Production, Characterization, and Performance Evaluation of Methyl and Ethyl based Biodiesels

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Biodiesel is a promising green renewable alternative fuel. The fuel either has the ability to replace the petro-diesel or can be supplemented with the pure diesel fuel. As a result using of this fuel in diesel engine can reduce the dependency on imported diesel fuel; reduce greenhouse (GHG) gas emission and the capability to reduce the apprehension of the continuous depletion of the reserves of the fossil fuels [1]. There by it may help to improve the economic status of many developing countries. The raw materials to process the biodiesel can be edible or non-edible oils [2].

The present study has intended to produce the biodiesel from waste cooking oil by one- step transesterification process. In transesterification process potassium hydroxide (KOH) is used as the catalyst and due the ability lower cost and faster reaction rate, methanol is used as the alcohol. In this investigation, Taguchi experimental design method is used to optimize the production parameters and to achieve the best quality biodiesel as the fuel. The optimum production parameters of biodiesel are estimated as (a) methanol to oil ratio is 6:1 (b) the concentration of catalyst is 1.0 wt% (c) reaction time is found 2hr and (d) the best reaction temperature is achieved as 60℃. The sample of waste cooking oil and the processed biodiesel oil fuel is analyzed using gas chromatography and yield of biodiesel fuel is 93%.

Table 1 List of compounds detected through GC-MS from biodiesel fuel sample

Peak	RT	FAME	GC-MS %yield	Compound Name	Formula
1	19.773	C_8:0	0.158	Octanoic acid, methyl ester	$C_9H_{18}O_2$
2	37.815	C_{14}:0	0.335	Methyl 12-methyl-tridecanoate	$C_{15}H_{30}O_2$
3	41.331	C_{21}:0	0.053	Methyl 9-eicosenoate	$C_{21}H_{40}O_2$
4	48.269	C_{18}:2	82.652	Methyl 9-cis,11-trans-octadecadienoate	$C_{19}H_{34}O_2$
5	49.059	C_{18}:1	8.646	Cyclopropanebutanoic acid 2-[[2-[[2-[(2-pentylcyclopropyl)methyl]cy	-
6	49.505	C_{18}:3	1.056	Cyclopropanebutanoic acid 2-[[2-[[2-[(2-pentylcyclopropyl)methyl]cy /	$C_{19}H_{34}O_2$
7	50.645	C_{20}:1	0.665	Methyl 9-eicosenoate	$C_{21}H_{40}O_2$

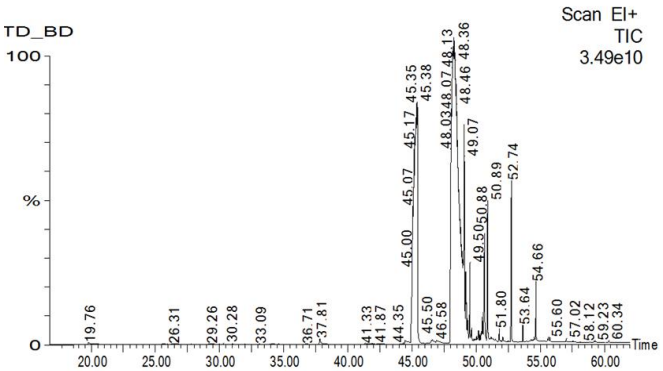

Figure 1 GC-MS of biodiesel FAMEs peaks

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