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Stomatal Types in Monocot and Dicot Plants within Flora of Nirmala College Campus, Coimbatore, Tamilnadu

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***Abstract:** This study mainly aimed to document different type of stomata, from the collected leaves and also to identify most commonly occurring stomata from the collected samples. The anatomical study of stomata in 40 dicot leaves shows four types of stomata such as Anomocytic, Anisocytic, Paracytic and Diacytic. Among the 10 plants collected from the 5 monocot families shows only Paracytic type of stomata. The study concluded that, in dicot plants mainly shows the Anomocytic type of stomata and Anisocytic type of stomata is the least occurring stomata in dicots. The monocot plants shows only paracytic type of stomata. Key words: Anomocytic, Anisocytic, Paracytic, Diacytic*

I. INTRODUCTION

In Botany stomata is a tiny opening or pore that is used for gaseous exchange. They are mostly found on the under surface of plant leaves. In a stoma there is the chloroplast, cell wall, a vacuole cell nucleus.

Air enter the plant through this opening, CO_2 is used in the photosynthesis some of the O_2 produced is used in respiration. Surplus O_2 exit through these opening also water vapors goes into the atmosphere through these pores in transpiration. The pores formed by a pair of cells known as guard cells. These adjust the size of the opening by opening or closing.

To open a guard cell, proton (H^+) are jumped into guard cell .Water enters into them, the cells get hard and they push opens. Guard cells are cells surrounding each stoma they help to regulate the rate of transpiration by opening and closing the stomata. Guard cells are located in the leaf epidermis and pair of guard cells surrounded and form stomatal pores, which regulate CO_2 influx from the atmosphere into the leaves for photosynthetic carbon fixation. Stomatal guard cells also regulate water loss of plants via transpiration to atmosphere.

The rate of transpiration can be affected by several factors.

There is guard cell surrounding each stoma that causes them to open or close throughout the life cycle of the plant. This occurs in response to water and less concentration in the plant cell.

A plant's guard cell regulate the opening and closing of the epidermal stomata by expanding or contracting in response to environmental signal that the stomatal pore need to open the guard cell pair fill with water, changing the cell shape and opening the pores. An inverse process occur when the guard cell receive a signal to close the stomata, initiating the loss of water and causing them to shrink and close the pores.

Stomata of monocot plants has tiny pores in the upper and lower epidermis of monocot leaves which are surrounded by a pair of dumb –bell shaped guard cell and Stomata of dicot plants have tiny pores in the lower epidermis of dicot leaves, which are surrounded by kidney shaped guard cell.

Stomata is mainly of four type,

1) *Anomocytic:* In this type, the stomata remain surrounded by limited number of subsidiary cells which are surrounded by the remaining epidermal cell.eg: malvaceae, ranunculaceae, papeveraceae.
2) *Anisocytic:* In this type stomata remain surrounded by three subsidiary cells of which one is distinctly smaller than the other two.eg: solanaceae, cruciferaceae.
3) *Diacytic:* In this type, the stomata remain surrounded by a pair of subsidiary cells whose common wall is at right angle to the guard cells.eg: Caryophyllaceae
4) *Paracytic:* In this type, the stomata are surrounded by two subsidiary cells which are parallel to the longitudinal axis of pore and guard cells.eg: Rubiaceae

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II. REVIEW OF LITERATURE

Dimble sharma *et al* (2012) concluded that the result of epidermal studies in selected species of family Apocynaceae has been identified. Total 12 epidermal characteristic were studied in the three varieties of Thevetia peruviana, Catharanthus roseus, Tabernaemonana divericata .Tabernaemontana Spp and C.roseus bearing ranunculaceous type of stomata in which no subsidiary cells present direct epidermal cells are joined with stomata. It is also called Anomocytic type of somata. In this study mainly two type of stomata observed by us in all above said plants spp i.e.; Anomocyic and Paracyic.

Sreelakshmi et al (2014) studied that Colocasia esculenta leaves are with pentagonal epidermal cells and the guard cell stomata is kidney shaped. The type of stomata is paracytic. Curcuma longa, the epidermis consists of pentagonal cells that are predominantly elongated at right angle to long axis of leaf, so the stomata are paracytic. Hidayat and Kusdianti (2009), studied that among the, 10 species are paracytic. One species is Anomocytic (Euphorbia pulcherima), and two species are Anisocytic, (Phyllanthus niruri green, P.niruri yellow).

