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FUTURE FUEL: A BIO-FUEL AS AN ALTERNATE SOURCE TO FOSSIL FUELS

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ABSTRACT
World of transportation is fueled by fossil fuels and considering today's energy scenario, depletion of fossil fuels is one of the major issue to be solved by every nation. As per energy scenario considered, India is leading the position of CO2 emitted among the top five nations. To overcome these two major issues, alternative to fossil fuels is today's concern and Bio-fuels are emerging source of alternate energy. In this paper, a critical discussion by researchers is done considering major issues related to fossil fuels and finding bio-fuels as an alternative to existing fuels. Adoption of fuel with existing engine system is the advantage of Bio-fuel over other sources of alternate energy. Also, almost same performance characteristics and improved emission characteristics with easily available non-edible oil Bio-fuel added a special impact for an alternative.

Keywords:
Manufacturing, Biofuel, Biodiesel, Energy, Alternate Energy, Non-Edible Oil.

I. Introduction
Energy is the indeed need in the life of people. Universe is surrounded by different types of energies and that are too utilized by us in our day to day life. With the available form of energy, fuels are also the non-separable part of human life. As per the energy scenario considered, diesel sources are depleting at a high rate and alternate to diesel fuel is necessity. Oil, either edible or non-edible, is the identified research area for the alternate fuel to diesel. As per the literature discussed in this paper, bio-fuel is sounding a good source of fuel energy that can fulfill the need of diesel. Such fuels, can be used as a green fuel because of their reduced emissions.

II. Literature
Biofuel -An alternative source of energy for present and future by Z. A. Kapasi et al explained in their paper. The world's population is concerned about the massive demand for different oils and their excessive pricing. The need to look into alternate energy sources is important considering the increasing awareness of environmental issues. There are different alternative energy sources, like solar energy, nuclear power, windmill power, and greenfuels or biofuels, which sound like some of the best suitable alternatives in terms of usage and production. [1] Bio-Fuels as a Second Generation focused by Dragan M. Stevanovi} et al. Among the various forms of renewable energy, biomass occupies a special place. It allows for a steady supply, in contrast to wind and solar energy. Furthermore, the production of even more lucrative biofuels based on hydrocarbons is only possible from biomass. [2] Biofuel production: Challenges and opportunities are explained by M.V. Rodionova et al. Energy produced from fossil fuels has a finite supply, is unpredictable from a geopolitical standpoint, and has severe effects on the global environment. It is becoming more and more clear that biofuels may be a viable source of renewable energy. [3] P. Govindhan et al performed a review study about different technologies used in bio-diesel production. Utilizing sustainable technology to address the issues related to depletion of fossil fuel with high

