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## A PROJECT -REPORT ON

"Phytochemical Analysis of Healthy & Stressed plant leaves"

#### SUBMITTED BY

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SUBMITTED TO,

VIVEKANAND COLLEGE, KOLHAPUR DEPARTMENT

#### **OF BOTANY**

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#### SCIENCE IN BOTONY

#### THE YEAR

#### 2024-2025

## UNDER THE GUIDANCE OF'

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## "Education for Knowledge Science and Culture"

## - Dr Bapuji Salunkhe

# Shri Swami Vivekanand Shikshan Sanstha'S Vivekanand College, Kolhapur, (Autonomous) <u>Department of BOTANY</u>

## Certificate

This is to certify that Rohini Balaso Karale, Aishwarya Vishnu Chavan and Om Chandrakant Patil. Exam Number has satisfactorily carried out his project report as per the syllabus prescribed by Department of, Botany. Vivekanand College (Autonomous) for B.Sc.- III Botany. This project report represents

his/her bonafied work during academic year 2024-2025.

Place: Kolhapur

Date: 04-03-2028

HEAD DEPARTMENT OF BOTANI WVEXANAND COLLEGE, KOLHAPUK (EMPOWERED AUTONOMOUS)

Dr. Abhijeet R. Kasabloo

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I am grateful to all teachers for their valuable suggestions during my project work.

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#### Introduction

## Definition of Phytochemical:

Phytochemicals are chemicals of plant origin. Phytochemical (from Greek Phyto, meaning "plant") are chemicals produced by plants through primary or secondary metabolism. They generally have biological activity in the plant host and play a role in growth or defense against competitors, pathogens or predators.

Example, Anthocyanidins, produced by red and purple berries.

Beta-carotene, found in orange and dark green leafy vegetables. Catechins, present in black grapes and strawberries.

## Types of Phytochemicals:

To date, over 10000 types of phytochemicals have been discovered, with their effects on human health depending on the type and structure.



#### 1. Flavonoids:

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Flavonoids are classified into 12 major subclasses based on chemical structures, 6 of which, namely Anthocyanidins, flavan-3-ols, flavonols, flavones, flavanones and isoflavones.

#### 2. Phenol:

Phenolic compounds are a large group of phytochemicals and the most widely distributed in the plant kingdom. The three most important groups of dietary phenolics are flavonoids, phenolic acid and polyphenols.

#### 3. Coumarin:

Coumarins are naturally bioactive compounds recognised for their anti-inflammatory, anticoagulant, antibacterial, antifungal, antiviral, anticancer pharmacological activities as well as its antioxidant and neuroprotective actions.

## Importance of Phytochemicals:

Phytochemicals are naturally occurring compounds found in plants that play a crucial role in human health and nutrition. Their importance can be highlighted through the following ten points:

 \*\*Antioxidant Properties\*\*: Phytochemicals such as flavonoids and carotenoids help neutralize free radicals in the body, reducing oxidative stress and lowering the risk of chronic diseases.

2. \*\*Anti-Inflammatory Effects\*\*: Many phytochemicals possess anti-inflammatory properties, which can help alleviate conditions like arthritis and heart disease by reducing inflammation in the body.

3. \*\*Cancer Prevention\*\*: Certain phytochemicals, including sulforaphane and resveratrol, have been shown to inhibit the growth of cancer cells and may reduce the risk of various types of cancer.

4. Heart Health: Phytochemicals like polyphenols found in fruits, vegetables, and whole grains can improve cardiovascular health by lowering blood pressure, reducing cholesterol levels, and improving blood vessel function. 5. \*\*Immune System Support\*\*: Compounds such as beta-glucans and saponins enhance the immune response, helping the body to fend off infections and diseases.

6. \*\*Hormonal Balance\*\*: Some phytochemicals, like phytoestrogens, can mimic or modulate hormone activity in the body, potentially alleviating symptoms of hormonal imbalances.

