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β-Amylase enzyme activity in industrially polluted soils and control soils in Kallur, Khammam District Telangana

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ABSTRACT

The β- amylase enzyme activity in different sugar and dairy industrially polluted and control soils of Kallur village were analyzed during 2015 -2016. The minimum and maximum range of β-amylase enzyme was 0.45mg/L to 1.16mg/L in sugar industry effluents flooded and control soils. The mean values of dairy industry effluents flooded soils and control soils were recorded 0.54mg/L to 0.81mg/L.

Key words: Amylase, enzyme.

INTRODUCTION

Soil is one of the most important needs of the environment. However, it is most valued, misused and abused resource of the earth. India adopted mixed economy policy which includes agriculture apart from industrialization, due to which the entrepreneurs are encouraged to setup manufacturing units of several kinds ranging from chemical based to agro based. This lead to multi di mentional pollution problems. Draining of effluents to soil was he practice used to dispose of industrial effluents.

Beta-Amylase is an enzyme complete that hydrolyses starch, polysaccharide in to disaccharide, maltose and monosaccharide, glucose. Starch is a complex carbohydrate composed of glucose molecules linked together by a- 1,4 glucoside bonds. The ability to degrade starch is used as the criteria for determination of amylase production by a microbe. Trevenot et al. (1992) feel that amylase released during seed germination hydrolyses reserve starch and releases energy. Chang (19820 could find appositive role of amylase in the seed germination by the hydrolyses of starch and release of energy.

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β-Amylase activity of soils has been studied by several investigators (Behera and Mishra, 1989; Stromgaard, 1992; Webb and Burgham, 1994) because of its potential importance as it indicates level of general biological activity and biochemical processes of soils. Amylase in soil is involved in the decomposition of organic matter and mineral cycling and is responsible for the rate and course of decomposition of plant and animal tissue. On many occasions amylase activities are considered to be indicators of soil metabolism.

MATERIALS AND METHODS

Study area:

Kallur village was 50 km away from Khammam city, Telangana, India. It lies between 17°12'15.84" N 80°33'12.60" E. In Kallur village four diary industries and one sugar industry effluents were flooded in to soils. Five grams soil was dissolved in 100ml of distilled water, filtered solution was taken for sample.

The following sites were selected for the study:

1.Soil samples collected from sugar industry effluents flooded soils.
2. Soil sample collected from near bank of the soil treated as control soils. Sugar industry effluents flooded soils.
3. .Soil sample collected from dairy industry effluents flooded soils.
4. Soil sample collected from near bank of the soil treated as control soil.

Methodology:

Principle : Beta–Amylase hydrolyses alternate bonds from non - reducing end of the substance. The enzyme degrades amylose amylopectin or glycogen in an exo –

or step- wise fashion by hydrolyzing alternate glycosidic bonds. The end product B – maltose. B- Amylase is incapable of by passing branch points i.e., conversion of amylopectin to maltose. The reducing sugars produced by the action of a and b amylases react with di nitro salicylic acid and reduce it to a brown colored product nitro amino salicylic acid.

Reagents: Citric acid (2.62 gm) citric acid in 250 ml distilled water. Tri sodium citrate : 3.7 gm in 250 ml distilled water.

Buffer substrate : 250 mg of maltose was taken and 14 ml of citric acid plus 12.5 ml of tri sodium citrate was mixed and used as a substrate for enzyme activity.

DNS reagent : 1 gm of 35 – di nitro salysilic acid dissolved in 50 ml of 2% NaOH and 0.2 ml phenol and 0.05% Na_2SO_4 added and the final concentration was made up to 100ml with distilled water.

Assay : One ml of soil enzyme and 1 ml of buffered starch were taken in a test tube and incubated for 10 minutes. After the incubation added with two ml of DNS reagent and healed on water bath for 10 minutes during which the test tubes are stopped with clean glass marbles. After that tubes were cooled under the running tap water and added with 20 ml distilled water. Change in the color was read at 575 nm. Blank was prepared using distilled water in case of soil enzyme.

RESULTS AND DISCUSSION

The amylase activity in the soils was assayed for one year 2015 to 2016 at monthly intervals and the results obtained are précised in figure1 and 2.

From the Figure 1 and 2 it is clear that amylase activity in soils increased due to the sugar industry effluents, which further increased during the year of observation. On the other hand, amylase activity in soils was inhibited under the influence of dairy industry effluents. However, the inhibitory effect was reduced during the year of observation. There were some fluctuations in the amylase activity of polluted soils which may be attributed to the time of sampling. The mean amylase activity varied between 0.54 mg/L and 1.16 mg/ L sugar industry effluent affected soil control soils, while in dairy industry effluent affected soils it was 0.54 mg/ L and 0.81 mg/ L in control soils.. The minimum and maximum amylase activity was 0.06 mg/ 100g and 1.39 mg/ Lin the soils affected by sugar industry effluents, while it was 0.20 mg/ L and 1.72 mg/ L in dairy industry effluents affected soils. Narasimha et al (2011) reported that soils polluted with cotton ginning mill effluents stimulated the soil amylase activity. Similarly, effluents from pulp and paper mill (Kannan and Oblisami, 1990b), Trasar –Cepeda et al 2000 cotton ginning mill (Nizamuddin et al 2008) and press mud with paper mill effluents (Chinnaiah et al., 2002) improved the amylase activity of soil. Mishra and Pradhan (1987) and Mishra et al (1987) observed inhibition of amylase of soil which they attributed to the susceptibility of microorganisms producing amylases. Morgan (1986) and Page and Gullet (1991) feel that the stability of amylase in soils is governed by different factors and suggested that lack of significance of correlation between amylase activity in some horizons and decline of activity with the depth of the soil non an organic carbon bases.

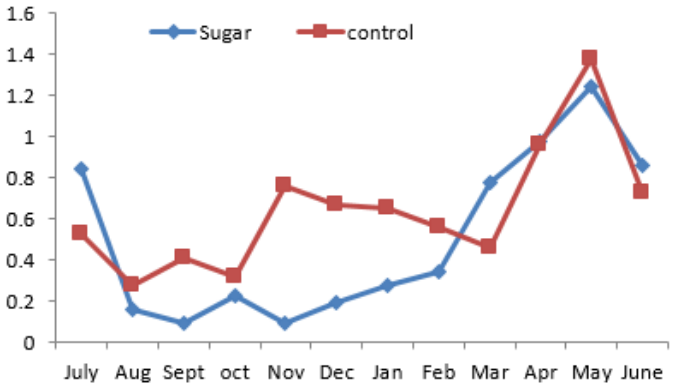

Figure-1. β-Amylase enzyme activity mg/L in sugar industry effluents flooded and control soils.

Figure-2. β-Amylase enzyme activity mg/L in dairy industry effluents flooded and control soils

Conflicts of Interest

Authors declare that there is no conflict of interests regarding the publication of this paper.

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