

**“Anatomical and cuticular studies on Costus pictus D. Don”**

**A**

**Report on the project entitled**

**TO**

**Department of Botany,**

**Vivekanand College,**

**Kolhapur (Autonomous)**

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**B.Sc. III**

**Under The Guidance of**

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**2022- 2023**

**CERTIFICATE**

This is to certify that, the project work entitled "**Anatomical and cuticular studies on Costus pictus D. Don**" is being submitted by Miss. Shruti Thorat, Miss Rutuja Patil and Miss Ritu Kumavat under the guidance of Dr. Lubdha A. Kagale, Assistant Professor, Department of Botany, Vivekanand College, Kolhapur (Autonomous).

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## **ACKNOWLEDGEMENT**

I wish to express a sense of gratitude towards Dr. Lubdha A. Kagale and HOD Dr. B.T. Dangat, Assistant Professor Department of Botany, Vivekanand College, Kolhapur (Autonomous) for providing me with all the facilities Support and guidance for carrying out this work.

## Introduction

*Costus* is a herbaceous rhizomatous monocot that belongs to the family Costaceae. *Costus* is represented by 97 species worldwide. It is mainly distributed in the tropics and subtropics (POWO, 2023). *Costus pictus* is Commonly known as Painted Spiral Ginger or Spotted Spiral Ginger. The native range of *Costus pictus* is from Mexico to Central America, mainly distributed in Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico Central, Mexico Gulf, Mexico Northeast, Mexico Northwest, Mexico Southeast, Mexico Southwest and Nicaragua (POWO, 2023).

Perennial, rhizomatous, erect terrestrial herbs, non-Aromatic. Stem slender, pale green, Glabrous. Leaves simple, spirally arranged on the stem, Dark olive-green, lamina narrowly to broadly Elliptic to lanceolate, base at Sub cordate, apex at acuminate to caudate, glabrous On both sides margin entire, venation Parallel with prominent midrib, petiole very short, flat, glabrous slightly thread like very long Hairs (Perumal Murugan 2016). In India, it is grown in gardens as an ornamental plant especially in Kerala in every home. The major attraction of this plant is its stem with spiral leaves and light airy and tissue paper-like flowers. The red painted stem enhances the beauty of the glossy leaves and strongly spiralling. (Flowers of India, 2023). Flowering and Fruiting: July – September (Perumal Murugan 2016).

*Costus pictus* was used as a traditional medicine because of its diuretic, carminative and antiseptic properties. The leaves served as a good source for the treatment of diabetes. The plant *Costus pictus* is cultivated in Uttarkannada of Karnataka in India and the people in this area take traditionally 2-3 leaves of this plant twice a day for the management of diabetes (Lyra et al., 2006). The rhizomes are used in Constipation, skin diseases, fever, asthma, bronchitis, Inflammation and anaemia and are medicinally tried to Utilize for antihelminthic, astringent, purgative and Aphrodisiac properties (Basha and Kumari, 2012). Rhizomes were used for a wide range of ailments in Southeast Asia, it was used to control diarrhoea, headache and vomiting whereas the Japanese utilized them for the treatment of syphilis disease (Saranya Selvakumarasamy et.al 2021). In India, it was used to control pneumonia and rheumatism (Jose and Reddy, 2010). It is a potent antidiabetic plant and is used in folk, ayurvedic and homoeopathic systems of medicine (Joshi, 2000). It also used asthma, eye Complaints and snake bites and 18 chemicals were analyzed and identified from leaves of *Costus pictus* (George et al., 2007). Aqueous leaf extract of *Costus pictus* has a definite but dose-related antibacterial effect on the strains tested. Remembering the economic and health burden caused by synthetic antibiotics, plants and plant-derived medicine will Be a better and safe alternative (Jeneth Berlin Raj 2018).

In the present work, I have studied the detailed anatomy and cuticular studies of the species *Costus pictus* which includes anatomy of leaf, stem and root. Cuticular details such as stomata were also examined.

## Material and methods

*Costus pictus* plant was collected from Lead Botanical Garden (LBG), Department of Botany, Shivaji University Kolhapur. For cuticular studies, fresh leaves were harvested. The epidermal cell is obtained by scraping with a sharp blade. The peel was taken to observe the

stomata and epidermal cells. Photographs were taken using the Leica DM with x40, and x100 magnification.

For anatomical studies, fresh stem, fresh root and fresh leaves were used serial transverse sections were taken with a blade and then stained with safranin and mounted in glycerine on a clean glass slide, photographs were taken using the Leica DM with 40x, 100x magnification.

