INTRODUCTION

Waste engine oil is a brown to black oil removed from automobiles when oil is changed and it could also be defined as a thick mineral liquid applied to a machine or engine so as to reduce friction between the moving parts of the machine (Shahida et al., 2015). Used engine oil as the name implies represent oil that has undergone destructive changes in the property when subjected to oxygen, combustion gases, and high temperature. The said oil also undergoes viscosity changes as well as additive depletion and oxidation (Mark et al., 2018). The disposal of spent engine oil (SEO) into gutters, water drains, open plots and farms is a common practice in Nigeria especially by motor mechanics. This indiscriminate disposal of spent engine oil adversely affects plants, microbes and aquatic lives (Nwoko et al., 2015; Adenipekun et al., 2018) because of the large amount of hydrocarbons and highly toxic polycyclic aromatic hydrocarbons contained in the oil (Wang et al., 2016; Vwioko and Fashemi, 2015). Heavy metals such as vanadium, lead, aluminium, nickel and iron which are found in large quantities in used engine oil may be retained in soil, in form of oxides, hydroxides, carbonates, exchangeable cation and/or bound to organic matters in the soil (Ying et al., 2017). These heavy metals may lead to build up of essential organic (carbon, phosphorous, calcium, magnesium) and non-essential (magnesium, lead, zinc, iron, cobalt, copper) elements in soil which are eventually translocated into plant tissues (Vwioko et al., 2016). Although heavy metals in low concentration are essential micronutrients for plants, but at high concentrations, they may cause metabolic disorder and growth inhibition for most of the plant species (Yadav, 2018). According to Nwadinigwe and Onwumere (2016), contamination of soil arising from oil spills affect the growth of plants and causes tremendous negative impacts on food productivity (Onewrah et al., 2007). Microbial degradation is the major mechanism for the elimination of used petroleum products from the environment. Soils contain very large numbers of microorganisms which can include a number of hydrocarbons utilizing bacteria and fungi. Hydrocarbon or oil biodegradation as a process makes use of natural microbial biodegradative activities and this often employs the enzymatic capabilities of indigenous hydrocarbon-degrading microbial populations and modifying environmental factors (Atlas, 2019). One major requirement for oil biodegradation is the presence of microorganisms with the appropriate metabolic capabilities. Soil contaminated by used lubricating oil is rapidly increasing due to the global increase in the usage of petroleum products. However, presence of different types of automobiles and machinery results in an increase in the usages of lubricating oil (Ameen et al., 2018). Hydrocarbon contamination of the soil especially by Polycyclic Aromatic Hydrocarbons (PAHs) attracts public attention because many PAHs are toxic, mutagenic and carcinogenic. Prolonged exposure to high oil concentration may cause the development of liver or kidney diseases, possible damage to the bone marrow and an increased risk of cancer (Olukunle and Boboye, 2016).

MATERIALS AND METHOD

Sample Collection The Soil samples were taken from 5 different mechanic workshops that had highly contaminated with spilled used engine oil in Bali Local...
Government and its environs which include Bali1, Bali2, Garba Chede, Maihula and Gazabu. A sterile hand gloves and trowel were used to collect the soil sample at a depth 5-8 cm into clean labelled plastic bags and conveyed to Science laboratory Technology Department of Federal Polytechnic, Bali, Taraba State. 25g from of each sample were collected into the conical flask containing 250 ml of distilled water.

Preparation of Nutrient Agar
The media was prepared by dissolving 3.5g of nutrient agar powder in 125ml of distilled water. The mixture was autoclave at 121°C for 15minute allow to cool but not solidify.

Inoculation of the Sample
The steriled nutrient agar were aseptically pure plate, 25ml each of the five different petri dish and allowed to solidify. Wire loop was used to transfer amount of spent engine oil polluted soil (stock solution) and inoculated by striking the solidified upper surface layer of the agar plate. The plate was invertically incubated for 24hrs at 370C.

