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Analysis of performance and emission characteristics of banana tree root/ pseudostem extracted ethanol blended fuel with nano-particle.

SUMEDH SHINDE and Prof. S.V.CHAITANYA

Department of Mechanical Engineering, AISSMS COE, SPPU, Pune, India

ABSTRACT:-

The accelerating use of the augmenting use of fossil energies has redounded in the upward thrust of hothouse feasts banana factory waste biomass(banana pseudo-stem and banana tree root) for the manufactured from bioethanol and checking out the performance of the ethanol amalgamated electricity on CI Engine. grease paint samples of tree root and pseudo stem were made. those greasepaint samples had been jumbled in distilled water and alkaline pretreatment is performed at the identical with the assist of 1N NaOH end result to growth the yield of ethanol. With the help of GC- MS, the chance of composites like glucose, cellulose, hemicellulose, lignin, and ash may be installation out to and the results can be compared of tree root and pseudo stem greasepaint. The result favorable for the delivery of ethanol could be also allowed to undergo enzyme hydrolysis. The conversion of carbohydrates into ethanol might be accomplished via turmoil, by using using the incentive Saccharomyces cerevisiae. After the delivery of ethanol, unique composites of uprooted ethanol with petrol will be examined over SI gadget and the performance and emigration characteristics will be additionally compared with well-known Diesel. fossil energies has redounded inside the upward push of hothouse feasts which is sooner or later leading to global warming. The inordinate use of fossil energies has triggered the reduction of these coffers and therefore we want to find essential assets of strength that allows you to be renewable and terrain friendly. This look at is aimed to apply banana factory waste biomass(banana pseudo stem and banana tree root) for the manufactured from bioethanol and trying out the performance of the ethanol amalgamated power on CI Engine. Grease paint samples of tree root and pseudo stem were made.

those greasepaint samples have been jumbled in distilled water and alkaline pretreatment is done at the same with the help of 1N NaOH result to increase the yield of ethanol. With the help of GC- MS, the chance of composites like glucose, cellulose, hemicellulose, lignin, and ash may be set up out to and the consequences may be in comparison of tree root and pseudo stem greasepaint. The end result favorable for the beginning of ethanol can be additionally allowed to undergo enzyme hydrolysis. The conversion of carbohydrates into ethanol could be done by using turmoil, by means of the use of the inducement Saccharomyces cerevisiae. After the beginning of ethanol, unique composites of uprooted ethanol with petrol can be examined over SI machine and the performance and emigration traits can be additionally in comparison with standard Diesel.

INTRODUCTION:-

The charge of combustion of fossil energies has been including with the increase in world population. The combustion of fossil energies has caused colorful impacts over the terrain. adding demand for fossil energies alongside reduction of these coffers has introduced inside the want for new Eco-pleasant generalities.

improvement of bioenergy as an quintessential strength might help to lessen those issues. Biofuels/ Bioethanol is a carbon neutral electricity due to the fact that its renewable source has the functionality to take in the CO2 emitted by the combustion of energies. considering the fact that business is considered one of the biggest sources of hothouse feasts(carbon emigrations), substituting fossil energies with biofuels will assist to reduce those emigrations. it is anticipated that the world populace would possibly increase to10.five Billion via 2050, and with this adding populace, there could be a rise in power consumption. To respond to this power call for, we have to use the herbal coffers more efficaciously and subsequently increase the use of natural coffers like biofuels.

Bioethanol may be generated with the assist of manufacturing facility biomass which comprise widespread portions of carbohydrates, which can be latterly converted to bioethanol. preliminarily, biofuel is said from different bio-sources together with wheat, sludge, sugar beet, potatoes, win tree, sun flower, end result. but, the usage of these comestible particulars may also beget food failure. therefore, on this study we're the use of

the banana wastes(lignocellulose agrarian waste) to prize bioethanol.

The authorities of India has also set a goal to use 20 ethanol amalgamated petrol by using 2030.

LITERATURE REVIEWS:-

Ahmed Faris Mohd Adnan found out that the fermented banana waste produced 4 to 7.1% bioethanol. The bioethanol yield was found to be increasing with increasing fermentation period. He found the optimum shaking hours for fermentation to be 6 hours at 5.8 pH. He found that the combination of enzymes like cellulase and pectinase produced more bioethanol. He found that energy can be produced by wasting banana fruit and could help in recycling wastes and save our environment.

