Contents lists available at Thomson Reuters

The American Journal of Science and Medical Research

Journal homepage: http://ajsmrjournals.com

Research Article

Assessment of Actinomycetes Population in Sugar and Dairy Industrial Effluents Flooded Soils and Control Soils

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http://dx.doi.org/10.17812/ajsmr2406
Received :25 September 2016
Accepted; 21 November, 2016
Available online : 30 December, 2016

ISSN: 2377-6196© 2016 The Authors.
Published by AIRA

Keywords: Actinomycetes, soil.

ABSTRACT

The actinomycetes colonies were estimated in sugar industry and dairy industry effluent flooded soils and control soils in kallur city are analyzed during in a year 2017-2018. The minimum and maximum actinomycetes range from 12 x10^5 to 43 x 10^5 population in soil collected from sugar industry effluents flooded soil. While the mean of the soil collected from control soil 28 x 10^5. The soil collected from dairy industry flooded soils minimum and maximum range was 14 x 10^5 to 58 x 10^5. The minimum and maximum actinomycetes range in between 11 x 10^5 to 19 x 10^5 In control soils.

1. Introduction

Soil is more than just an elaborate inert plant growth medium and contains large populations of microorganisms (bacteria, fungi, algae and protozoa) along with smaller numbers of soil animals such as nematodes, earthworms and insects.

Biological diversity is essential for evolution and sustenance of life in the biosphere. The main objective of biodiversity is the conservation of macro and microbiological species in the biosphere and sustainable use of them and fair and equitable sharing of the benefits and using out of the utilization of genetic resources. The diversity includes biological resources (i.e. genetical resources, organisms, or parts of there of populations) of any eco system useful for humanity. The fundamental requirement.

For the conservation of eco system and natural habitats and the maintenance and recovery of viable germ plasma of species in their natural surroundings.

2. Material and Methods

2.1 Study Area

Kalloor is situated from 50 Kms away from Khammam city in Telangana State It is West Krishna District of Andhra Pradesh, East Godavari, West Nalgonda, North Bhadradri Kothagudem. 17.2010° N, 80.5522° E. Average Rainfall – 980 cm. Common crops are paddy, cotton, sugarcane, chillies. Temperature: in between 21^{0}C to 39^{0}C in summer.

2.1 Isolation and Enumeration of Microorganisms in soil.

Sample 1 : soil sample collected in sugar industry effluents flooded soils and Sample 2: near by soil sample collected from bank of the effluents flooded soil treated as control. Sample 3 : soil sample collected in dairy industry effluents flooded soils and Sample 4 : near by soil sample collected from bank of the effluents flooded soil treated as control.

Medium containing soluble starch 10.0 g, casein - 0.3g, potassium nitrate -2.0 g, sodium chloride -2.0 g, dipotassium hydrogen phosphate -2.0 g, calcium carbonate -2.0 g, ferrous sulphate - 0.01 g, agar – agar- 20g, distilled water – 1 liter was employed.

The sterilized medium at its 50^0 C temperature poured in to a sterilized petri plates containing 0.5 ml diluted soil sample (10^{-6}) for enumerating bacteria and allowed to cool room temperature. The petri plates thus prepared were incubated at 37^{0}C for 3 days. At the end incubation period, bacterial colonies appeared were scored with the help of colony counter. The microorganisms per g of soil was calculated with the following formula.

Number of microorganisms (Fungi, bacteria and actinomycetes) per g soil = Number of colonies (average of three replicates) x Dilution factor.

Microbial population of polluted and healthy soils was analyzed by different standard microbiological methods.

