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Performance of Vachellia Nilotica Seed Oil BioFuel with Different Nozzles

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Abstract*: This present study reports about the Acacia nilotica (karuvel) seed oil from which biodiesel for experimenting is produced. The greatest advantage of Karuvel oil is free from the content of fatty acid and so esterification of free fatty acid was done which was then undergone a transesterification process and from which the production of biodiesel was done. The catalyst like Sulphuric acid along with KOH was used as a catalyst and made available for the transesterification process. The gas chromatography and also the physiochemical properties is characterized for the biodiesel which is produced. Unsaturated fatty acid methyl esters are been found in a high value in the Karuvel biodiesel. A detailed report has been given on the Catalyst concentration and reaction time for completing the transesterification process.

***Keywords* :. Acacia nilotica (karuvel), Nozzle.**

I. INTRODUCTION

Energy crisis is the worst problem the world is facing and we have to find an alternate for the fossil fuels. In the relation the Acacia nilotica (Karuvel) seed oil was used for biodiesel production. The Acacia nilotica is 2-3m in diameter and 15-18m of height. It is slate green for the young trees and black for the immature trees. When the trees are young it is 7-15 cm in length, green tomentose in colour and greenish black in colour when it is immature. Pods look necklace like an appearance when it is indehiscent and constricted deeply amidst the seed. In each pod the number of seeds present is around 8 to 12. The seeds with hard testa look compressed and ovoid in nature in dark brown colour.

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In Africa and Asia the Acacia nilotica is found in drier areas usually. In our areas it is mostly found in road sides and also in tank foreshores and sometimes even in the waste lands. During the drought period and also in highly extreme temperature condition of more than 50° C also it can withstand without any crisis; also either it may be a saline or alkaline soil , the seeds grow without any change. The paper describes the biodiesel production through Karuvel seeds by using the process of transesterification.

For controlling the temperature a magnetic stirrer provided with heating plate along with a thermostat was used. The table 1 provides the taxonomic classification of the Vachellianilotica seed oil.

Table I. Taxonomic classification of Vachellianilotica

Kingdom	Plantae
Sub Kingdom	Tracheobionta
Super Division	Spermatophyta
Division	Magnoliophyta
Subclass	Rosidae
Order	Fabales
Family	Fabaceae
Genus	Acacia

II. LITERATURE REVIEW

The emissions of M 85 and E 85 alternatively used in the gasoline engine [1]. He also showed that most of the particulate matter along with Nitrous oxide with some percentage of carbon monoxide occurs mainly from the diesel fuel. Huang et al. (2008) [2] explained how the ethanol diesel blends perform when the tests are carried out in the engine. They also found that the n butanol can also be replaced for diesel as an alternate. Kariuki and Njoroge (2011) [3-5] helped us to know that the Vachellianilotica has an antimicrobial property by testing it against the Staphylococcus aureus, [6] and also the Streptococcus pneumonia along with Escherichia coli [7-9] by using a method called bioassay and the method called test by disk diffusion [10].

III. METHODOLOGY

By using diesel base value the experiments were conducted and provide with base line data. The engine was made to run with the biofuel which was prepared from the Vachellianilotica.

For few minutes the engine was made to run by using the diesel which was then followed by the biodiesel. After reaching a steady state condition with full stability the base data was taken. The load value was recorded by varying the alternator.The fuel consumption along with various emissions of gases was recorded by using the different sensors. The engine was first made to run with diesel and after some period the two way valve supplied biodiesel which was mixed and then the tests were done and the values were noted down for plotting the graph.

IV. RESULT AND DISCUSSION

The thermal input from the fuel is utilized to find the Brake power of the heat engine from which the Brake thermal efficiency is calculated. The mechanical energy obtained from fuel heat tells us how much the engine can perform well. As there is an increase in compression ratio the piston rings and bearings suffer due to increase in load, the result of which the mechanical efficiency decreases. The product obtained by multiplying the indicated thermal efficiency and mechanical efficiency is the Brake thermal efficiency. In SI engine thermal efficiency is equal to 40% and CI engine is equal to 42-45% approximate.The value of single hole nozzle is 1.0 and for double hole nozzle is 2.0 and for triple hole nozzle is 4.0.Figure 1illustrates the variation of BP Vs BTE.

