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Physiochemical Analysis of Oil Extract from Ricinus Communis and Study of their Fatty Acids

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***Abstract:** This study focuses on the extraction and characterization of oil from Ricinus communis, a plant known for its industrial and medicinal significance. Lipids, primarily composed of fatty acids, exhibit diverse structural and functional properties. The oil was extracted using Soxhlet apparatus and analyzed using standard physicochemical methods. Fatty acids were isolated and converted into methyl esters for detailed analysis. The oil content (40%) indicates a high potential for industrial applications. The protein content (21.5%) suggests possible use in processed by-products. A high iodine value (134) reflects significant unsaturation, making it suitable for lubricants and coatings. Overall, castor oil is more suitable for industrial and technical applications rather than direct edible use.*

I. INTRODUCTION

Lipids are organic compounds initially defined by their insolubility in water and solubility in organic solvents, but now are considered derivatives of fatty acids. Fatty acids are the basic units of all lipids and occur naturally in small amounts in tissues. Global production and consumption of vegetable oils have increased significantly, especially in countries like India. These oils are widely used in food, pharmaceutical, cosmetic, and industrial sectors. However, rising demand, industrial use, and biofuel production have created a gap between supply and demand. Fats are essential for energy and biological functions like hormone synthesis, yet actual intake is below recommended levels. Therefore, there is a need to increase indigenous production and explore new plant sources of oils.

Fatty acids are essential components of lipids found in plants and animals, showing wide diversity due to environmental factors. They are usually straight-chain compounds with even-numbered carbon atoms, though odd-numbered ones occur in microorganisms. Their chain length ranges from 2–80 carbons, commonly 12–24, and they are classified as short, medium, and long chain. Fatty acids are categorized based on unsaturation, branching, rings, and functional groups. Straight-chain fatty acids include saturated, monoenoic, polyenoic, and acetylenic types, with or without substituents like hydroxy or keto groups. Branched-chain fatty acids contain one or more (branches) with variations like methoxy or hydroxy groups. Ring-containing fatty acids include cyclopropane, cyclobutane, and other cyclic structures. Overall, fatty acids exhibit great structural diversity leading to varied chemical and biological properties.

II. MATERIAL AND METHOD

A. Ricinus Communis

The castor plant(seed) (*Ricinus communis* L.) has been known since time immemorial in traditional medicine in the pharmacopeia of Mediterranean and eastern ancient cultures. Moreover, it is still used in folk medicine worldwide. Castor bean has been mainly recommended as anti-inflammatory, anthelmintic, anti-bacterial, laxative, abortifacient, for wounds, ulcers, and many other indications.

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B. Extraction of Oil

The seed samples were collected from different sites especially grown in arid zone area; and authenticated by taxonomists. After proper cleaning, drying and weighing an exact amount of seeds were soxhlet - extracted with petroleum ether (40° - 60°C) and the solvent was evaporated under vacuum using rotary evaporator. The analytical value of oils and seeds was determined according to the procedure recommended by American oil chemical society. This was followed by simultaneous determination of moisture content. The result were reported as percentage calculated to a specified moisture basis and are summarized in (Table-I).

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Identification and analysis of oils:
Refractive Index :- The refractive indices were recorded on Abbe Refractometer.
Melting point :- The most commonly used method entails the recording of the first and the last visual stage of melting at constant rate of heating. Melting points were observed on a Kofler apparatus and are uncorrected.