7. \*\*Weight Management\*\*: Phytochemicals can influence metabolism and fat storage, aiding in weight management and reducing the risk of obesity-related diseases.

8. \*\*Gut Health\*\*: Many phytochemicals act as prebiotics, promoting the growth of beneficial gut bacteria, which is essential for digestive health and overall well-being.

9. \*\*Cognitive Function\*\*: Certain phytochemicals, such as flavonoids found in berries, have been linked to improved cognitive function and a reduced risk of neurodegenerative diseases.

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10. \*\*Skin Health\*\*: Phytochemicals can protect the skin from UV damage and promote skin repair, contributing to overall skin health and appearance.

Occurrence of Phytochemical in Healthy and Infected Plants:

<u>Phytochemicals</u>, the bioactive compounds found in plants, play a crucial role in plant defense mechanisms and overall health. Their occurrence varies significantly between healthy and infected plants, reflecting the plant's response to biotic stressors such as pathogens.

- In healthy plants, phytochemicals such as flavonoids, alkaloids, terpenoids, and phenolic compounds are present in balanced concentrations. These compounds contribute to the plant's growth, development, and resistance to pests and diseases. For instance, flavonoids are known for their antioxidant properties, which help in protecting plant cells from oxidative damage. Additionally, healthy plants often exhibit a diverse array of phytochemicals that support their metabolic processes and enhance their nutritional value.
- Conversely, in infected plants, the occurrence of phytochemicals can change dramatically. When a plant is attacked by pathogens, it often triggers a stress response that leads to the upregulation of specific phytochemicals. For example, the production of phenolic compounds may increase significantly as a defense mechanism against fungal infections. Similarly, certain alkaloids may be synthesized in higher quantities to deter herbivores and inhibit pathogen

growth. This adaptive response can result in a higher concentration of specific phytochemicals, which may vary depending on the type of infection and the plant species involved.

 Moreover, the balance of phytochemicals in infected plants can be disrupted, leading to a potential trade-off between growth and defense. While the increased production of phytochemicals can enhance resistance to pathogens, it may also divert resources away from growth and reproduction, ultimately affecting the plant's overall fitness.

In summary, the occurrence of phytochemicals in healthy and infected plants highlights the dynamic nature of plant responses to environmental stressors. Understanding these variations is essential for developing strategies to enhance plant health and resilience against diseases.

## Review of Literature

For this project report, there have been various literatures referred; few of them are given below

> The research article published by Japar Sidik Bujang et.al (2021) Feb 24; 16(2).

<u>Maize</u> Pollen contains a high total phenolic content (TPC) and total Flavonoid content (TFC) of 783.02mg gae100g<sup>-1</sup> and 1706.83mg QE 100g<sup>-1</sup>.

https://pmc.ncbi.wm.nih.gov.

Chemical constituents and phytochemical properties of floran, maize pollen

- The research article published by Amandeep Singh Etal (2015). Phytochemical profile of sugarcane and its potential health aspects Jan-June, 9(17): 45-54.
   Presence of various fatty acid, alcohol, phytosterols, higher terpenoits, flavonoids & phenolic acids.
- 3. The research article published by Rama Swamy Nanna et.al (2013) Sep-October, 22(1); 11-18 Evaluation of phytochemicals and fluoresent analysis of seed and leaf extracts of Cajanus Cajan L. In fresh and dried leaves, phytochemicals analysis Revealed the presence of glycosides, resins, phenol, lignins in more amounts in fresh leaf & dry leaf extracts.
- 4. The research article published by Bindu Jayprakash (2018), 19(3); 803-810
  Extraction and characterization of chick PEA (<u>Cicer</u>)

<u>arietinum)</u>

5. The research article published by Amer Khorshed Aalam et.al (2016), 5(6); 366-370

Phytochemical analysis and antioxidant, anagesic and thrombolytic activity investigation of methanol extract of <u>Pisum sativum.</u>

Phytochemical analysis of extract of <u>Pisum sativum</u> indicated the presence of glycoside, alkaloid, flavonoids, saponin and tannin compounds.