Obtaining Pure Culture
Singly colonies growing on nutrient agar plate was transferred using wire loop and sub-culture on to freshly prepared culture media(certified agar).The pure culture-plate was inocculated for 24hrs at 370C. The pure culture isolate was identified macroscopically, microscopically and biochemically using standard protocols as stated in Owuama (2013).

RESULTS AND DISCUSSIONS
The table below shows the characterization and identification of bacteria isolates from spent engine oil polluted sites

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Bali1</th>
<th>Bali12</th>
<th>Garba Chede</th>
<th>Maihula</th>
<th>Gazabu</th>
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</thead>
<tbody>
<tr>
<td>Culture media</td>
<td>25ml steriled</td>
<td>25ml steriled</td>
<td>25ml steriled</td>
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<td>nutrient agar plate</td>
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<td>Morphological</td>
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<td>Cell type</td>
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<td>Cell arrangement</td>
<td>Single</td>
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<tr>
<td>Gram reaction</td>
<td>-ve</td>
<td>-ve</td>
<td>+ve</td>
<td>+ve</td>
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<tr>
<td>Biochemical</td>
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<tr>
<td>Catalase</td>
<td>+ve</td>
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<tr>
<td>Probable organism</td>
<td>Pseudomonas</td>
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Note: +ve = Positive, -ve = Negative

DISCUSSIONS
The results revealed that, Pseudomonas sp. was the best degraders of the used engine oil for certain period of incubation. The superiority of Pseudomonas species over Bacillus sp. in hydrocarbon degradation has been well established by many researchers (FA. and Adamu. 2022; Tirmizhi et al., 2022). The bacterial species isolated were Pseudomonas aeruginosa. Whereas Gazabu has the highest count of the species and Garba Chede has the least. 13 species isolated and screened 5 bacterial isolates for their ability to utilize spent engine oil. The authors found that Pseudomonas putrefaciens CR33 (68%) had the best degradation potential compared with other isolates, while Bacillus coagulans CR31 (45%) had the least potential. (15) screened 19 isolates for their potential to utilize 0.5% 2T spent engine oil and discovered that Pseudomonas sp. GD18 was the best candidate based on its increasing optical density (OD600) in M9 broth. Nevertheless, Bacillus sp. has been used with great success in the biodegradation of used engine oil. The extent of degradation is determined by hydrocarbon concentration and usually, microbes degrade at lower concentrations rapidly while th higher concentration was reported to be lethal for many soil microorganisms( Aboye et al., 2012). Therefore, the higher degradation observed in used engine oil concentration in this study might be attributed to its low toxicity. Muniz et al., (2004); Adesodun and Mbagwu (2008); Adeniyi and Owoade (2010); Abdullah et al. (2011) as expected, the microbial population of the polluted soils is generally lower than that of the control soil samples. This may be due to a shift in the ecological balance of the biota in favour of metal-tolerant strains (Jiang et al., 2008); or may result from the sparse population of plants in the polluted soils, which deprives the soil of the organic matter inputs necessary to support the growth of the microbial population (Kuperman and Carreiro, 1997). It is expected that microbial processes will play...
an important role in the restoration of these and other similar polluted ecosystems.

CONCLUSION
The search for efficiently used engine oil-degrading bacteria has been on the increase. Therefore, in this study the isolate tested, Pseudomonas sp. was the best degrader of spent engine oil. The results revealed that Pseudomonas sp. was able to degrade higher percentage of the used engine oil.

REFERENCES


Jai, S. P, Tiwari, K. L. and Jadhav, S. K. (2015). Long Term Preservation of Commercial Important Fungi in Glycerol at 4°C. International J07x1010 ± 1.07x1010 ± 3.33x108 ± 3.33x108 S5 1.07x1010 ± 1.07x1010 ± 3.33x108 ± 3.33x108 S6 6.67x109 ± 6.6 ± 6.6


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