Kranti Rai and Ela Tiwari (2012) concluded that Jaropha curcas, J.gossypifolia are the plant under the family Euphorbiaceae. They can be identified by Brachy paracytic, Anomotetracytic, Anomocyic, Actinocytic, Paratetracytic stomata

III. MATERIALS AND METHODS

Different leaves (dicot and monocot) were collected from the college campus, washed using running tap water properly, and then peeled off, and peelings were stained using the counter safranin, observed under the trilocular microscope and recorded. Finally photographs were taken.

IV. RESULT AND DISCUSSION

Different leaves (dicot and monocot) were collected from the college campus, washed using running tap water properly, and then peeled off, and peelings were stained using a counter stain safranin, observed under the trilocular microscope and recorded. Finally photographs were taken.

Among the 40 dicot leaves collected from the flora of college campus mainly shows four types of stomata such as Anomocytic, Anisocytic, Paracytic, and Diacytic (Plate 1). The collected 40 dicot plants mainly comes under 22 families. 10 monocot plant shows Paracytic type of stomata (Plate 2).

Among the 40 collected plants (Chart 1), 16 plants show Anomocytic type of stomata, 9 plants showing Paracytic type of stomata, 8 plants showing Diacytic type of stomata and 7 plants showing Anisocytic type of stomata. The study concluded that, in dicot plants mainly shows the Anomocytic type of stomata and Anisocytic type of stomata is the least occurring stomata. This study concluded that Anomocytic type of stomata mainly found in nine families, Paracytic type of stomata found in seven families, Diacytic type of stomata found in four families and Anisocytic type of stomata found in five families. The collected four plants from the family Acanthaceae shows only Diacytic type of stomata hence this character can be used for taxonomic studies. The three plants collected from the family Nyctaginaceae shows mainly Anomocytic type of stomata hence this also used for the taxonomic studies. The family Euphorbiaceae show both Anomocytic and Paracytic type of stomata. Lamiaceae and Rubiaceae leaves show both Anomocytic and Anisocytic type of stomata.

V. CONCLUSION

Stomata are tiny pores on the upper epidermis of leaves they serve as passage for the movement of water vapour, carbon dioxide, oxygen. A typical stoma is a microscopic pore, flanked by two guard cells. Guard cells are bean shaped in dicot but are dumb - bell shaped in monocots. The present study aimed to compare stomatal type in monocot and dicot leaves collected from the college campus (Nirmala College for Women Coimbatore), leaves of 50 plants were collected washed using running tap water properly peeled off. The peelings were stained using a counter stain safranin, finaly observed under the microscope, recorded and photographs were taken.

Among the collected leaves, dicot leaves mainly shows Anomocytic, Anisocytic, Diacytic, Paracytic type of stomata. The monocot leaves only show Paracytic type of stomata. This study concluded that Anomocytic stomata is the most commonly occurring stomata in dicot plants and follow Paracytic, Diacytic and Anisocytic type of stomata. The selected leaves of dicot plants coming mainly under 22 families and monocot leaves under the 5 families. In the dicot plants stomata distributed as regularly and monocot plants shows irregular type of distribution.

The epidermal character can prove to be the importance with respect to identification of a particular plant species. This work is a small contribution as an aid the identification of the species with the help of anatomical studies.

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Chart: 1 Graphical Representation Of Dicot Plants And Its Stomatal Types