For cytological studies, chromosome numbers have been determined in root-tip metaphases. Fresh roots were harvested and pre-treated for cytological studies with a saturated solution of *para*-Dichloro benzene for 4-5 hours at 8-10°C. Further, the root tips were hydrolysed in 5N HCL and squashed in 2% propionic orcein. Suitable somatic plates were photographed under LEICA DM 750 microscope. Five cells with well-separated chromosomes were selected for karyotype analysis.

## **Result and discussion**

### **a) Somata**

In *Costus pictus* stomata were hexacytic type, similar results were found by Venkatachalam Karthikeyan *et.al* 2014. Stomata have six subsidiary cells around both guard cells, one at either end of the opening of the stoma, one adjoining each guard cell, and one between that last subsidiary cell and the standard epidermis cells. Stomata with guard cells are found in the epidermis.

### **b) Anatomy of stem**

The transverse section of the stem is circular in outline

The epidermis consists of a single layer of living cells which are closely packed. The walls are thickened and covered with a thin waterproof layer called the cuticle.

Ground Tissue is composed of small, thick-walled sclerenchyma on the inside of the epidermis. These layers of cells are followed by larger thin-walled parenchyma cells. Intercellular air spaces Are found in the parenchyma.

The vascular bundles are found scattered throughout the ground tissue. The vascular Bundles occurring nearer the rind of the stem are smaller and are closer to one another. The Vascular bundles contain no cambium and consequently, secondary thickening does not occur. Thick-walled sclerenchyma fibres surround the vascular bundle.

### **c)Anatomy of root:**

Epidermis is the outermost covering of the root formed by a single layer of compactly arranged, barrel-shaped parenchyma cells.

The cortex is a major component of the ground tissue of the root. It is represented by several layers of loosely arranged parenchyma cells. Intercellular spaces are prominent.

Endodermis is the innermost layer of the cortex formed by compactly arranged barrel-shaped Cells. Some of the cells in the endodermis are thin-walled and are known as passage cells. The Passage cells allow water to pass into the xylem vessels. The remaining cells in the

endodermis the presence of thickening on their radial walls. These thickenings are known as Casparian thickenings.

Stele is the central cylinder of the root consisting of pericycle, conjunctive tissue, pith and Vascular bundles. Pericycle is the outermost covering of the stele represented by a single layer of Parenchyma cells.

Conjunctive tissues is represented by loosely arranged parenchyma cells found in between the Vascular bundles.

Pith is the innermost region of the root representing the central axis. It is composed of a few loosely arranged parenchyma cells.

Vascular bundles are radial in arrangement. There are eight bundles each of xylem and phloem. Xylem is described as an exarch.

#### **d) Anatomy of leaf**

Epidermis is uniseriate, with barrel-shaped, compactly arranged cells and is covered with thick cuticles.

Mesophyll is not differentiation of mesophyll into spongy and palisade parenchyma.

The vascular bundles are numerous, arranged in parallel series

Phloem is towards the lower epidermis

Each vascular bundle is surrounded by a chlorenchymatous bundle; this sheath also serves for temporary Storage of starch.

#### **e) Cytological studies**

*Costus pictus* somatic chromosome number is  $2n=18$

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<b>Sr.no</b>	<b>Attributes</b>	<b>Abaxial</b>	<b>Adaxial</b>
1	Stomatal index SD	396.2 ± 13.50	32.2 ± 0.51
2	Guard cell length (µm)	33.76 ± 5.50	28.13 ± 0.73
3	Gurd cell breadth (µm)	9.31 ± 1.68	7.815 ± 3.684
4	Epidermal cell length (µm)	42.53 ± 19.45	51.318 ± 14.52
5	Epidermal cell breadth (µm)	15.97 ± 8.2	23.96 ± 9.473
6	Pore length (µm)	33.96 ± 3.80	25.52 ± 0.73
7	Pore breadth (µm)	12.08 ± 12.60	3.12 ± 1.47

