A PROJECT -REPORT

ON

" Study of Phytochemical analysis of fruit peel "

SUBMITTED BY

Miss. Perana Prakash Vibhute

SUBMITTED TO,

VIVEKANAND COLLEGE, KOLHAPUR

(AN EMPOWERED AUTONOMOUS INSTITUTE)

(DEPARTMENT OF BOTANY)

THE YEAR

2025-2026

UNDER THE GUIDANCE OF

Dr. Abhijeet . R. Kasaskar

" 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 **Prerana Prakash Vibhute** 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 2025-2026.

Place: Kolhapur

Date: 14/10/2025

Examined
14.10.25

HEAD
DEPARTMENT OF BOTANY
VIVEKANAND COLLEGE, KOLHAPUR
(AUTONOMOUS)
14.10.25

DECLARATION

I declare that the project work entitled " **Study Of Phytochemical analysis of fruit peel** " 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: - 14/10/2025

Miss. Perana Prakash

Vibhute

INDEX

- Introduction
- Aim & Objectives
- Materials & Methods
- Observation
- Result & Conclusion
- References

INTRODUCTION

A fruit is one of nature' s most creations – the mature ovary of a flower, developed after fertilization, enclosing and protecting the precious seeds within. It is a living vessel that ensures the continuation of life from one generation to the next.Fruits appear in diverse forms and types. Some arise from a single ovary (simple fruits like mango, tomato, and pea), some from multiple ovaries of one flower (aggregate fruits like custard apple and strawberry), while others grow from an entire inflorescence (multiple fruits like pineapple and jackfruit). There are also seedless fruits, such as bananas and grapes, that form without fertilization – known as parthenocarpic fruits.

In the ecosystem, fruits play a sacred and vital role. They protect seeds, aid in their dispersal, and provide nourishment to a wide variety of organisms. Birds, animals, and even natural forces like wind and water carry fruits or their seeds to new regions, ensuring the eternal cycle of life. When fruits decay, they return their nutrients to the soil, enriching it for the next generation of plants.

For humans, fruits are not merely sources of food but symbols of health, prosperity, and purity. Rich in vitamins, minerals, and natural fibers, they support life and vitality. In Indian tradition, fruits are considered auspicious and are offered to deities as a mark of devotion and gratitude.

Thus, the fruit stands as a symbol of life' s generosity – sweet, nourishing, and eternal. Even the peels, often thrown away as waste, are rich in nutrients and minerals that can be utilized for scientific, medicinal, and environmental purposes.

1.Kiwi fruit

1.Classification:

Kingdom : Plantae

Division : Magnoliophyta (Angiosperms)

Class : Magnoliopsida (Dicotyledons)

Order : Ericales

Family : Actinidiaceae

Genus : *Actinidia*

Species : *Actinidia deliciosa*

Binomial name: *Actinidia deliciosa*

Common name: Kiwi fruit, Chinese gooseberry

Native region: China (later cultivated widely in New Zealand, Italy, an India)

2.Morphology of Kiwi Fruit

Type: Berry

Shape: Oval or egg-shaped

Size: 5– 8 cm long

Peel: Brown, thin, and covered with short, fine hairs.

Pulp: Green with a whitish core and numerous small black seeds arranged in a circle.

3. Importance of Kiwi Fruit

(a) Nutritional Importance

Rich in Vitamin C (more than orange or lemon)

Contains Vitamin K, E, potassium, folate, and antioxidants.

Good source of dietary fiber– helps digestion and improves gut health.

(b) Medicinal Importance

Strengthens immunity and reduces oxidative stress.

Helps in blood pressure regulation and heart health.

Contains actinidin enzyme, which aids protein digestion.

Beneficial for skin and vision due to antioxidants like lutein and zeaxanthin.

(c) Economic Importance

Widely cultivated as a commercial fruit crop in temperate regions.

Major producing countries: New Zealand, Italy, China, Chile, India (Himachal Pradesh, Arunachal Pradesh, Sikkim).

