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BACTERIAL FLORA OF A TRANSIT LANDFILL AT MEERUT

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ABSTRACT

Flouting all norms of dumping hazardous solid wastes of diverse kinds, wastes deposited at Abu drain of Meerut, yielded a bacterial count of 5.9 x 10^8 CFU/GM on nutrient agar and other media. In all a total of 23 bacterial taxa were isolated. These were of significance to the health of plant and animal systems including of man.

Key words : Bacterial flora, Landfill, Meerut.

INTRODUCTION

14 Km long Abu drain passes across the Meerut city and gets loaded with a huge amount of domestic, municipal, agricultural, biomedical and wastes from hospitality industry amounting to several metric tons per day (Joshi, 1965; Bajpayee, 2004, Singh *et al*, 2006). Besides, being a breeding ground to mosquitoes and fleas, a source of bad odour and a reservoir of potential pathogens, this storm drain has both enviornmental and health implications (Choudhary *et al*, 2002). Blatant flouting of waste management and handling rules (1989, 1998) and their poorer implementation prompted us to investigate bacterial flora of this dumpyard because earlier, aeromycofloral, mycorrhizal and nemal studies were undertaken and reported by us Singh, 2001, Singh *et. al*, 2002 and Dube *et al*, 2003).

MATERIALS AND METHODS

The media used to grow and isolate bacteria from the waste-littered soil and sewage were of many kinds (due to specific nutrient and other requirements), namely NDA, blood agar, Jensen's agar, Kings B, Tetrazolium medium, Mac Conkey Agar, SS agar, TDA, SL-medium, CRYEMA, KF-Agar, Thioglycollate broth, Deoxy-chocolate citrate agar and other selective and enrichment media. Incubation was generally done at 37°C. In some cases anaerobic cultures were prepared. Standard procedures used were those by Holt (1994) and Sharma (2005). Morphology, flagellation, sporulation, colony characters, staining, O_2 requirements and biochemical tests especially IMViC tests

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and fermentation tests were used to identify bacterial as per methods described by Cowan and Steel (1965), Ainsworth (1974) and Cappucino and Sherman (2004). Stoke cultures, Broth cultures and gelatin stabs were also used as and where required.

RESULTS AND DISCUSSION

Total bacterial count was observed to be 5.9 x 10^8CFU/GM. Twenty three genera of bacteria belonging to 29 identified species were isolated from the littered soil, dung, leftovers, soiled biomedical wastes, stool and mud dumped at Abu drain (Table-1). Bajpayee (2004) estimated that solid wastes of Meerut amount to 650 metric tons/day of which 20 metric tons/day has been estimated by us at the transit dump yard of Abu drain. This thwarted the cleanliness of the enviornment and the health of the inhabitants living nearby. The inventory of bacterial flora from this site was prepared due to lack of such information locally and health implications of the study. From the Table-1, it is clear that importance-wise bacterial flora could be divided in to (1) agriculturally important and (2) medically important.

Xanthomonas sp. isolated from agricultural wastes were *X. citri, X. oryzae*, the known incitants of Citrus canker and bacterial blight of paddy. *Erwinia ceratowora* and *E. amylovora* isolated cause soft-rot of vegetables and fruit blights (Sharma, 2005). *Rhizobium meliloti* forms root nodules with the pea and adds to the soil fertility while *Azorhizibium* forms nitrogen-fixing nodules in the stem of Sesbania. *Bacillus firmus* and *Brevibacillus* strains isolated in the present study have earlier been reported in the bio-management of potato fungal pathogens like *Fusarium*, *Alternaria*, *Rhizoctonia* and *Pythium* sp. (Panwar, *et. al*, 2006). Enterobacter species KH-7 strain was observed to control Fusarial Dry Rot of Potato (Panwar, *et. al.*, 2004).

Clostridia, likewise are also important agriculturally. Verma *et. al*, (1999) reported Clostridia as incitant of Slimy rot of Potato. *Rastonia* had no value as biocontrol agent (Panwar *et. al*, 2006). *Thiobacillus thioparus*, isolated in the present study is a sulphur oxidizing bacterium and is known for forming deposits which may cause corrosion in water-pipes of cooling towers of thermal plants (Little *et.al*, 1991). *Flavobacterium* is also agriculturally important. Most of the bacteria reported in the present investigation are gram negative and are medically important. *Alcaligens, Clostridiuml, Escherichia, Helicobacter, Klebsiella, Proteus and Pseudomonas* (important both medically and agriculturally) are some such cases.

That gram negative enterobacteria, *Escherichia coli* and species of *Klebsiella, Salmonella* and *Pseudomonas* are medically important is already well known (Turk *et. al*, 1983). Similarly, Staphylococcal, Streptococcal, Clostridial and Salmonellosis as important food poisonings and are well recorded in the literature. Staphylococcus is generally associated with burns and causes Folliculitis, Carbuncles and Impetigo in the skin *S.aureus* is also responsible to bacterial endocarditis and osteomyelitis. Acne, fibrosis. septic arthritis and septicemia are other disorders worth mention *Streptococcus pyrogens* cause throat infection while *Clostridium perfringens* is the cause of gas gangrene. *Helicobacter pylori* is a sure cause of gastric troubles and causes peptic and duodenal ulcers. *Pseudomonas aeruginosa* can cause burns and cystic fibrosis, besides increasing crop yields. Faecal coliforms and Faecal *streptococcus* are equally important. Commensal *Escherichia coli* may also become pathogenic (Harsh Mohan, 2005). Thus, it is clear that present investigation has significance for our existing knowledge at Meerut, for agricultural and biomedical consequences and creating public awareness about hazards of solid wastes. Measures to remedy environmental cleanliness shall therefore be important.

