A Project under Department of Biotechnology, Govt. of India,

Foldscope Scheme

# Final Progress Report

# STUDY OF LEAF SURFACE DIVERSITY IN THE PLANTS IN AND AROUND CITY OF AMRAVATI


**Dinesh D. Khedkar**

*Associate Professor in Botany*

**Shri Shivaji Science College**

**Amravati, Maharashtra - 444 603**

A UGC - CPE, NAAC - "A" Grade

Identified as : DST – FIST, SGBAU – Lead College

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"In my mind, every Biology book should have a Foldscope as the last page, Because you're not just imparting knowledge, you're also imparting the tools to gain that knowledge." Manu Prakash

# Document Index

Accredited by NAAC with "A" grade (very good) with a CGPA of 3.13

SHRI SHIVAJI EDUCATION SOCIETY AMRAVATI'S

**SHRI SHIVAJI SCIENCE COLLEGE**

*College with Potential for Excellence.*

Shivaji Nagar, Morshi Road, Amravati - 444 603, M.S.

Founder : Dr. Panjabrao Alias Bahusaheb Deshmukh
President : Shri. Harshavardhan Pratapsinh Deshmukh
Principal : Dr. V. G. Thakare

E-mail : shivajiscamt.office@gmail.com Website : www.shivajiscamt.org
Off. : (0721) 2660855; Res. (0721) 2551400, 2553130, Comp. Dept. : (0721) 2551366 Fax : (0721)2665485

Ref. No. SC/ / / Date : / /

**Reference No: SSSC/ Foldscope/Audit/ 4984 /2019** **Date: 2nd Dec. 2019**

**To,**
**Mr. Vinod Kumar**
*Manager*
Biotech Consortium India Limited
Anuvrat Bhavan, 5th Floor
201, Din Dayal Upadhyaya Marg,
New Delhi – 110 002

**Subject : Submission – Final Progress Report**

Respected Sir,

The project entitled "Study of leaf surface diversity in the plants in and around city of Amravati" is sanctioned by Department of Biotechnology, Govt. of India, New Delhi under Foldscope Scheme vide sanction order no. BT/IN/Indo-US/Foldscope/39/2015 dated 20.03.2018 issued by the Department of Biotechnology (DBT), Ministry of Science & Technology, Government of India in favour of Principal Investigator Dr. D. D. Khedkar, Associate Professor in Botany.

With reference to official letter dated September 21, 2019, we are sending the necessary documents as per the instructions and formats given.

Hope this will serve the purpose and the settlement / project completion report will be issued at an earliest possible.

Thanking you in anticipation.

**D. D. Khedkar**
**Principal Investigator (Foldscope Project)**
Associate Professor in Botany
Shri Shivaji Science College, Amravati

**V. G. Thakare**
**Principal**
Shri Shivaji Science College
Amravati

**Encls:** 1. Audited UC, SoE and Manpower engaged

2. Project report

# Shri Shivaji Science College

**Shivaji Nagar, Morshi Road, Amravati – 444 603 (M. S.), India**

"Study of leaf surface diversity in the plants in and around city of Amravati"
A Project supported by Department of Biotechnology, Govt. of India, New Delhi
Under Foldscope Scheme

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## UTILISATION CERTIFICATE

(for the financial year 01.04.2019 to 19.09.2019)

**(Rs. 2.00 in lakhs)**

| | | |
|---|---|---|
| 1. | **Title of the project/scheme:** | "Study of Leaf Surface Diversity in the plants in and around city of Amravati" is sanctioned under the Foldscope Scheme. |
| 2. | **Name of the Organization:** | Shri Shivaji Science College, Amravati |
| 3. | **Principal Investigator :** | Dinesh D Khedkar |
| 4. | **Deptt. of Biotechnology sanction order No. & date of sanctioning the project :** | BT/IN/Indo-US/Foldscope/39/2015 20.03.2018 |
| 5. | **Amount brought forward from the previous financial year quoting DBT letter No. & date in which the authority to carry forward the said amount was given :** | Nil |
| 6. | **Amount received from DBT during the financial year** *(Please give No. and dates of sanction orders showing the amounts paid) :* | Rs. 1,78,048 (BT/IN/Indo-US/Foldscope/39/2015 dated March 20, 2018) |
| 7. | **Other receipts/interest earned, if any, on the DBT grants :** | Rs. 21952 (Amount Carried Forward from last Financial Year) |
| 8. | **Total amount that was available for expenditure during the financial year (Sl. nos. 5,6 &7) :** | 2.00 Lakhs |
| 9. | **Actual expenditure (excluding commitments) incurred during the financial year (statement of expenditure is enclosed ) :** | Rs. 578048/- |

| | | |
|---|---|---|
| 10. | **Unspent balance refunded, if any (Please give details of cheque No. etc.)** | Nil |
| 11. | **Balance amount available at the end of at the end of the financial year** | Nil |
| 12. | **Amount allowed to be carried forward to the next financial year vide letter No. & date:** | Rs. 21952/- (BT/IN/Indo-US/Foldscope/39/2015 dated March 20, 2018) |

1. Certified that the amount of **Rs. 2,00,000/-** mentioned against col. 9 has been utilised on the project / scheme for the purpose for which it was sanctioned and that the balance of **Nil** remaining unutilized at the end of **31st March 2020** will be adjusted towards the grants-in-aid payable during the next year.

2. Certified that I have satisfied myself that the conditions on which the grants-in-aid was sanctioned have been duly fulfilled / are being fulfilled and that I have exercised the following checks to see that the money was actually utilised for the purpose for which it was sanctioned.

**Kinds of checks exercised:**

1. Sanction Order
2. Grant deposit details
3. Account Details
4. Original Bills
5. Previous Utilization Certificates

For V. S. JADHAO & ASSOCIATES
Chartered Accountants
Vijay Jadhao
Partner
Mem.No.45400

V.S.JADHAO & ASSOCIATES
FRN-111974W
AMRAVATI
CHARTERED ACCOUNTANTS

SHRI SHIVAJI SCIENCE COLLEGE
NAAC Accredited with 'A' Grade
AMRAVATI

**Date:** 19.10.2019

**(D. D. Khedkar)**
(Signed and stamped)

**(FINANCE OFFICER)**
(Signed and stamped)

**V. G. Thakare**
**Principal**
Shri Shivaji Science College
Amravati, MS, India – 444 603
(Signed and stamped)

Principal
Shri Shivaji Science College,
Amravati.

# Shri Shivaji Science College

**Shivaji Nagar, Morshi Road, Amravati – 444 603 (M. S.), India**

"Study of leaf surface diversity in the plants in and around city of Amravati"
A Project supported by Department of Biotechnology, Govt. of India, New Delhi
Under Foldscope Scheme

**Statement of Expenditure referred to in para 9 of the Utilization Certificate**
Showing grants received from the Deptt. of Biotechnology and the expenditure incurred during the period **from 01.04.2019 to 19.09.2019** for **Rs. 2.00 Lakhs**

| Item | Unspent balance Carried forward from previous year | Grants received from DBT during the year | Other receipts/ interest earned - if any, on the DBT grants | Total of Col. (2+3+4) | Expenditure (excluding) commitments) incurred during the year | Balance (5-6) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| **A. Non –Recurring** | | | | | | | |
| Equipment | Nil | Nil | Nil | Nil | Nil | Nil | |
| **B. Recurring** | | | | | | | |
| Human Resource | 21952 | 53048 | | 75000 | 84000 | Nil | Amount of **Rs. 21952** was Carried Forward from previous financial year |
| Consumables | Nil | 50000 | | 50000 | 19120 | Nil | |
| Travel | Nil | 50000 | | 50000 | 71880 | Nil | |
| Contingency | Nil | 25000 | | 25000 | 25000 | Nil | |
| Other receipts/ Interest | Nil | Nil | | | Nil | Nil | |
| **Total** | **21952** | **178048** | | **200000** | **200000** | **Nil** | |

