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Comprehensive Analysis of Oil Extraction from Various Seed - a Near Fuel

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Abstract: **- The present world population is very difficult to maintain the consuming energy. It is very serious problem to face for coming years. It is mandatory and major responsibility to care about energy generation from various biomass wastes. The renewable energy is the very big source to get bio fuel from various seed. Among the bio-fuel sources, the coconut shell, citrullus seed, gulmohar seed have an enormous amount of oil is available. There are 32% of area is covered by gulmohar trees and 21% of area is covered by citrullus seed. The south zone of India have major area of coconut tree from Kerala and Tamil Nadu. This investigation is collected those seeds, and crushed in the form of powder. The traditional method of Transesterification process is used and for this investigation. The bio fuels are extracted from these oils and analyzed with combination diesel with periodic blending percentages. The comparison test for Emission and CO2 have been conducted from the following bio fuels. The result were discussed and concluded the various blending combination of bio fuels.**

Key words: Gulmohar seed, Citrullus seed, Coconut shell

1. INTRODUCTION

Today the human life is very essential to use Petroleum products of fuel oil, gasoline or various chemicals. With Explosion of world population, the demand for Fuel is growing day by day. It is very challenge task to supply of petroleum to the world. Even though the cost of oil also very high and it is overcome a record of high cost 5000/barrel in 2019. It is very essential for industry and sophisticated living standard life in developed countries. Flourishing financial prudence, such as India, is the world second position of purchasing the oil consumer. Day by day the world is facing a difficult situation to solve the price of oil cost. As a Alternate fuel source, biofuel is the major global supplier of primary energy source and has some advantages associated with conservative fossil fuel. The usage of petroleum products are growing every year due to growth in population, normal of active life and urbanization. Biodiesel is one variety of petroleum fuels derivative from bases like vegetable oils that are natural, renewable biological sources.

Charmaine Sj. Lamiel et al (1) investigated the possibility of castor seed as feedstock for best production of biodiesel. The castor oil extraction done with methanol as solvent. The following response periods of 1 to 2 hours were exposed to the methoxide concentrations (0.6M, 0.7M and 0.8M). The optimal parameters at 70°C were found at 0.7 M NaOH-CH3 and 1 hour with the extreme yield of 63.29% Castor Methyl Ester (CasME). Sushma S et al (2) analysed the various tests were lead at various combination of biodiesel with normal diesel on a diesel engine. The Biodiesel is created from dairy excess milk scum and karanja. The Significant possessions like fire point, flash point, calorific value, density, kinematic viscosity are analyzed and were create to be within the restrictions of biodiesel values. The thermal efficiency of diesel fuel is raised about 1.44% on comparison with neat biodiesel. Nur Syakirah Talha and Sarina Sulaiman (3) discussed the Catalyst plays a crucial role and therefore the overall cost can be reduced by optimizing the efficiency of the catalyst used. In this paper gives an overall idea about the merits and demerits about the various types of catalysts that could be used. (Heterogeneous acid/base, homogeneous acid/base).

The Heterogeneous catalysts are used as its reusable, high reaction rate, lower cost and requires less energy compared to acid catalyzed transesterification. Lebnebiso et al (4) aimed to reduce the FFA by the esterification of cottonseed oil instead of edible oil refining. The esterification process does not need neutralization, deodorization and bleaching of the oil and hence it could be preferred over Edible-oil refining process. The experimental results indicate the high conversion rate of 96.7% and the optimal methanol to oil molar relation came out to be 7:1 with the attentiveness of catalyst to be one percentage of weight and a response temperature of 60oC and the FFA content has also been reduced from 5.2% to 0.9%.

