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Method article

Analysis of biodiesel by high performance liquid chromatography using refractive index detector

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GRAPHICAL ABSTRACT

ABSTRACT

High-performance liquid chromatography (HPLC) was used for the determination of compounds occurring during the production of biodiesel from karanja and jatropha oil. Methanol was used for fast monitoring of conversion of karanja and jatropha oil triacylglycerols to fatty acid methyl esters and for quantitation of residual triacylglycerols (TGs), in the final biodiesel product. The individual sample compounds were identified using HPLC. Analysis of fatty acid methyl esters (FAMES) in blends of biodiesel by HPLC using a refractive index and a UV detector at 238 nm. Individual triacylglycerols, diacylglycerols, monoacylglycerols and methyl esters of oleic, linoleic and linolenic acids and free fatty acids were separated within 40 min. Hence HPLC was found to be best for the analysis of biodiesel. Analysis of biodiesel by HPLC using RID detector. Estimation of amount of FAMES in biodiesel. Individual triacylglycerols, diacylglycerols, monoacylglycerols and methyl esters of oleic, linoleic and linolenic acids and free fatty acids were separated within 40 min.

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Materials

The standards (mixture of methyl esters) were purchased from Sigma-Aldrich Chemicals Pvt. Ltd, India.

Method details

Jatropha and Karanja oil characterisitics

The non-edible crude jatropha and karanja oils were purchased from local market and stored at 4 °C to avoid rancidity of the vegetable oil. Major fatty acid profiles of jatropha and karanja oils were given in Table 1. The characteristics of jatropha and karanja oils were determined according to the standard methods given in Table 1.

Lipase enzyme – biocatalyst

The following lipases were procured from Sigma – Aldrich Chemicals Pvt. Ltd., Bangalore: and other chemicals were listed in Table 2

- *Pseudomonas fluorescens* lipase (300 U/mg)
- *Candida rugosa* lipase (700 U/mg)
- *Rhizopus arrihizus* lipase (10.5 U/mg)
- *Aspergillus oryzae* lipase (15.5 U/mg)
- *Candida antartica* lipase (600 U/mg)

HPLC analysis for biodiesel

A High Performance Liquid Chromatographic system (HPLC Model- LC 20 AT Prominence, Shimadzu, Japan) fitted with Refractive index detector (RID-10A, Shimadzu, Japan) and millennium 32 system software was used to quantify the fatty acid methyl esters produced during reaction.

Table 1
Fatty acid profile of Jatropha and Karanja oil.

Fatty acids with (carbon atoms:double bonds)	Composition of Karanja oil (w/w of oil)	Composition of Jatropha oil (w/w of oil)
Myristic acid (14:0)	–	1.4
Palmitic acid (16:0)	10.6	15.6
Stearic acid (18:0)	6.8	9.7
Oleic acid (18:1)	49.4	40.8
Linoleic acid (18:2)	19.0	32.1
Arachidic acid (20:0)	4.1	0.4
Gadoleic acid (20:1)	2.4	–
Behenic acid (22:0)	5.3	–
Lignoceric acid (24:0)	2.4	–