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ROLE OF MICROBES IN SEWAGE TREATMENT :A REVIEW

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Abstract

Industry and the public feel an urgent need for more cost-effective alternatives to traditional physical and chemical methods for remediating contaminated sites. Many institutions are studying exogenous specialized microorganisms or genetically engineered microorganisms to optimize bioremediation. This review is primarily based on the role of microorganisms in wastewater treatment.

Keywords-***Sewage,Microorganisms,Bioremediation*** etc.

Introduction

The production, distribution, use, misuse, disposal or accidental spills of many chemicals have polluted the environment that threatens the health of humans, livestock, wildlife and indeed whole ecosystems. However the cost of restor-ing the contaminated ecosystem to healthy and acceptable level is virtually incalcula-ble. As a result the government, industry and the public have acutely felt the need formore cost effective alternatives to traditional physical and chemical methods of re-mediation of these contaminated sites.The microbial bioremediation program includesimmobilization or to transform the contaminants to useful products no longer hazard-ous to human health and the environment.

Bioremediation

Many institutions are studying exogenous specialized or genetically engineered microorganisms to optimize bioremediation (Hassan et al., 2003). The success of cost-effective microbial remediation programs depends on hydrogeological conditions, contamination, microbial ecology, and other widely varying spatial and temporal factors. Microbiological assays are performed to assess microbial growth conditions, degradation product population densities, and the presence of enzymes capable of destroying contaminants of concern; It is done to assess mediation potential (Fredrickson et al., 1991). Performance monitoring plays an important role in evaluating effective treatment. Properly implemented microbial bioremediation can cheaply and rapidly destroy or immobilize contaminants and protect human health and the environment (Heitzer and Sayler, 1993).

Bioremediation of animal excretes and biogas production

In Asian counties, the agro-industrial residues and sewage water form a main contribution to the pollution of soil and waterways. Large poultry and pig farms are often a major source of pollution from agricultural activities with odour being pollu- tant and were most noticed by the public. At the same time these pollutants constitute a large potential for production and of bioenergy through anaerobic digestion as well as potential substrates for other biological fermentation process.Technologies for treating farm wastes along with sewage polluted environ- ments have been a major concern over the last couple of decades (Barber, 1978). Research on anaerobic degradation of cellulosic wastes of cattle dung by rumen microorganisms for enhanced production of biogas and ethanol has shown a clear correlation between the cellulosic content of cat- tle dung and natural materials and their degradability by rumen microorganisms (Huub et al., 1988). More biogas production and methane yield is achieved by Rubin- damayugi et al., (1989; 1992) when acetogenic and methanogenic biomass are immo- bilized on polyurethane carrier.More amount of biogas production achieved by two phase process involving connecting the acidogenic reactor to methanogenic reactor which leads to more effi- cient conversion of volatile fatty acids into biogas from piggery waste treatment (Ki- vaisi et al., 1990). Several attempts have been made to update this technology.

Biomass substrates

(Kannan et al., 2003) combined poultry manure, parthenium, eucalyptus leaves and donkey manure to continuously generate biogas. Preeti rao and Seenaya (1994) reported that addition of $FeSO4$ to cattle manure and poultry litter wastes increased methane production. More biogas is produced from a mixture of agrotanin, cow manure and poultry manure from El-Hadidi and Al-Turki (2007). Comparative analysis of biogas production from poultry, cattle, and pig manure at moderate temperatures by Itodo et al. (2001) showed significant differences in gas production from poultry waste. Kim et al., (2006) explained that the main limitation of anaerobic digestion is the long hydraulic residence time. Alvarez (2007); Padmasiri et al. (2006) recognized that pretreatment of waste improves biogas production more effectively than performance without pretreatment.

Environmental conditions

Temperature has a profound effect on bacterial methanogenic activity, bioremediation, and stabilization efficiency (Zhang et al. al., 2006). The effect of temperature is independent of load speed and dwell time. Munoz and Guieysee (2006) showed that microorganisms and microalgae facilitate the removal of nutrients, organic pollutants, heavy metals and pathogens from industrial waters and provide interesting feedstocks for biogas production. Gomec et al., (2005) report chemical oxygen demand, dry matter, volatile solids, pH, biogas yield, biogas composition, volatile fatty acids, and feedstock occupied reactor He pointed out that volume is an important parameter in biogas production.

Biodigested slurry as biofertilizer

Organic fertilizers have become a hope for most countries from an economic and environmental point of view. Especially in developing countries like India, it can solve the problem of high chemical fertilizer costs and save the country's economy. Disposal of biofertilizer after biogas production is a major environmental problem (Gaur, 1990) .It contains significant amounts of phytonutrients and helps improve crop production while preventing negative environmental impacts from waste disposal. (Schmid et al., 2000) suggested that biogas plants in the soil promote microbes, so applying a biofertilizer with a bio-pulped slurry from a biogas plant with a microbial source is easy to transport. , which requires less labor to apply and is environmentally friendly compared to chemical fertilizers.

