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ISOLATION AND CHARACTERIZATION OF MICROORGANISM FROM MUNICIPAL WASTE

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Abstract

Municipal waste is a type of waste that consists of household waste, commercial waste, and waste from the street. The soil contains many microorganisms which can live in extreme condition there are still 80 to 90 % microorganism is unidentified. The microorganism present in the waste is termed solid waste microflora. The waste contains many pathogenic microorganisms and its presence hike the danger of pollutant to human and their environment. The study aims to isolate microorganisms from municipal waste. The presence of microorganisms causes harmful effects on the environment and the public. So the proper solid waste management should be there.

Keyword: Microorganism, Municipal waste, Environment

1. INTRODUCTION

Municipal Solid Waste (MSW), is a type of waste that mainly consists of household waste (domestic waste) and sometimes includes commercial wastes, construction and demolition debris, sanitation residue, and waste from streets collected by a municipality within a given area(Atalia, et al 2015). The rapid urbanization in modern societies has led to an increase in the number of people and activities in our cities leading to accumulation or the production of greater amounts of solid municipal wastes (Iheukwumere and Okezie,2017). Municipal wastes will be divided into 2 major parts -- organic and inorganic. In general, the organic parts of solid waste will be classified into 3 broad categories: decayable, fermentable, and non-fermentable. Decayable wastes tend to decompose rapidly and unless rigorously controlled, decompose with the assembly of objectionable odors and visual unpleasantness. Fermentable wastes tend to decompose speedily, however, while not the unpleasant accompaniments of putrefaction. Non-fermentable wastes tend to resist decomposition and, therefore the rate of breakdown is terribly slowly. The major contribution to decayable waste is the food we consume.

The quantity and characteristics of solid waste vary from place to place and this is influence by factors like average income level, population, climate, the market for waste material, and industrial production. The author stated that, presently, in Indian cities, the annual quantity of solid waste generated has increased from 6million tons in 1947 to 48 million tons in 1997 and to 90 million tons in 2009 and it will maybe increase

to 300 million tons by 2047(Neha Gupta,2015). In one study it is said that in India the quantity of waste increase from 46 million tons in 2001 to 65 million tons in 2011(Chetan et al. 2017).

A large amount of microbial population present in the soil and these microorganism are of a wide variety such as bacteria, archaea, yeast, fungi, algae, and protozoa. They can live in extreme conditions like hot springs, inside the rock, and in cold temperatures (Begum, et al.2017). But still, there are 80 to 90% of microorganisms stay unidentified whereas these biological communities are known to play important role in maintaining a sustainable biosphere (Saha, et al. 2014). Microorganisms that are present in solid wastes are grouped as Solid Waste Microflora (SWM) and the common organisms which are generally found in solid waste are bacteria and fungi. This microorganism utilizes components of the waste for its growth (Chetan et al 2017).

The MSW may contain pathogenic organisms and their presence, hike the danger of pollutants to humans and their environment, so the aim of the study to isolate and characterized the microorganism which is present in municipal waste.

2. MATERIAL AND METHOD

2.1 Study area:

Soil sample was collected from the temporary dumpsite of Vadodara.

2.2 Collection of sample:

Soil sample was collected from the temporary dumpsite in the sterile zip- lock plastic bag. The collected sample brought to the laboratory for the isolation of bacteria from the soil.

2.3 Isolation of bacteria from waste sample:

The serial dilution technique were used to isolate the bacteria from the soil. In thus technique 10ml distilled water is taken in the test-tube and 1gm soil sample was added. Mix it well and this was stock solution. The dilution was prepared till 10^{-5}. From the stock solution 1ml transferred to the 10^{-1} dilution, from 10^{-1} tube 1ml transferred to the 10^{-2} dilution tube and from 10^{-2} dilution tube 1ml transferred to 10^{-3} dilution tube. This process continues till 10^{-5} dilution. From each dilution 0.1 ml aliquot was transferred aseptically onto freshly prepared Nutrient agar plate and spread with the help of spreader. The inoculated plates were inverted and incubated at 37^{o}C for 24 hrs after which plates were examined for growth.

2.4 Pure culture:

To obtain pure colony the microorganism is picked from the spread plate culture and streaked on solidified Nutrient Agar plate. Then the plates were incubated at 37^{o}C for 24-48hrs. After the growth Gram staining and biochemical test were performed.

2.5 Microbiological and biochemical characteristic of isolated bacteria:

After the growth of microorganisms, colony morphology was determine such as its shape, margin, elevation, size, color and texture. The Gram staining was performed to observe its cellular morphology and gram nature of the bacteria. The biochemical characterization of the strains were also performed. The biochemical test MR test, Catalase test and urease test were performed.

