Castor Oil as Green Lubricant: A Review

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Abstract

Castor oil is one of the most versatile plant oils. The various grades of the oil and its derivatives are currently used in over a dozen diverse industries. In future, with the rising environmental concerns and the need for bio-based products to replace synthetic feed stocks, castor oil and castor oil oleo-chemicals have the potential to be used in many newer industries. Many derivatives and oleo-chemicals of castor oil require relatively simple methods for their production, while higher generation derivatives such as sebacic acid or salts of ricinoleic and undecylenic acid could require more sophisticated production methods. In this paper overview of various other non edible oils is carried out and attempt is made to find out the properties of different nonedible oils to compare with properties of castor oil to show the usefulness of castor oil over other nonedible oils

Keywords- *Castor oil, Nonedible oil, Jatropa, Karanja, Cotton Seed*

1. Introduction

Engine oils plays very important role in not only automobiles but also in industries. The role of engine oil is to keep the moving parts of the engine lubricated, to protect them against rust corrosion, and with modern detergent oil additives to keep them free of sludge and general engine gunk.

With the world becoming more environment conscious and with increasing replacement of synthetic products with naturally derived products, castor oil-based derivatives could find increasingly attractive markets worldwide. So because of this its need of clean environment that, used oil should be environment friendly. By considering this fact and requirements exhaustive work is going on in the field of manufacturing of oil from nonedible oils and from other compounds that can be environment friendly.

In the world India is the producer of castor oil, producing over 75% of the total world's supply. This can be used as engine oil with some adhesives. There are over a hundred companies in India small and medium which are into castor oil production, producing a variety of the basic grades of castor oil. Castor oil's unique oleochemical properties make it a potential feedstock for a variety of end applications. Castor oil is unique owing to its exceptional diversity of applications. The oil and its derivatives are used in over 100 different applications in diverse industries such as paints, lubricants, pharma, cosmetics, paper, rubber and more. Castor oil can be use in many industrial and nonindustrial applications such as: Agriculture, Plastics & rubber, Food, Cosmetics and perfumeries, Paper and Pharmaceutical, Electronics &telecommunications, Paints, inks & additives, Textile chemicals, Lubricants because of it high flash pint castor oil is useful in the field where high temperature occurs. And also because of its high oxy-rich property it will be beneficial in the vehicle engine and gear box as a lubricant.

In this paper different nonedible oil and edible oils properties are reviewed and attempt is made to compare these properties with castor oil which will be useful to manufacture good engine oil from castor

2. Performance and emissions of karanja oil and its blends in a single cylinder agricultural diesel engine.

Avinash Kumar Agarwal, K. Rajamanoharan (2009) studied the single cylinder agricultural diesel engine performance and

emissions with Karanja oil and its blends, during his study he investigated that the karanja seeds containing 30-40% oil, air dried karanja kernals have typically 19% moisture, 27.5% fatty oil, 17.4% protein, 6.6% starch, 7.3% crude fibre and 2.4% ash. Properties of karanja oil are given in table 2 [1]

Table 2: Properties of Karaja Oil[1]

Property of Kraja Oil	Conatint
Density	938
Flash point (◦C)	237
Fire point (◦C)	258
K viscosity 40 ◦C (cSt)	35.98

3. Performance and emission characteristics of a di compression ignitionengine operated on honge, jatropha and sesame oil methyl esters[3]

N.R. Banapurmath, P.G. Tewari, R.S. Hosmath (2008) worked on the experimental investigations of performance and emission of single cylinder agricultural diesel engine with jatorpha oil and its blends. They suggested that Vegetable oils are a mixture of organic compounds ranging from simple straight chain compared to complex structure of proteins and fat-soluble vitamins.[2] The honge jatropha and sesame oil are extracted from this seeds. The use of neat vegetables oils posses some problems when subjected to prolonged chains (Higher viscosity). The oil content of jatropha seedsranges from 30-40%.properties of honge, jatropha and sesame oil are as given in table 3

Table 3 : Properties of honge, jatropha and sesame oil[3]

Property	HOME	JOME	SOME
Density (kg/m3)	870	870	882
Sp. gravity	0.870	0.870	0.882
K V (c St) at 40	5.5	5.65	5.34
Flash point (1C)	170	170	170

4. Plant oils as fuels for compression ignition engines: A technical review and life-cycle analysis

A.K. Hossain, P.A. Davies (2010) carried out experimentation as plant oils as fuels for compression ignition engine a technical review and life cycle. In this paper comment is made on the plant oil and its properties also the uses of various oil as a base oil and as a derivatives their uses raises technical, economical and environmental issues.[5] A compressive review of edible and non-edible plants oils properties are given as in table 4

Table 4 : Non-edible plants oils properties[4]

Name of oil	Density	Flash point	Pour point	Ki at 27 viscosity
sunflower	918	73	-15	58.60
cottonseed	912	234	-15	50.10
Soyabean	914	254	-12.2	65.40
Corn	915	277	-40	46.30
rapeseed	914	246	-31.7	39.20
sesame	913	260	-9.4	35.50
palm	918	267	-31.7	39.60
coconut	915	-	-	31.59
jatropha	918	240	-	49.90
jojoba	863	292	-6	25.48
Rubbersee	922	198	-	33.91
Mahua	900	238	15	37.18

5. Energy efficiency applied for the performance optimization of a direct injection compression ignition (ci) engine using biofuels

Y. Azoumah, J. Blin, T. Daho (2009). Did work on the performance optimization of a direct injecton compression ignition (CI) engine using bio-fuels .The concern of this paper is to analyze the performance of cotton seed oil and palm oil in various field. During their experimental study they found the properties of cotton seed oil and palm oil which are tabulated in table 5[6]

Table 5 : Properties of cotton seed oil and palm oil

Properties	cottonseed oil	palm oil
Density(kg/m3)	921	915
viscosity 40 ◦C	38	60
Pour point (◦C)	0	31
Flash point (◦C)	243	280
Melting point (◦C	-3	23/50

6. Jatropa—the future fuel of india

R.D. Misra, M.S. Murthy (2011) Studied the future fuel of India jatropha. For their study

jatropha is small evergreen tree. Jatropha oil especially the quality of oil depends on the interaction of environment and genetics. As for the seed size, weight and oil content, oil quality it is believed that the environment condition have a larger impact than the genetics. It consist of oleic acid and linoleic acid 37-63% and 19-41%. He also found properties of jatropha oil in table 6 [7]

Table 6: Properties of jatropha oil.

Property	Jatropa oil
Density	918.8
Flash point (◦C)	186
Sp. gravity (60/60 F)	0.91
Ash content (wt%)	0.07
RI at 40◦C	1.4691
Sulphur (ppm%)	21.5
K viscosity 40 ◦C (cSt)	35.47
Molecular weight	887.7
Pour point	−6
Carbon residue (%)	0.3

7. Castor oil properties

By looking at the all above literature a study is carried out with Indian Biodiesel Corporation, Baramati, India to find out the properties of castor oil and findings of this study are tabulated in table 7 [8]

Table 7 : Properties of castor oil

Property	Content
Density	0.889
Gravity	0.88 gm/cm3
Viscosity	145 cst
Flash Point	210 0c
Pour Point	-6 0c
pH	6.8
Moisture Content	0.07
Cloud Point	below -4 0c

8. Conclusion

From the reviews of literature and study carried out at Indian Biodiesel Corporation, Baramati, India for Castor oil its is observed that castor oil with some adhesives have good potential to work out as engine oil because of its promising properties over other edible or nonedible oils. Castor oil can be used as green lubricant rather than fissile lubricant which will diminish in coming year.

10. References

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