Enkuahone Abebe et al (5) analysed the biodiesel from galamensis oil using alkali catalyst with ethanol. Additionally, the effect of catalyst since 0.25% to 0.2% of weight of oil, molar ratio of ethanol to oil from 6:1 to 12:1 and reaction temperature from 35oC to 75oC were investigated. The oil extracted from this can contain 78-80% of vernolic acid which is amusing in epoxy fatty acid, linoleic

acid of 12-14% and oleic acid os 2-3%. songmeiwang et al (6) investigated a novel method for extracting lipid has been proposed by using formic acid with minor quantities of hydrochloric acid. it is also used to treat water-containing microalgae, liquid/solid ratio, temperature and dosage of formic acid influence the lipid abstraction from water comprising microalgae. The optimal dosage of formic acid, hydrochloric acid, l/s ratio was found to be 5.57 g/g, 0.1g/g, and 10:1 respectively at a temperature of 100oc.

Silitonga et al analyzed the Cerberamanghas oil is one of those non-edible oils that can used for feedstock for the making of bio diesel. FFA content was found to be over 2%, therefore it cerberamanghas methyl ester should be formed via 2 stage transesterification process with H2SO4 acid catalyst and KOH alkaline catalyst. The maximum yield of biodiesel was attained with 9:1 methanol ratio. Songphon Phimsen et al (7) analysed the Yield of up to 13% oil can be achieved by soschlet removal with hexane as solvent. Since the extracted oil had FFA of 6.14%, Hydro treating of extracted oil had to be performed over two catalysts. The NiMo/γ- Al2O3 and Pd/c with various parameters like operating temperature, reaction time and H2/oil.

R.Vallinayagam et al (8) studied the effect of neat pine oil as feedstock for biodiesel by providing ignition assistance as it has a very low cetane number. The inlet air has been preheated and the cylinder head has been provided with a glow plug to provide ample ignition support. The CO emissions and smoke were found to be reduced by 13.2% and 16.8%. Cumalİlkılıç et al used terebinth oil as analysis for the making of biodiesel which is a non-edible oil. The optimum conditions were found to be 77% yield with 20% methanol in the occurrence of 1% sulphuric acid. The biodiesel was used in the diesel engine with blends B10 and B50. Sarina Sulaiman et al analysed the solid coconut excess is an innovative source for biodiesel production. KOH is added to catalyze the reaction of a maximum FFA volume of raw material. The resulting optimum solutions were 2 % weight of KOH catalyst at 700 rpm of collaborating intensity with a temperature of 62oC with a yield of 88.5%.

Anil Kumar et al (10) obtained the 1:17.5 compression ratio, 3.7 KW power with 1200 rpm, 1500rpm by 4 KW, 1800rpm by 5.7 KW and 2000rpm by 6.2 KW. The results indicated that mixing up to 30% of biodiesel with diesel can be efficiently used in IC engines without affecting the performance of engines. Shaiful et al (11) experimentally analysed the performance and output emissions of a adjustable compression ratio with 50% to 100%, and turpentine oil and Jatropha bio-diesel. The results at maximum and minimum of load and compression ratio and brake thermal efficiency were found with various chemicals. Mohd Afiqa et al (12) deals with study of various analysis have been taken in diesel engine. The combination of wastage cooking oil as biodiesel used in this research and found various result of brake thermal efficiency is greater than the diesel of HC, NOX, CO and emission. The result shows lesser emissions and good presentation than the other combination of diesel. The requirement of diesel and petrol in India is enormous amount of volume is raising in every year. It is very more expensive and environment problem facing our country. The projected crude necessity of India is given in the Table 1.

Table 1: The import of crude oil in India (MT)

S. No.	Year	Availability	Import %
1	1995-2000	92	63
2	2001-2005	114	67
3	2005-2010	138	74
4	2011-2015	120	88
5	2016-2020	129	92

Based on the literature review, the various seeds are analyzed and found the optimal blending ratio of bio diesel. It is clear that the combination of various seed oils are not analyzed so far. In this investigation, the coconut shell powder, Citrullus powder and gulmohar powder are analyzed. The biodiesel extract by using transesterification process. The various seed oils are mixed together and analysed the engine performance with various blending ratio.