environmental risk is urgently required. The experts have turned to alternative as green energy sources like biodiesel due to the ongoing rise in energy use. [4] DB Jani also have performed a critical review upon uses of different bio-diesels for an IC Engine as sustainable fuel. Because plants can grow year after year, vegetable oil holds a great deal of potential as a renewable energy source. They are known as a source of clean energy because there is no harmful sulphur in them. The main concern with using vegetable oils in CI engines is the high viscosities of such fuels. Due to the need to alter the combustion time when using vegetable oils in CI engines, higher levels of CO, HC, and PM are frequently produced. [5] Bio-Fuel: As An Alternative Source Of Energy was explained by Vineet Kumar Singh d et al. The fact that ethanol and methanol are oxygenates with a 35% oxygen content and renewable is a benefit of employing them as mixes in motor spirit. Because there is significantly more molasses available than is required for generating and supplying domestic demand for industrial and potable alcohol, they cut automobile emissions of hydrocarbons and carbon monoxide & remove emissions of lead, benzene, butadiene, and other harmful substances. [6] Biofuels (solid, liquid, and gas fuels) are among these well-known sources. Biofuel is a technique that substitutes renewable biomass (energy from organic materials) for the usefulness of fossil fuels. Gasoline acts as a buffer energy supply when supply and demand are inelastic, which helps to lower prices. The assumption that both demand and supply are inelastic is true in the short term, but both are elastic over the long term. [1] Biofuels are a general term for all compounds with increased energy that are created solely biologically or derived through chemical reactions using the biomass of organisms that used to exist. Most photosynthetic organisms, including woody plants, tiny and macro Algae and photosynthetic microbes, are used to produce biofuels. [3] The most promising method, then, is the one that uses biomass to produce liquid fuels since it has the potential to be financially viable even in the absence of specific energy policy support measures. The market for food is constantly at risk of being negatively impacted by such energy consumption. There are very rigorous requirements for a new generation of biofuels, the so-called second generationbiofuels, due to already experienced negative developments: Use of the entire biomass, optimistic CO2 balance, no disruption of the food production chains, and improved conversion efficiency. Diesel and kerosene of exceptional quality are characteristics of biomass to liquid processes based on Fischer-Tropsch synthesis. It is the only viable option, particularly for aviation, for incorporating renewable energy and reducing the CO2 footprint of that industry. The main initiatives and process developments for the second generation of biofuels are discussed. Some of them might be highly intriguing Serbian biomass consumption applications. [2] Trans-esterification, which transforms vegetable and animal oils into ones that can be used as fuel. Algae generates a substantial amount of energy from a variety of sources.Algae are an important class of biological systems since only a few number of species are known to produce enormous amounts of lipids in comparison to the rest of their biomass. It is crucial to remember that the technology has not yet advanced enough to enable the production of these biofuels on a commercial scale. A seamless transition to a biofuel era is being made possible in large part by economics. [1] Numerous studies on the physical characteristics of bio-diesel have been conducted, and the results point to the possibility that the presence of FFA content affects the properties of diesel and the price of bio-diesel. Oils and fats can be converted into biodiesel using four main and significant processes including pyrolysis, trans-esterification method, micro-emulsions, and blending of fuels. The cost of producing biodiesel is determined by the variety of feedstocks, inventory management strategies, catalysts, and operating expenses. The trans-esterification system, a key method that makes use of, is frequently used to manufacture bio-fuels. Numerous studies' findings have indicated various types of trans-esterification pathways. The first and most important step in constructing a trans-esterification process