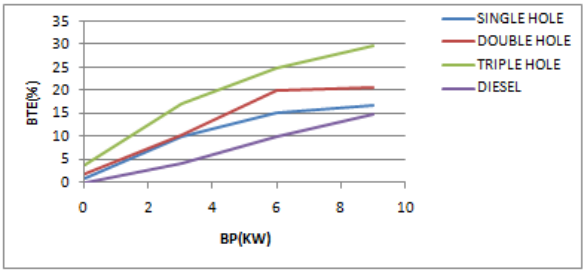

Fig. 1.Brake power Vs Brake Thermal Efficiency.

The fuel efficiency is measured by Brake specific fuel consumption which tells us the amount of fuel burned for producing power on the shaft. It is typically comparing the efficiency of internal combustion engines with shaft output. The fuel consumed by the power generated has an effect in the Brake specific fuel consumption value. A direct comparison can be done in the different engines for the fuel efficiency with the help of Brake specific fuel consumption. BSFC numbers change a lot for different engine designs and power rating and compression ratio .Fig. 2 shows the variation of BSFC vs BP. The value of single hole nozzle is 0.02 and for double hole nozzle is 0.04 and for triple hole nozzle is 0.06.The value of single hole nozzle 0.02 is closer when compared with diesel and so it can be selected for using in the experiment.

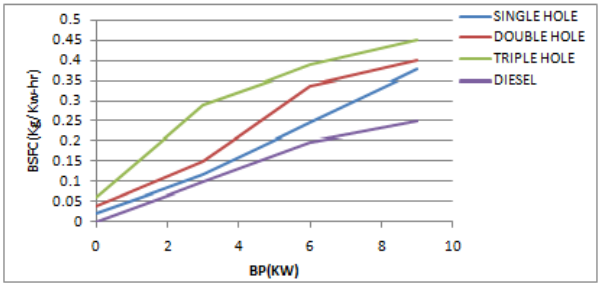

Fig. 2.Brake Power Vs Brake Specific fuel Consumption.

The natural compound which comprise of the hydrogen and carbon completely is known as a hydrocarbon. Hydrocarbons are instances of gathering 14 hydrides. Hydrocarbons from which one hydrogen molecule expelled are practical gatherings called hydrocarbon. Since carbon has four electrons in peripheral shell .Most hydrocarbons found on earth generally occur in raw petroleum where decayed natural issue offers a bounty of hydrogen and carbon . The estimation of single gap spout is 2.0 and for twofold gap spout is 2.2 and for triple opening spout is 2.5. The estimation of single gap spout 2.0 is nearer when contrasted and diesel thus it very well may be chosen for utilizing in the analysis. Figure 3 shows the variety of Hydrocarbon Vs Brake control

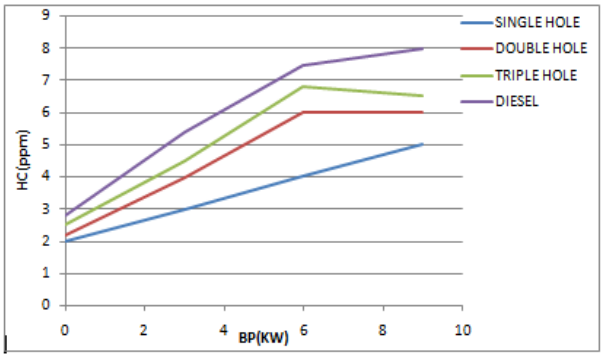

Fig. 3.Hydrocarbon Vs Brake Power.

Figure 4 shows the variety of Carbon di oxide with Brake control. The gas which has a thickness of about 60% more than the dry air is called as Carbon dioxide which is a dry gas. A solitary carbon particle when is covalently attached to two oxygen frames as a Carbon dioxide. It happens normally in earth's air as follow gas. The focus is about 0.04% (410 ppm) by volume, having raisen from pre-modern degrees of 280 ppm. Carbon dioxide is solvent in water ,it happens generally in ground water , , ice tops , lakes, ice sheets streams and ocean water. It is accessible in stores of oil and flammable gas. The estimation of single opening spout is 0.7 and for twofold gap spout is 0.8 and for triple gap spout is 0.9. The estimation of single gap spout 0.7 is nearer when contrasted and diesel thus it tends to be chosen for utilizing in the test.