Abdul Majeed Khan* Shaista Khaliq and Rabia Sadiq found that the oily content from waste banana peels could be converted to biodiesel. The carbohydrates could be extracted by distilled water by doing some physical, chemical and biomechanical processes. The carbohydrates were subjected to anaerobic fermentation using the yeast Saccharomyces cerevisiae to produce bioethanol.

Pranav V N1 , Shambu S Krishna1 , Ajith J Kings2 , Monisha Miriam L R3 in their research work found out that the acidic pretreatment could be given to the waste banana biomass by HCL to breakdown the lignin content and later enzymatic hydrolysis using thermamyl (α-amylase) and amyloglucosidase was carried out. Saccharomyces Cerevisiae yeast was employed for the fermentation process.

Also in this research paper we found the chart of constituents present in pseudostem. refer fig. below -

Fraction		Pseudo stem
Liquid	Glucose	38.9± 1.1
	Xylose	9.1 ± 0.2
	WSS	11.2± 0.0
	Furfural	0.4 ± 0.1
	5-HMF	0.6 ± 0.1
	Acetic Acid	0.9± 0.1
	Formic Acid	0.2 ± 0.1
WIS (% in dry weight)	Cellulose	54.4 ± 0.5
	Hemicellulose	2.4± 0.2
	Lignin	23.1± 1.1
	Ash	13.1 ± 0.1
	Total	93.1 ± 1.8

Table (a) Constituents in pseudostem

Snehal Ingale1,3, Sanket J. Joshi1,2*Akshaya Gupte1 found out the various pretreatment processes, viz. Acidic pretreatment and alkaline pretreatment. Alkali pretreatment: 5% plant biomass with 1N NaOH for 18 hour at room temperature. s. The hydrolysate obtained after alkali and microbial treatments was fermented by Saccharomyces cerevisiae NCIM 3570 to produce ethanol.

Table 5.1. Chemical composition of untreated and pretreated banana pseudostem.

BPS and pretreatment	Cellulose (%)	Hemicellulose (%)	Lignin (%)
Untreated	24.47 ± 0.839	22.56 ± 1.658	14.14 ± 1.585
3% NaOH	52.32 ± 2.878	10.84 ± 1.591	8.68 ± 0.464
5% H_2SO_4	48.17 ± 0.351	9.88 ± 1.641	8.31 ± 1.688
Hot water	25.44 ± 0.314	15.02 ± 1.189	9.25 ± 0.072

NB: Standard deviation (SD) ± values of independent triplicates

Table (b) Impact of pretreatment

Mortadha K. Mohammed, Hyder H. Balla, Zaid Maan H. Al-Dulaimi tested blends of ethanol in different compositions and analysed their performance and emission characteristics with pure petrol.

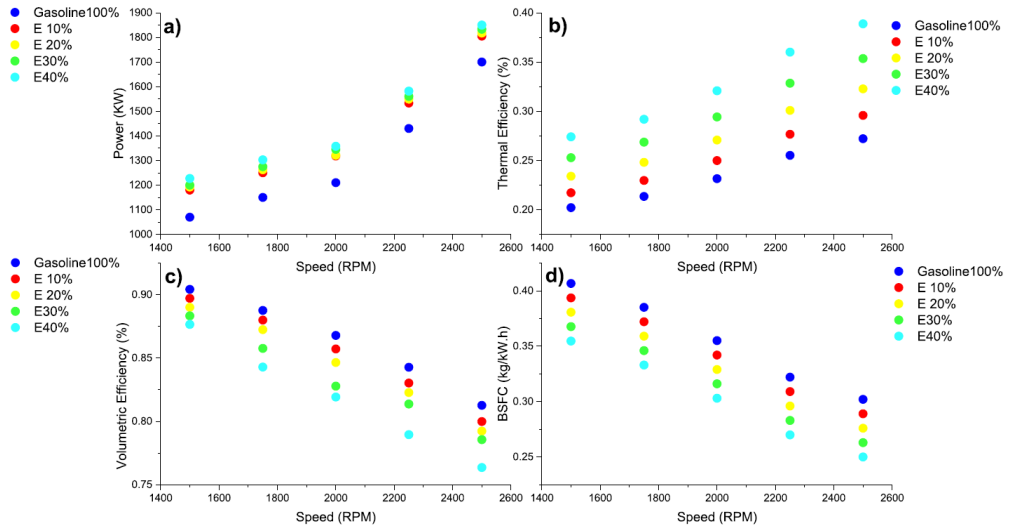


Fig. (1) Effect of the speed of an engine on brake power, thermal efficiency, volumetric efficiency and BSFC