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Table 1. Enumeration of bacteria, their habitats and characteristics

S.No.	Bacteria	Isolated from	Diagnostic Characteristics
1.	*Alcaligens faecalis*	Littered soil	Grow on Mac Conkey agar; fruiting smell; motile; Oxidase positive; Gram negative; aerobic.
2.	*Azatobacter chroococcum*	Soil	Nutrient agar; free living; Gram negative; aerobic.
3.	*Azorhizobium* sps.	Soil	
4.	*Bacillus firmus*	Soil	Grow at NDA medium; spore forming; Gram-ve; growth at 30°C; requires O_2; round colonies; creamy; raised at centre; margins wavy; measure 3 x 3 mm^2
5.	*Brevibacillus brevis*	Soil	Grow at NDA medium; spore forming; Gram –ve; growth at 30°C; requires O_2; colonies oval; dull white; flat; margins wavy; measure 4 x 3 mm^2
6.	*Clostridium* sps.	Horse dung Cow dung	Grow on blood agar; Gram –ve; rod; spore forming; anaerobic; motile; gelatin liquefication +ve; Citrate utilization –ive; Indole +ve; Catalase –ve.
7.	*C. perfringens* (*C. welchii*)	Poultry soil food left overs in winters	Grow on glucose blood agar; non motile; capsulated; non terminal spores; non aerotolerant; double zone haemolysis.
8.	*C.paurometabolum*	Water	Czapek's medium; aerobic, grows on blood agar; Catalase +ve; non sporing; Gram +ve; non acid fast lipase.
9.	*Escherichia coli*	Drain water & sewage	Grow on Mac Conkey & EMB agar; Gram-ve; rods; facultative anaerobic; Indole +ve; Lysine +ve; Lactose +ve; Citrate utilization –ve; Acetate +ve; VP –ve; MR +ve.
10.	*E. aerogens*	Drain water & sewage	Indole –ve; MR –ve; VP +ve; Citrate +ve
11.	*Flavobacterium*	Soil	On Tryptophan broth produce indole; motile; Gram-ve; rod like; aerobe; metabolise glucose oxidatively; Oxidase +ve
12.	*Helicobacter pylori*	Placentae & soil	Grows on sheep blood agar; curved; Gram-ve; motile; Catalase +ve; Urease +ve
13.	*Klebsiella*	Soil & dressings	Grows on TSI medium; non motile; non spore forming; Gram-ve; Coagulase-ve; Catalase-ve; Indole-ve; MR –ve; VP +ve; Citrate +ve
14.	*Lactobacillus*	Dairy waste	Grows on SL medium; anaerobic; Gram +ve; rod; bipolar body; non endospore forming
15.	*Proteus vulgare*	Soiled bandages & soil	Grows on enrichment medium Deoxy chocolate citrate agar; motile; Urease +ve; Lysine –ve; H_2S +ve
16.	*Pseudomonas aeruginosa*		Grows on enrichment culture citrimide agar; greenish colony colour; slime forming; motile; gram-ve rod; Oxidase +ve; β-haemolytic
17.	*Rastonia= Alcaligens*	Soil	Grows on Tetrazolium medium; Gram-ve
18.	*Rhizobium meliloti*	Soil	Grows on YEMA with congo red; Tests positive for pentothenate; Thiam-ve; grows on nutrient agar medium
19.	*Staphylococcus* sps.		Grows on TDA medium; Cocci in clusters; Gram +ve; Catalase +ve; Ferment glucose +ve
20.	*S. aureus*	Skin, Stool	Grows on Mac Conkey nutrient agar; non-spore forming; Coagulase +ve
21.	Streptococcus faecalis		Grows on KS agar; Cocci in chains; Gram+ve; Catalase +ve; Oxidase +ve
22.	*S. pyrogens*		Capsular; β-haemolytic
23.	*Salmonella* sps.	Faeces, Soil, Uncooked food	Grows on TSF agar, SS agar & Mac Conkey agar; Rod like, Gram-ve; motile; Lysine +ve; H_2S +ve, Indole +ve; Citrate +ve.
24.	*Erwinia*		White yellow; Rods; Peritrichous; Gram-ve; Aminopeptidase +ve; Oxidase –ve; Fermenting bacteria.
25.	*Enterobacter* KH-7		Dull white colony; Spore forming; Gram-ve; O_2 requiring.
26.	*Xanthomonas* sp.	Soil	Yellow colonies on nutrient agar; motile; Grows well on SX agar; Polar flagella; mucoid colony on glucose media.
27.	*X.citri*		Yellow colonies on nutrient agar; motile; Grows well on SX agar; Polar flagella; mucoid colony on glucose media; Corky spots are produced on inoculation on healthy citrus leaves.
28.	*X. oryzae*		Yellow colonies on nutrient agar; motile; Grows well on SX agar; Polar flagella; mucoid colony on glucose media; Produce blighted streaks on re-inoculation rice leaves.
29.	*Thiobacillus thioparus*	Mud & Water	Sulphur oxidizing bacteria.

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