**Date:** 19.10.2019

**D. D. Khedkar**
**PROJECT INVESTIGATOR**

SHRI SHIVAJI SCIENCE COLLEGE NAAC Accredited with 'A' Grade AMRAVATI

**(FINANCE OFFICER)**
**(Signed and stamped)**

**V. G. Thakare**
**PRINCIPAL**
Shri Shivaji Science College
Amravati, MS, India – 444 603
(Signed and stamped)

For V.S. JADHAO & ASSOCIATES
Chartered Accountants
Vijay Jadhao
Partner
Mem.No.45400
V.S. JADHAO & ASSOCIATES FRN-111974W AMRAVATI CHARTERED ACCOUNTANTS

# Shri Shivaji Science College

**Shivaji Nagar, Morshi Road, Amravati – 444 603 (M. S.), India**

"Study of leaf surface diversity in the plants in and around city of Amravati" A Project supported by Department of Biotechnology, Govt. of India, New Delhi Under Foldscope Scheme

## Details of Manpower engaged

**For the period from 01.04.2018 to 19.09.2019**

| S. No. | Name & Designation of the Manpower engaged | Pay Scale provided | Date of Appointment | Salary Due | Salary disbursed | Difference, if any | Date of leaving, if any |
|---|---|---|---|---|---|---|---|
| 1 | **Mr. Ajinkya Narendra Gite**<br>At Post: Bhandaraj, Tq:Anjangaon Surji– 444 705 Dist:Amravati, MS, India<br><br>**Project Fellow** | Rs. 14,000/- Consolidated | 1st October, 2018 | Rs. 1,68,000 | Rs. 1,68,000 | Rs. 1,32,000/- Surplus amount reappropriated to the travel and logistics of the students working on the project | 30.09.2019 |
| | **Total** | | | **Rs. 1,68,000** | **Rs. 1,68,000** | **Rs. 1,32,000/-** | |

**Date:** 19.10.2019

**D. D. Khedkar**
**PROJECT INVESTIGATOR**

SHRI SHIVAJI SCIENCE COLLEGE NAAC Accredited with 'A' Grade AMRAVATI

**(FINANCE OFFICER)**
**(Signed and stamped)**

For V. S. JADHAO & ASSOCIATES
Chartered Accountants
Vijay Jadhao
Partner
Mem.No.45400

V. S. JADHAO & ASSOCIATES FRN-111974W AMRAVATI CHARTERED ACCOUNTANTS

**V. G. Thakare**
**Principal**
Shri Shivaji Science College
Amravati - 444 603
(Signed and stamped)

Principal
Shri Shivaji Science College,
Amravati

# Progress report

## DBT-Prakash Lab Foldscope Project (Category B)

| | | |
|---|---|---|
| 1. | **Name & address of the organization** | Shri Shivaji Science College<br>Shivaji Nagar, Morshi Road, Amravati – 444 603 (M. S.), India |
| 2. | **Name, designation contact details of the of the Coordinator including mobile and email** | Dr. Dinesh D. Khedkar<br>Associate Professor in Botany<br>Shri Shivaji Science College,<br>Shivaji Nagar, Nagpur Road,<br>Amravati -444603(MS) India<br>Website : www.dineshkhedkar.co.in<br>Email: sonudin@gmail.com<br>Contact Nos.: 0721-2530473,<br>Fax: 0721-2553969<br>Mobile No.: +919423622287 |
| 3. | **Sanction order no. and date** | BT/IN/Indo-US/Foldscope/39/2015<br>20.03.2018 |
| | **Total budget sanctioned** | 8.00 Lacks |
| 4. | **Budget released by DBT** | 6.00 Lacks |
| 5. | **Title of the project** | Study of Leaf Surface Diversity in the plants in and around city of Amravati |
| 6. | **Project objectives highlighting proposed activity with foldscope** | 1. Taxonomically significant leaf surface morphology will be searched<br>2. Exploration of the more opportunities to carry of significant research by using Foldscope.<br>3. To develop scientific understanding of the students and instil research aptitude in them.<br>4. To blend social and academic outreach activity to showcase miniscule world to the students, parents and society.<br>5. Assign UG and PG students with the research problems to rise with scientific data to publish in journals of National and International repute. |

| | |
|---|---|
| **7. Summary of the Progress made so far under the project (not more than 200 words)** | Appendix – I |
| **8. Major relevant pictures (colour) of images taken during use of Foldscope (please post only relevant pictures below)** | |
| ➢ Pictures of images (Pollen/ microbes/ tissues etc.) observed using foldscope (please post pictures with description, place, date and time): | Appendix – II |
| ➢ Workshop pictures: | Appendix – III |
| ➢ Number of workshops conducted: | 26 (Appendix – IV) |
| ➢ Number of students trained: | 1721 (Appendix – IV) |
| ➢ Types of activates carried out using foldscope: | Appendix – IV |
| **9. Any specific new observations made If yes, details thereof** | **Yes** Appendix – V |
| **10. Whether registered under https://microcosmos.foldscope.com** | Yes |
| **11. Number of pictures/videos posted on https://microcosmos.foldscope.com** | 141 Appendix – VI |

**(D. D. Khedkar)**
**Principal Investigator**

**Dr. V. G. Thakare**
Principal
Shri Shivaji Science College, Amravati
(Signature & Stamp)

## 7. Summary of the Progress made so far under the project (not more than 200 words)

**Appendix – I**

The project was started in the month of July 2018 with the process of selection of the students for the implementation. The team of more than 100 B. Sc. III Botany students were selected to carry out research and outreach activities envisaged under the project proposal.

10 groups of the 10 to 12 students were formed to work further. They were assigned with the three outreach activities to showcase applications of the Foldscope to the school students and common citizens. Targets were fixed as Rural School, Urban Schools and Community area. For research they were assigned with the one family of the plants. Junior research fellow was appointed in the month of October through due process. Following are the outcomes of the work done under the project –

1. The workshops as "Exploration of Minuscule World through Foldscope" in the 26 schools in and around city of Amravati. Around 1721 students were offered with an hands on experience to see and enjoy the microworld. The same experience was imparted to common citizens in the city of Amravati by conducting sessions at colonies and societies.
2. Under the NE twining programme Dr. Mousmi Saikia, Anandarm Dhekial Phookan College (A. D. P College), Nagaon, Assam and Dr. Roohi Mushtaq, Sri Pratap College, Cluster University, Srinagar agreed to collaborate for the research and students exchange.
3. North East Students visited Amravati during 9$^{th}$ Oct. to 10$^{th}$ Oct. 2018. This Exchange Program was one day Twining Sessions to explore opportunities of research through Foldscope and visit to the Ankur Seeds Company, Nagpur.
4. 34 Students from Shri Shivaji Science College, Amravati has also visited Assam under the similar program during 24$^{th}$ Nov. 2018 to 2$^{nd}$ Dec. 2018. This visit includes Kolkata, Guwahati, Nagaon, Kaziranga and Shillong. Besides, twinning partner institute, Indian Council of Agricultural Research was also explored. Dr. Krishnappa and other three Principal Investigators were working in this centre for different research areas with foldscope.
5. The Junior research fellow and the B. Sc. Final year students are simultaneously working on the research target under the project. 10 groups of the students with 10 to 12 students in each group are exploring the Leaf Surface Diversity in the plants in and around city of Amravati. Many of the students are now at the stage to publish their research as an article in reputed journal of research. The outstanding achievement of the project is to inculcate social responsibility, communication skill and research attitude in the students at early stage of their under graduate studies.
6. Four M.Sc. Research Projects based on Foldscope were submitted to University as partial fulfilment of the PG Degree in the session 2018-19, all have awarded with the degree.
7. Research outcomes in M.Sc. Projects based on Foldscope were presented in National Conference held at Institute of Science, Nagpur. Four students presented papers during 6 – 7 March, 2019.
8. Twinning MoU signed with Muthyammal College, Rasipuram, Tamilnadu. One day national seminar was jointly organized and conducted at Rasipuram on 26-27$^{th}$ Sept. 2019.
9. Innovative Workshop was conducted as Mission Foldscope: with a vision to cultivate one million children as Neotric Innovator and Foldscope with every child. The programme was coordinated by Mr. Pravin Patankar, Foldscope PI on 23$^{rd}$ Jan. 2019 at Shri L. C. Kherde Junior College, Karajgaon, Dist Amravati.