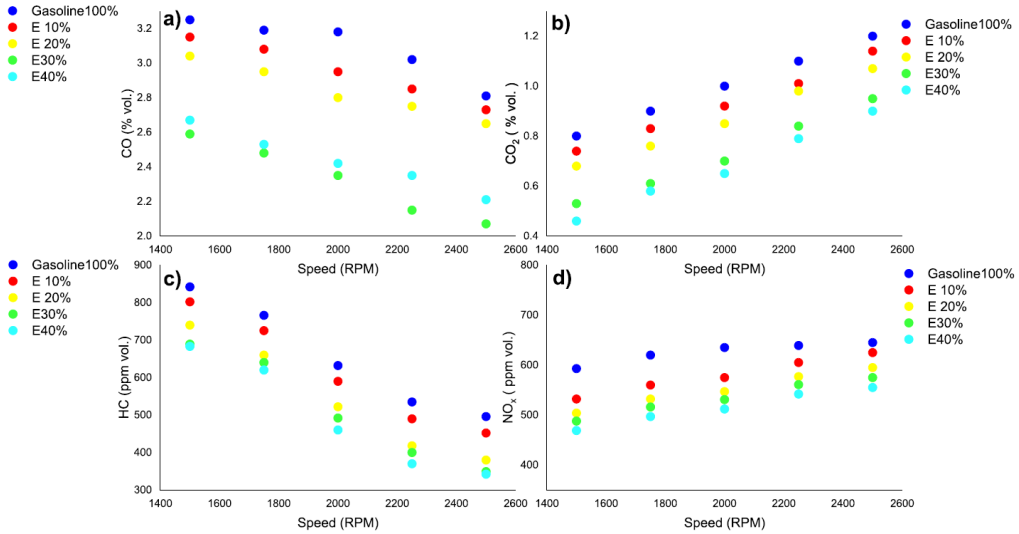


Fig. (2) Effect of the speed of an engine on CO, CO2, HC and NOx emission.

PROBLEM STATEMENT

Analysis of performance and emission characteristics of banana tree root/ pseudo stem extracted ethanol blended fuel with Nano-particle.

OBJECTIVE:-

To analyze the different constituents present in banana tree root and banana pseudo stem and select one optimum solution.

To increase the yield of ethanol with alkaline pretreatment.

To study the rate of fermentation with different concentrations.

To extract ethanol from banana tree root/pseudo stem.

To analyze the characteristics of the tree root/ stem extracted ethanol.

To analyze performance and emissions characteristics of CI engine fueled with different blends of banana tree root/pseudo stem-extracted ethanol mix with nano particle with diesel.

EXPERIMENTAL VALIDATION:-

Fuel property test:-

The characteristics of CeO2 nanoparticle additives algae oil methyl ester and diesel blends had been tested as according to the ASTM standard. properties observed had been flash point and fireplace point, pour factor and cloud factors, density and additionally calorific cost. test specs were examined for B20, B20 + 25 ppm, B20 + 50 ppm, B20 + 75 ppm and B20 + one hundred ppm are indicated in the desk 1. No sizable development was noticed within the density, cloud and pour points in addition to kinematic viscosity because of the addition of

CeO2 nanoparticles in the gas blends. CeO2 nanoparticle additive gasoline blends shown an enhancement in flash point while compared to B20. growing flash point temperatures can be appropriate for secure protecting of the fuel. The calorific fee of fuel is a crucial parameter and it's been found that the calorific cost of the CeO2 nanoparticle additive gasoline blends is more than that of B20. It consequences in greater thermal performance as well as much less gasoline intake.