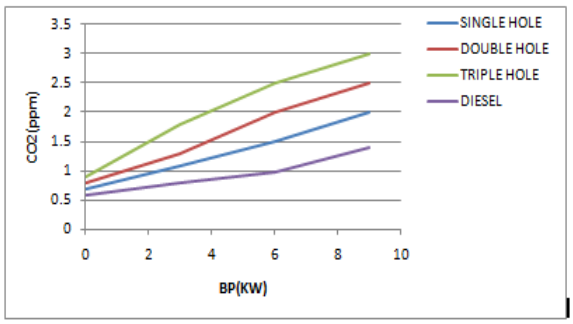

Fig. 4.Carbon di oxide Vs Brake Power.

The nitrogen oxides which is the most dangerous for polluting air is generally written as NOx which may be either Nitrogen di oxide (NO2) and nitric oxide(NO). The tropospheric ozone is mainly affected by the acid rain and smog formation which forms due to these Nitrogen oxides. During the combustion of fuel the nitrogen and oxygen react and it is the main reason for the formation of NOx. The value of single hole nozzle is 42 and for double hole nozzle is 52 and for triple hole nozzle is 70. The value of single hole nozzle 42 is closer when compared with diesel and so it can be selected for using in the experiment.Figure 5 shows the variation of NOxVs BP.

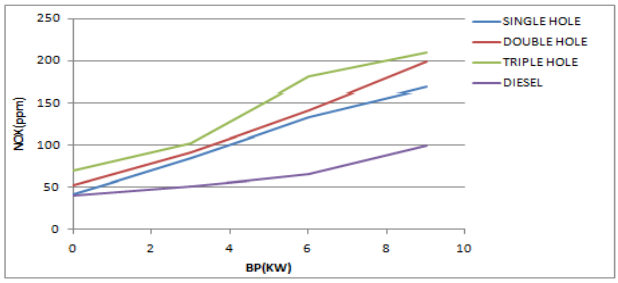

Fig. 5.Nitrogen di oxide(NOx) Vs Brake Power.

Carbon monoxide (CO) is colorless, odorlessand denser than air which is not a flammable one. When the hydrocarbon concentration is above 35ppm and mixes with air it becomes a toxic to the animals and it affects the metabolism and biological functions. The carbon monoxide is connected by the triple bond in which two of them are covalent bonds one of dative covalent bond which itself previously contains a carbon and oxygen atom. The value of single hole nozzle is 0.02 and for double hole nozzle is 0.022 and for triple hole nozzle is 0.026. Fig 6 illustrates the variation of Carbon monoxide Vs Brake Power.

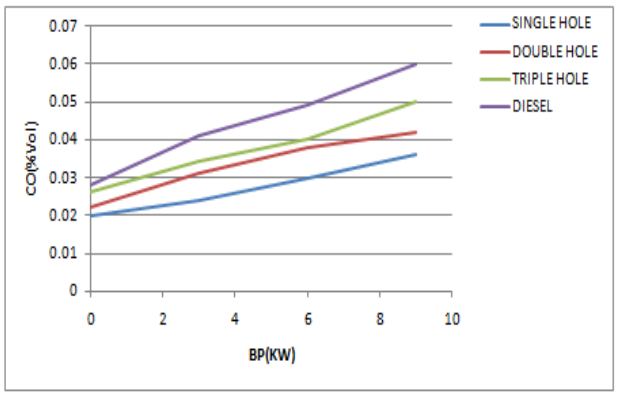

Fig. 6.Carbon monoxide Vs Brake Power.

V. CONCLUSION

While concluding we can find that the Vachellia nilotica obtained from Iran has a high amount of phytosterol which can be easily edible and must be fully exploited upto its potential. The people in the rural areas can be also benefitted by using the seeds from which biodiesel can be prepared by transesterification process. Non toxicity is a very essential nature which has been found in the plant has been studied by the different reports and so the seed oil can be the good source of vegetable oil and utilized in the engine for testing and checking the performance. While performing the tests the Brake Specific fuel consumption and Brake thermal efficiency of the three hole nozzle when compared with the other two nozzles was closer to the diesel values. The emission characteristics such as Hydrocarbons, Carbon monoxide, Carbondioxide, and Nitrogen di oxide values are found to be a closer to the three hole nozzle. Thus as a conclusion the Acacia nilotica (karuvel) seed oil can be used and will give a better efficiency and performance when it is sprayed in a three hole nozzle.

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