**Appendix – II**

# STUDY OF LEAF SURFACE DIVERSITY IN THE PLANTS IN AND AROUND CITY OF AMRAVATI

Under the project, total 300 plants were studied. From this 300 plants, 150 plants from Amravati, 50 plants from Melghat Region, 50 plants from Anjangaon Surji Tehsil region and 50 plants from the region of North East (Nagaon, Kaziranga, Shillong, etc.). Leaf surface diversity includes its epidermal cell, stomata and hairy structure, which are present on plant known as trichome. To study leaf surface diversity of plant simple mechanical method was used. In this method to study leaf surface diversity peel of leaf is removed and then it was focused in foldscope after slide preparation. In some plant leaf peel naturally separated but in some plant it is not easy task. So, there is one method known as impression method. In such case with the help of xylene or colourless nail polish we can get impression of leaf surface structure. Xylene or nail polish spread on leaf surface and then kept it drying at room temperature. After 5 minute xylene layer was separated and observed in foldscope.

On the basis this work the leaf surface diversity of 50 plants has completed. In this work the different type of plant was studied. Some plants are aquatic, xerophytic and terrestrial. Different type of cell and stomata are present in different pant. In some plant trichomes were present. This trichomes were present in two form mainly Glandular and Non-Glandular. Trichomes are hairy structure which is present on leaf surface. In some plant its present on only one part and in some plant its present only on one side. The length of trichomes is different in different plant.

In this work the epidermal cell of 50 plants was studied. Epidermal cell shape is different in Different plant. In some plant the cell shape was hexagonal. In some plant it was circular or cuboidal. In some plant it was irregular amoeboid e.g. Annona reticulata. In some plant the epidermal cell shape is rectangular and long for e.g. *Alium cepa, Sorghum sp*. The stomata varies in their structure and shape in different

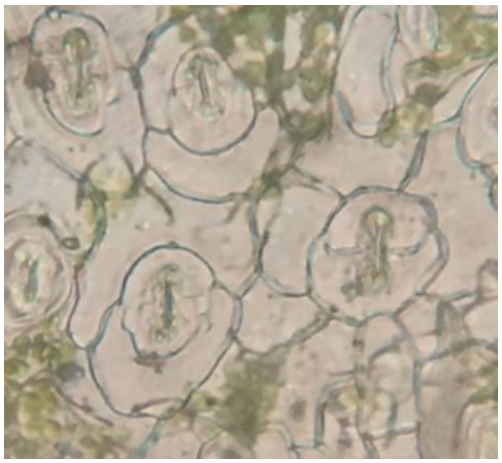
plants. In some plant stomata are circular, cuboidal or rectangular. In all stomata structure guard cell are present in different shapes.

The presence of stomata or the number of stomata we generally count in stomatal index. The stomatal index means the number of stomata in percentage. In this work, the stomatal index of 300 plants had studied. The stomata are surrounded by epidermal cell and number of stomata are always less than epidermal cell. Different type of stomata are present in this 300 plant. Anomocytic, Anisocytic, Diacytic, Paracytic, Actinocytic, Gramineous, Tetracytic, Cyclocytic, Tetracytic, Hypocytic, Pericytic, Desmocytic, Polycytic, Staurocytic and Gramineous type stomata are present in this 300 plants. There is one specific formula to calculate stomatal index. The formula is,

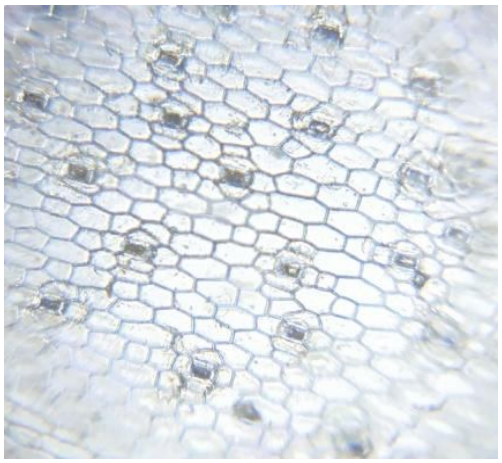
$$Stomatal\ Index = \frac{Number\ of\ Stomata\ per\ Unit\ Area}{Epidermal\ Cells + Stomata\ (per\ Unit\ Area)} x\ 100$$

After observing the structure of cell, trichomes and stomata in foldscope photograph had taken with the help of mobile phone camera. Photographs showed complete structure of cell, stomata and trichomes. In some plant we can see the structure on normal magnification but in some plant it could not possible. So, this photographs we could see on zoom image.

