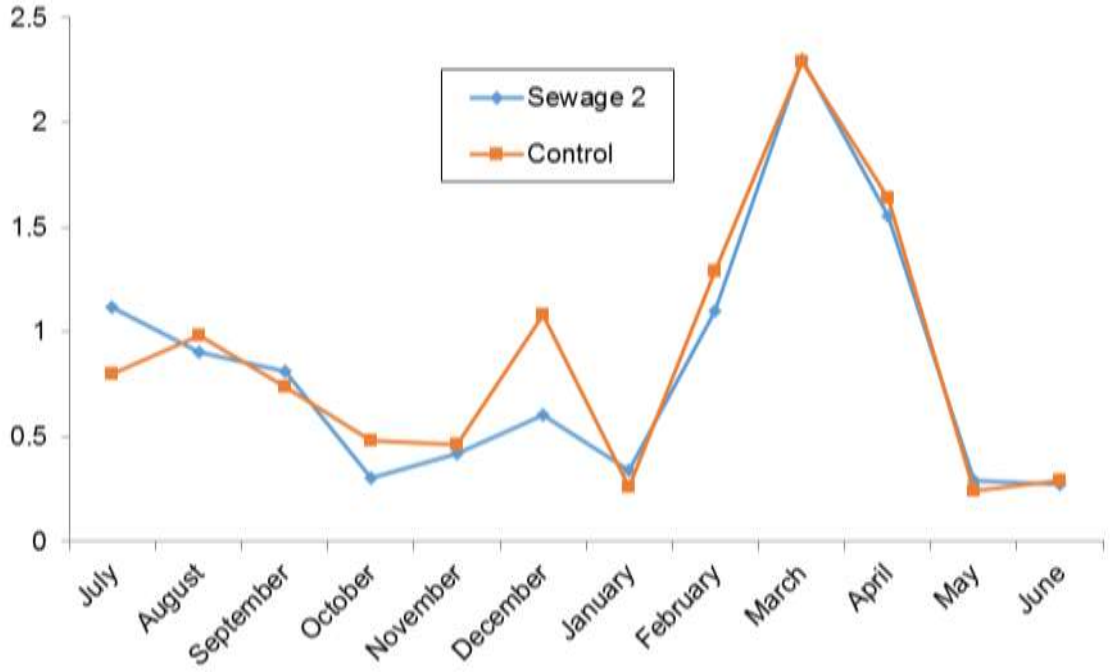
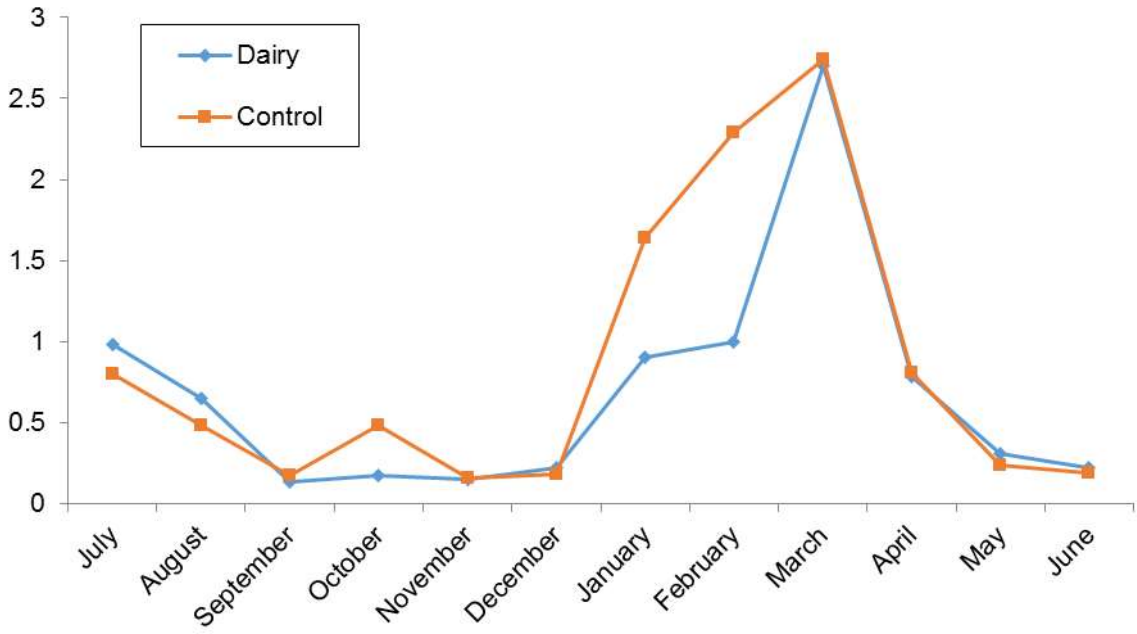