**Table 1. Stomatal attributes of *Costus pictus* D. Don**



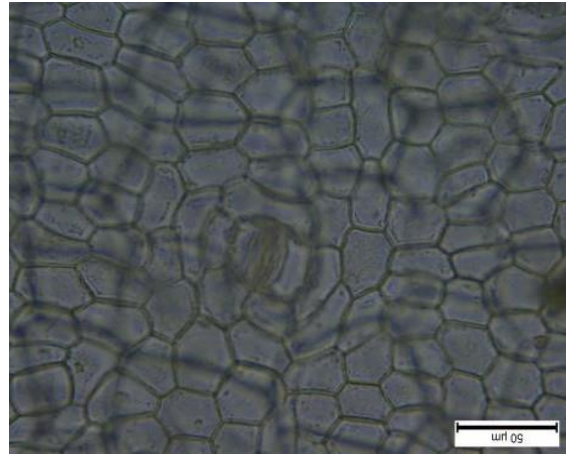
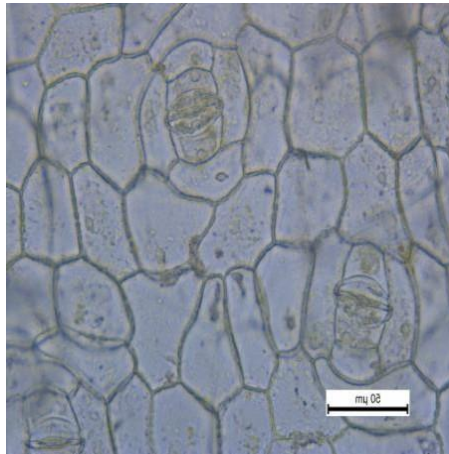
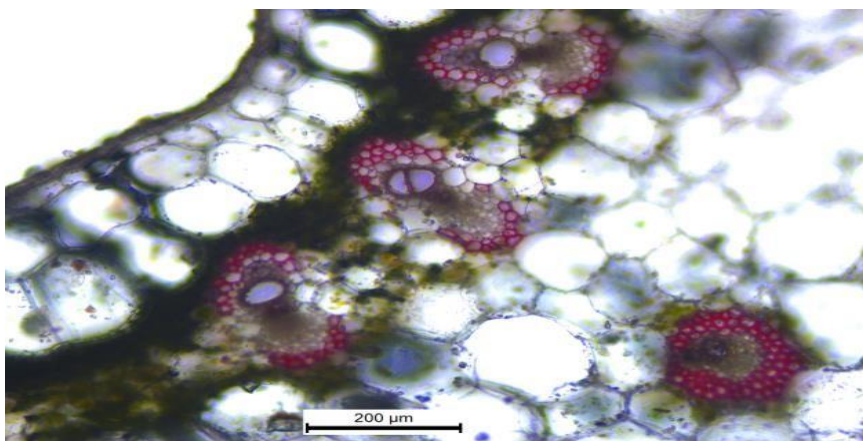
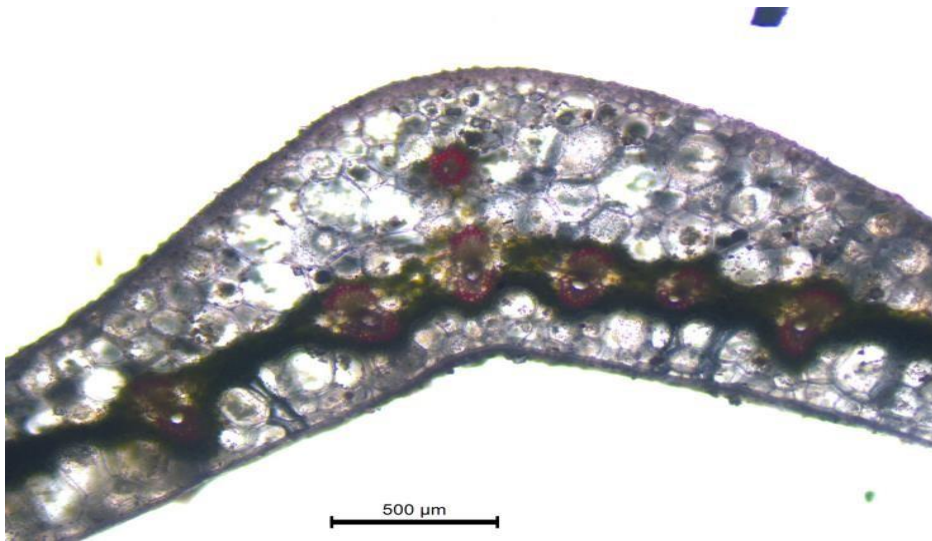


Fig1:A) Epidermal layer a) adaxial, b) abaxial



B)a) Fig2: Anatomy details of root a) outline and b) enlarge part of the transverse section of leaf.