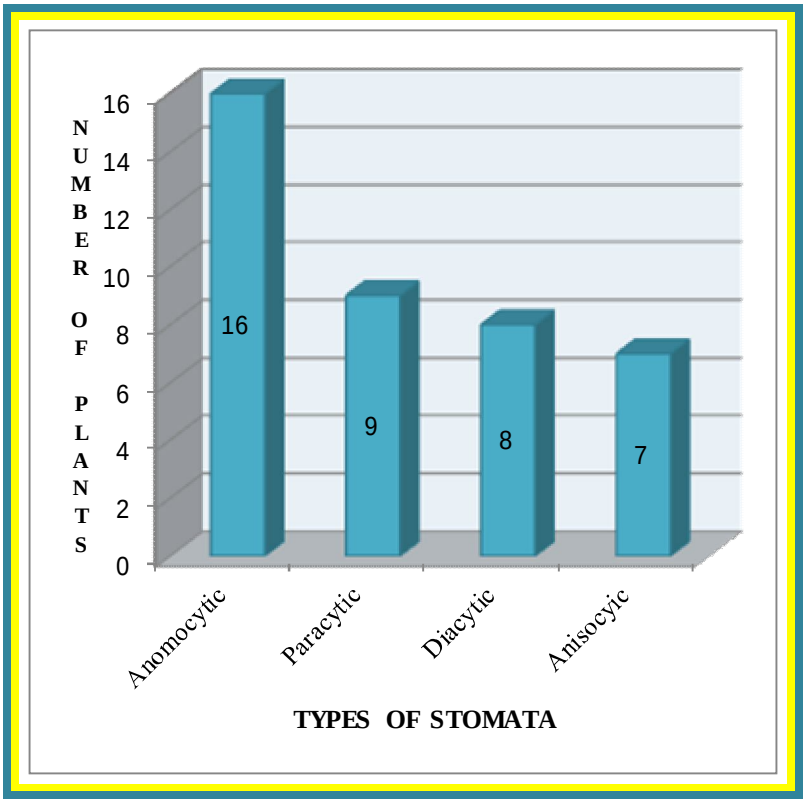
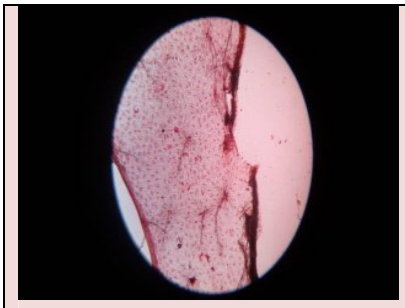
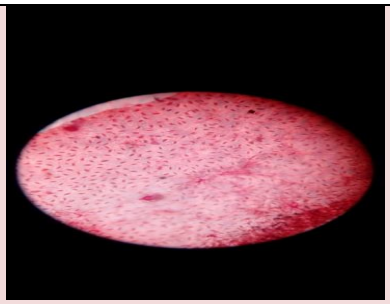
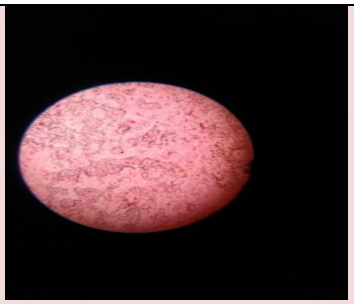
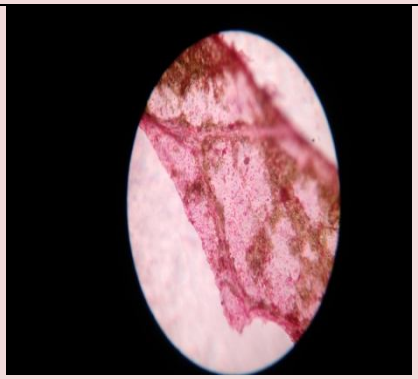
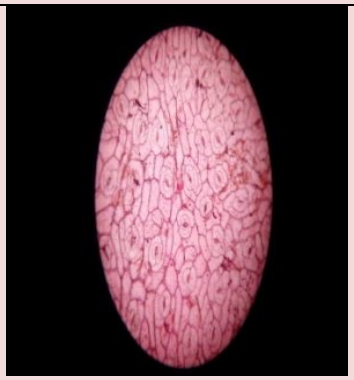
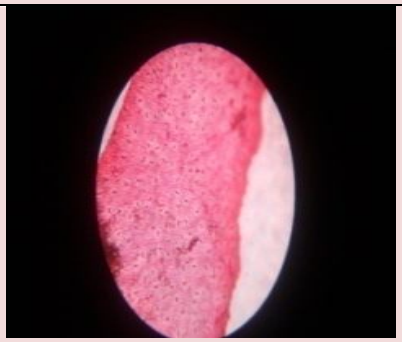
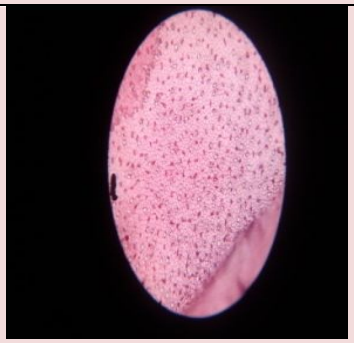
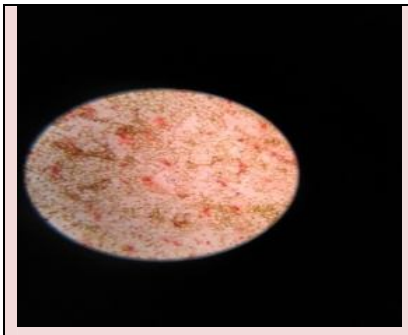
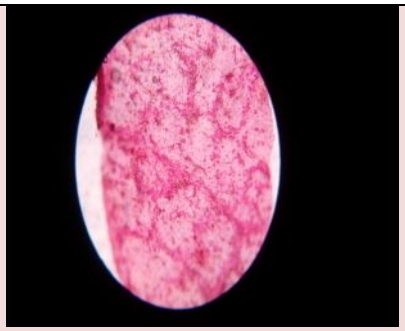
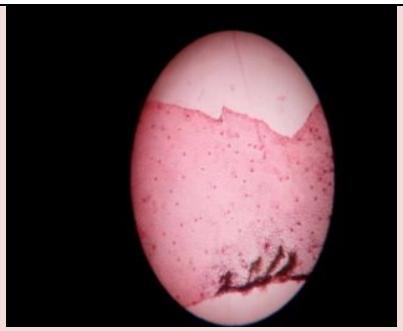
