



KOLHAPUR

A PROJECT -REPORT

ON

“Study Of Qualitative Test For Lipids”

SUBMITTED BY

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SUBMITTED TO,

VIVEKANAND COLLEGE, KOLHAPUR

(AN EMPOWERED AUTONOMOUS INSTITUTE)

(DEPARTMENT OF BOTANY)

THE YEAR

2024-2025

UNDER THE GUIDANCE OF

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“Education for Knowledge Science and Culture”

- Shikshan Maharshi Dr Bapuji Salunkhe

‘Shri Swami Vivekanand Shikshan Sanstha’

Vivekanand College, Kolhapur,

(An Empowered Autonomous Institute)

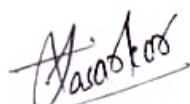
Department of Botany


Certificate


This is to certify that **Pratibha Varun Kamble & Owes Amjadhusen Momin** has satisfactorily carried out her/his project report as per the syllabus prescribed by Department of Botany Vivekanand College (An Empowered Autonomous Institute) for B.Sc.- III Botany. This project report represents his/her Bonafide work during academic year 2024-2025.

Place: Kolhapur

Date: 04/03/2025


04-03-25


06-03-25


HEAD
04-03-25
DEPARTMENT OF BOTANY
VIVEKANAND COLLEGE, KOLHAPUR
(EMPOWERED AUTONOMOUS)

Dr. Abhijeet R. Kasarkar

ACKNOWLEDGEMENT

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We are grateful to all teachers for their valuable suggestions during my project work.

We are also thankful to the non-teaching staff members who helped us to carry out project satisfactorily.

DECLARATION

I hereby declare that the project work entitled "**Study Of Qualitative Test for Lipids**" submitted to the Vivekanand College for the award of the degree of "Bachelor of Science, Botany" is the result of Bonafide work carried out by me under the guidance of Dr. Abijeet R. Kasarkar Sir.

I further declared that the results presented here have not been the basis for the award of any other degree.

Place: - Kolhapur

Date: - 04/03/2025

Miss. Pratibha Kamble

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INTRODUCTION

The lipids are a heterogeneous group of compounds, including fats, oils, steroids, waxes, and related compounds, which are related more by their physical than by their chemical properties. Lipids are a class of compounds distinguished by their insolubility in water and solubility in nonpolar solvents. Lipids are important in biological systems because they form the cell membrane, a mechanical barrier that divides a cell from the external environment. Lipids also provide energy for life and several essential vitamins are lipids.

Lipids can be divided in two major classes, non-saponifiable lipids and saponifiable lipids. A non-saponifiable lipid cannot be broken up into smaller molecules by hydrolysis, which includes triglycerides, waxes, phospholipids, and sphingolipids. A saponifiable lipid contains one or more ester groups allowing it to undergo hydrolysis in the presence of an acid, base, or enzyme. No saponifiable lipids include steroids, prostaglandins, and terpenes. Within these two major classes of lipids, there are several specific types of lipids important to life, including fatty acids, triglycerides, glycerophospholipids, sphingolipids, and steroids. Each of these categories can be further broken down. Nonpolar lipids, such as triglycerides, are used for energy storage and fuel. Polar lipids, which can form a barrier with an external water environment, are used in membranes. Polar lipids include glycerophospholipids and sphingolipids. Fatty acids are important components of all of these lipids.

Oil is a viscous liquid that is typically flammable and hydrophobic (does not mix with water). It can be derived from various sources and used for different purposes.

Constituents of Oil: -

Oil is a complex mixture of various chemical compounds, primarily composed of hydrocarbons along with some non-hydrocarbon components. The main constituents of oil include:

1. Hydrocarbons (Primary Component) –

- i. Alkanes (Paraffins): Saturated hydrocarbons (e.g., methane, ethane, octane)
- ii. Cycloalkanes (Naphthene's): Saturated cyclic hydrocarbons
- iii. Aromatic Hydrocarbons: Contain benzene rings (e.g., benzene, toluene)

2. Non-Hydrocarbon Components-

- i. Sulfur Compounds: Hydrogen sulfide (H_2S), mercaptans, thiophenes
- ii. Nitrogen Compounds: Pyridines, quinolines
- iii. Oxygen Compounds: Phenols, carboxylic acids
- iv. Metals: Trace amounts of nickel, vanadium, iron

3. Resins & Asphaltenes-

- i. Heavy molecular weight compounds responsible for viscosity and stability.
- ii. The exact composition of oil varies based on its source (crude oil, vegetable oil, essential oils, etc.).

