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A study on Seasonal Variation of Hydrocarbon content and its relationship with Chlorophyll in *Euphorbia hirta* and *Ricinus communis*

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Abstract

Petroleum fuels, such as gasoline, diesel, and jet fuel, contain a complex mixture of hydrocarbons (molecules of hydrogen and carbon), which are burned to produce energy. Hydrocarbons can also be produced from biomass sources through a variety of biological and thermochemical processes.The seasons in the present study were based on climatological data of the year starting from February, 2018 to January, 2019. The year was divided into high light period / summer / dry period (February / July) and low light period/ winter/wet period august- January).In *Ricinus communis* the hexane (11.50) methanol (17.60) and total (29.10) extractables were maximum during the month of December.The maximum yield with hexane extractables (6.20) and methanol extractables, (16.00) were recorded at 65o C in *Euphorbia hirta* during the month of May. The yield of organic extractables were comparatively high during the period from August 2018 to January 2019.

Keywords: *Bio-energy ,Energy plantations ,bio-fuels,hydrocarbon content in Euphorbiaceae plants and its relationship with chlorophyll*

1. Introduction

In looking for new energy sources, attention is naturally being focussed on biomass, which, as a reliable and continuous renewable resource, can make a significant contribution to satisfying the needs of society of energy (Ruiz-Altisent, 1994). Some species of these families which accumulate the photosynthetic product (hydrocarbon) of high molecular weight are better source of energy Dubey (1993).

One of the largest genera of flowering plants is Euphorbia with approximately 2,000 species. This enormous genus belongs to the very diverse Euphorbia Family (Euphorbiaceae) with at least 7,500 species. The variation within this genus is astonishing, from low-growing garden weeds called spurges to giant, cactus-like succulents that rival in size our North American sahuaro and organ-pipe cacti. South African euphorbias have evolved succulent, spine-covered stems that greatly resemble North American cacti, a biological phenomenon known as convergent evolution.Vegetable oils are the most acceptable alternative to solve the declining global supply of fossil fuels

. They are considered as first generation biofuels and have been used as primary raw materials. In comparison with conventional diesel, biodiesel combustion reduces emission of greenhouse gases as follows: 100 % sulfur dioxide, 48 % carbon monoxide and 47 % particles (Caye et al. 2008). However, biofuels may face some constraints: They are required in refined forms to obtain diesel of quality, and some are also foodstuffs. Biofuels have been produced from crops such as rapeseed, soybean, sunflower, coconut and palm oil (Okullo et al. 2012).

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Jatropha and *Ricinus communis(R. communis*) both producing non-edible plant oil provide a better economical alternative (Deligiannis et al. 2009), and using pressing and extractionmay offer vegetal oils. These can also be used as bio-oil (fuel without transesterification) which can then being completely biodegradable (Boza and Saucedo 2011).

2. Aim of the study

An attempt was made in the present study to assess the hydrocarbon content and its relationship with chlorophyll in ***Euphorbia hirta*** and ***Ricinus communis.***

3. Methodology

The seasons in the present study were based on climatological data of the year starting from February, 2018 to January, 2019. The year was divided into high light period / summer / dry period (February / July) and low light period/ winter/wet period august- January). During the present study the plants ***Euphorbia hirta*** and ***Ricinus communis*** were screened for the organic extractables using hexane-methanol extraction procedure (ashwani kumar, 1995). Estimation of chlorophyll A, chlorophyll B, and total chlorophyll were done following (Sadasivam and Manikam, 1992)

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4. Results

The ambient temperature during the course of the study was between 29 to 40^{o} C. The temperature of water was between 28-29^{o} C. the solar insolation around 12.00 h was between 6.20 and 960 wm – 2. The soil pH was 7.5 and electrical conductivity was 0.68 mm hos/cm.