# Epidermal ornamentation in the plants from Amravati region

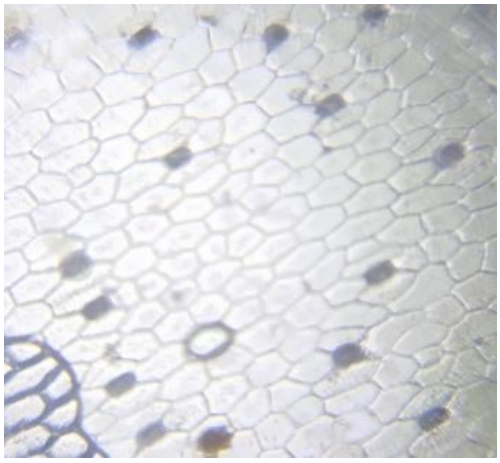


***Adathoda vessica***

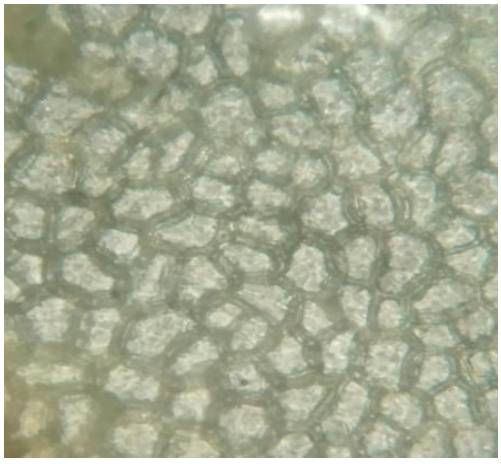


***Agave* sp.**

***Alium cepa***



***Alove vera***

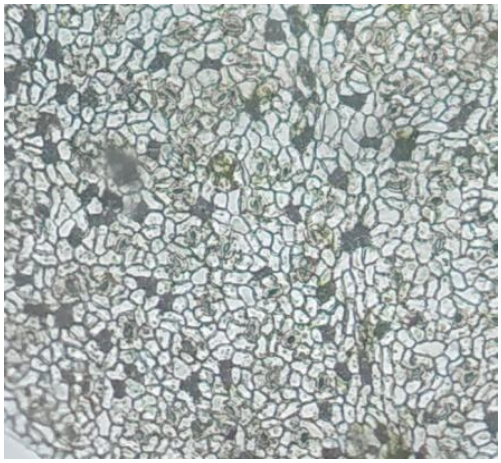


***Alstonia scholaris***

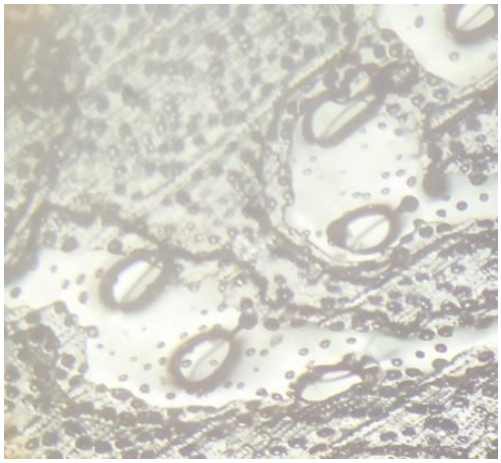
***Annona reticulate***

***Annona sqamosa***

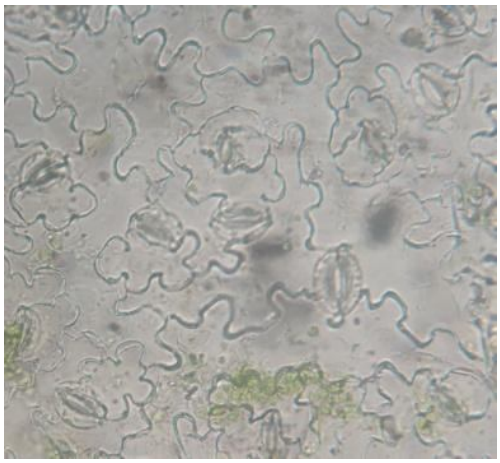
***Arachis hypogea***



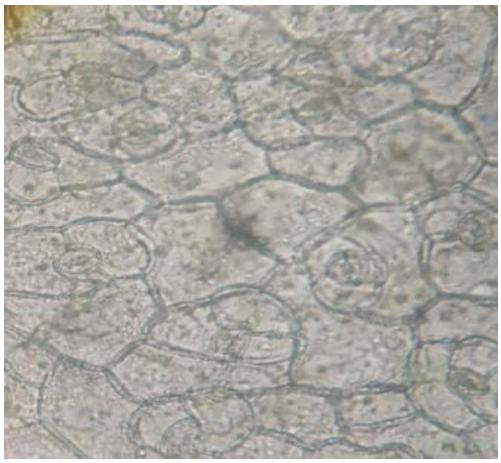
***Azadiracta indica***



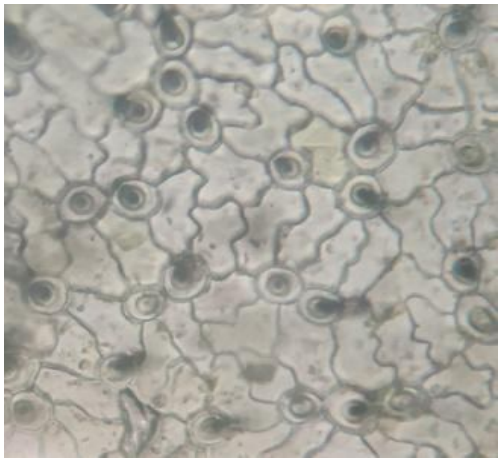
***Bambusa vulgaris***



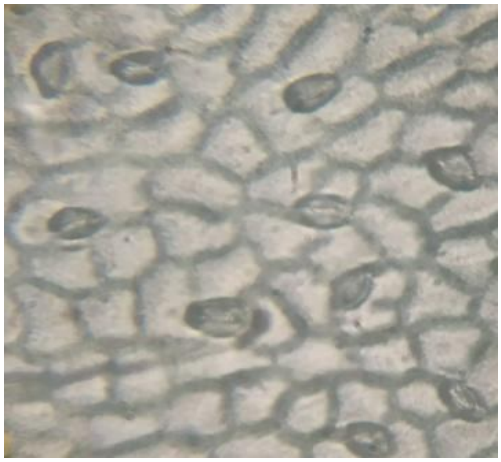
***Brassica niagra***



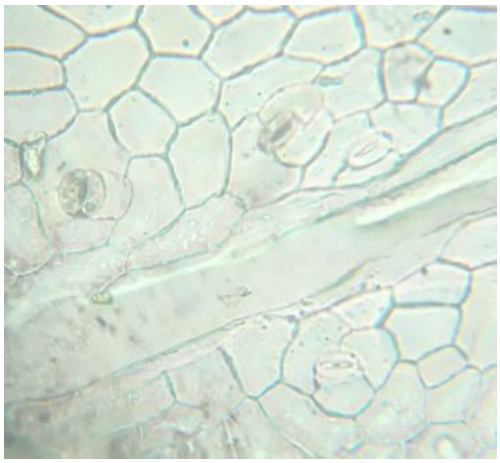
***Brassica oleracea***



***Cajanus cajan***

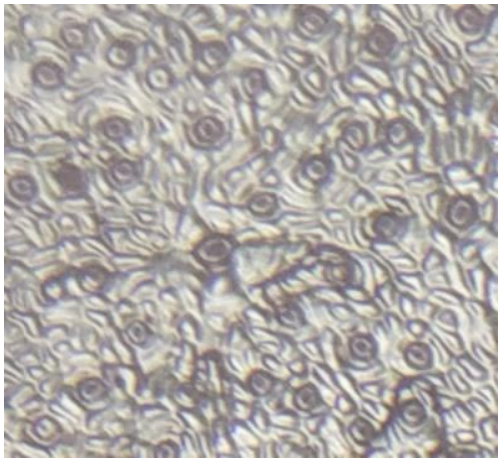