C. Preparation of mixed fatty acids from Oils

The fraction of fatty acid was obtained by hydrolysis of the fat. All the oil samples were tested for the presence of epoxy function, hydroxy function, carbonyl component and cyclopropenoid moiety. The sequence that leads to the separation of fatty acid from oil sample is shown in flow diagram which includes following steps:

- 1-1.5 g of oil sample, 25ml ethanol and 3-5ml of 0.5N alcoholic KOH were taken in flask and refluxed for 1 hour.
- Excess of solvent removed after completion of the reaction, the progress of the reaction was continuously monitored with the help of thin layer chromatography. The reaction contents were diluted by 50ml distilled water.
- The mixture contained saponified and unsaponified matter. the saponified matter was removed by repetitive washing with diethyl ether in a separating funnel. The organic layer was taken in a weighed beaker to know percent of unsaponified matter.
- The remaining aqueous solution, which contained sodium salt of acid, was then hydrolysed with 6N HCI.
- Mixture of fatty acid (Mixed Fatty Acid (MFA)) was then extracted using diethyl ether. The combined ether extract was washed with distilled water and dried over anhydrous sodium sulphate. Solvent was allowed to evaporate and MFA was stored in a cool dry place.

D. Derivatization of fatty acid

The fatty acid methyl ester (FAME) was prepared from the oil as described earlier following acid - catalysed trans- esterification. The flow chart depicting the derivatisation of the MFA to methyl ester is, as shown in the flowchart:

E. Preparation of Methyl Esters

The fatty acids methyl esters were prepared by trans-esterification of oil (1g) in 50 ml of absolute methanol that contain 1% Sodium methoxide. The reaction was allowed to proceed by refluxing for 20 min, the methyl ester were extracted with ether as usual and examined quantitatively by various TLC techniques prior to GLC analysis, using **Sterculia foetida** esters as reference standard.

F. Determination of Saponification Number/ Saponification Value

50 ml of 4% alcoholic solution of Potassium Hydroxide was taken along with accurately weighted oil sample under air condenser. The contents were refluxed till the oil sample became set and completely saponified. After cooling the mixture, it was titrated against 0.5N NaOH using Phenophthalein as an determination was also carried out along side.

If V_b = Volume of 0.5N HCI required for blank titration.
V_s = Volume of 0.5N HCI required for the sample.
N= Normality of acid used.
W=Weight of sample used.

Then, S.V.= $56.1x(V_b-V_s)$ x N/W.

G. Determination of Iodine Value

Wij's method was used to determine iodine number. Wij's solution was readily prepared by direct interaction of chlorine or bromine with iodine in acetic acid (7.8g Iodine trichloride + 8.5g iodine). This reagent has a good shelf life and it was kept in dark in K stoppered bottles.

The determination was made by weighing the requisite amount of sample in a clean 500ml round bottomed flask, to which 25ml of Wij's solution and 25ml of carbon tetrachloride was added. The flask was stoppered and left in dark for 30 minutes. After this, 20ml of 15% KOH solution and 100ml of water were added to the solution. The liberated iodine was then titrated with 0.1 N Sodium thiosulphate solution using freshly prepared 1% solution of starch as an indicator. A blank determination was also carried aside.If V, and V, are the respective volume of the titrants used in blank and sample titration. N is the normality of the thiosulphate solution; and w is the weight of sample in grams.

Then, I.V. =$12.69(V - V_3)$ X N/W

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H. Determination of Unsaponifiable Matter:

2-2.5 g material was accuratelyweighted in 250 ml flask. 25 ml of 0.5 N alcoholic Potassium hydroxide solution was added and the fat was saponified by refluxing on a water bath for one hour. Afterwards the contents were transferred to a separating funnel, the flask rinsed first with 50 ml water and then with 50 ml ether. The funnel was then shaken vigorously and allowed to settle until the two layers separated. The ethereal layer was then poured into a weighed beaker. The aqueous alcoholic soap was extracted twice more by ether portions. From the collected solution, ether was evaporaand 2.0 ml acetone was added which was then mixed with 10 ml neutral alcohol and titrated with 0.1N alcoholic NaOH solution. A blank determination was also carried out.

Weight of fatty acid in unsaponifiable matter:

B = 0.0282 X V X N (1ml of 0.1N alcoholic solution and 0.282g acid)

V = Volume of standardized NaOH solution

N= Normality of standardized NaOH solution

Percent unsaponifiable matter: = (A-B)\times100/W

A=Weight of residue

B= Weight of fatty acid in the extract

W=Weight of material taken for test.

