

Catalase Enzyme Activity in Sewages, Dairy, Dying Industry Effluents Flooded Soils in Khammam City District, Telangana, India

B. Lalitha Kumari

*Department of Botany, University Arts & Science College,
Kakatiya University, Warangal -506 001. Telangana, India*

E-mail: lalitha21prasad@gmail.com



©gspg licensed

ABSTRACT

The catalase enzyme activity in different sewage and industrially polluted and control soil in Khammam town were analyzed during 2015-2016. The minimum and maximum catalase enzyme levels were 0.9 to 1.14 units in sewage polluted soils, while this range was 1.10 to 2.6 units in the soil amended with dairy industry waste water flooded soil. The minimum and maximum range catalase activity was 1.2 to 3.8 units in minimum industry waste water flooded soil. The catalase enzyme activity range in soil amended with dying industry waste water flooded soil was 0.9 to 2.0 units, while the range of activity was 1.0 to 2.4 units in control soils.

Keywords: Catalase, Khammam, Dairy, Sewage.

INTRODUCTION

Catalase enzyme activity of soil is potentially a more specific tool for characterizing the biochemical capacities of soil or microbial counts or respiration measurements. During aerobic respiration in the presence of oxygen, microorganisms produce hydrogen peroxide which is to be lethal to microbial cells. The enzyme catalase present in some microorganisms breaks down hydrogen peroxide to water and oxygen and helps microbes in their survival. Johnson and Temple 1964 established the role of some variables affecting the measurements of catalases accumulated in various contaminated and control soils were estimated.

MATERIALS AND METHODS

The district of Khammam derived its name from its Headquarter town, from a hill known as the Stambhadri Located in the heart of the town. The town was termed variously as Stambhadri

and Khammam mettu. It lies between 17.2473° N latitude and 80.1514° E longitude. It is situated in Hyderabad to Rajahmundry State Highway. Hyderabad is Capital City of Telangana. It is historic city of erstwhile Kakatiya Dynasty who ruled this area in 13th Century. It is about 200km away from Hyderabad and well connected by rail and road from all major cities in Telangana. Population of the District is 27,97,370 (2011 census). The climate of this District is characterized by a hot summer and good seasonal rain fall. The summer season is from about the middle of February to about first week of June. Rapid Industrialization, Urbanization and 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 in this study:
Site 1. The soil sample collected from sewage canal near Munneru.
Site 2. The soil sample collected from sewage canal near Main Highway.

Site 3. The soil sample collected from Dairy Industry.

Site 4. The soil sample collected from near dying industry

Site 5. Control soil collected from near place.

Hydrogen Peroxide Reductase:

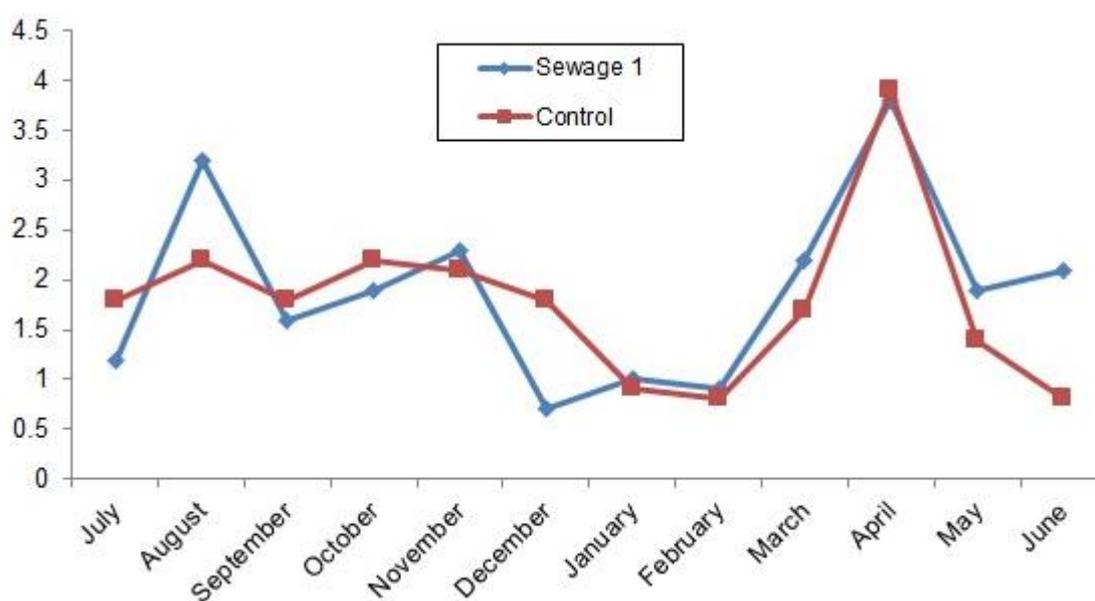
Catalase has a double function as it catalase the following reactions. 1) Decomposition hydrogen peroxide to give water and oxygen, 2) Oxidation of hydrogen donors for example methanol formic acid phenol with the consumption of the mole of peroxide. Catalase activity in soil was demined by hydrogen peroxide decomposition method s suggested by Johnson and Temple (1964). Ten ml of soil enzyme extract was added with 5ml of hydrogen peroxide solution (30% hydrogen peroxide, diluted 1:100) and the slurry was shaken for 20 minutes. The remaining peroxide was taken for 20 minutes. The remaining peroxide was then stabilized by adding 5ml of 3N Sulfuric acid and the contents of flask were filtered through Whatman No.42 filter paper. The 25 ml clear aliquot was titrated with 0.1 N Potassium permanganate and all titrations were corrected for a blank. The titration values were subtracted from the amount of Potassium permanganate need to titrate the initial peroxide and calculated