***Carrica papaya***

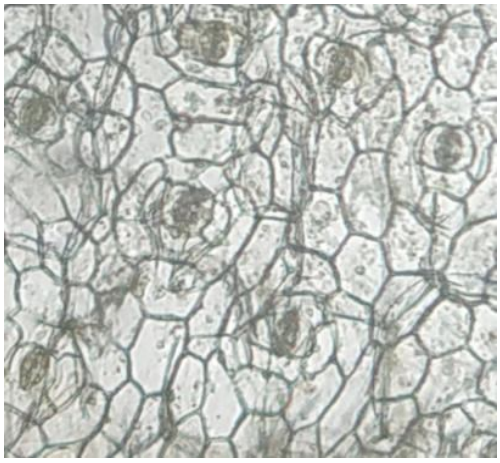


***Catharanthus roseus***

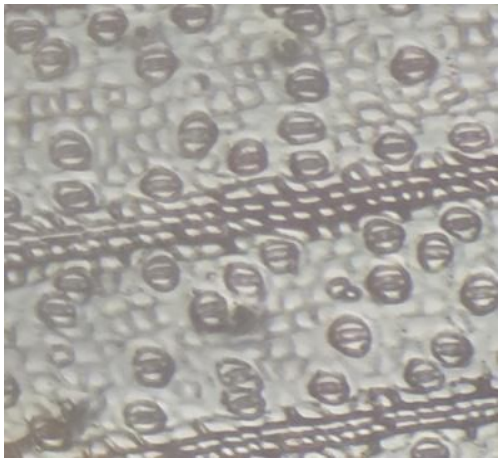
***Cicer arietinium***



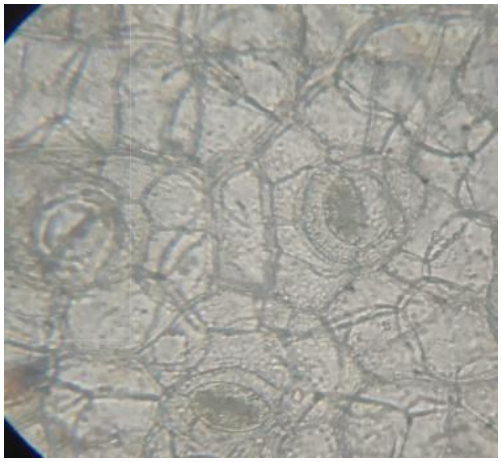
***Citrus limon***



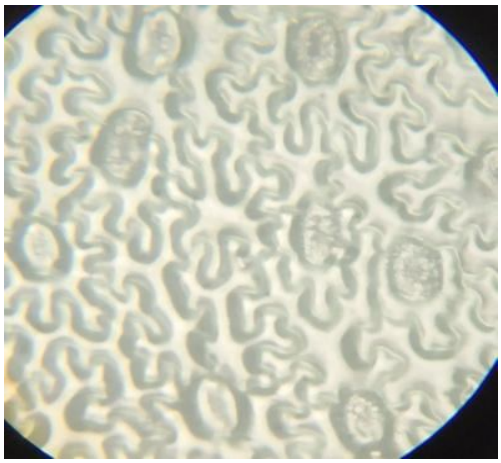
***Costus sp.***



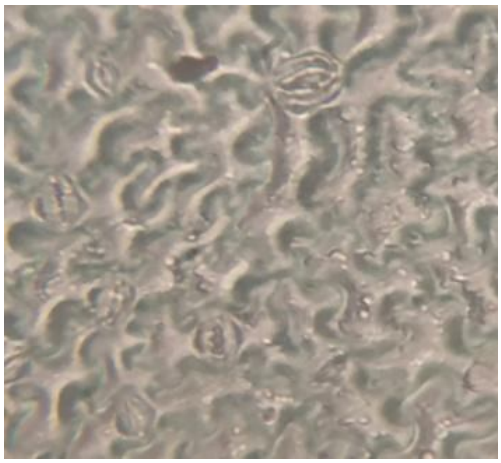
***Elettaria cardamomum***



***Euphorbia antiquorum***

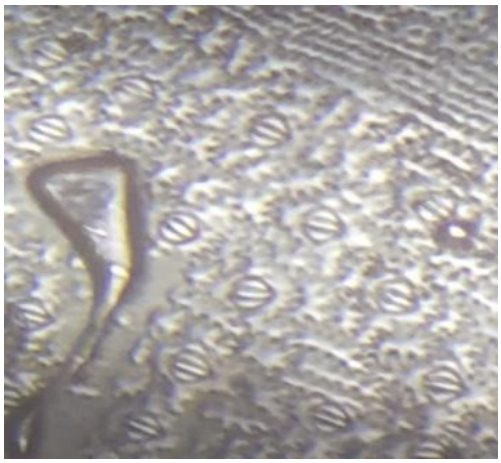


***Ferns***



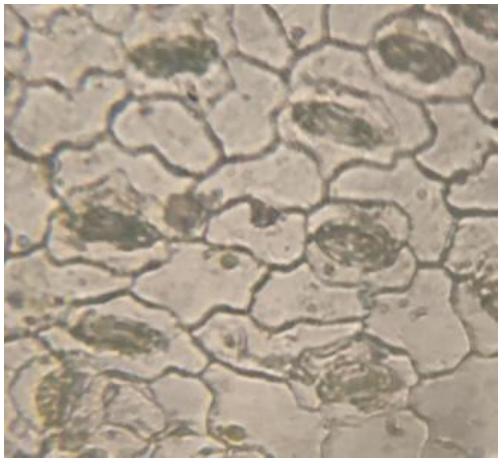
***Ficus racemosa***

***Ficus religiosa***

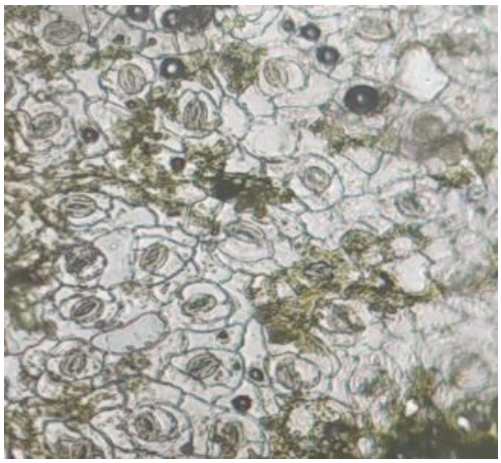


***Gloriosa superba***

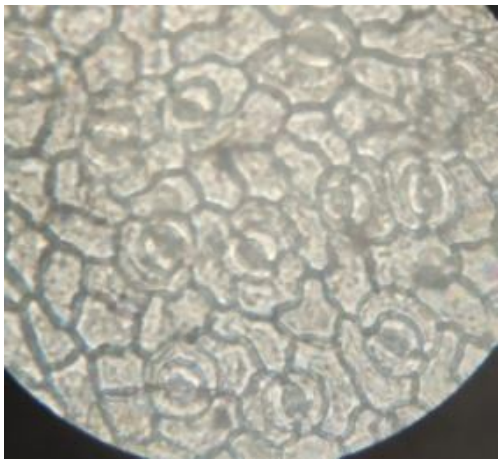
***Gossypium herbacium***



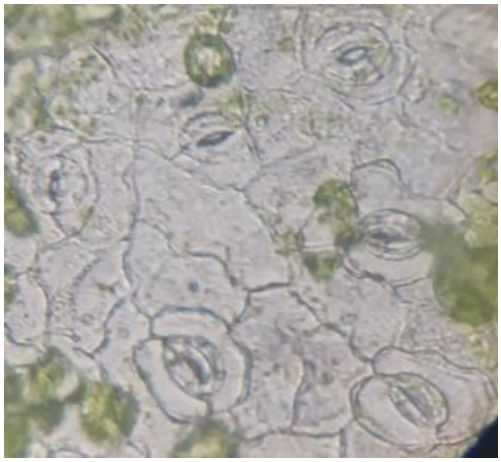
***Hamelia patens***



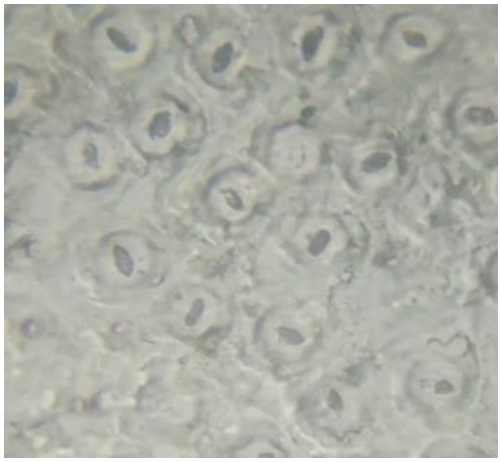
