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MYCODEGRADATION OF DRILL MUDS BY AXENIC AND MIXED FUNGAL ISOLATES FROM DRILL CUTTINGS AT OLOGBO, EDO STATE, NIGERIA.

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Abstract

Drilling produces large volumes of drilling waste, which can pose significant threats to soil, water quality and development. Fungi are known to degrade a wide variety of materials and compounds. This study examined the mycodegradation potentials of axenic and mixed fungal isolates associated with drill cuttings emanating from onshore well located at Ologbo, Edo State. Aerobic mycodegradation was determined using shake flask experiment (assessing the total viable counts (cfu/ml), pH, turbidity, Biological Oxygen Demand (BOD5) and Chemical Oxygen Demand (COD)were also determined for a period of 28 days. Results of shake flask experiment revealed the highest total viable count (9.1 x 102 cfu/ ml) for the broth cultures containing consortium of isolates on day 16. Generally, the pH and turbidity were in the range of 7.16 to 8.37and 33 to 63 respectively. The reduction in COD (from 88 mg/ l at day 1 to 60 mg/ l at day 28) and BOD5 (from 20.9 mg/ l at day 1 to 0.14 mg/ l at day 28) were evidence of the oxidation of the substrates. The growth profile showed that Aspergillus and Penicillium strived better in the water based mud than in synthetic based mud, with Penicillium sp. having the highest fungal count of (0.57x103 cfu/ml) and attained its peak at day 4.There was no significant difference in the degradation of the drilling muds by the isolates ($p > 0.05$). It was therefore shown that these selected isolates have potential applications in the bioremediation of sites polluted with mud waste[FJPAS 1[1} 2016].

1.0 Introduction:

In oil and gas operations, drilling fluids, also referred to as drilling muds, are used to lubricate and cool the drilling apparatus, transport drill cuttings to the surface and seal off porous geologic formations [9, 10, 11, 17, and 20]. Drilling fluids typically consist of bentonite and a range of additives mixed with fresh water or hydrocarbons. The two primary types of drilling muds are water based muds and non-aqueous based muds [14]. Water based muds consist of water mixed with bentonite clay and additives such as barium sulfate (barite), are used for most types of drilling. The non-aqueous drilling muds comprise all non-water and non-dispersible based muds and they include Oil Based Muds (OBM), Low Toxicity Mineral Based Muds (LTMBM), Enhanced Mineral Oil Based Muds (EMOBM) and Synthetic Based Muds (SBM) [14]; and are mostly used in offshore wells or other water sensitive formations.The oil and gas industry has developed technologies and practices to reduce environmental damage with advanced chemical gel drilling fluid systems rather than traditional drilling fluids [11]. Environmental impacts associated with advanced drilling waste disposal are unclear.

Fungi are known to degrade a wide variety of materials and compounds - processes known as mycodegradation. According to Singh 006 [23], fungi have been harnessed by humans in many diverse applications for thousands of years. Fungi are usually slow in growth and often require substrates for cometabolism and their liquid cultures constitute appropriate model systems to explore the biotransformation of a wide variety of compounds [23]. During the last decade, fungi have been used in the treatment of a wide variety of wastes and