Types of Oil: -

- Cooking Oil (Edible Oil)
- Medicinal & Carrier Oil
- Groundnut Oil
- Cotton Seed Oil
- Olive Oil
- Castor Oil
- Sunflower Oil
- Mustard Oil
- Almond Oil
- Coconut Oil
- Pongame Oil
- Sesame Oil

Importance of oil: -

Oils are a type of fat that is liquid at room temperature and can be used in cooking. Dietary fats are essential for increasing the amount of energy your body produces and for promoting cell

growth. They even aid in the protection of your organs as well as the preservation of your body's moisture.

All types of seed oil importance are given below:

1. Cotton seed oil:

- i. Cottonseed oil has many health benefits, including improving heart health, reducing inflammation, and protecting skin.

2. Almond oil:

- i. Almond oil has many uses, including for skin, hair, and overall health

3. Groundnut oil:

- i. Groundnut oil is important for cooking and has many health benefits.
- ii. Sautéing and stir-frying
- iii. Groundnut oil's moderate smoke point enhances the natural flavors of vegetables and meat without overpowering them.
- iv. Deep frying
- v. Groundnut oil's ability to retain flavors makes it ideal for frying snacks like samosas or pakoras

4. Olive oil:

- i. Olive oil has many health benefits, including reducing inflammation, lowering cholesterol, and protecting against heart disease and cancer. It's a key part of the Mediterranean diet, which is known for its heart health benefits. Health

5. Castor oil:

- i. Castor oil is a vegetable oil that has many uses, including as a laxative, moisturizer, and treatment for skin conditions. It's also used in manufacturing, food, and pharmaceuticals.

6. Sunflower oil:

- i. Sunflower oil is important because it's a healthy cooking oil that contains vitamin E and polyunsaturated fats. It can also be used on the skin.

7. Mustard oil:

- i. These healthy fats play a crucial role in supporting overall well-being, promoting heart health, and reducing inflammation. Additionally, mustard oil contains significant amounts of vitamin E, vitamin K, and small quantities of vitamin A, which are

essential for various bodily functions and help support healthy skin.

8. Coconut oil:

- i. It has a moisturizing effect when applied to the skin. People commonly use coconut oil for eczema and growth in premature infants. It's also used for psoriasis, obesity, breast cancer, heart disease, MS, and many other conditions, but there is no good scientific evidence to support these uses.

9. Pongame oil:

- i. Pongamia pinnata used as green manure, wood, animal fodder and also used a biofuel contains around 40% oil.
- ii. Tree tolerant to drought, salinity and heavy metal in soil and has potential to mitigate climate change.
- iii. Additionally, pongamia oil has medicinal properties, can be used to soa produce, as a source of edible grade vegetable oil Seed can also be used as a source of bioenergy, food and feed protein and food for plants and the flower are good source of pollen and nectar help for bee farming.

10. Sesame oil:

- i. Sesame seed oil is often used to sauté meats and vegetables or is added to dressings and marinades. Sesame oil is believed to have some important health benefits, like providing heart-healthy fats, combating inflammation, and protecting skin from sun damage.

Definition Of Lipids:

Lipids are a diverse group of organic molecules that are insoluble in water but soluble in nonpolar solvents. They include fats, oils, waxes, phospholipids, and steroids. Lipids play essential roles in energy storage, cell membrane structure, and signaling processes in living organisms.

• Types of lipids: -

Lipids in botany include fatty acids, glycolipids, glycolipids, and polyketides.

Fatty acids:

The simplest type of lipid, made up of long chains of carbon atoms with hydrogen atoms attached Saturated fatty acids have no double bonds between their carbon atoms, while unsaturated fatty acids have one or more double bonds Unsaturated fats or oils are usually of plant origin.

Glycerolipids:

Consist of glycerol molecules bound to one or more fatty acid chains Glycerolipids are essential for energy storage in plants

Glycolipids:

Lipids with a carbohydrate attached by a glycosidic (covalent) bond Glycolipids maintain the stability of the cell membrane.

Polyketides:

Made by polymerization of acetyl and propionyl subunits using enzymes Polyketides form a large number of secondary metabolites and natural products from plant sources.

Importance of lipids: -

Lipids are essential biological molecules that play crucial roles in the body. Their importance includes:

1) Energy Storage –

Lipids store more energy per gram than carbohydrates, making them the primary long-term energy reserve in the body.

2) Cell Membrane Structure -

Phospholipids and cholesterol are key components of cell membranes, helping maintain structure and fluidity.

3) Insulation and Protection –

Fat acts as an insulator, maintaining body temperature, and cushions organs to protect them from mechanical shock.