is selecting an appropriate catalyst, among other features that have been highlighted. With simultaneous mediation of the esterification and trans-esterification processes, acid catalysts produced better results for oil containing more than 2% FFA. Due to the reuse of the catalyst for the cost-effective intermittent and continuous production of biodiesel, inhomogeneous catalytic reaction gradually converts C6H8O6 chemically into $C_{14}H_{28}O_2$, then $C_3H_8O_3$ as a byproduct, and eventually yields biodiesel. Because of the issue with progressive test cost and feasible economic viability, research done on the strong acid catalyst immediately for the trans-esterification method has not received much attention. [4] The most sensible and justifiable long-term use of biomass is the generation of biofuels. Avoiding disruption of the food supply chain and ensuring a reduction in GHG emissions are essential for the second generation of biofuels. Not just for highway use, but also for aviation (the replacement of jet fuels), there is currently a significant demand for such fuels. But there is still a need for a technology with a proven track record of dependability and effectiveness. For Serbia, the use of biomass and biofuels represents an enormous possibility. Because labor, household equipment, and input biomass are less expensive here than in the majority of wealthy western countries, the economy may be significantly better. Serbia should take advantage of this fantastic potential with the appropriate energy and technological policies. The goal should include both the export of high-quality fuels and the replacement of oil imports. [2] However, due to their slow burning and lower combustion chamber temperatures, vegetable oils reduce NOx emissions. Vegetable oils offer a substitute fuel, but they still come with risks that neither automakers nor makers of agricultural machinery and equipment are willing to tolerate. The findings demonstrate that employing vegetable oil as bioenergy is a good alternative to using conventional diesel fuel since fossil fuels with a petrochemical base have merely sometimes been discovered. [5] The primary byproducts of biofuel might be solid, liquid, or gaseous. These goods can undergo additional physical, thermochemical, and biological transformations. Biofuels can be divided into two categories: primary biofuels and secondary biofuels. The biofuels are produced by burning dryanimal dung and woody or cellulosic plant material. [3] If a facility is built that dehydrates ethanol at our distilleries and restrictions on the transfer of molasses and the construction of ethanol manufacturing facilities are lifted, a 7% blended ethanol is a realistic goal given the current demand and supply for the fuel. The following actions could require to be taken into consideration. Given that transportation accounts for 50% of all oil consumption, along with other uses, diesel demand is closely tied to financial growth and is considered a growth-inducing factor. The projected increase in demand over diesel from the 2001–2002 level of 38.815 million metric tons to 52.324 million metric tons in 2006–2007 and 66.095 million metric tons indicates a significant hike of 34% to 70% over the 2001–2002 level, respectively, which will increase crude oil imports from the current level of 85 million metric tons. There are numerous tree species that produce oil-rich seeds. These prospective types of trees have been assessed, and it has been discovered that several of them, including Jatropha curcas and Pongamia Pinnata, will thrive in our environment. [6] The greater acid site density of the catalyst, the propensity of water to eliminate non-polar molecules, which prevents the process of substituting water with hydroxide group, and hydrophilic functional groups (-SO_3H), which improve Me-OH access to the $C_6H_8O_6$, are all factors that contribute to the catalyst's higher catalytic activity and balance. This catalyst is then used to create biofuel from leftover cooking oil that contains too much FFA. This study discusses various cutting-edge biodiesel production technology. Researchers established that inhomogeneous catalysts, in particular those of an alkalic type, are reusable and have a higher overall output when producing biodiesel from feedstocks with high levels of free fatty acids because they can accept moist raw materials from the WVO. the use of environmentally friendly heterogeneous catalysts. [4]