II. EXPERIMENTAL METHODS

In India traditional areas for cultivating coconut are the states of Tamil Nadu, Kerala, Andhra Pradesh, Goa, Karnataka, Pondicherry, Orissa, Maharashtra West Bengal and Islands of Andaman and Lakshadweep. The major coconut production state is Kerala, and is famous for the India's most caring coconuts. They are also well-known for the coconut-based crops like copra, coconut water, coconut cake, coconut shell-based products, coconut leaves, coconut oil, coconut toddy, coir pith and coconut wood-based products.

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Figure 1: Gulmohar, Citrullus and Coconut Powder from Seeds

In Tamil Nadu, major southern states account for 92% of the maximum production in the country (Andhra Pradesh 8.93%, Tamil Nadu 26.56%, Kerala 45.22%, Karnataka 10.85%, and other states (8.44%). The coconut, gulmohar and Citrullus seeds prepared by the powder form as shown in Figure 1. The raw materials are collected from various source and separated to seeds and cover of all those materials. The collected materials are crushed by the help of crushing machine in the powder form.

Chemistry of Bio Diesel Production

Processing the vegetable oils, waste cooking oils or animal fats by the method of transesterification is behind the production of conventional biodiesel. In the presence of a catalyst, a glyceride reacting with an alcohol (preferably ethanol or methanol) produces an alcohol and fatty acid alkyl esters. The transesterification is a reversible process that occurs due to the presence of a mixture of reactants like fatty acids and alcohol in the presence of a strong acid or strong base as catalyst. The products obtained from this process are raw biodiesel and raw glycerol. In large scale production, sodium and potassium methanolates are used as catalysts. The products obtained from this process are further refined. Biodiesel is produced if methanol is used as alcohol FAME (fatty acid methyl ester). The refined glycerol is used in food, cosmetic and chemical industries, and can also be used in anaerobic digestion as substrate. The various seed oils are shown in Figure 2.

Figure 2: Coconut shell, Citrullus and Gulmohar oil from Seed

Bio Fuel Properties of Various Seed

The various Fuel properties are shown in Table 2 . it is clear that the density of bio diesel is less than one g/ml and it is very suitable for transertrification process.The end of transertrification process the bio diesel and glycerol are seperated from the filttering process. The glycerol is used to various purpose for making soap and other product. The bio diesel is mixed with diesel with blending percentages like 10%, 20%, 30 % and 40%.

Table 2: Comparison of Fuel Properties of various Seed with Diesel

Properties	Coconut shell Bio Diesel	Gulmohar Seed Bio Diesel	Citrullus Seed Bio Diesel	Diesel
Density, g/ml	0.864	0.763	0.745	0.841
Viscosity @40º C	4.7	4.4	4.3	4.4
Calorific Value, MJ/kg	36.1	34.5	32.1	41
Flash Point º C	161	158	154	163
Cloud point º C	10	11	10	10

In this investigation, coconut shell is used as raw materials and the following objectives are described as

1. To attain bio oil from Gulmohar, Citrullus and coconut shell by transesterification process.
2. To analyze the bio fuel for their physical properties and chemical composition.
3. To analyze the various combination of blending with diesel.

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III. RESULTS AND DISCUSSION

The combination of seed biodiesel is analysed by various performance characteristics of engine. The performance of specific biodiesel consumption thermal efficiency and output power have been analysed by various combination of blending ratio. The exhaust gas temperature verses brake power for combination of biodiesel.