4) Hormone Production –

Steroid hormones (like testosterone, estrogen, and cortisol) are derived from lipids, regulating various physiological functions.

5) Vitamin Absorption –

Lipids help absorb fat-soluble vitamins (A, D, E, and K), which are vital for different bodily functions.

6) Signaling and Communication –

Some lipids act as signaling molecules (e.g., prostaglandins) that regulate inflammation, blood pressure, and other processes.

7) Brain and Nervous System Function-

Lipids, such as myelin, insulate nerve cells to enhance signal transmission in the nervous system.

8) Digestion –

Bile acids, derived from cholesterol, help break down dietary fats for digestion and absorption in the intestine.

Lipids are essential for survival, but maintaining a balance is key, as excessive lipids can lead to health issues like obesity and cardiovascular diseases.

Aims & Objectives

Aim – To Study of Qualitative Tests for Lipids.

Objective –

- To identify the presence of lipids in a given sample using qualitative tests.
- To understand the physical properties of lipids, such as solubility and emulsification.
- To perform specific chemical tests (e.g., Sudan III test, grease spot test, acrolein test) to detect lipids.
- To differentiate lipids from other biomolecules based on their unique reactions.

- To observe the staining and emulsification behavior of lipids in different solutions.
- To study the role of lipids in biological systems through qualitative analysis.

Materials: -

- Oil Sample
- Groundnut Oil
- Cotton Seed Oil
- Olive Oil
- Castor Oil
- Sunflower Oil
- Mustard Oil
- Almond Oil
- Coconut Oil
- Pongame Oil
- Sesame Oil

Chemicals: -

- 5% Sodium bicarbonate
- 50% alcohol
- Sudan III
- Chloroform

Glassware: -

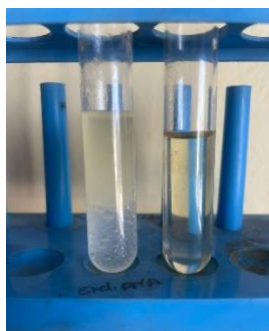
- Test tube
- Test Tube holder
- Beaker

- Pipette
- Spirit lamp

Methods: -

• Solubility Test

Test	Observation	Inference
i. 3ml Oil sample + 3ml Distilled water	Insoluble	Lipids present
ii. 3ml Oil sample + 3ml Chloroform	Soluble	Lipids present



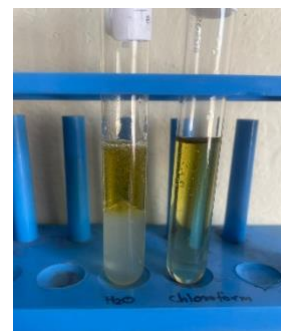
Groundnut Oil



Cotton Seed Oil



Olive Oil



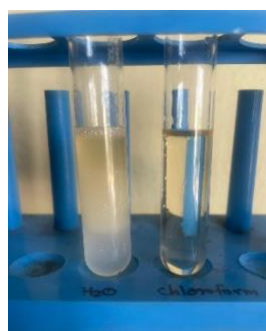
Castor Oil



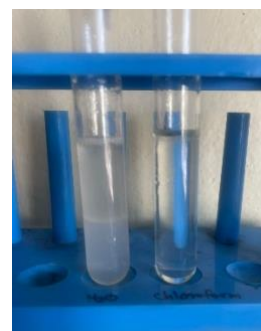
Sunflower Oil



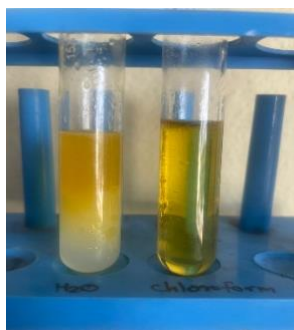
Mustard Oil



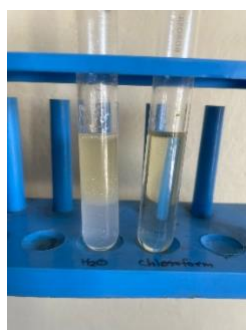
Almond Oil



Coconut Oil



Pongame Oil



Sesame Oil

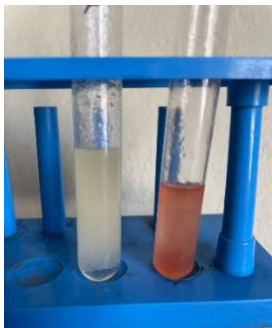
Lipids will be insoluble in water but soluble in Chloroform.