2.1 Testing and Performance of Bio-fuel through Literature Review

Vikram Kumar Gupta explained about experimental research work of engine performance where he used lean sapindus-mukurossi bio-diesel blends. With petro-diesel added lean soap nut blended bio-diesel used as engine fuels, the current work was done to experimentally test the engine effectiveness of a 1cylinder, 4 S diesel engine with water cooling provision. A medium to high load range of 50% to 93.75% was used for the experiment. Because it represents the majority of an engine's working load range, the load range of 50% to 93.75% was chosen. The experimental research made it possible to reach the following conclusions: Over the full load range, petro-diesel and all of the blends demonstrated satisfactory engine performance. With 0.2% greater BTE than petro-diesel at 62.5% load, B10 outperformed the competition for speed, fuel economy, and BTE over the medium load range of 50% - 62.5%. Petro-diesel, however, did better for BP. Additionally, B10 outperformed the competition in the high load range of 62.5% - 93.75% in terms of speed, fuel consumption, BTE, and BP, with 0.2% more BP and 0.8% more BTE than petro-diesel at 93.75% load.The B5, B10, B15, and B20 blends of lean soap nut biodiesel all performed admirably and were identified as suitable replacement fuels for CI engines. B10 was determined to be the most practical blend as an alternative fuel to CI engines when compared with different blends of the lean soap nut bio-diesel blends. [7] Researcher H.G. How working on common rail CI engine performed testing to investigate emission as well as combustion characteristics of CRCI engine. The set up was fuelled with bioethanol-coconut oil blended biodiesel. The performance, emissions, and ignition characteristics of a CRDI CI engine running on diesel, bio-diesel blended fuel and bio-ethanol fuel mixes have been investigated at various engine load operations. From this investigation, the following key findings may be inferred. 1. Blend B20E5 &B20 have greater Break-Specific-Fuel-Consumption than standard diesel. Overall, at all engine loads, B20E5 initiates with 2.0–2.7% higher Break-Specific-Fuel-Consumption than pure diesel fuel. 2. Compared to base diesel, the B20 & B20E5 exhibit better Brake-Thermal-Efficiency. The biggest improvement for B20E5 over diesel fuel is roughly 5.4% when performed testing at medium load (Brake-Mean-Effective-Pressure = 0.69 MPa). 3. Regardless of load setting, the B20 as well as B20E5 gasoline blends have a positive impact on decreasing CO and smoke. The decreased level of NOx emission under every loading circumstance is due to the inclusion of ethanol in the blends. 4. At an operational load of 0.17 MPa, the B20E5 exhibits slightly below peak pressure and peak HRR values. The reductions in peak HRR through the premixed combustion phase, which indicated lower the NOx emission, may be due to the cooling impact of ethanol. In conclusion, CI engines can use ethanol with a greater oxygen concentration as an additive for biodiesel-diesel blends without requiring any engine modifications. [8] S.M. Auti explained effect of hybrid fuel prepared by pyrolysis of oil from raw tyre as well as karanja biodiesel on diesel fueled to 1-cylinder 4S CI Engine. (i) BTE was found to be 27.06% and 27.67%, respectively, in the TP10KB20 and TP20KB10 the hybrid blends. Diesel fuel reports a maximum BTE of 26.11% at 125% of FL. Therefore, TPKB hybrid blends report BTE that is about 7% higher than diesel and 10% on greater side than TPO30 or KBD30. Blend has a higher thermal brake efficiency. (ii) The lowest BSFC, 0.32 kg/kw-hr at condition of full load, was observed for TP20KB10, TP10KB20, and pure diesel fuel. When compared with TPO30 and KBD30 mixes, this BSFC is 6.5% lower. This might be because hybrid mixes have a higher calorific value and less density and viscosity. Additionally, karanja biodiesel improves the cetane number of the hybrid mix without significantly impacting the TPO vaporization quality. (iii) The peak pressure of combustion in a cylinder rises from no load to a percentage of load by 27% and from zero load to full load by 61%. However, different mixes record peak pressure that is nearly closer to that of any given load. This is to produce enough combustion and heat to provide the necessary power requirement. (iv) For gasoline and the TP20KB10 hybrid blend fuel, rate of pressure rise (RPR) or combustion noise is 6.5 bar/degCA. This could be as a result of higher cetane numbers, ideal delay times, fuel vaporization, and higher calorific values. Less RPR results in less combustion shock, which is observed. (v) CO2 emissions rise as load rises. At full load, KBD30 shows the highest CO emissions, with volumes of 0.42%, 0.4%, and 038%. TP20KB10 and TPO30 are next. Because of the high density and increased level of karanja biodiesel viscosity. With an increase in load, hydrocarbon emissions grow. Higher UHC emissions were measured at 125% FL by KBD30, TP20KB10, and TPO30, respectively, at 73, 68, and 64 ppm. However, diesel and TP10KB20 recorded reduced HC emissions of 60 ppm. Due to the hybrid blend's improved thermophysical qualities, emissions have decreased by almost 14%. Nitric oxide (NO) emissions rise as the load increases. Higher NO emissions were observed in KBD30 and TP20KB10 at 723 and 675 ppm, respectively. Additionally, NO emissions from diesel, TPO30, and TP10KB20 were 611, 612, and 658 ppm, respectively. The greater combustion temperature is responsible for the roughly 18% higher NO emissions. Opacity rises with increasing load. TP20KB10, KBD30, and TPO30 blends have demonstrated increased smoke emissions. The experiment's findings support the use of TP10KB20 and TP20KB10 as their higher thermal brake efficiency, also TPO30 or KBD30 have less effectiveness and also produce more emissions under high load, making their use unwise due to their negative effects on the environment. Long-term study is needed to determine the effects of tyre pyrolysis oil on the materials involved in engine components, which will determine its future commercial application. [9]