***Hibiscus rosa sinesis***



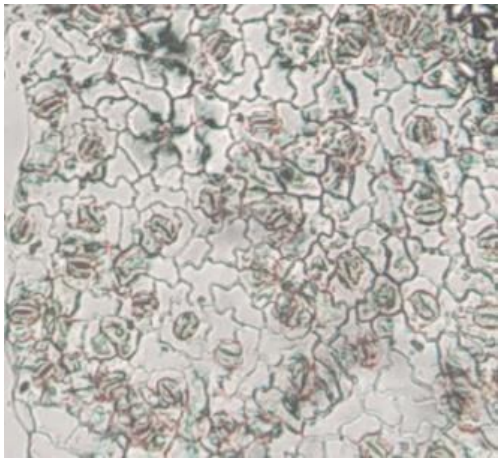
***Ixora chinesis***



***Jatropa curcas***



***Kigelia africana***



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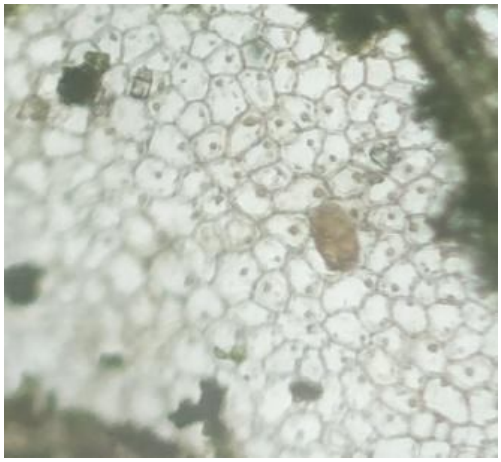
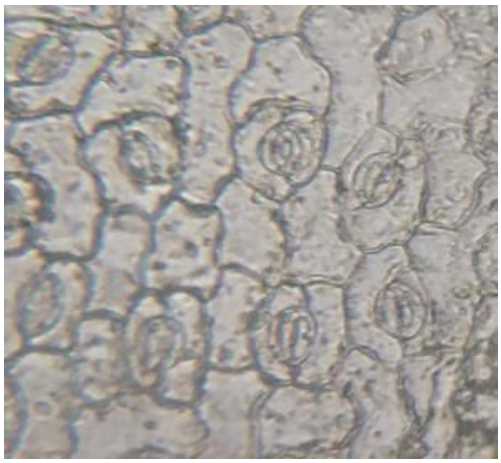
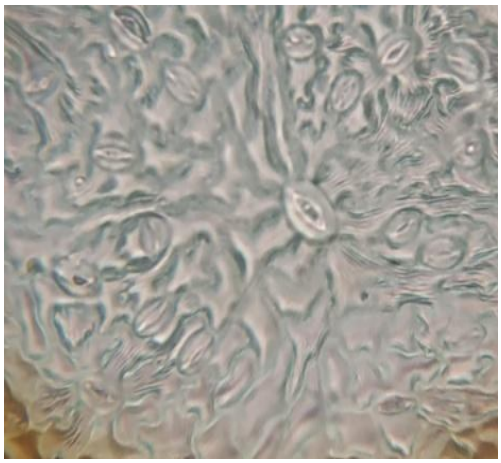


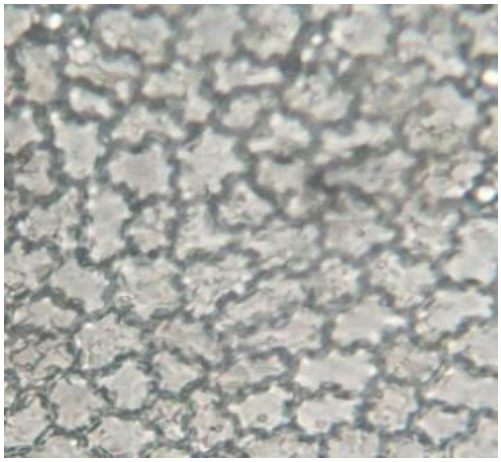
***Mangifera indica***



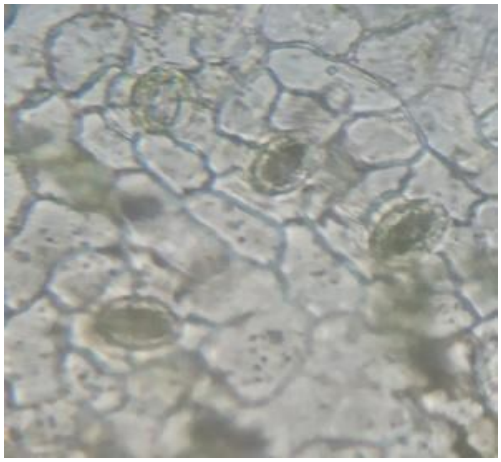
***Mimosa pudica***



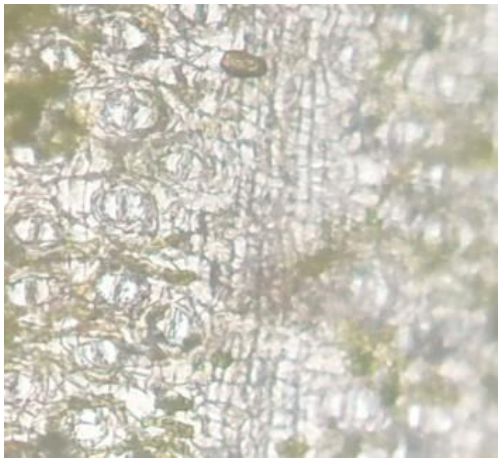
***Morus alba***



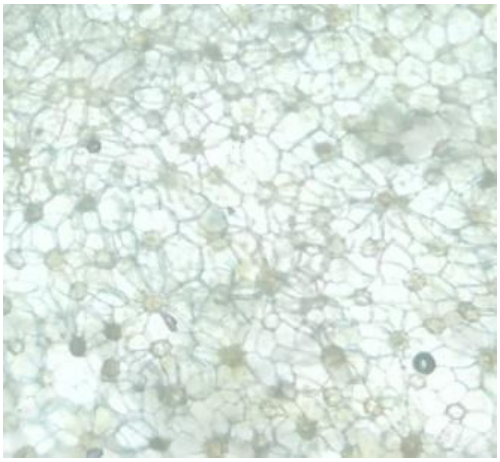
***Murraya paniculata***



***Murraya koeniggi***



***Musa sp.***



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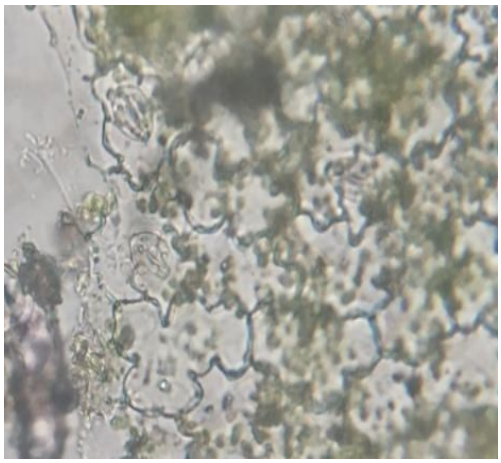
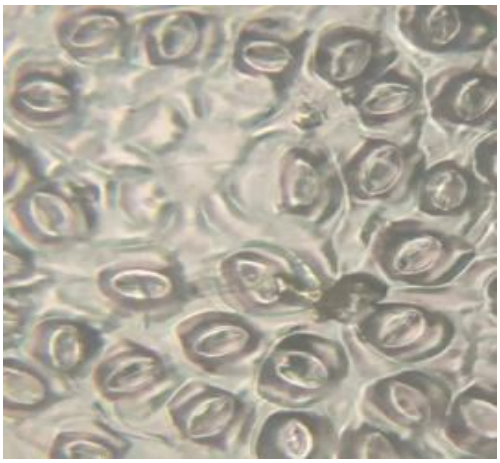