Used in juices, salads, desserts, jams, and cosmetic products.

(d) Horticultural Importance

Grown as a high-value export crop.

Requires cool climate and well-drained fertile soil.

Plays an important role in agro-tourism and horticultural diversification.

2. Dragon fruit

1.Classiication

Kingdom : Plantae

Division : Magnoliophyta (Angiosperms)

Class : Magnoliopsida (Dicotyledons)

Order : Caryophyllales

Family : Cactaceae

Genus : *Hylocereus*

Species : *H. undatus*

Binomial Name : *Hylocereus undatus*

Common Names : Dragon Fruit, Pitaya, Strawberry Pear

Native Region : Tropical America (Mexico and Central America)

2. Morphology of fruit

Type: Berry

Shape: Oval to oblong

Size: cm long

Peel: Bright pink or red , green scales

Pulp: White, red or purple with numerous small black seeds.

3.Importance / Economic Uses

1. Nutritional Value:

Rich in Vitamin C, antioxidants, fiber, calcium, and phosphorus.

Low in calories and cholesterol-free – ideal for health-conscious diets.

2. Medicinal Importance:

Strengthens immunity, improves digestion, and helps control blood sugar.

Antioxidant compounds help in anti-aging and reducing inflammation.

3. Economic and Agricultural Value:

High market demand as an exotic fruit.

Suitable for dry and semi-arid regions due to drought tolerance.

Cultivation is profitable for small and medium farmers.

4. Ornamental Value:

Attractive climbing cactus with beautiful night-blooming flowers – used in landscaping.

5. Industrial Use:

Pigments from red-fleshed varieties are used as natural food colorants.

Seed oil used in cosmetic products.

3. Pomegranate fruit

1.Classification

Kingdom :Plantae

Division : Magnoliophyta (Angiosperms)

Class : Magnoliopsida (Dicotyledons)

Order : Myrtales

Family : Lythraceae (earlier placed in Punicaceae)

Genus :*Punica*

Species : *Punica granatum L.*

Botanical Name:*Punica granatum L.*

Common Name: Pomegranate

lative region:

2. Morphology of fruit

Type: Balaustiform berry (specialized berry type) called balusta.

Structure: Globose, leathery pericarp (rind) enclosing numerous seeds. Each seed is covered with a juicy red aril (edible portion).

3. Importance of fruit

1. Nutritional Importance:

Rich in vitamins C and K, antioxidants, polyphenols, and iron.

The arils are refreshing, aid digestion, and improve immunity.

2. Medicinal Importance:

The fruit rind and bark are used as astringents, vermifuge, and for treating diarrhea.

Juice acts as a heart tonic and helps regulate blood pressure.

Flowers and rind possess antibacterial and anti-inflammatory properties.

3. Horticultural Importance:

Widely cultivated in tropical and subtropical regions.

Popular varieties: Bhagwa, Ganesh, Arakta, Mridula.

4. Cultural and Religious Significance:

Symbol of fertility, prosperity, and eternal life in many traditions.

Mentioned in ancient texts like the Charaka Samhita and Atharva Veda.

5. Ecological Importance:

Flowers attract pollinators like bees and butterflies, aiding biodiversity.

Drought-tolerant, thus useful for dryland farming.

4.Orange fruit

1.Classification of fruit

Kingdom : Plantae

Division: Magnoliophyta (Angiosperms)

Class : Magnoliopsida (Dicotyledons)

Order : Sapindales

Family: Rutaceae

Genus: *Citrus*

Species: *sinensis*

Common Name: Sweet Orange

Binomial Name: *Citrus sinensis (L.) Osbeck*

Native Region: South-East Asia (India and China)

2. Morphology of fruit

Type: Hesperidium (a special kind of berry).

Developed from a multilocular syncarpous ovary.

Pericarp differentiated into:

Epicarp (flavedo): Outer coloured rind containing oil glands.

Mesocarp (albedo): White spongy layer.

Endocarp: Inner juicy segments filled with juice vesicles.