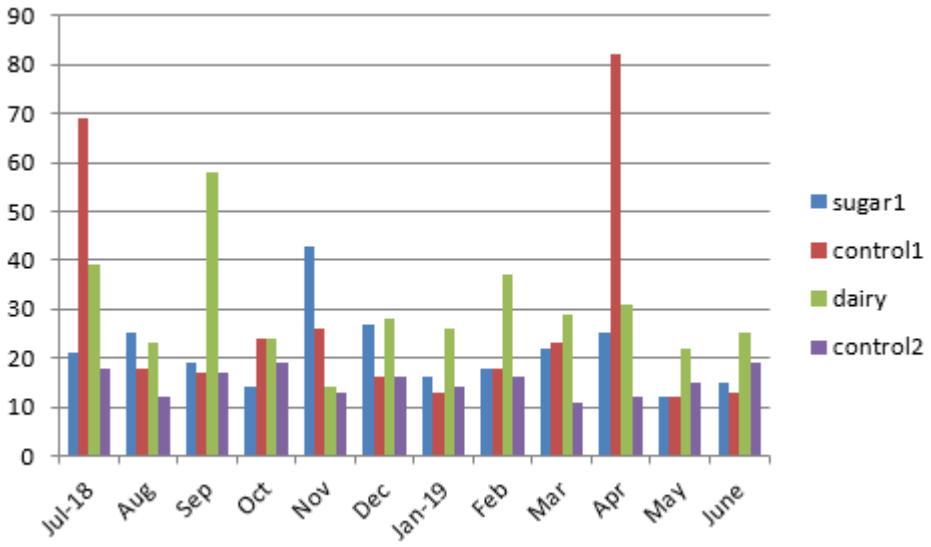

Figure-1: Actinomycetes activity in sugar and dairy industry effluents flooded soils and control soils.

3. Results and Discussion

The actinomycetes population in soils polluted with sugar industry and dairy industry was analyzed for one years (2017and 2018) at monthly intervals and the results are presented in figure-1.

Actinomycetes are gram positive aerobic bacteria which produce mycelium-like structures, typically 15-20 µm long and 0.5-2.0 µm in width. Actinomycetes belong to class Schizomycetes and order Actinomycetales. Because of their resemblance with fungi in many characters such as filametous nature, branching pattern and conidia formation, the actinomycetes are also called'ray fungi'. However, size, spore and many other characters of actinomycetes are similar to bacteria. Actinomycetes colonies on agar plates appear slowly, show low consistency and sticky firmly to agar surface. The cell wall of actinomycetes has no chitin or cellulose. The growth of soil actinomycetes occurs from the hyphal apices with regular branching occurring behind the main apices of leading hyphae as in fungi. The vegetative mycelium in lichnoid and usually exists below the surface of agar medium. There are seven groups of actinomycetes classifides on the basis of their hyphal nature, mycelia characteristics, sporulation, fragmentation, etc.

Most actinomycetes are free-living saprophytes and decompose carbonaceous substances including recalcitrant molecules like chitin, cellulose , hemicellulose ,phospholipids, keratin, lignin etc. under alkaline conditions. Actinomycetes develop best in moist and well aerated soils. However, in times of drought , they remain active when soils do not usually exhibit either bacteria or molds. Actinomycetes or generally sensitive to acidic soil conditions,and their optimum development occurs at p^H values between 6.0 and 7.5 Actinomycetes number in soils exceed those of all organisms except bacterial , their numbers sometimes reaching hundreds of millions , about one tenth the population of bacteria (Cardinali et al., 1989) .Holt et al (1994),Gupta(1991) reported that actinomycetes are of great importance in the decomposition of soil organic matter and the liberation of its nutrients.Sebiomot at al(2011),Zian NM(2013), Picccolo and Mbagwu (1990) could establish relationship with amendments of the different organic wastage and soil micro – aggregates stability and molecular size of humic substances with density of actinomycetes.

The actinomycetes population in soils showed a fluctuation under influence of effluents. Comparatively more actinomycetes population was recorded during the first year of observation and declined subsequently the mean actinomycetes population recorded in sugar industry effluent affected soils was $28.91x10^5$ g and $26.5x10^5$ g, while in dairy industry effluent affected soils it was $28x10^5$ /g and $18x10^5$/g .On the other hand, actinomycetes population in the controlled soil was constant. In effluent treated soils actinomycetes population was fluctuated. Aulenbach(1980)and Baslas and Singh (1985) have reported that maximum reduction in actinomycetes colonies in the soils flooded with tannery industrial waste waters. Garcia et al. (1980) could find relations between mineral element concentration in tannery effluents with that of the quantities of actionomycetes in the soils. Chany(1973) in his review stressed the importance of actinomycetes and bacteria in sludges and industrial effluents and crop productivity. David et al. (1996) and Hammer Meister(1996) have also observed changes in soil microbial biomass depending on characterization of the effluents.

Competing Interests

The authors have declared that no competing interests exist.

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