***Oscimum sanctum***



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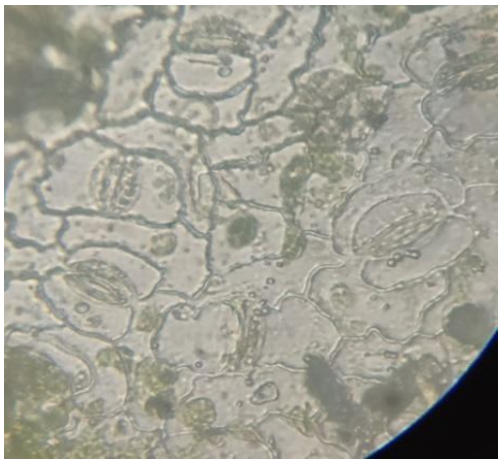
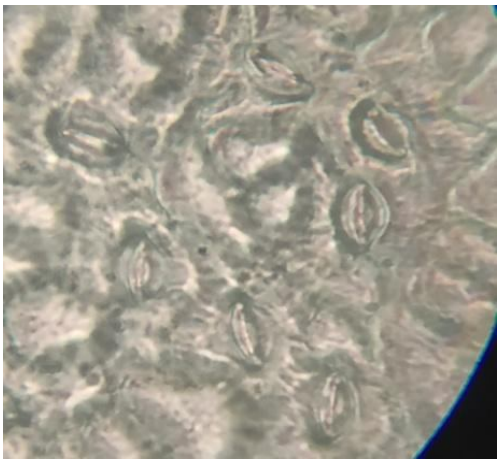
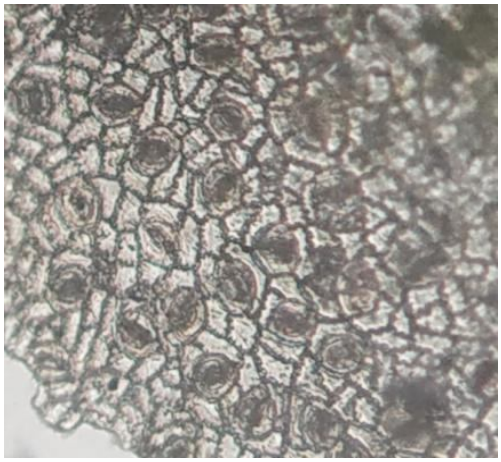