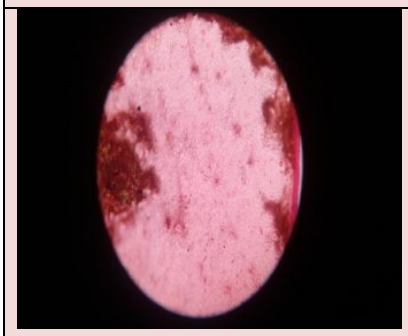
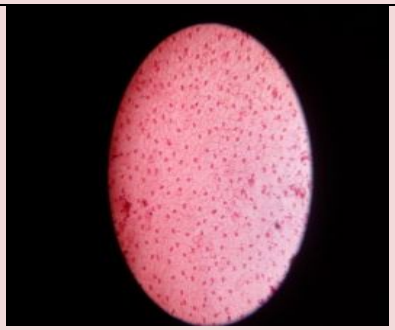
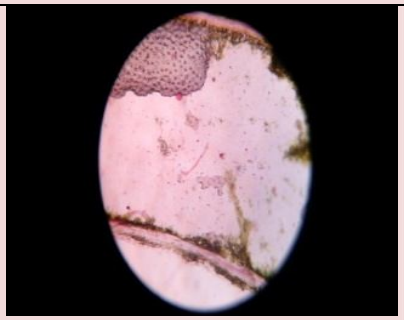
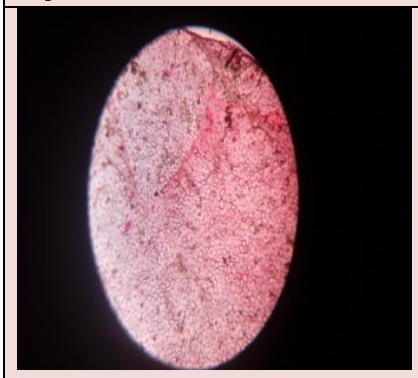
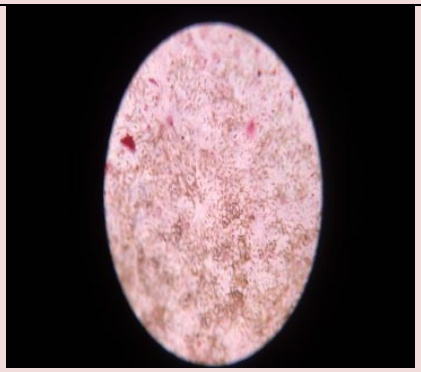
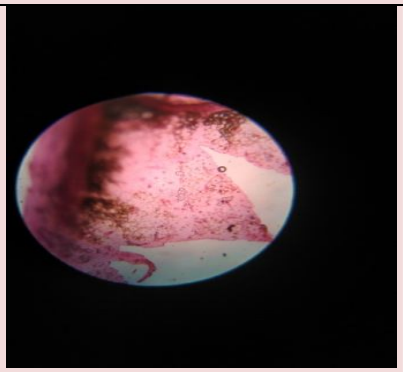
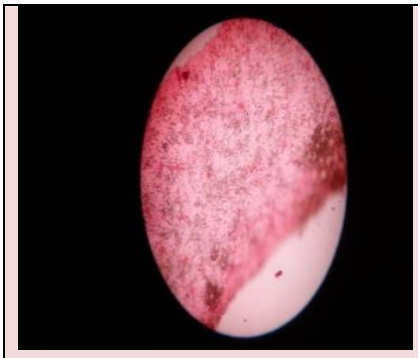
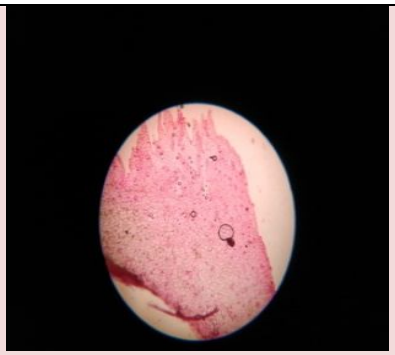
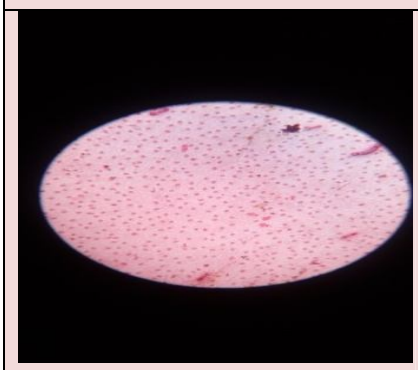
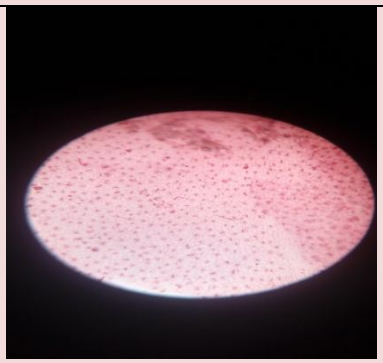
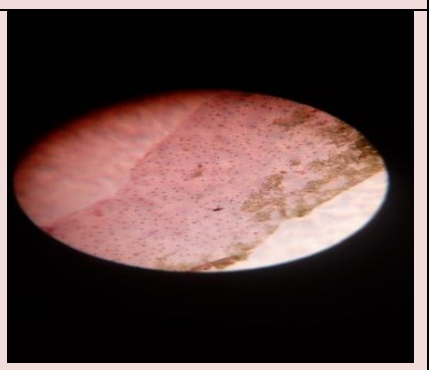
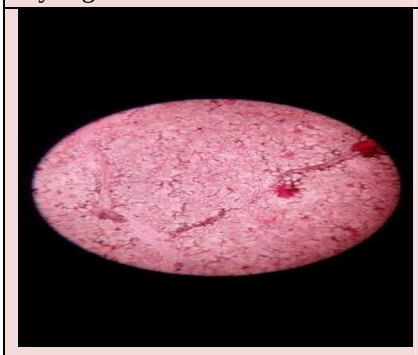