2.2 Bio-Fuel from Different Plant oil

Syeda Alia Zehra Bukhari published a research work on biodiesel prepared from dodonaea plant oil focusing on its synthesis and characterization. And also stated about the mentioned oil and a promising nonedible oil in an industry for bioenergy. According to the most recent research on Dodonaea species oil offers a new and promising source for the production of biodiesel. In this study, the biodiesel yield was stated to be 90% when the following requirements were satisfied: An oil-to-alcohol ratio of 1:6M, with reaction time approximately equals to 70 min, and reaction temperature of 600 °C, and a catalyst that contained 0.25% potassium hydroxide were all employed. The Dodonaea plant biodiesel's fuel properties were examined and contrasted with the requirements set by ASTM. Based on the previously discussed fuel characteristics and physico-chemical tests, dodonaea species oil is neither palatable nor a reliable source for the synthesis of biodiesel. To boost the availability of feedstock to the biofuels industry, it is also advised that Dodonaea species of plants can be grown easily on marginal and barn land. Monitoring and maintaining control over both the amount and the standard of the prepared biodiesel as well as their potential for effective economy was the major focus of numerous research and the fuel characteristics test in the Dodonaea plant oil blended biodiesel. [10] Coconut oil as an Hybrid Fuel for Diesel Engine by Ashish Kumar. The characteristics for the experimental study are plotted as follows:

1. A solid micro emulsified ethanol and coconut oil with a purity level of almost 95% may be made by using octan-1-ol as an efficient surfactant. 2. The efficiency is compared between a hybrid engine and a diesel engine. 3. Because coconut oil indicated a lower gross calorific value than that of diesel, it has a higher specific fuel consumption value. 4. The direct injection system for fuel can utilise these hybrid fuels directly. 5. Compared to diesel, CO, NO, and SO2 emissions are lower. [11] Callophyllum Inophyllum Linn (“honne”) Oil, A source for Biodiesel Production by Chavan S.B. explained in their research paper with production of biodiesel from honne oil. The Calophyllum oil had good physical and chemical characteristics, making it suitable for use in both industrial applications and as a feedstock for biodiesel. The utilization of cheaper source containing FFA, such as contained by non-edible oils, can lower the cost of producing biodiesel. This trait draws attention to the plant Calophyllum inophyllum Linn, which thrives along our country's coasts and has no rival food uses. This oil's conversion into biodiesel could have significant local, regional, and global advantages. Like Pongamia pinnata, the calophyllum tree can be grown as a specimen tree in gardens, by the side of roads, and next to railroad tracks. Through an NGO, IBDC, Baramati is working to plant these diesel trees, which produce non-edible oil. It is necessary to focus on biological improvements to increase the output and shorten the duration of gestation of the Calophyllum inophyllum linn species in order to make biodiesel an economically significant choice in India. [12]