I. Determination of Protein Content

To determine protein content of defatted seeds Kjeldahl method was used. This method involves taking 0.7-2.2 g exactly known weight of seed sample in a digestion flask along with 0.7 g HgO, 15 g anhydrous sodium sulphate and 25ml conc. H2SO4. The mixture was gently heated till frothing ceased and then boiled briskly for two hours till the solution became clear. The contents were cooled and 200 ml of water and 50ml of 4% potassium sulphide solution were added along with a few pieces of zinc granules. The reaction contents were made strongly alkaline by adding 10ml of 40% NaOH solution. The flask was immediately connected to the digesting bulb and the tip of the condenser was kept immersed in the standard solution of 50ml of 0.2N HCI solution. The reaction mixture was heated until all ammonia was distilled. The receiver was removed and tip of the condenser was washed, the excess standard acid in the distillate was titrated with standard 0.1 N NaOH using methyl red as an indicator. A blank determination was also carried out under identical situation.

$N\% = (V_1 \times N_1 - V_2 \times N_2) \times (1.4007) / W$

Where, V_1 = Volume of standard HCI solution

V_2 = Volume of standard NaOH solution

N_1 = Normality of HCI solution

N_2 = Normality of NaOH solution

W = weight of the sample taken in grams.

Percent Protein = %N x 6.25

Ricinus Communis

Oil & Soap

Unsaponified Soap

Esterification

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Table 1
Physiochemical Properties of oil extracted from *Ricinus communis*

Name &family	Oil%	Protein% N x 6.25	Moisture%	I.V. Wij's	S.V.	R.I.
Ricinus communis	40%	21.5	1.02	134	134	1.4621

III. RESULTS AND DISCUSSION

The data for *Ricinus communis* indicates that it is a rich source of oil with a high oil content of 40%, making it highly suitable for industrial oil extraction. The moderate protein content (21.5%) adds some nutritional value, particularly for non-edible applications like animal feed after processing. The low moisture content (1.02%) suggests good storage stability and reduced risk of spoilage. A high iodine value (134) reflects a greater degree of unsaturation, which is important for applications such as lubricants, coatings, and chemical industries. The saponification value (134) indicates the presence of relatively longer-chain fatty acids compared to oils with higher S.V., making it suitable for specific industrial uses like soap and surfactant production. The refractive index (1.4621) confirms its characteristic composition and helps in quality control. Overall, *Ricinus communis* oil is more suited for industrial and technical applications rather than direct edible use.

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REFERENCES

[1] Bansal, S.K., Singh, K.V. and Sherwani, M.R.K., J. Environ. Biol., 30 (50): 883-888 (2009).
[2] Bansal, S.K., Singh, K.V. Sharma, S and Sherwani, M.R.K., J. Environ. Biol., 32: 7175 (2011).
[3] Sherwani, M.R.K., Mathur, A., Afreena and Sharma, R., JLST, 41 (3): 95-97 (2009).
[4] Sherwani, M.R.K., Mathur, A., J. Med. and Aro. Plant Sci., 28: 216-218 (2006).
[5] Deora, M. A., Jaiswal, P., Mathur, A. and Sherwani, M.R.K., J. Ind. Chem. Soc., 80: 141-142 (2003).
[6] Garg, S.P., Sherwani, M.R.K. and Arora, A., J. Oil Tech. Assn. Ind., July- Sept, 63 (1987).
[7] Official and Tentative Methods of the American Oil Chemists Society Vol. I, 3rd Ed. AOCS, Champaign, Illinois, (1971).
[8] Basniwal P.K., Suthar M., Rathore G.S., Gupta R., Kumar V., Pareek A. and Jain D., Natural Product Radiance, 8:483 (2009).
[9] Kumar G., Banu G.S., Murugesan A.G. and Pandian M.R., J. Appl. Biomed., 5:97 (2007).