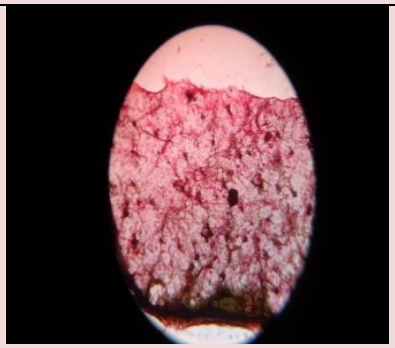
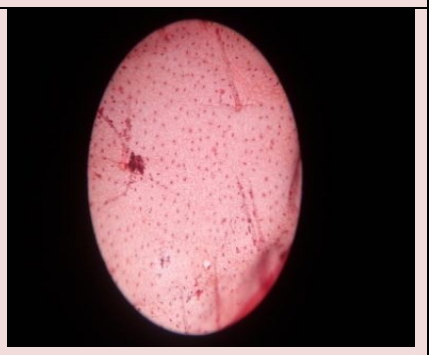
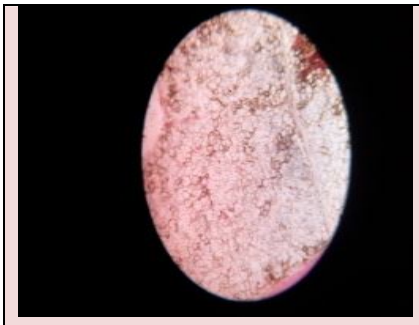
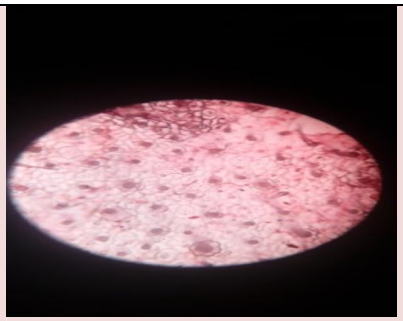
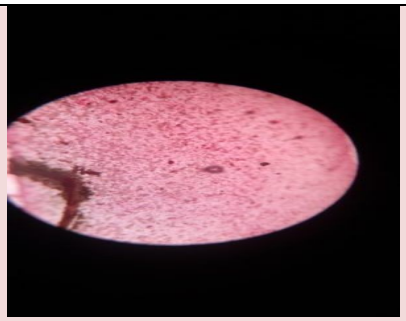
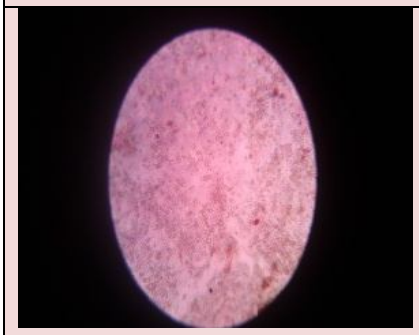
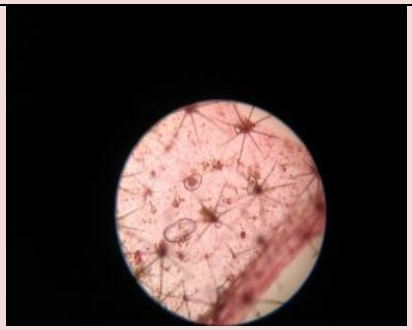
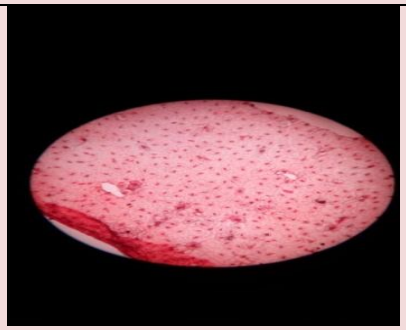
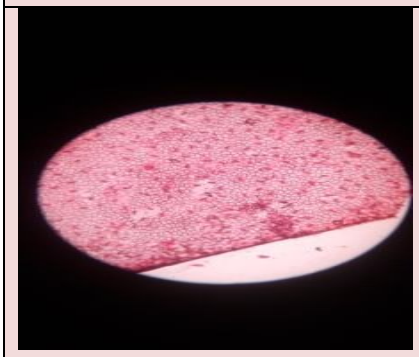
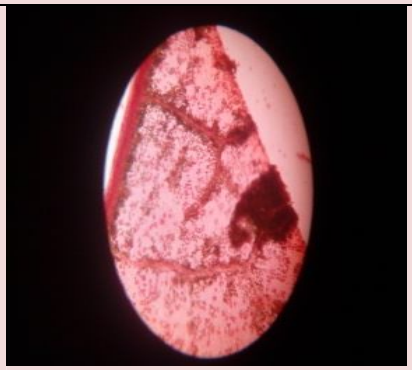
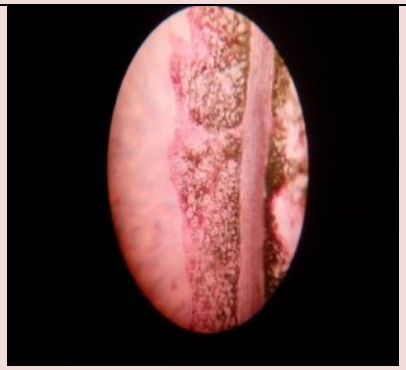