## Materials

#### Chemicals:

- 1. 10 % 2N Sodium hydroxide
- 2. Alcoholic Ferric chloride
- 3. 2N Sodium hydroxide
- 4. Dilute ferric chloride
- 5. Conc. HCl
- 6. Mayer's reagent

#### Glasswears:

Test tubes, test tube holder, test tube stand, Beaker, Conical Flask, Funnel, Measuring cylinder, Pippettes, glass road.

Miscellaneous:

Distilled Water, Filter Paper.

Plant Material:

Healthy and stressed leaves of

- 1. Cicer arietinum
- 2. Zea Mays, L.
- 3. Cajanus Cajan, L.
- 4. Saccharum Officinarum ,L.
- 5. Pisum sativum ,L.

## Methodology

#### Sample collection:

The healthy & Stressed leaves of plant material were collected from Kotoli. The plant was used for the purpose of phytochemical analysis.

#### Preparation of Plant Extract:

- For the comparative study of healthy and stressed leaves of plant sample collected from Kotoli.
- 2. Selection of leaves samples.
- 3. Wash and blot the leaves.
- Take 1gm of into morter and pestle. After extraction filter through muscline cloth.
- Collect the filterate and make the final volume 100ml.
- This extract was used for further Phytochemical test.



HEALTHY Zea mays, L. LEAVES EXTRACT



STRESSED Zea mays, L. LEAVES EXTRACT



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HEALTHY Saccharum officinarum,L. LEAVES EXTRACT



STRESSED Saccharum officinarum, L. LEACES EXTRACT



HEALTHY Cicer arietinum, L. LEAVES EXTRACT

![](_page_13_Picture_6.jpeg)

STRESSED Cicer arietinum,L. LEAVES EXTRACT

![](_page_14_Picture_0.jpeg)

HEALTHY Pisum sativum, L. LEAVES EXTRACT

![](_page_14_Picture_2.jpeg)

INFECTED Pisum sativam, L. LEAVES EXTRACT

![](_page_14_Picture_4.jpeg)

HEALTHY Cajanus cajan L. LEAVES EXTRACT

![](_page_14_Picture_6.jpeg)

STRESSED Cajanus cajan, L. LEAVES EXTRACT

#### • HEALTHY LEAF EXTRACT

CROP	Flavonoid	Phenol		Coumarin	
		Diluted	Alcoholic	2N(NaOH)	10%(NaOH)
Cicer arientinum	Absent	Present	Present	Absent	Absent
Zea mays, L.	Present	Absent	Present	Absent	Absent
Cajanus cajan, L.	Present	Present	Present	Absent	Present
Saccharium officinarum, L.	Absent	Absent	Absent	Absent	Absent
Pisum sativum, L.	Absent	Absent	Present	Present	Absent

#### STRESSED LEAF EXTRACT

CROP	Flavonoid	Phenol		Coumarin	
		Diluted	Alcoholic	2N(NaOH)	10%(NaOH)
Cicer arientinum	Present	Absent	Absent	Present	Present
Zea mays, L.	Present	Absent	Absent	Present	Present
Cajanus cajan, L.	Present	Present	Present	Present	Present
Saccharium officinarum, L.	Present	Absent	Present	Absent	Absent
Pisum sativum, L.	Absent	Absent	Absent	Absent	Present

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### RESULT

 <u>Phytochemical analysis</u> of leaf extracts can show the presence of different chemical compounds, such as flavonoids, Phenol, Coumarin. These compounds may contribute to the medicinal value of the plant.

#### CONCLUSION

- Phytochemical analysis can help identify the chemical compounds in plants and their potential medicinal value.
- Phytochemical analysis can also help to various test like Flavonoids, Phenol, Coumarin ,etc.
- Analysis of healthy and stressed leaves extract of plants some test are present some are absent.

Hayastor