as ml of 0.1N Potassium permanganate till the solution turn to pink color. Blank assay was exercised same as above but used distilled water in place of soil enzyme. Final results were expressed as ml of 0.1 N Potassium permanganate equivalent to the peroxide decomposed for gram of oven dry soil/unit time.

RESULTS AND DISCUSSION

The sewage polluted soils were analyzed and data and not role present in figure 1-4. From the figures, it was recorded that the enzyme activity (catalase activity, 0.1 km no.4 equivalent to hydrogen peroxide decomposed in 20 minutes) ranged differently in different soils under study. No activities between control and polluted soils. The catalase also showed its maximum accumulation during summer period. The maximum and minimum values of enzyme activity were 3.9 and 1.14 units in the soil near sewage canal this variation is dairy industrial estate efferent flooded soils it was 1.2 to 3.8 units the during industry effluent with much of toxic substances could of affect much and activity of catalase was 0-9 to 2.0 units in control soils. Broad man (1985) measured five soil types for catalase activity incubated with the without adding organic matter and bentonite the

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



measurement was affected by soil type, addition of organic matter, addition of bentonite and drying of the sample. Biol et.al., (1989) characterized in soils in relations to catalase activity in presence of glucoreaffalfa etc., and stability proposed position role. Courty and Trudgill (1984) studied the use of soils

sterilizant to permit the measurements to catalase in various soils studied. Buol et.al. (1980) characterized the soils in relation to catalase activity in present in of glucose, alfalfa etc. and statistically proved that the catalase activity has appositve role.