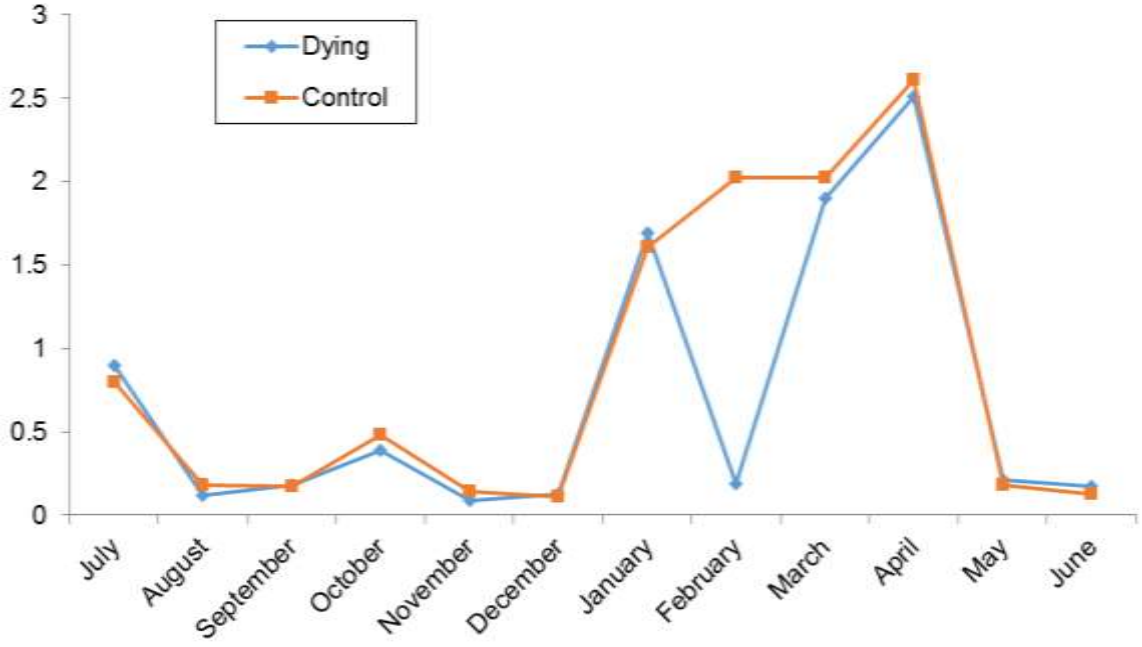
Figure-3. Amylase enzyme activity in polluted and control soils in Khammam (Dairy)



Competing interests

Authors declares that they have no Conflict of Interest. All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (Institutional and National) and with the Helsinki Declaration of 1975, as revised in 2008. Informed consent was obtained from all the patients for all diagnostic and therapeutic procedures. .It does not contain any studies with animal subjects.

Figure-4. Amylase enzyme activity in polluted and control soils in Khammam (Dying)



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