Plate: 1 Anatomical Study Of Dicot Plants

		
Acalypha indica, L.; Anomocytic Euphorbiaceae	Allamanda cathartica,L.; Anomocytic Apocynaceae	Alternanthera sessilis, Lamk.; Paracytic Amaranthaceae
		
Andrographis paniculata, (Burm.f).; Diacytic Acanthaceae	Azadirachta indica, A. Juss.; Anomocytic Meliaceae	Basella alba ,L.; Paracytic Chenopodiaceae
		
Boerhaavia diffusa, L; Anomocytic Nyctaginaceae	Bougainvillea spectabilis .willd.; Anomocytic Nyctaginaceae	Calotropis gigantea, R.Br.; Paracytic Asclepiadaceae

		
Capsicum annum ,L.; Anisocytic Solanaceae	Cassia fistula ,L.; Paracytic Caesalpinaceae	Catharanthus roseus, L.; Anomocytic Apocynaceae
		
Clitoria ternatea ,L.; Paracytic Papilionaceae	Crotalaria medicaginea, Lamk; Paracytic Papilionaceae	Euphorbia heterophylla ,L.; Paracytic Euphorbiaceae
		
Ficus religiosa ,L.; Diacytic Moraceae	Hibiscus rosa – sinensis,L.; Anomocytic Malvaceae	Justicia adhatoda ,L.; Diacytic Acanthaceae

		
Justicia gendarussa, L.; Diacytic Acanthaceae	*Lawsonia inermis* ,L.; Anisocytic Lythraceae	*Millingtonia hortensis*,L.f.; Anomocytic Bignoniaceae
		
Mirabilis jalapa, L.; Anomocytic Nyctaginaceae	*Morinda citrifolia*, L.; Anisocytic Rubiaceae	*Murraya exotica*, L.; Paracytic Rutaceae
		
Murraya koenigii, Spreng.; Paracytic Rutaceae	*Ocimum* sanctum ,L.; Anisocytic Lamiaceae	*Pentas lanceolata*, (Forsk).; Anomocytic Rubiaceae

		
Phyllanthus acidus, (L). Skeels.; Anomocytic Euphorbiaceae	*Plectranthus amboinicus,* (Lour). Spreng.; Anomocytic Lamiaceae	*Punica granatum,* L.; Anisocytic Lythraceae
		