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

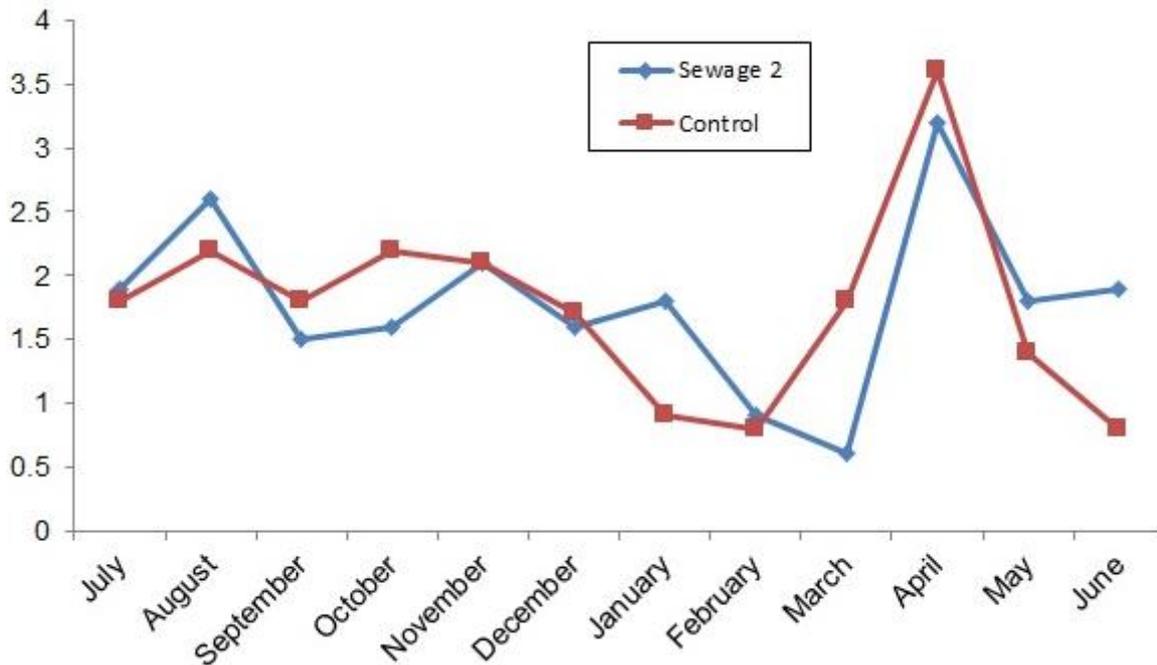


Figure-3. Catalase enzyme activity in polluted and control soils in Khammam (Dairy)

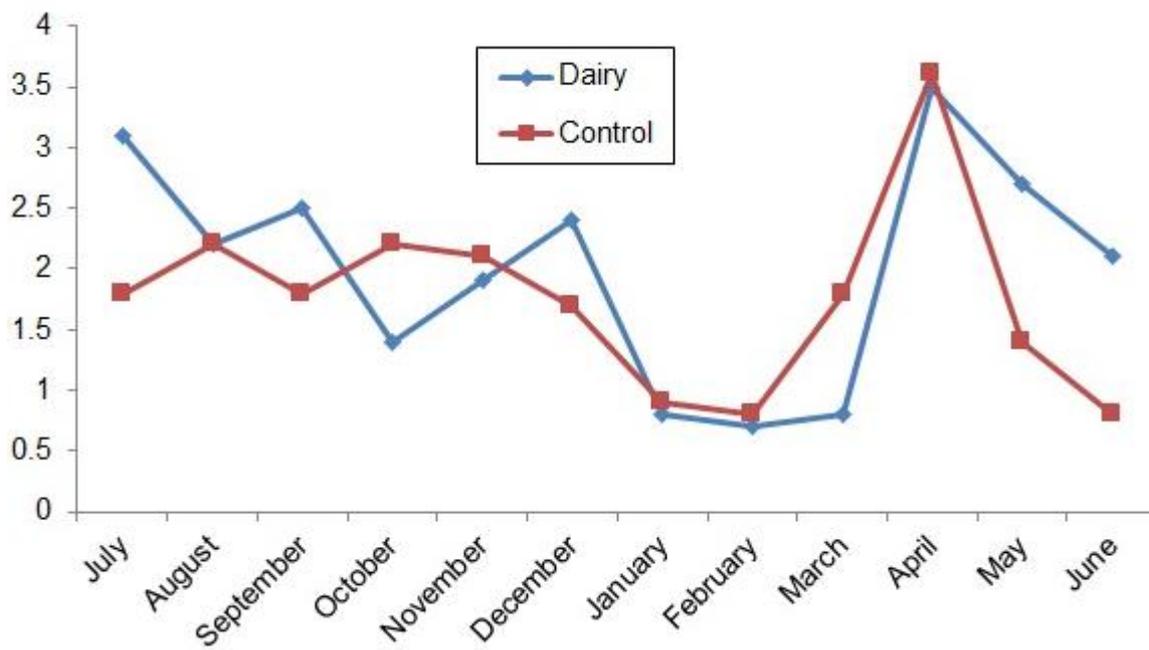
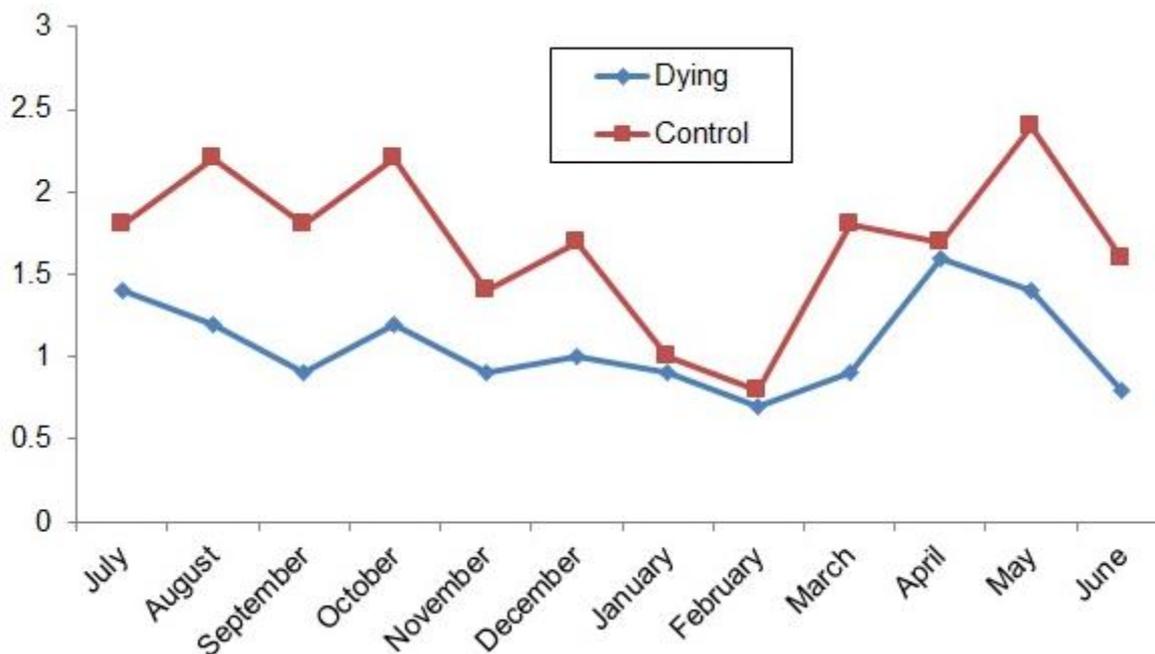


