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Preliminary Phytochemical Evaluation of the Oil Extracted from Leaves of Curcuma longa L. and its Application as Biofuel

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ABSTRACT

Turmeric leaves are the waste product for farmer after removing turmeric rhizome. In the present work the oil was extracted from the leaves of *Curcuma longa* L. (Family - Zingiberaceae) by hydro distillation method. The extracted oil was studied for preliminary physicochemical and phytochemical tests. The phytochemical evaluation of the turmeric leaf oil indicated the presence of terpenes. Extracted turmeric leaf oil was used to run two stroke and four stroke engine. Engine eliminates less environment harmful product with turmeric oil as compared to Petrol. It has been concluded that turmeric leaf oil can be used as an alternative biofuel for Petrol.

Key Words: BioFuel, Leaf oil, *Curcuma longa*, Zingiberaceae, Terpenes, Distillation

INTRODUCTION

Turmeric (*Curcuma longa*) is a rhizomatous herbaceous perennial plant belongs to the family Zingiberaceae¹. Turmeric is known worldwide for its multipurpose use in medicine, cosmetics, food flavoring and textile industries. Several pharmacological activities of turmeric like anti-inflammatory, hepato-protective, antimicrobial, wound healing, anticancer, anti-tumour and antiviral properties have been reported in the literature^{2,3}. The essential oil of turmeric rhizome has been studied in detail by a number of workers and the main constituents were ar-turmerone, turmerol and atlantone^{4,5}. Leaves of *Curcuma* species are waste product during post harvest operations⁶. The present investigation deals with extraction oil from the leaves of *Curcuma longa* L. collected from the District Bhandara, its preliminary phytochemical evaluation and application as biofuel.

MATERIAL AND METHODS

Plant Material

Fresh leaves of turmeric were collected from Pavani Taluka of Bhandara District, Maharashtra in the month of January and February. The plant specimen was authenticate by Dr. Rajendra D. Shinde ,Associate Professor , Department of Botany, St. Xavier's College, Mumbai - 400 001 as *Curcuma Longa* L. (Family: Zingiberaceae). The plant specimen matches with the Blatter Herbarium specimen no. B.R. – 469 of B. Rukmini Bai.

Chemicals and Reagents

All the chemicals and reagents used were of LR grade.

Instruments

Distillation unit (Make: CIMAP- SIR, Capacity: 1 ton), Abbes Refractometer, Two stroke engine and four stroke engine.

Extraction of oil from leaves *Curcuma longa* L.

Fresh leaves were collected, cleaned and cut into small pieces. Leaves were kept on perforated bottom of the distillation unit below which sufficient quantity of water was charge as extracting solvent. The water was heated at about 100°C and the generated steam was passed under pressure through the leaves. The extracted oil along with steam was condensed & collected in the receiver. The mixture was cooled & allowed to stand for some time to separate the oil & water layer. After complete separation of layers, the oil was separated and yield was calculated. (Yield = 1%v/w)

Preliminary Phytochemical Evaluation of the oil

Color & odor of the oil was noted. The solubility of oil was performed in various solvents such as ethanol, chloroform, benzene, toluene and hexane. The specific gravity was determined using Pycnometer. The refractive index of the oil was found out by Abbes Refractometer.

The extracted oil was evaluated for the presence of different phytoconstituents such as alkaloids, glycosides, terpenes, steroids, carbohydrates, proteins, tannins and saponins using standard reagents^{7, 8}.

Application as Biofuel

The extracted oil was used as fuel to run both two stroke as well as four stroke engines in bike. The performance of the oil as fuel was compared with petrol in the same bike. Pollution under control (PUC) analysis was done for turmeric oil as well as petrol in the same bike.

RESULT AND DISCUSSION

The results of preliminary physicochemical & phytochemical evaluation are summarized in Table-1, 2. The preliminary phytochemical screening suggested the presence of terpenes in the extracted oil.

The turmeric leaf oil is giving the same engine performance compared with petrol i.e. it burn completely and clearly in engine at which the petrol burns. The spark plug faces the problem of carbons deposition many times which has been found reduced with the use turmeric leaf oil.

Pollution under control (PUC) certificate (Fig.1) issued by Maharashtra Motor Vehicle Department mentions the carbon monoxide and hydrocarbon quantity eliminated by the vehicle. The quantity of carbon monoxide and hydrocarbon emitted after using petrol as fuel was 0.41% and 390PPM respectively where as in the same bike the quantity of carbon monoxide and hydrocarbon emitted after using turmeric leaf oil as fuel was 0.39% and 70PPM respectively. This indicated that turmeric leaf oil produces less pollution as compared with petrol when used as fuel for bike.

CONCLUSION

The turmeric leaf oil is very cost effective since it is obtained from the leaf which is waste product for farmers after collection of rhizomes and the solvent required for the extraction is water. Secondly, turmeric leaf oil is less flammable, less volatile and can be safely stored at room temperature. Thus turmeric oil can be used an alternative biofuel for Petrol. The more efforts and scientific studies need to be carried out to increase the yield of oil & explore its application as biofuel.

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TABLES AND FIGURES

Table-1: Physicochemical evaluation of turmeric leaf oil

Parameter	Result
Colour	Pale yellow
Odour	Characteristic
Solubility	Soluble in ethanol, chloroform, benzene, toluene and hexane
Specific gravity	0.8505
Viscosity (At Room Temperature)	0.00876 poise
Refractive Index	1.51

Table - 2: Preliminary phytochemical screening of turmeric leaf oil

Serial No.	Test performed	Result
1.	Alkaloid	
a)	Dragendorff's test	--
b)	Mayer's test	--
c)	Wagner's test	--
d)	Hager's test	--
2.	Carbohydrates	
a)	Molish's test	--
b)	Fehling's test	--
c)	Benedict's test	--
3.	Glycoside	
	Borntrager's test	--
4.	Tannin and phenolics compounds	
a)	Ferric chloride test	--
b)	Lead acetate test	--
5.	Phytosterol	
	Liebermann Buchard test	--
6.	Saponin	
	Foam test	--
7.	Terpenes	
	Vanillin-Sulphuric Acid Test	+

“+” = Present,

“--” = Absent



For Petrol

For Turmeric oil

Fig.1: PUC Certificate

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