Santalum album, L.; Anisocytic Santalaceae	*Solanum nigrum,* Mill.; Anisocytic Solanaceae	*Swertia chiratta, L.,* Diacytic Gentianaceae
		
Tabernaemontana divaricata, L;. Diacytic Apocynaceae	*Tecoma capensis,* (Thumb). Lindl.; Anomocytic Bignoniaceae	*Thespesia populnea,* Cav.; Anomocytic Malvaceae

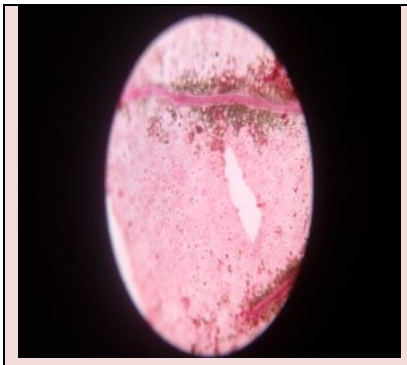
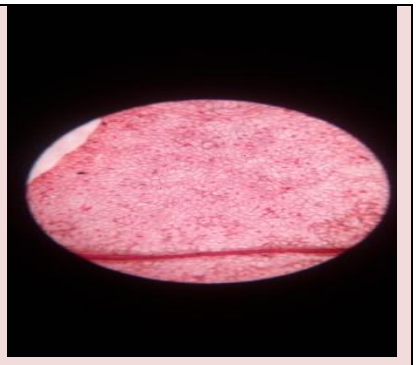
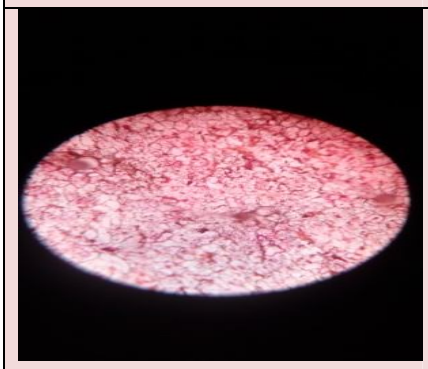
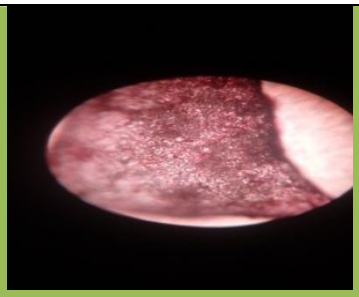
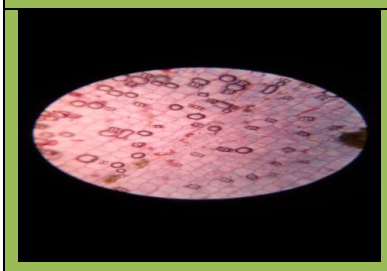
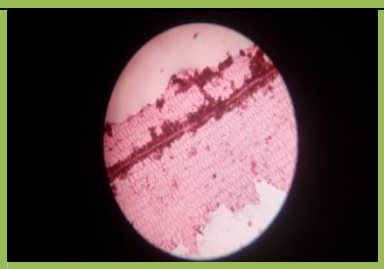
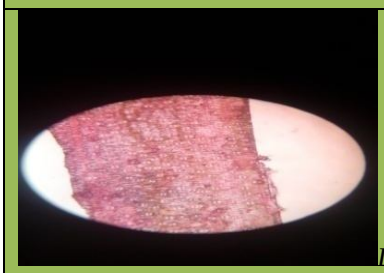
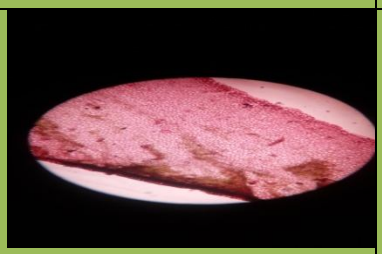
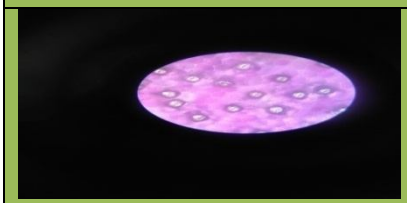
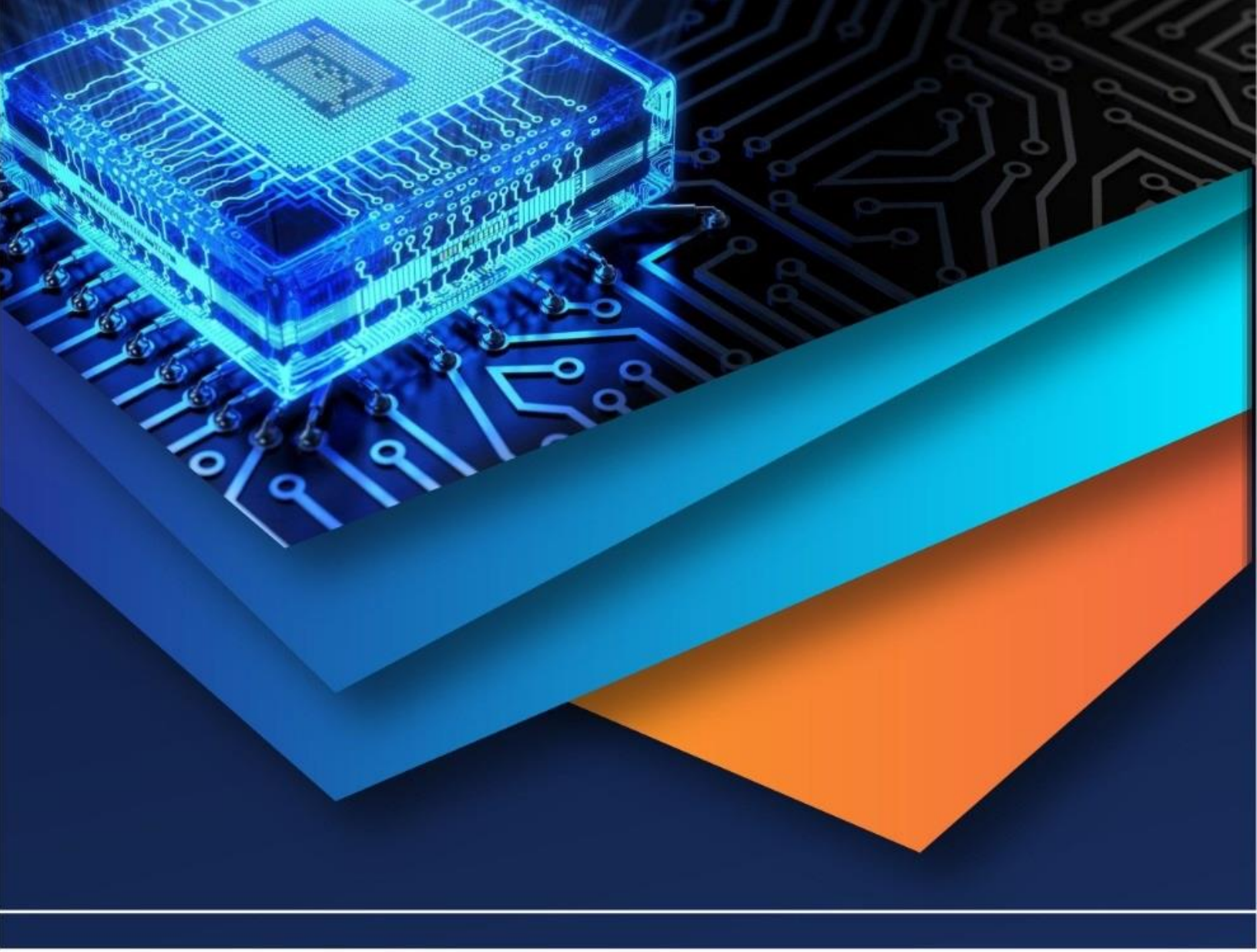
	
Thunbergia erecta ,T. And.; Diacytic Acanthaceea	*Tinospora cordifolia* ,Miers.; Diacytic Menispermaceae
	
Tridax procumbens, L.; Anomocytic Asteraceae	*Vernonia cinera*, Less.; Anomocytic Asteraceae

PLATE:2 ANATOMICAL STUDY OF MONOCOT PLANTS

 *Amorphophallus paeoniifolius*, (Dennst). Nicolson.; Paracyti Araceae	 *Anthurium acutum*, N.E.Br.; Paracytic Araceae	 *Colocasia esculenta*, schott.; Paracytic Araceae
 *Commelina benghalenis*,L.; Paracytic Commelinaceae	 *Costus speciosus*, sm.; Paracytic Zingiberaceae	 *Curcuma longa*, L.; Paracytic Zingiberaceae
 *Dracaena fragrans*, (L)ker Gawl Ga.; Paracytic Agavaceae	 *Epipremnum pinnatum*(L), Engl.; Paracytic Araceae	 *Pancratium triflorum*, Roxb.; Paracytic Amaryllidaceae
 *Tradescantia spathacea*, Sw.; Paracytic Commelinaceae		



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