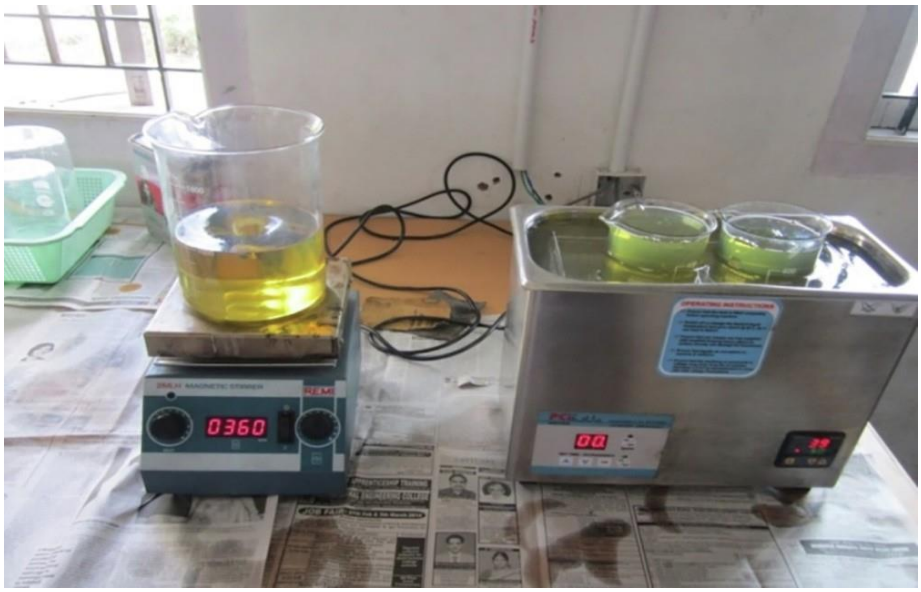
Preparation of nano blends:-

on this gift studies commercially supplied CeO2 nanoparticles having an average size of fifty to one hundred nm were bought from the Sigma Aldrich. The specs of CeO2 nanoparticles are displayed in table 2. The nanoparticles with the amount of 25 ppm had been weighed and additionally distributed into the algae oil biodiesel blend (B20) with the help of an ultra sonicator. The Ultra sonication technique changed into done at a frequency of one hundred twenty W for 30 min duration. This method is displayed in Fig.The processed gas pattern were named as B20 + 25 ppm. the similar process is attempted for the amount of fifty, 75, and a hundred ppm to prepare the CeO2 nanoparticles added biodiesel fuel.

EXPERIMENTAL SETUP

The investigation is carried out on Kirloskar four-stroke, single cylinder, water-cooled direct injection diesel engine. The rated power of the engine is 5.4 kW with the constant speed of 1500 rpm. The graphical view of the experimental setup is dis- played in Fig. 2. The engine standards are displayed in Table 3. The engine operates at its rated speed for load testing. The diesel fuel engine is worked at a standard input of 200. An opening is made at the top side of cylinder head surface to set up the piezo- electric pressure level transducer for calculating the net heat release as well as cylinder pressure. The engine will be stable for the specific operating condition as well as fuel flow rate and exhaust gas temperature were recorded. The engine is permitted to run for 30 min to achieve steady state condition to attain cooling water temperature of 60 °C. Engine emission such as NOx, CO, and HC of test fuels are reported by AVL digas 444 gas analyzer; the

smoke opacity of fuels is determined using AVL 437C; and the exhaust gas temperature is calculated using thermocouple. Each test are carried out three times for an average result. The change in cylinder pressure according to crank angle had been calculated with the aid of AVL GH12D pressure transducer crank angle encoder.