3. RESULT:

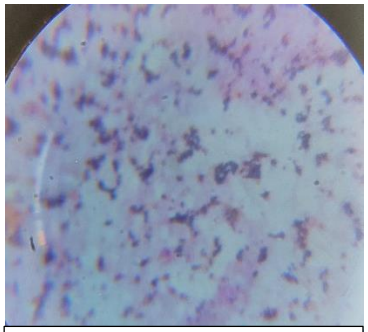
The dump site have an excellent environment for the growth of microorganism. In this study we have studied bacterial population from the municipal waste. Soil sample as collected from the dumpsite. Bacterial colonies were identified based on their color and morphology. For characterized bacterial isolation gram staining and biochemical test were performed. By performing gram staining the rod shape and round shape bacteria were analyzed (Table1). Biochemical test were performed such as urease test, methyl red test, catalase test (Table 2). From colony morphology, gram staining and biochemical test sample A is *Staphylococcus aureus*, sample D is *Bacillus pasteurii.*

Table 1 Morphology study and Gram staining

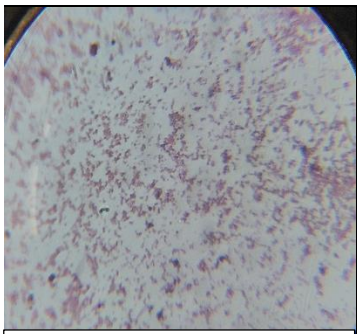
Isolates	Colour	Size	Shape	Elevation	Margin	Gram staining	Shape
A	Yellow	Small	Circular	Raised	Entire	Positive	Cocci
B	White	Small	Circular	Convex	Entire	Negative	Cocci
C	White	Small	Circular	Convex	Entire	Negative	Cocci
D	White	Moderate	Circular	Convex	Filiform	Positive	Bacilli
E	Yellow	Moderate	Irregular	Convex	Entire	Negative	Cocci
F	White	Small	Circular	Convex	Entire	Positive	Cocci
G	White	Punctiform	Circular	Flat	Entire	Positive	Cocci

Table 2 Biochemical test

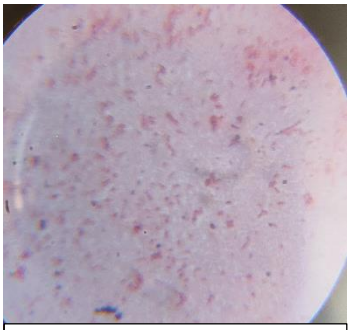
Isolates	Catalase	Methyl Red	Urease	TSI	Sulfide	Indole	Motility
A	Positive	Positive	Negative	Absence of carbohydrate	Negative	Negative	Positive
B	Positive	Negative	Negative	Fermentation of dextrose, lactose and sucrose ad production of Gas	Negative	Positive	Positive
C	Positive	Positive	Negative	Dextrose fermentation	Negative	Negative	Positive
D	Positive	Positive	Negative	Dextrose fermentation	Negative	Negative	Positive
E	Positive	Positive	Negative	Absence of carbohydrate	Negative	Positive	Positive
F	Positive	Negative	Negative	Absence of carbohydrate	Negative	Negative	Positive
G	Positive	Negative	Positive	Absence of carbohydrate	Negative	Negative	Positive