Table – 1.
Showing monthly yield of (hydrocarbons) organic
Extractables, percent dry weight & chlorophyll of *Euphorbia hirta*

Month	Plant weight (g)		Percent Dry Weight (%)	Organic extractables(% dry weight basis)			Extraction Temperature (^{0}C)	Cholophyll (mg/g) weight basis (Fresh weight)		
	Fresh			Hexane(ml)	Methane (ml)	Total (ml)		Chl a	Chl b	Chl c
February	80	8.90	11.12	2.00	3.10	5.10	65	0.80	0.40	1.20
March	94	11.75	12.50	2.45	3.80	6.25	65	1.20	0.50	1.70
April	120	15.20	12.66	4.65	9.95	14.60	65	1.24	0.54	1.78
May	148	18.00	12.16	6.20	16.00	22.2	65	1.30	0.70	2.00
June	165	18.10	10.90	4.45	7.25	11.70	65	2.00	1.20	3.30
July	260	32.00	12.30	4.15	4.50	8.65	65	2.10	1.20	3.30
August	290	39.00	13.44	5.00	5.60	10.60	65	2.46	2.00	4.46
September	340	45.00	13.23	5.20	6.10	11.30	65	2.60	2.40	5.00
October	365	56.00	15.34	6.10	7.20	13.30	65	2.70	2.52	5.34
November	380	60.00	15.78	7.30	7.40	14.70	65	2.78	2.56	5.34
December	425	67.00	15.76	7.90	10.10	18.00	65	2.82	2.64	5.46
January	450	69.00	15.33	6.10	7.00	13.10	65	2.90	2.68	5.58

Considerable difference were recorded in percent dry weight and hydrocarbon yield in various samples analysed at different months. The percent dry weight ranged from 11.12% (February) to 15.78% (November). The maximum yield with hexane extractables (6.20) and methanol extractables, (16.00) were recorded at 65^{o} C in *Euphorbia hirta* during the month of May. The yield of organic extractables were comparatively high during the period from August 2018 to January 2019. The percent dry weight ranged from 13.23% to 15.78%. total extractables were high in the month of December. The chlorophyll a & b content (2.90 mg/g) maximum during the month of January 2018. Hence, positive increase was observed in percent dry weight and organic extractables.

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Table – 2
Showing monthly yield of (hydrocarbons) organic
Extractables, percent dry weight & chlorophyll of *Ricinus communis L*

Month	Plant weight (g)		Percent Dry Weight (%)	Organic extractables(% dry weight basis)			Extraction Temperature (^{0}C)	Cholophyll (mg/g) weight basis (Fresh weight)		
	Fresh			Hexane(ml)	Methane (ml)	Total (ml)		Chl a	Chl b	Chl c
February	75	6.50	8.66	3.40	6.00	9.40	65	20.585	16.228	36.813
March	94	10.92	11.61	4.00	6.70	20.730	65	20.730	16.985	37.715
April	144	13.00	9.02	4.50	6.80	11.30	65	21.070	16.987	38.057
May	157	13.50	8.59	5.00	7.00	12.00	65	22.520	17.012	39.532
June	168	14.00	8.330	6.70	7.00	13.70	65	22.152	17.817	39.969
July	198	17.00	8.58	7.00	7.80	14.00	65	21.275	18.915	40.190
August	215	17.50	8.13	8.00	7.90	15.90	65	22.150	18.920	41.070
September	224	18.90	8.43	8.60	12.00	20.60	65	22.215	18.970	41.185
October	238	19.20	8.06	8.90	13.50	22.40	65	22.270	19.982	41.252
November	249	20.40	8.19	9.70	15.00	24.70	65	22.160	19.100	41.260
December	264	24.50	9.28	11.50	17.60	29.10	65	22.370	19.215	41.585
January	-	-	-	-	-	-	-	-	-	-

In ***Ricinus communis*** the hexane (11.50) methanol (17.60) and total (29.10) extractables were maximum during the month of December. The chlorophyll content also was minimum and total chlorophyll were 0.80 mg/g, 0.40mg/g and 1.20mg/g respectively. The chlorophyll a, chlorophyll b, total chlorophyll contents and total extractables (29.10) were high during December. In summary, ***Euphorbia hirta*** and ***Ricinus communis*** appear to offer an opportunity for the development of whole plant utilization crop based on multiple products like liquid hydrocarbons and carbohydrates.

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