• Emulsification Test

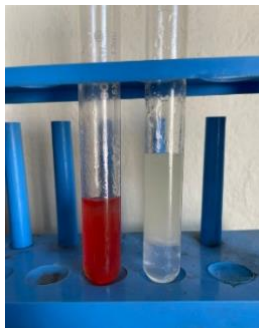
Test	Observation	Inference
3ml Oil sample + 2ml distilled water + 4 drops of 5% sodium bicarbonate shake well.	Lipids uniformly distributed in solution forming emulsion	Lipids present

• Sudan III Test

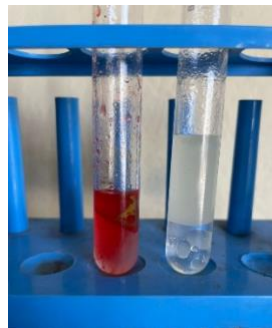
Test	Observation	Inference
3ml Oil sample +Boil & cool + few drops of Sudan III shake well	Upper light red precipitation	Lipids present



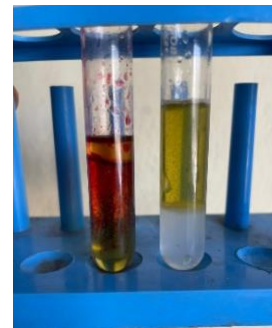
Groundnut Oil



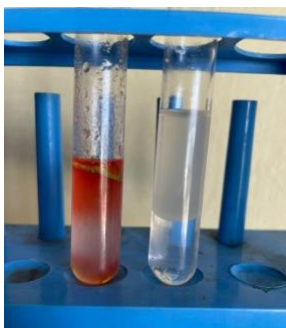
Cotton Seed Oil



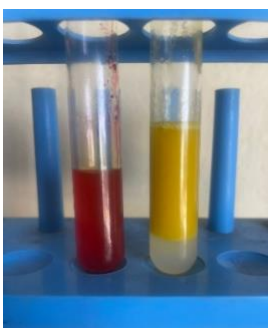
Olive Oil



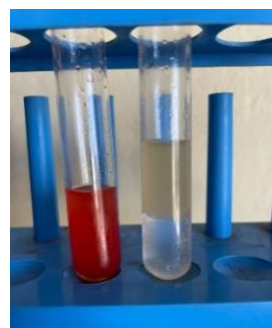
Castor Oil



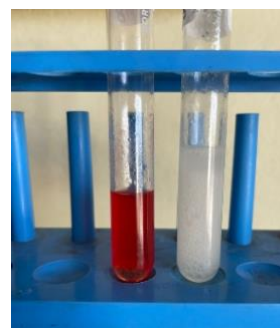
Sunflower Oil



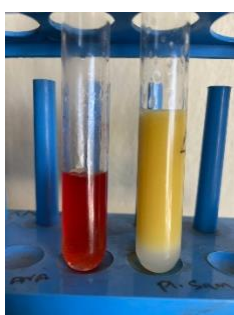
Mustard Oil



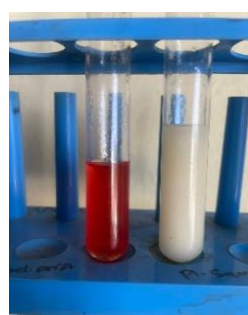
Almond Oil



Coconut Oil



Pongame Oil



Sesame Oil

Red-stained oil droplets confirm the presence of lipids.

A milky white emulsion indicates the presence of lipids.

Observation Table:

Sr. No.	Name of the Oil Sample	Solubility Test		Emulsification Test	Sudan III Test
		D/W Test	Chloroform Test		
1.	Groundnut Oil	Positive	Positive	Positive	Positive
2.	Cotton Seed Oil	Positive	Positive	Positive	Positive
3.	Olive Oil	Positive	Positive	Positive	Positive
4.	Castor Oil	Positive	Positive	Negative	Positive
5.	Sunflower Oil	Positive	Positive	Negative	Positive
6.	Mustard Oil	Positive	Positive	Negative	Positive
7.	Almond Oil	Positive	Positive	Negative	Positive
8.	Coconut Oil	Positive	Positive	Positive	Positive
9.	Pongame Oil	Positive	Positive	Positive	Positive
10	Sesame Oil	Positive	Positive	Positive	Positive

Result: - In given oil lipids content is present.

Conclusion: -

The qualitative tests for lipids, including the Solubility Test, Emulsification Test, Sudan III Staining Test, Grease Spot Test, and Saponification Test, effectively confirm the presence of lipids based on their unique physical and chemical properties.

Insolubility in water but solubility in organic solvents distinguishes lipids.

Emulsification Test demonstrates lipid dispersion in water with the help of emulsifiers.

Sudan III Test stains lipids red, confirming their presence.

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