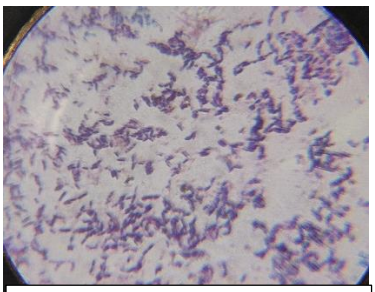
Sample A Gram +ve cocci



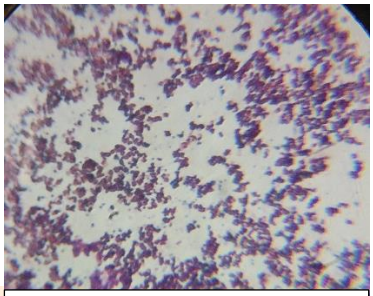
Sample B Gram –ve cocci



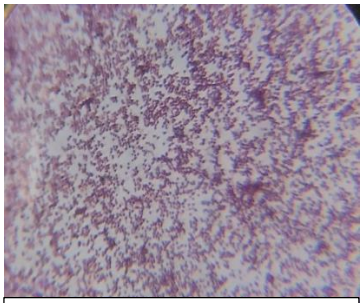
Sample C Gram –ve cocci



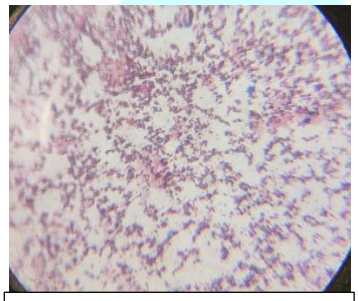
Sample D: Gram +ve Bacilli



Sample E: Gram –ve, cocci



Sample F: Gram +ve, cocci



Sample G: Gram +ve cocci

Figure 1 Gram staining

Sample A +ve

Sample B +ve

Sample C +ve

Sample D +ve

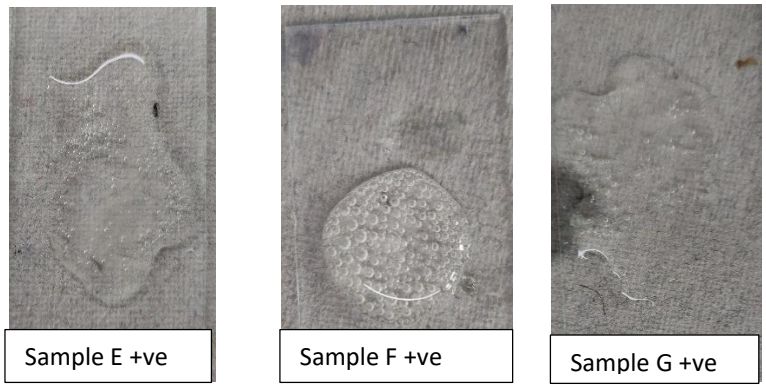


Figure 2 Catalase test

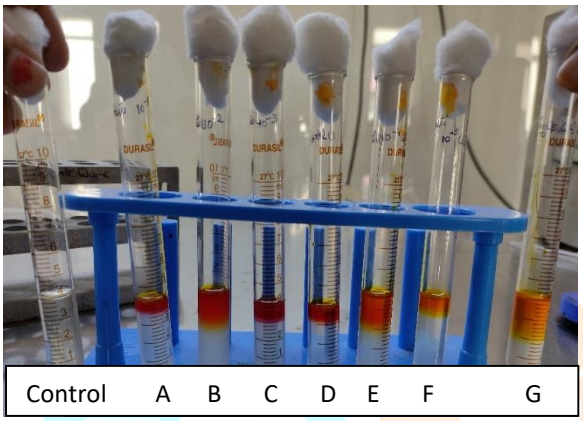


Figure 3 Test of Methyl Red

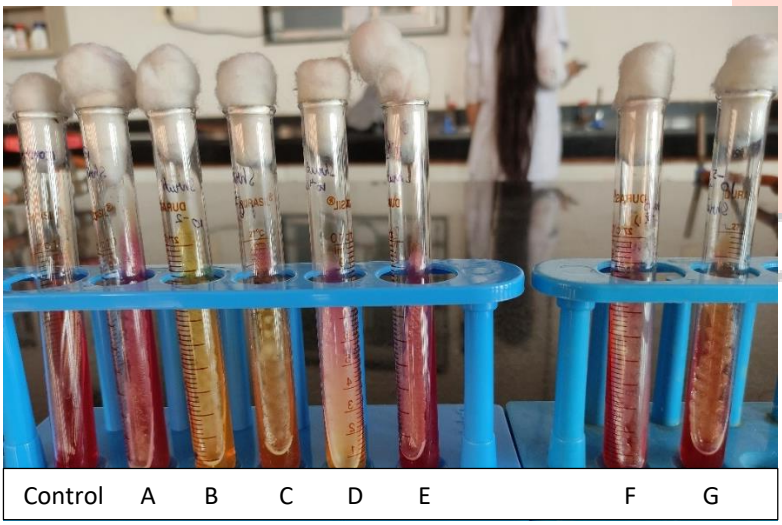


Figure 4 TSI test

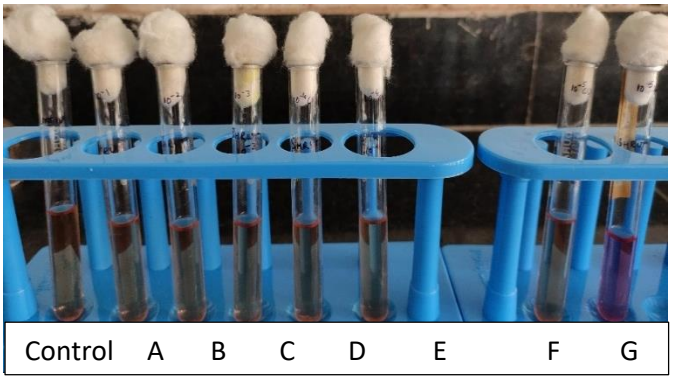


Figure 5 Urease test

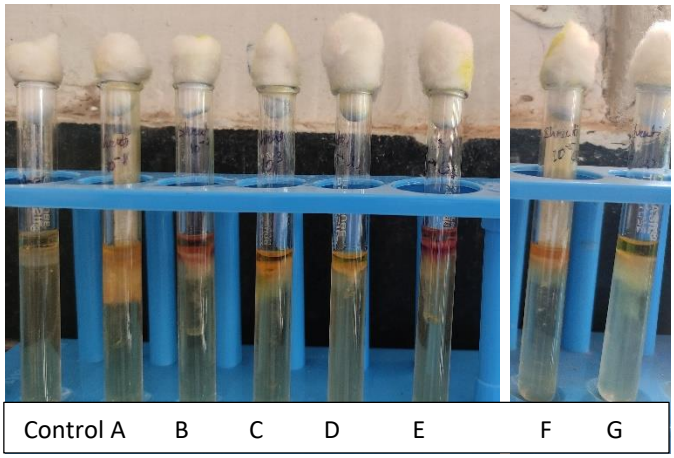


Figure 6 SIM test

4. CONCLUSION

From the study we found bacteria which is harmful to the human. Results shows that there is lack of awareness about the proper waste management. The people live near to the dumpsite have negative effect on their health. The microorganism found in the municipal waste, cause various diseases to human being and also by decomposition of perishable waste, methane gas is generated which creates a foul smell. Because of this there is a negative impact on the environment and human health. Therefore it is recommended that carless disposal of waste should be stop and proper waste management technique should apply.

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References:

1. Atalia, K. R., Buha, D. M., Joshi, J. J., & Shah, N. K. (2015). Microbial biodiversity of municipal solid waste of Ahmedabad. *J. Mater. Environ. Sci*, *6*(7), 1914-1923.

2. Chetan, D. M., Raghavendra, H. L., & Prithviraj, H. L. (2017). Isolation and Characterization of bacteria from solid waste. *International journal of Research and Scientific Innovation (IJRSI) vol. IV, issue V*. 63-68

3. Diaz, L. F., Savage, G. M., & Eggerth, L. L. (2005). *Solid waste management* (Vol. 1). UNEP/Earthprint.

4. Gupta, N., Yadav, K. K., & Kumar, V. (2015). A review on current status of municipal solid waste management in India. *Journal of environmental sciences*, *37*, 206-217.