3. Importance of fruit

a) Nutritional Importance:

Rich in Vitamin C (ascorbic acid) – strengthens immunity.

Contains vitamin A, B-complex, calcium, phosphorus, and potassium.

Juice helps prevent scurvy and detoxifies the body.

b) Medicinal Importance:

Acts as an antioxidant and boosts immunity.

Peel and leaves used in Ayurvedic medicine for digestion and skin care.

Dried peel used in herbal teas and tonics.

c) Economic Importance:

Major commercial fruit crop in India and globally.

Used for juice, jams, squash, essential oils, perfumes, and cosmetic products.

Peel oil used in aromatherapy and perfumery.

d) Ecological Importance:

Orange orchards provide habitat for pollinators like bees.

The tree helps in carbon sequestration and maintaining biodiversity.

5.Banana fruit

1.Classification of fruit

Kingdom : Plantae
Division: Magnoliophyta (Angiosperms)
Class: Liliopsida (Monocotyledons)
Order: Zingiberales
Family: Musaceae
Genus : *Musa*
Species:*Musa paradisiaca L.*

Common name : Banana
Native region : Southeast Asia (India, Malaysia)

2. Morphology of fruit

Type: Berry (parthenocarpic — develops without fertilization).
Fleshy, elongated, yellow when ripe.
Seeds are absent or vestigial in edible varieties.

3. Importance of fruit

1. Nutritional Value:

Rich in carbohydrates, vitamins A, B6, C, and potassium.

Easily digestible and a quick energy source.

2. Medicinal Uses:

Helps in treating ulcers, constipation, and hypertension.

The inner stem and flower are used in traditional Ayurvedic medicine.

3. Industrial Uses:

Banana fiber used for paper, ropes, and handicrafts.

Banana peel used in biogas production and organic manure.

4. Agricultural Importance:

A major cash crop in tropical countries.

Propagated vegetatively through suckers or tissue culture.

5. Cultural Value:

Considered auspicious in Indian rituals and ceremonies.

Banana leaf is used as a plate and in religious offerings.

What is Fruit Peel

The fruit peel, also known as the pericarp, is the outer protective covering of a fruit. It develops from the ovary wall after fertilization and serves as a shield to protect the inner edible portion and the seeds. The fruit peel is generally divided into three layers:

1. Epicarp (Exocarp): The thin, outermost, often colorful layer (as seen in apples or mangoes).
2. Mesocarp: The middle layer, which is usually soft and fleshy (as in mango or orange).
3. Endocarp: The innermost layer that directly surrounds the seed – hard in fruits like coconut and stone fruits, papery in citrus fruits.

Functions and Importance of Fruit Peel:

A. For the Plant:

Protects the fruit from physical damage, pests, and dehydrationGives structure and firmness to the fruit.

Helps in seed dispersal by attracting animals through color, aroma, and taste.

B. For Humans and the Environment:

Rich in minerals, vitamins, fiber, and natural antioxidants.

Used in medicines, cosmetics, biofertilizers, animal feed, and biogas production.

AIM AND OBJECTIVE

Aim

To detect the presence of various phytochemical constituents in selected fruit peels.

Objectives

1.. To collect and prepare fruit peel samples.

2. To perform preliminary phytochemical screening.

3. To identify the major groups of bioactive compounds present.

4. To promote the utilization of fruit peel waste for health and environmental benefits

MATERIAL AND METHODOLOGY

Material

Fresh fruit peels (e.g., Banana, Orange, Kiwi, Dragon, Pomegranate)
Mortar and pestle or Grinder
Test tubes and racks
Dropper, pipette, beakers, funnel, filter paper
Distilled water

Reagents for tests:

Mayer' s reagent (for alkaloids)
Ferric chloride (for phenols/tannins)
Lead acetate (for flavonoids)
Foam test reagent (for saponins)
Fehling' s solution (for reducing sugars)
Benedict' s reagent (for carbohydrates)

Methodology

A. Sample Preparation

1. Collect fresh fruit peels and wash thoroughly with distilled water.

2. Shade dry for several days until all moisture is removed.

3. Grind the dried peels into fine powder using a mortar and pestle or Grinder

4. Extract the powder with distilled water (1:10 ratio).

B.Extract Preparation

Extraction of plant material Preparation of aqueous extracts

Samples were weighed using an electronic balance and 1gm of fruit peel powder were crushed in 100 ml of distilled water and filter through muscline cloth. These samples are used for phytochemical analysis.

