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SUMMARY AND CONCLUSION

Biodiesels are fatty acid methyl esters formed by transesterification of vegetable oils. Being hygroscopic in nature, biodiesel has the ability to retain water, which creates a favorable condition for the growth of microorganisms. The presence of water and microorganisms in fuel can cause changes in its properties and may lead to MIC. MIC issues of crude and distillate fuels have already been evaluated, which depend on the nature of the bacteria and fungi that occur in petrodiesel and the data available on the microflora of biodiesel are very less. Biodiesels have different chemical and biological characteristics. Hence in the present study, the bacteria present in stored JBD sample have been isolated and the influence of the bacteria on the corrosivity of JBD has been studied.

The bacteria isolated from stored JBD, were subjected to genomic DNA extraction, amplification of rRNA by PCR, and 16SrRNA gene sequencing. The sequences obtained were matched with the previously published sequences in Genbank. The three bacterial strains revealed close similarity with *Bacillus pumilus* and the nucleotide sequences have been deposited in Genbank with the accession numbers **KF410588**, **KF410589, KF410590**.

The characteristics of JBD determined as per ASTM D6751 bear close similarity with the standard allowing the safe use of *Jatropha curcas* biodiesel as an alternative fuel for diesel. The higher value of acid number for JBD may be due to the free fatty acids formed during transesterification.

The influence of *Bacillus pumilus* on the corrosivity of JBD on the five selected metals Aluminium, Brass, Copper, Mild steel I and Mild steel II was studied using mass loss measurements and electrochemical studies. The corrosion behavior of the selected metals in the presence of blends of JBD with CD (5%, 10% 20% and CD) was also studied. All the studies were carried out in the absence (control) and presence (experimental) of *Bacillus pumilus*.

The mass loss measurements carried out in the control system reveal that all the metals show highest corrosion rate in B100. The calculation of the most repeated trend in the corrosion rate of metal shows the trend as

Mild steel II ≈ Mild steel I > Brass > Copper >Aluminium

The results of the statistical analysis of the average corrosion rate of metals in the control system show that the corrosion of aluminium is insignificant in all the test media.

In the experimental system all the metals except mild steel II show the highest corrosion rates in B100. The order of corrosion rates of metals based on the most repeated trend is

Mild steel II > Mild steel I > Copper > Aluminium > Brass

It is interesting to note that *Bacillus pumilus* has retarded the corrosion rates of selected metals in some of the fuel matrices. In brass there is retardation of corrosion in JBD and in all blends with CD.

The results of statistical analysis of average corrosion rates of metals in the experimental system indicate that the non ferrous metals exhibit insignificant corrosion rate in B5, B10, B20 and CD.

The results of electrochemical study show that the conductivities of all the test matrices are very low. The corrosion rates of copper and mild steel I are the highest in B100 compared to CD in both the control and experimental system.

The surface morphology of the metal samples exposed to different test matrices were analysed by optical microscopy. The SEM micrographs of the metal surfaces exposed to JBD and CD in the presence of *Bacillus pumilus* show the deposition corrosion products on the metal surfaces. The laser profiles of the metal samples exposed to JBD in the presence and absence of *Bacillus pumilus* show that the surface morphology differs from metal to metal in that the maximum number of pits occur at different pit depths. Various profile roughness parameters such as R_a, R_q and R_t have been calculated.

The present investigation of the influence of *Bacillus pumilus* on the corrosivity of JBD has revealed that *Bacillus pumilus* has inhibited corrosion rate of

metals in some of the test matrices, while the corrosion rates of metals have increased in some of the test matrices. A regular trend cannot be observed and this is characteristic of MIC since it is a complex phenomenon. Very little work has been done on the influence of bacteria on the corrosivity of biodiesels. Hence further work may be undertaken with other biodiesels for the identification and mitigation of MIC which may be helpful to confidently use biofuels devoid of corrosion problems.