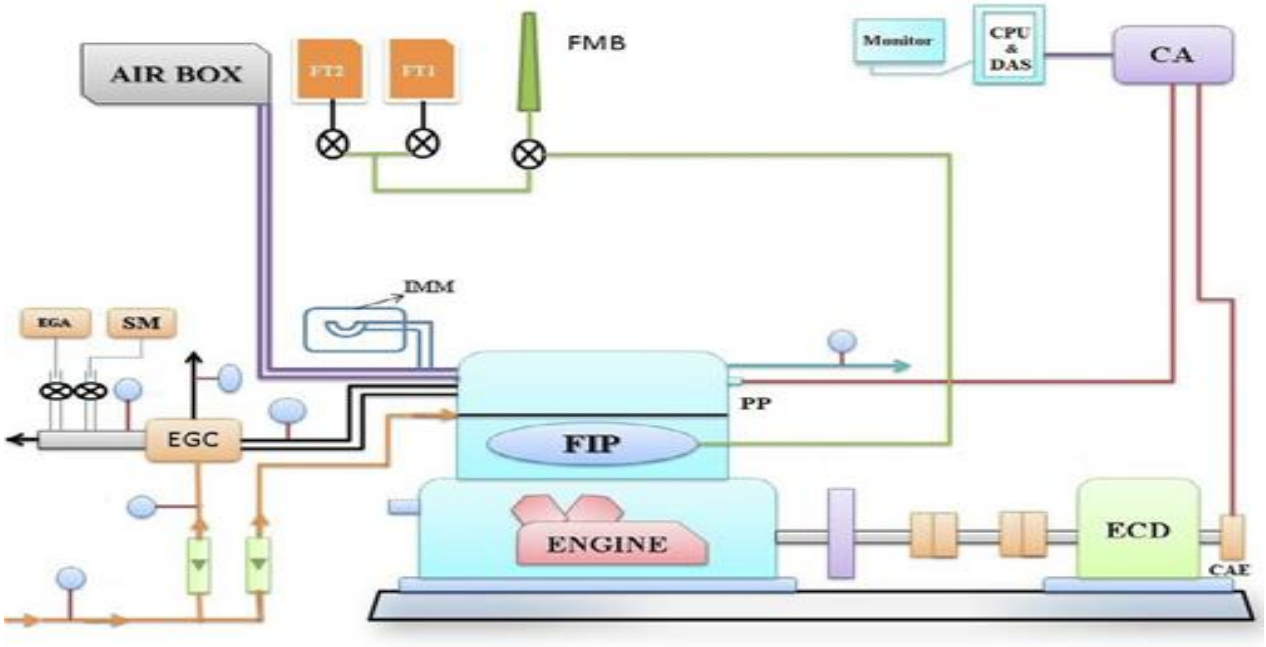


. Preparation of nanoparticles blended biodiesel fuels.

The specifications measured based on ASTM standard for B20 and CeO2 blend fuel

			D20 + 25	D20 + 50	D20 + 75	D20 + 100
			(CeO2)ppm	(CeO2)ppm	(CeO2)ppm	(CeO2)ppm
Density (g/cm3)	D-4050	0.82	0.835	0.8298	0.838	0.8316

Kinematic viscosity at 40 °C (mm2/s)	D-445	4.71	5.1776	5.6451	5.6669	5.6888
Flashpoint (min °C)	D-92	175	175.5	176	176.5	177
Cloud point (°C)	D-2500	—1	—3	—3	—3	—3
Pour point (°C)	D-97	—4	—4	—4	—4	4
Calorific value (kJ/kg)	D-240	43,590	44606.5	45,623	45,921	46,219
Cetane index	D-613	58	54.75	51.5	51.75	52
Water and sediment (% vol.)	D-2709	0.05	0.05	0.05	0.05	0.05



RESULTS:-

Brake specific fuel consumption

The exchange of BSFC at extraordinary load for diverse take a look at fuels is dis- played in paper. For all of the cases, the BSFC become reduced with enhancing the load. mainly, the BSFC of the CeO2 nanoparticles delivered fuel blends changed into lowered in comparison to the B20. it is due to the much less calorific price of the B20 gas. The CeO2 nanoparticles additive impacted the advanced atomization in addition to improved combustion and so the gasoline intake were decreased while enhancing the electricity. The BSFC reduces with enhancing the dosage level of CeO2 nanoparticles within the gas mixture.

Exhaust gas temperature

indicates the alternate of EGT in keeping with load. it could be seen that the EGT have been stepped forward while enhancing the weight for all take a look at fuels. From this determine, it may be viewed that the EGT of the CeO2 nanoparticles added gas blends have been more than com- pared to the B20. this will be associated with the improved gas injection. further, the better usage of oxygen with the aid of the CeO2 nanoparticles introduced fuel blends being promoted the burning technique, that better the height temperature as well as thus improved the EGT.

Conclusion:-

An experimental analysis of CeO2 nanoparticle components combustion in diesel fueled engine had been executed at a extraordinary dosage of nanoparticle. The ASTM specification tests for the gas exceptional measurements were said in this paper for biodiesel customized by using including CeO2 nanoparticles. The gas description statistics proved some similarities as well as variations while considering B20 and also B20 with nano additives. The CeO2 nano additive fuel blends suggest slight improving in calorific fee in addition to kinematic viscosity whilst as compared to B20. The decreasing in BSFC can be due to the best effect of nanoparticles on bodily traits of gasoline as well as decrease within the ignition put off time. It brings approximately maximizing in BTE. it is able to be regarded that the maximum BTE and EGT changed into discovered by the usage of Nanoparticle brought biodiesel blends. And also that fuel blends produces less BSFC when in comparison to conventional diesel.

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