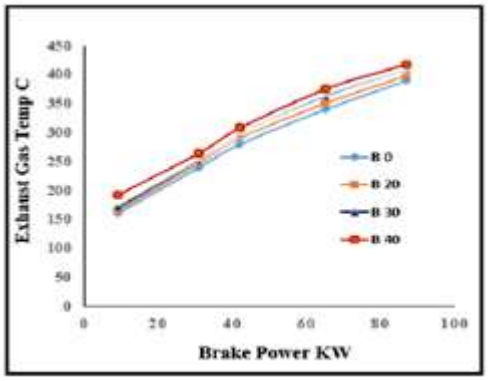

Figure 4: Exhaust Gas Temp Vs BP

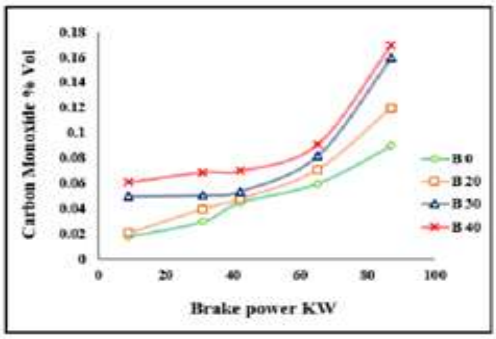

Figure 5: Carbon Monoxide % Vol Vs BP

The comparison result of brake power and exhaust gas temperature as shown in Figure 4. The highest gas temperature of 410ºC is achieved the 40% of biodiesel blending and lowest temperature of 150ºC is achieved the 20% of biodiesel blending. From this graph, it is clear that the B 20 is very suitable for the best combination of biodiesel. The very important output result of carbon monoxide as shown in Figure 5.

The combination of brake power and carbon monoxide is achieved good result. The maximum percentage of carbon monoxide is reached by B 40 in the rate of 0.17%. the lowest percentage of 0.023 is achieved by B 10 combination of biodiesel. It is clear that the best combination of biodiesel is achieved by B20 combination of biodiesel.

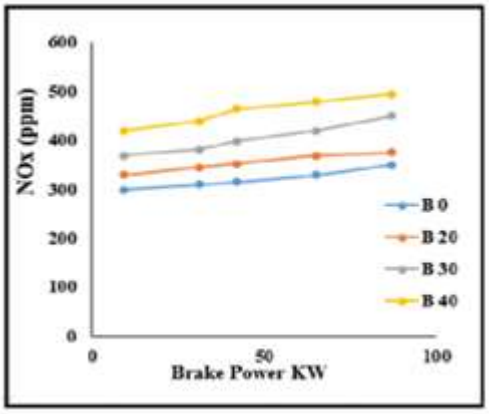

Figure 6: NOx Vs BP

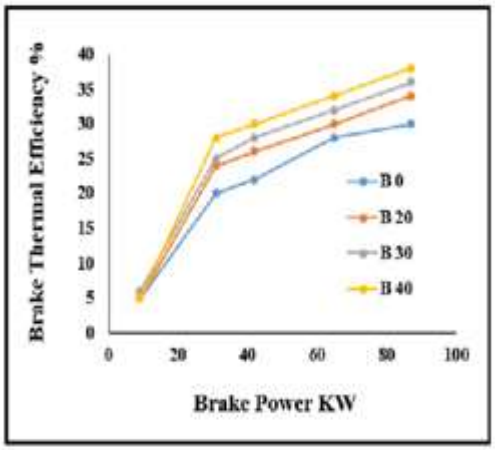

Figure 7: Brake Thermal Efficiency Vs BP

The comparison result of NOx and brake power as shown Figure 6. This graph is clearly indicated the B 20 combination is achieved the normal NOx . From this graph, the B 30 and B 40 is achieved high NOx and it is not recommended for the further research work. The brake thermal efficiency and brake power as shown in Figure 7. It is clear that the normal brake power is achieved by the combination of B20. The B30 and B40 is achieved more efficiency with high fuel consumption. The recommended combination of B20 is very suitable for the further process.

IV CONCLUSION

The combination of biodiesel extract from various seed is achieved the high performance of Exhaust gas temperature, carbon monoxide, NOx and thermal efficiency. The best result of various thermal performance of diesel engine is analysed and the various levels are discussed as follows.

- The B20 combination of biodiesel is achieved moderate carbon monoxide.
- The brake thermal efficiency is achieved by B20 blending ratio.
- The 320ppm is best level of NOx is reached in the B20 combination.
- The exhaust gas temperature of 150ºC to 310ºC is achieved by B20 combination.
- The combination of B20 bio diesel with diesel is 7 million tons of diesel is going to be saved in India.

The various combination of biodiesel is analysed and comparison result is strongly recommended by the combination of B20 biodiesel.

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