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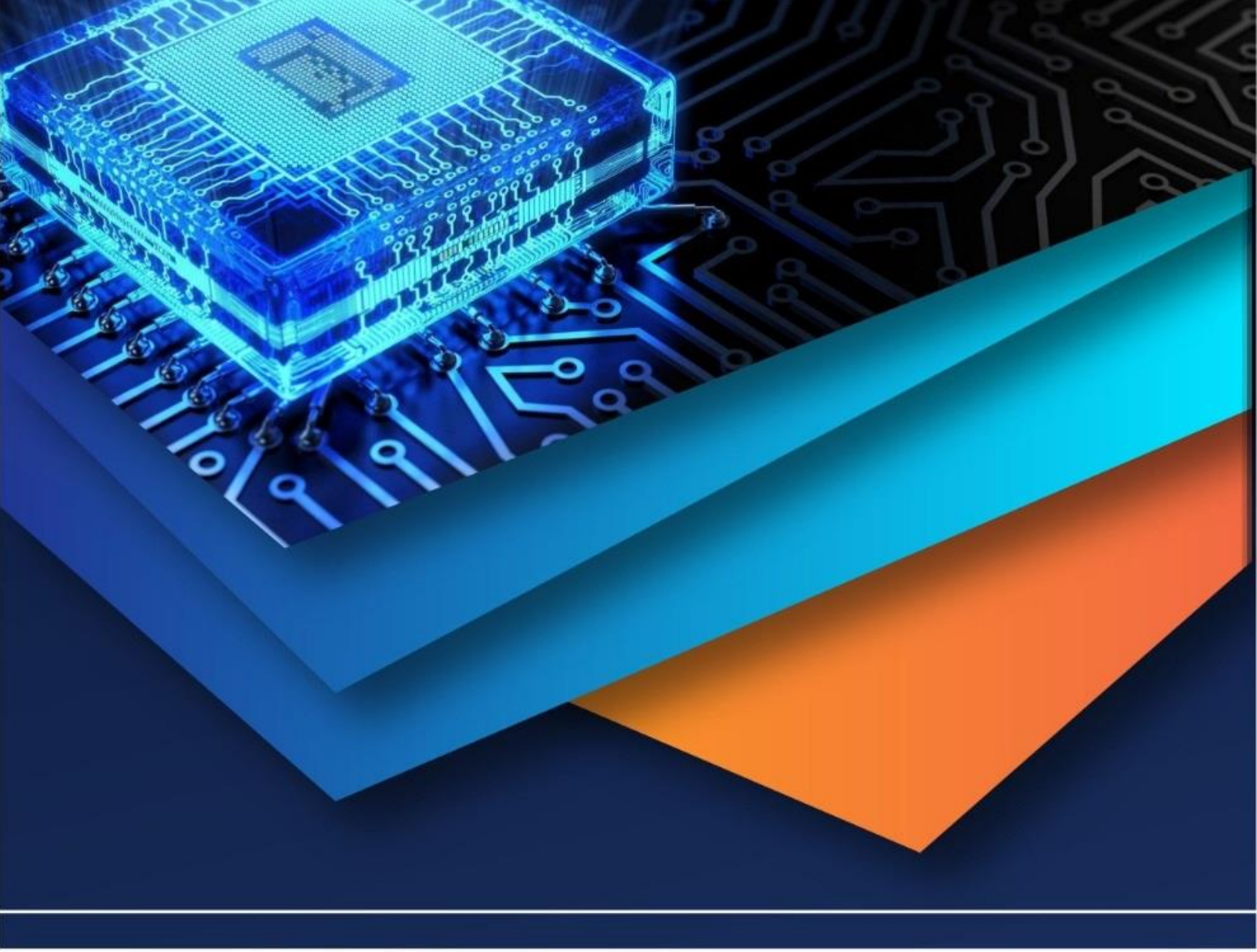

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