2.3 Influence of Nano-Additive to Bio-Fuel

Influence of Nano-additive on the Performance of Diesel with Rape Seed Oil as Bio-diesel by Satyanarayana Tirlangi focused on influence on nano additive used in biofuel on the performance of rape seed oil blended diesel. A biodiesel was used to test the emission and performance characteristics of an internal combustion engine (IC) that burns diesel fuel. The bio-diesel was formerly made by mixing 25% rapeseed oil with diesel.Additionally, after adding 0.1%, 0.2%, and by 0.3% nano-SiO2 nanoparticles to the biodiesel, respectively, the effects of different nano-SiO2 particle proportions were examined. The outcomes demonstrated that adding nano-SiO2 particles considerably improved the diesel's emission characteristics and brake power in reduced volume fractions. The biodiesel with 0.2% nano-SiO2 nanoparticles had a maximum BP of 8.49 kW and lowest CO and HC pollutants, at 29.55% and 27.63%, respectively. As the concentration of nano-SiO2 climbed, so did the NOx emissions. However, NOx emissions were somewhat reduced in biodiesel that contained 0.2% nano-SiO2. The biodiesel blend's 0.2% nano-SiO2 particle fraction delivered the best results. [13] Vegivada Venkata Ganga Pradeep and et al explained about bio diesel characteristics including production, performance and emissions prepared from animal waste fats along with its degradation of over time. By using the transesterification method, bio diesel is created from a blend of chicken tallow & pork lard fat. Biodiesel was combined with ethanol, conventional diesel, and biodiesel to create a variety of blends. The blends' various characteristics were discovered. In a diesel engine with a variable compression ratio, all the mixes underwent efficiency and exhaust gas analytical tests at various pressures. In the end, the following judgments are reached:- a) To produce greater calorie content and oil qualities that are close to diesel, pork liver oil and chicken fatty oil were blended in an ideal ratio of 80:20 by volume. b) Conventional diesel has an increased density and calorie content than biodiesel. This is because conventional diesel contains less oxygen and water vapor than modern diesel. c) Conventional diesel has lower viscosity, flash, fire, pour, and cloud point temperatures than biodiesel. Because of this, traditional diesel is simple to operate at low temperatures. However, biodiesel can be used at the lowest possible temperatures by adding various additives, such as ethanol and nano fluids. d) The Brake-Thermal-Efficiency graph shows that the brake-thermal-efficiency is greater for blends with low viscosity and lower density at 210 bar than at 190 bar and 230 bar. This is the result of the fuel in the cylinder burning completely. Because of the ethanol's ability to atomize and evaporate, biodiesel blends with ethanol also function well. e) Because there is more oxygen present in biodiesel than in regular diesel, NOx emissions from biodiesels are higher than those from conventional diesels, although HC emissions are lower. The biodiesel will burn completely with more oxygen present. Biodiesels emit less CO because of complete combustion. f) It was discovered that blends made recently had better qualities than blends made two years prior and kept at ambient pressure and temperature. g) Finally, biodiesel mixed diesel (B5+D95, B10+D90, and B15+ D85) is good for higher performance and reduced emissions. It is blended into diesel and ethanol in the following ratios: B5+D90+E5 and B10+D80+E10. When compared to regular fuel, biodiesel is more effective and produces less emissions. [14]

2.4 Bio-Fuel and Aviation Fuel

Rehab M. El-Maghraby studied and explained about bio-diesel and jet fuel blended to produce renewable aviation fuel. Four mixtures were looked into as prospective fuel substitutes for Jet A-1 and Jet A. Different ratios of biodiesel were used with Jet A-1 fuel to create blends, including 5vol.% (B5), 10vol.% (B10), 15vol.% (B15), and 20vol.% (B20). After the data was reviewed, it was discovered that no amount of biodiesel fuel made from palm oil could be substituted for it in the creation of bio Jet A-1. It is possible to create Jet A bio-based fuel by blending biodiesel fuel made from palm oil with standard jet fuel up to 5% by volume (B5). Biodiesel fuel with a freezing point greater than -15°C will produce a mix that does not adhere to the requirements for Jet A-1 and is not able to be applied as a drop-in replacement for Jet A-1-style fuels. Up to 5 vol.% of regular jet fuel can be blended with biodiesel having freezing point of +5 oC to create bio-based jet A fuel. The laboratory measured requirements could be predicted using blend indices from the literature. They can be used to determine whether any biodiesel made from various oil sources is suitable to serve as a drop-in fuel for bio-based aviation fuel blends. This will do away with the requirement for early investigational laboratory tests. [15]

2.5 Selection Techniques of Bio-fuel

Selection of Bio-Diesel Blend using Mcdm Methods by P.Ganesan. The outcome makes it obvious that pure diesel is superior to blended diesel. However, because humanity must turn to alternative energy sources, experts are working to identify fossil fuel alternatives. Blended biodiesel is one such replacement. The best ratios for various diesel-biodiesel blends, in descending order of effectiveness,