C. Phytochemical Tests

Test for Alkaloids

A quantity (3 ml) of concentrated extract was taken into test tube, cooled and filter, the filtrate was used for following test.

Dragendroff' sTest: 2 drops of Dragendroff' s reagent were added to 1ml of the extract. The development of a creamy ppt was indicates that presence of alkaloids.

Test for Saponin

5 ml extract was mixed with 20 ml of distilled water then ,wait for 15 min formation of foam indicates saponin present.

Test for Tannin

4ml of extract was treated with 4 ml $FeCl_3$ formation of green colour indicates that presence of condensed tannin.

Test for Proteins

Xanthoproteic Test: Extract was treated with few drops of concentrated HNO_3 formation of yellow colour indicates the presence of Proteins.

Test for Amino Acid

Ninhydrin Test: Take the 2 ml of extract and 2 ml on the Ninhydrin reagent was added and boil for few minutes, formation of blue colour indicates the presence of the amino acid.

Test for Flavonoids

Alkaline Reagent Test: Extract was treated with 10% of NaOH solution, formation of intense yellow colour indicates the presence of the flavonoids.

Test for Phenol

Ferric chloride Test: Test extract were treated with 4 drops of Alcoholic $FeCl_3$ solution. Formation of bluish black colour indicates the presence of phenols.

Test for Phlobatannins

Deposition of red ppt when aqueous extract of each plant sample is boiled with 10% aqueous HCl was taken evidence of presence of the phlobatannins.

Test for Cardial Glycosides

Killer-KillaniTest: Plant extract treated with glacial acetic acid containing a drop of FeCl3. A brown coloured ring indicates the presence of the cardial glycosides.

Test for Carbohydrates

Iodine Test: Take 2 ml of extract were treated with 5 drops of Iodine solution, gives blue colour, indicates the positive test and presence of carbohydrates.

OBSERVATION

Phytochemical Tests	Banana	Dragon	Kiwi	Orange	Pomegranate
Saponin	-	+	+	+	+

Tannin	-	-	-	-	+
Protein	-	-	-	+	+
Amino acid	-	-	-	+	-
Alkaloids	-	-	-	-	-
Carbohydrates	-	-	-	-	-
Flavonoids	+	+	-	+	+
Coumarin	+	+	-	+	+
Cardial glycosides	+	+	+	+	+
Pholobatannins	-	-	-	-	-

Observation table for Phytochemical Tests

RESULT

The results confirm that fruit peels contain a variety of secondary metabolites, many of which have medicinal and antioxidant properties.

For instance, orange peel showed high levels of flavonoids and phenolic compounds, indicating strong antioxidant potential. Banana peel contained saponins and glycosides that contribute to antimicrobial activity. Such findings emphasize that fruit peels, often treated as waste, can be utilized in pharmaceutical, cosmetic, and food industries.

The study concludes that fruit peels are valuable sources of phytochemicals such as flavonoids, tannins, phenols, saponins, and alkaloids.

These compounds can be exploited for the development of natural medicines, antioxidants, and eco-friendly health products. Thus, fruit peel waste can be transformed into wealth, contributing to sustainable resource utilization.

REFERENCE

1. Harborne, J.B. (1998). Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis. Springer.

2. Trease, G.E. & Evans, W.C. (2002). Pharmacognosy. 15th Edition, Saunders Publishers.

3. Sofowora, A. (1993). Medicinal Plants and Traditional Medicine in Africa. Spectrum Books Ltd.