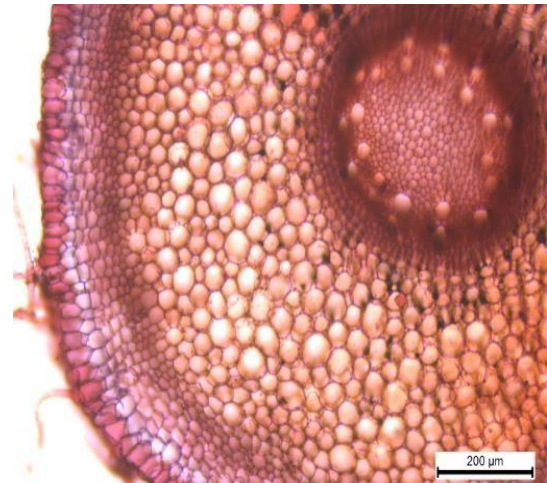
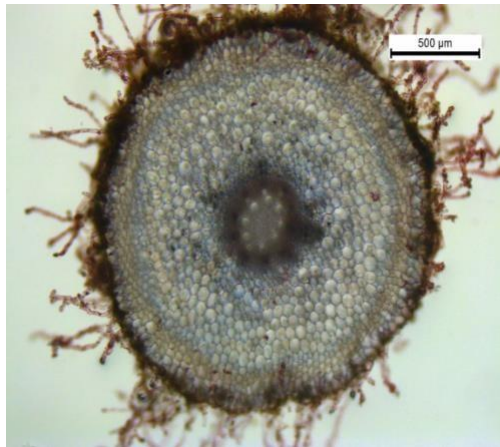


Fig 3 : b)Anatomy details of root a) outline and b) enlarge part of the transverse section of root.

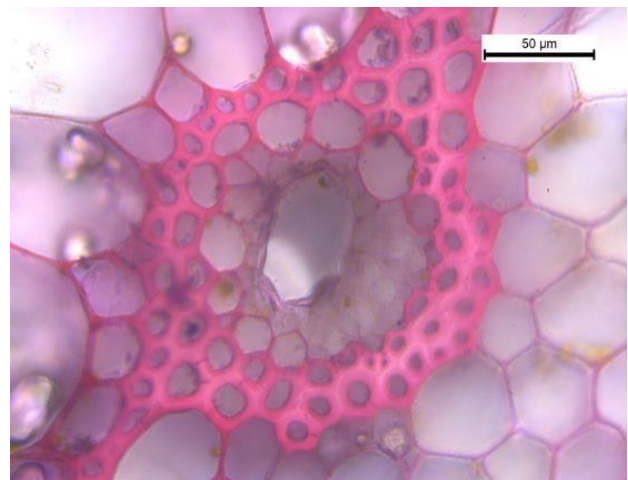
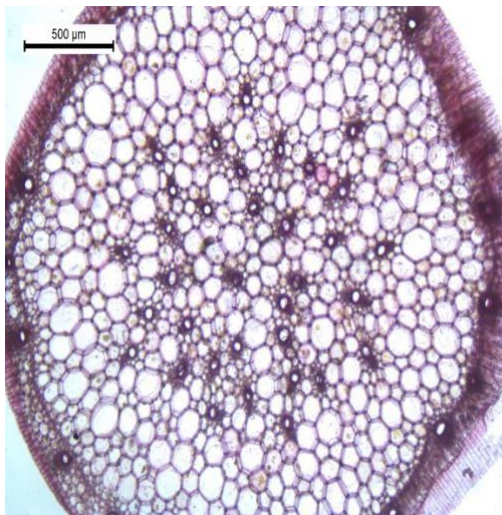


Fig : c) Anatomy details of root a) outline and b) enlarge part of the transverse section of stem

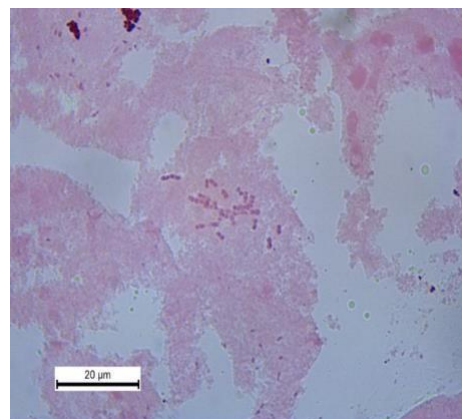
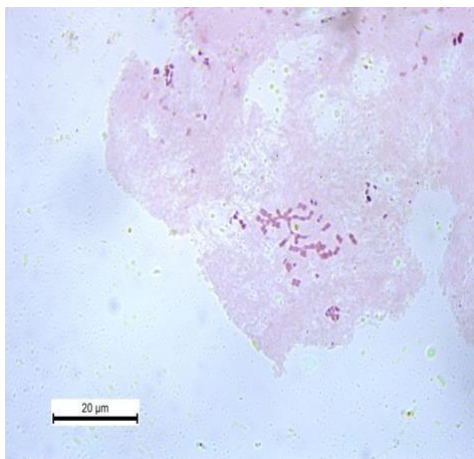


Fig d) cytology Of *Costus pictus*