are B10, B20, B30, and B40. Mixtures that are more than this may perform less well. Three different MCDM approaches are used to rank various blends. The five most popular positions are ranked in the same order by all 3 techniques. By outlining all the significant aspects and evaluating their understanding, beliefs, and values, it seems inevitable that we will require an organized approach to making judgments and gathering information pertinent to them. MCDM assists in achieving this. The approach taken in the current work can be expanded to larger data sets and a variety of data from other experimental and design configurations. The potential uses of MCDM techniques include everything from choosing a car to choosing the components for a nuclear reactor or a missile. [16]
Author in this paper, worked on bio-fuels prepared with sugar beet considering bio-ethanol as well as bio-gas. The use of sugar beet to produce bio-ethanol and bio-gas is highly economical, both in terms of efficiency and the method of getting sugar beet, according to all the factors discussed in this study. We outline various business opportunities for sugar beet-derived bioethanol.
100.000 ha of sugarbeet with cultivation times of 60 t/ha equals to 6000.000 t of sugar beet each year. 6000.000 t sugarbeet times 105 l of bioethanol per ton sugar beet equals approximately 630.000 t ethanol yearly or annually. Considering draff as 2500000 t of draff and 2500000 t of leaves are subproducts. About 4000.000 t of gasolene are used in Romania each year.
We can use gasoline with 4% bioethanol as of 1 July 2009.
160.000t of bioethanol per year are required; 470.000t of bioethanol per year are available for export.
Potential for business with sugar beet biogas:
2.500.000 tons of draff times 31 mc biogas each ton equals 77.500.000 mc biogas every year
2.500.000 tone of frunze-colete times 31 mc of biogas per ton equals 77.500.000 mc of biogas each year. Focusing on above values final output could be given as, Total = 151000.000 mc biogas per year, or 2500.000 tons of draff multiplied by 108 kilowatt/h per ton, or 270000.000 kw per year. 2500.000 tons of leaves times 108 kilowatt/h per ton equals 270000.000 kw per year. 540000.000 kw/h total for the year. These numbers demonstrate that the amounts of bio ethanol and biogas produced from sugar beets are significant. As a result, it is crucial to analyze how effectively sugar beet production can be used to produce these alternative fuels. [17]

2.6 Catalyst and Bio-fuel

Ahmad Zikri worked on production of green fuel with crude palm oil and diesel along with catalytic hydrogenation method. The process of hydrogenating crude palm oil with a NiMo/Al2O3 catalyst to create green diesel fuel operates best at 315 °C and yields 68.2% of the final product. Both the chemical and physical properties of diesel fuel meet the requirements for density, its kinematic viscosity, flash point of fuel, cetane number for diesel or blended diesel, and calorific value of fuel, which are 0.8101 gr/ml, 4.27 cSt, 58 oC, and 75, respectively. [18]

III. Conclusion

Critical Literature Survey performed in this paper focused on need of bio-fuel, different types of bio-fuels including Ist, IInd and IIIrd generation fuels. All the three kind of bio-fuels are surving best as a fuel with the available fuel preparation methodologies. Among different fuel preparation methods like pyrolysis, esterification, triesterification, etc., triesterification is adopted by maximum researchers as per the literature survey done. Nano additives added are used to improve the characteristics of fuel and found the advancemet in performance of a diesel engine, as said by some of the researchers. Catalyst addition is also a main factor to increase the rate of reaction while preparing a fuel and found benefiacial effects on transesterification process. As per the overall literature survey performed, bio-fuel is found a good alternate source of energy as plenty of input raw oil seed species are available for testing. Also, already tested seeds are showing same output characteristics as shown by diesel engine with decrease in emission characteristics. So, with many advantages over physical properties and performance characteristics of a diesel engine, Bio-fuels could be used as an alternative source of fuel energy.
Study of different literature focused on following major outcomes as follows:

1. Biodiesel blend with B20 blending ratio have shown better performance and emission characteristics for different bio-fuels.
2. Blends prepared with more than two fuels shown good results as compared with blends with two fuels.
3. Non-edible oil gain the attention because of higher Calorific value of their blends and providing a huge future scope for an alternative to fossil fuels. Adding benefits as utilization of wasteland in rural areas, providing employment at rural areas, etc.

IV. Abbreviations and Acronyms

GHG – Green House Gases
FFA – Free fatty Acid
BP - Brake Power
BTE - Brake Thermal Efficiency
ASTM – American Society for Testing and Materials
IBDC - Indian Biodiesel Corporation
CRDI - Common Rail Direct Injection
CI - Compressed Ignition

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