Figure-4. Catalase enzyme activity in polluted and control soils in Khammam (Dying)

Pascal et.al. (1988) observed that the amount of organic materials added to soils will determine the catalase activity. Shiyin et.al. (2004) found that soil catalase activity will depend on the hydrolysates. Guwy et. al. (1999) reported that catalase is actively does not drop until the in below 3.5 catalase activity is very stable in soil and shown a significant correlations with the count of organic carbon decreasing with soil depth (Alef and Nannipieri, 1985) on the alter hand negative correlation between heavy method and soil catalase, release and other enzyme activities were demonstrated by Kigilkarra et.al. (2004) Trasar-Cepeda et.al. (2007).

REFERENCES

1. Alef, K. and P Nannipieri (1995).Catalase activity in: Methods in Applied Soil Microbiology and Biochemistry. London: Academic Press, 362-363.
2. Broadman, J. (1985).Soils and Quaternary Landscape Evolution Wiley Chichester.
3. Buol, S.W., F.D. Hole and M. Cracken (1980). Soil Generic and Soil classification. Iowa state press Amsterdam.
4. Courtney, FM. and S.T Trudgill (1980).The soil introduction to soil study Edward Arnold, London.
5. Guwy, A.J., S.R Martin, F.R. Hawkes and D.W. Hawkes (1999), Catalase activity measurements in suspended aerobic biomass and soil samples enzyme and microbial technology. 25:669-676
6. Johnson IJ. And K.L Temple (1964).Some variables affecting the measurement of catalase activity in soil.Soil Soc amen. Proc. 28:207-209
7. Kizilkaya, R. T Askin, B. Bayrakli and M. Saglam (2004). Microbiological characteristics of soils contaminated with heavy metals European Journal of Soil Biology, 40: 95-102
8. Mishra, PC. And S.C Pradhan (1987). Seasonal variation in amylase invertase ,cellulose activity and CO₂ Evolution in a tropical protected grass land of Orissa , India, Sprayed with Carbonyl insecticide. Environmental Pollution, 43:296-300.
9. Pascal, J.A., J Hernandez, C Garcia and M. Ayaso (1998). Enzymatic activities in an arid soil amednded with urban organic waste:laboratoryexperimentbio resource technology, 64: 131-138

10. Shiyin, L.,NLixiao, P. Panying, S Change and w. Ling Sheng (2004) Effects of pesticides and their hydrolysates on catalase activity in soil. Bulletin of environmental contamination and toxicology, 72:600-606
11. Trasar- Cepeda, C.P Gril –Stotres and M.C Lerios (2007).Thermodynamic parameters of enzymes in grassland soils from Galicia; N.W Spain.Soil biology and Bio Chemistry, 39:311-319.