Soil phosphate in agriculture

Natural soil phosphorus is largely unavailable to crops due to its low solubility. Saxena and Tilak in 2000 found that the concentration of soluble phosphate in soil is usually very low, leading to soluble phosphate deficiency and being a limiting factor for plant nutrients. Microbial inoculum of plants grown in Indian soils in which phosphate solvents had low phosphorus availability and were supplemented with RP or tricalcium phosphate (TCP). indicated that it could be used as a drug. Microorganisms and plant roots readily dissolve insoluble phosphate and make it readily available to plants (Gaur, 1990). Broadbent (1957) stated that one way to correct phosphorus deficiency in plants is to inoculate seeds or soil with phosphate-dissolving microorganisms along with phosphate-containing fertilizers.

Phosphate solubilizing organisms (PSO)

The abundance and distribution of phosphate-soluble bacteria revealed 66% Gram-positive bacilli, 32% Gram-negative bacilli, and 25% Gram-positive cocci (Smid 1994).Gram-negative bacilli were represented by the genera Bacillus and Corynebacterium, and Gram-negative bacilli included the genera Pseudomonas, Alcaligens, Vibrio and Enterobacter. Gram-positive cocci are represented by the genera Micrococcus and Staphylococcus. Bacillus and Pseudomonas were the predominant genera, accounting for 64% and 23%, respectively, of all bacterial isolates identified. Gaur et al. (1980) found that grain yield increased significantly when wheat was inoculated with Pedomonas striata in the presence of phosphate rocks.

Biodigested slurries as biocarriers

The incidence and distribution of phosphate solubilizing micro organism discovered 66% gram-fantastic bacilli, In a few region the biodigested slurries of biogas plant used as providers for the education of service primarily based totally inoculums acclaimed to play a essential function in contemporary-day agri- culture (Sharma et al., 2000). Mukhe, (1987) said that seed coating substances or right service primarily based totally inoculum lined seeds enhance ger- miability and multiplied seedling emergence on the converting soil moisture specially withinside the suboptimal conditions.A subject test became carried out through (Nagarajan and Balachandar, 2001) to observe the affect of natural amendments like farmyard manure, leaf compost and biodigested slurry from biogas plant with rhizobium on nodulation and grain yield of black gram and inexperienced gram. The effects found out that most of the unique natural amendments used, biodigested slurry incorporation at the side of Rhizobium inoculation recorded most plant height, nodule number, nodule weight and grain yield.

Types of carriers

Legume inoculants occupy a leading position among biofertilizers. The reason is that legumes are agronomically important for correct planting and feeding, enabling uniform and vigorous crop stands (Iswaran et al., 1969) Nilgiri-Tal available has proven to be an excellent carrier and lignite is another carrier widely used in the Neyveli Lignite in southern India. Indian peat soil, farm manure (FYM), compost, or a combination of compacted mud with charcoal found that it could increase the number of rhizome fungi more than a single support.

Cellulosic biodegradation

In addition to cattle manure and poultry offal, deposits of cellulosic material closely associated with other compounds such as hemicellulose, lignin and other polysaccharides make their biotransformation difficult. Cellulose is an important carbon component of higher plants and is probably the most abundant organic compound in nature. Wastewater is a major reservoir of cellulose accumulation. Recycling of these waste residues is necessary to prevent pollution and conserve scarce natural resources (Caughlan, 1985). Wastewater contains large amounts of hydrolytic, proteolytic, cellulolytic, hydrogenogenic, acetogenic, methanogenic, and sulphate reducing organisms. Cellulolytic microorganisms in wastewater play an important role in degrading cellulose to produce valuable substances. Cellulosic materials were mostly solubilized by aerobic soil-dwelling microorganisms. This microbiota breaks down undigested cellulosic material into glucose and low-carbon compounds. (Lori Robson 1984) selectively grew B. subtilis on various sugars and found cellulolytic activity in the culture supernatant.

Sewage water

The effluent played a major role as a supplementary nutrient in anaerobic digestion of cattle manure and poultry waste, biogas generation, and separation of cellulolytic organisms for cellulolysis. Spent manure from biogas plants can also be a new source of organic fertilizer. (Johnson et al., 2003) reported that anaerobic digestion is an important wastewater treatment process that can stabilize the organic fraction of wastewater prior to land use. Hayes et al. (2006) found that wastewater is composed of multi-element organic wastes that are used as useful supplements to the soil and as a nutrient source for irrigation. leafy green vegetables such as cauliflower, cabbage and spinach grow very well in the presence of wastewater. Vegetables such as radishes are sensitive to wastewater. Accordingly, Qadir et al. (1999) show that vegetables grown using wastewater are high in heavy metals that pose serious health risks to communities and animals. Long-term and indiscriminate use of raw sewage causes accumulation of heavy metals in above-ground and below-ground soils (Datta et al., 2000).

Conclusion

Direct application of wastewater to the ground is not recommended as it contains many heavy metals and pathogens that can cause serious health hazards to communities and animals. Prior to its use in agriculture, wastewater from any source must be specially pretreated by anaerobic digestion methods to destroy pathogens and reduce the hardness of heavy metals.

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