5. OCHIENG, S. J. (2003). *Isolation and molecular characterization of composting bacteria from municipal solid waste disposal sites in two Kenyan cities, Nairobi and Kisumu* (Doctoral dissertation, Ph. D. Thesis, School of Pure and Applied Sciences, Kenyatta University).

6. Hoffmeister, D., Germani, J. C., & Van Der Sand, S. T. (2005). Characterization of bacterial population during composting of municipal solid waste. *Acta Scientiae Veterinariae*, *33*(3), 283-290.

7. Kalwasińska, A., & Burkowska, A. (2013). Municipal landfill sites as sources of microorganisms potentially pathogenic to humans. *Environmental Science: Processes & Impacts*, *15*(5), 1078-1086.

8. Adebayo, F. O., & Obiekezie, S. O. (2018). Microorganisms in waste management. *Research Journal of Science and Technology*, *10*(1), 28-39.

9. Kumar, S., Smith, S. R., Fowler, G., Velis, C., Kumar, S. J., Arya, S., ... & Cheeseman, C. (2017). Challenges and opportunities associated with waste management in India. *Royal Society open science*, *4*(3), 160-764.

10. Speight, J. G. (2015). Waste gasification for synthetic liquid fuel production. In *Gasification for Synthetic Fuel Production* (pp. 277-301). Woodhead Publishing.

11. Emmanuel, U., Ifeanyichukwu, I., Chika, E., Chike, O., & Chinyere, N. Isolation and Characterization of Bacteria and Fungi Associated With Biodegradation of Municipal Solid Wastes in Abakaliki Metropolis, Nigeria. *International Journal of Environment, Agriculture and Biotechnology*, *2*(3), 1294-1304.

12. Saha, A. (2012). Biochemical and molecular characterization of bacterial consortium of municipal solid wastes.

13. Gupta, N., Yadav, K. K., & Kumar, V. (2015). A review on current status of municipal solid waste management in India. *Journal of environmental sciences*, *37*, 206-217.

14. Begum, K., Mannan, S. J., Rezwan, R., Rahman, M. M., Rahman, M. S., & Kamal, A. N. E. (2017). Isolation and characterization of bacteria with biochemical and pharmacological importance from soil samples of Dhaka City. *Dhaka University Journal of Pharmaceutical Sciences*, *16*(1), 129-136.

15. Iheukwumere, I., & Okezie, O. STUDIES ON THE MICROBIOLOGY OF MUNICIPAL WASTE SITES IN ABIA STATE Academic Journal of Science, CD-ROM, 07(02):155–164