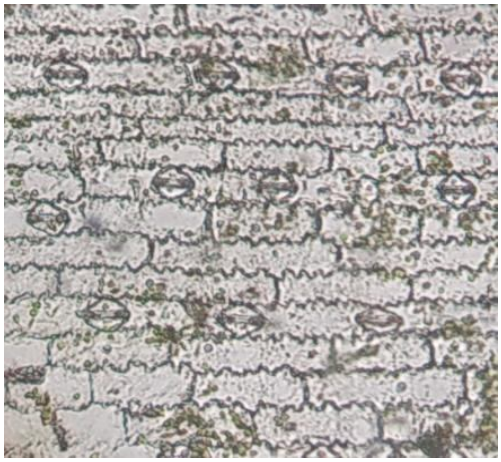
***Ricinus communis***



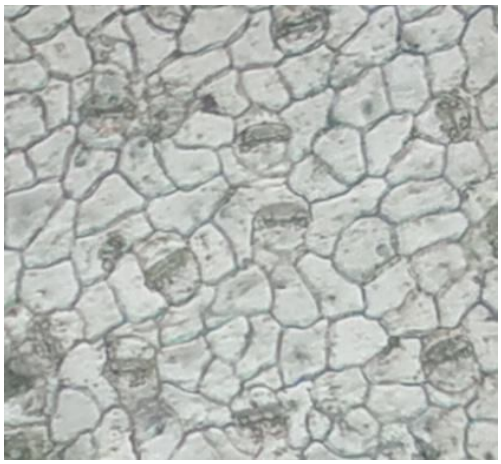
***Rosa sp.***



***Saraca indica***

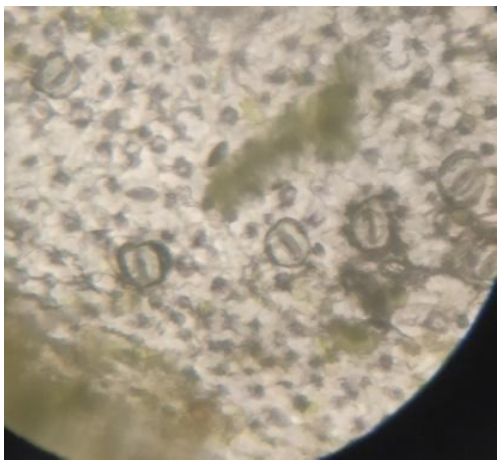


***Sorghum sp.***

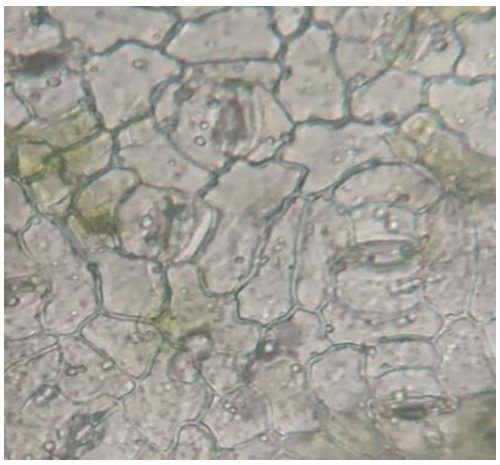


***Tabernaemontana divericata***

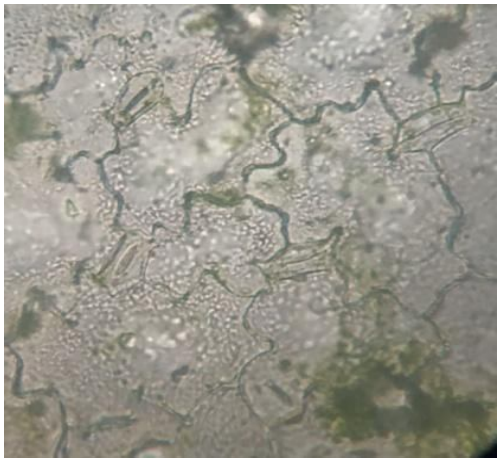
***Tamarindus indica***



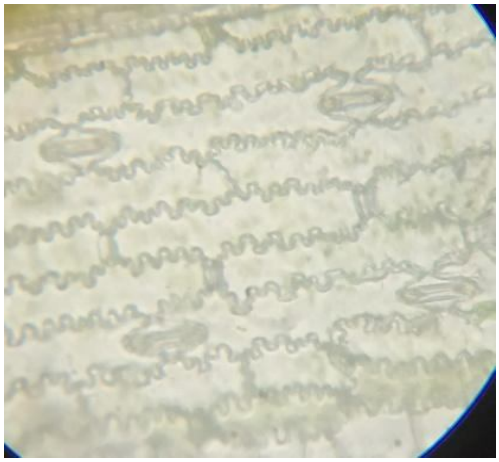
***Terminalia cattapa***



***Thevetia peruviana***



***Trigolnella foenum***



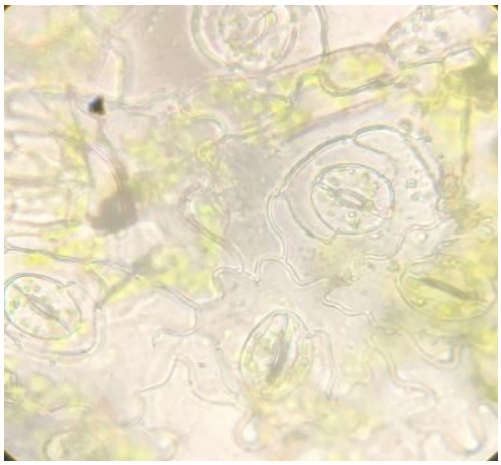
***Zea mays***

# Stomatal Index

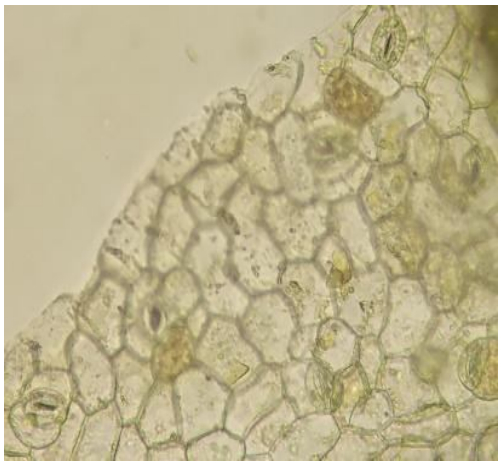
| Plant name | Stomata Number | Epidermal Cell | Stomatal index (Percentage) |
|---|---|---|---|
| *Azadiracta indica* | 20 | 120 | 14.28 |
| *Tamarindus indica* | 25 | 100 | 20.00 |
| *Annona squamosa* | 40 | 240 | 14.28 |
| *Catharanthus roseus* | 20 | 80 | 20.00 |
| *Mangifera indica* | 30 | 180 | 14.28 |
| *Nymphaea stellata* | 40 | 160 | 20.00 |
| *Annona reticulata* | 20 | 100 | 16.67 |
| *Ixora chinesis* | 15 | 45 | 25.00 |
| *Murraya paniculata* | 10 | 40 | 20.00 |
| *Alove vera* | 10 | 80 | 11.11 |
| *Citrus limon* | 40 | 120 | 25.00 |
| *Thevetia peruviana* | 10 | 55 | 16.67 |
| *Brassica oleracea* | 20 | 70 | 22.22 |
| *Oscimum sanctum* | 10 | 45 | 18.18 |
| *Alium cepa* | 15 | 45 | 25.00 |
| *Trigolnella foenum* | 20 | 40 | 33.33 |
| *Cicer arietinum* | 40 | 160 | 20.00 |
| *Brassica nigra* | 40 | 120 | 25.00 |

| | | | |
|---|---|---|---|
| *Gossipium herbaceum* | 20 | 120 | 14.28 |
| *Cajanus cajan* | 40 | 120 | 25.00 |
| *Sorghum* | 15 | 45 | 25.00 |
| *Lawsonia inermis* | 50 | 100 | 33.33 |
| *Murraya koenigii* | 10 | 50 | 16.67 |
| *Hibiscus rosa sinesis* | 40 | 160 | 20.00 |
| *Adathoda vesica* | 15 | 30 | 33.33 |
| *Tabernaemontana divericata* | 20 | 120 | 14.28 |
| *Bambusa vulgaris* | 20 | 60 | 25.00 |
| *Mimosa pudica* | 20 | 80 | 20.00 |
| *Alstonia scholaris* | 50 | 200 | 25.00 |
| *Costus* | 20 | 200 | 09.09 |
| *Moras alba* | 15 | 60 | 20.00 |
| *Crica papaya* | 20 | 100 | 16.67 |
| *Saraca indica* | 30 | 120 | 20.00 |
| *Ferns* | 10 | 40 | 20.00 |
| *Musa sp* | 10 | 20 | 33.33 |
| *Terminalia catappa* | 15 | 90 | 14.28 |
| *Psidium guajava* | 20 | 40 | 33.33 |
| *Jtropa curcas* | 20 | 120 | 14.28 |
| *Agave* | 20 | 200 | 09.09 |
| *Elettaria cardamomum* | 50 | 100 | 33.33 |
| *Ficus racemosa* | 20 | 80 | 20.00 |
| *Rosa sp* | 20 | 80 | 20.00 |
| *Kigelia africana* | 50 | 100 | 33.33 |
| *Hamelia patens* | 10 | 50 | 16.67 |
| *Euphorbia antiquorum* | 20 | 200 | 09.09 |
| *Gloriosa superba* | 20 | 120 | 14.28 |
| *Ficus religiosa* | 30 | 180 | 14.28 |
| *Ricinus communis* | 20 | 80 | 20.00 |
| *Zea mays* | 10 | 30 | 25.00 |
| *Arachis hypogea* | 10 | 60 | 14.28 |

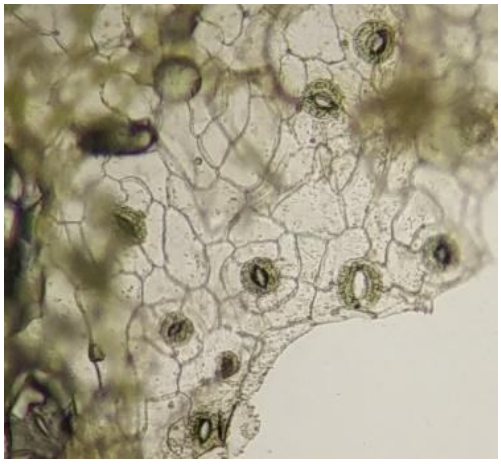
# Assam and Meghalaya Collection



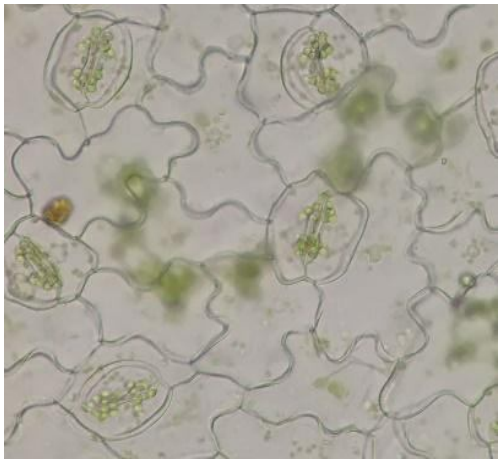
***Poostemon benghalensis***



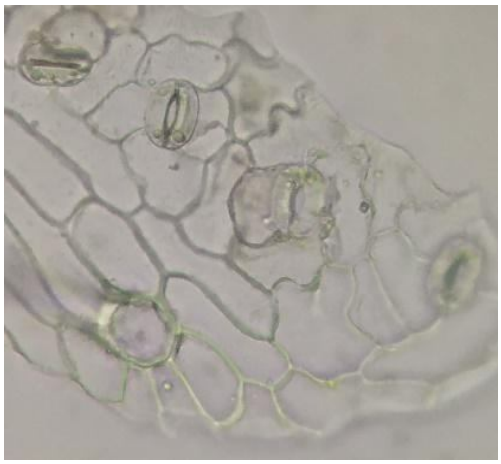
***Bauhinia purpurea***



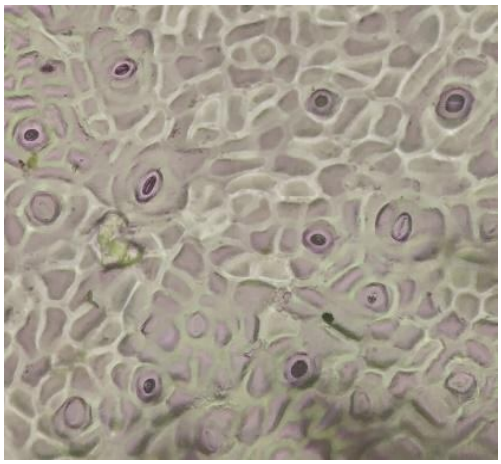
***Houttuynia cordata***



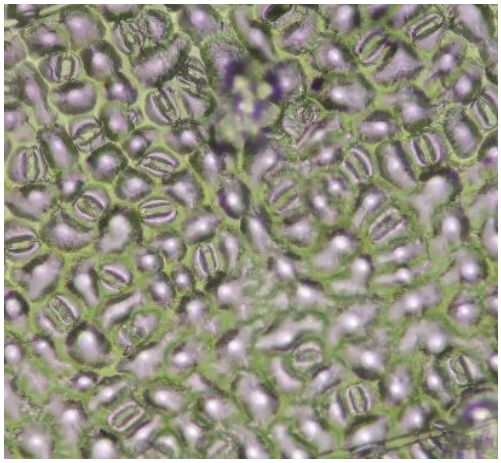
***Paederia scandens***



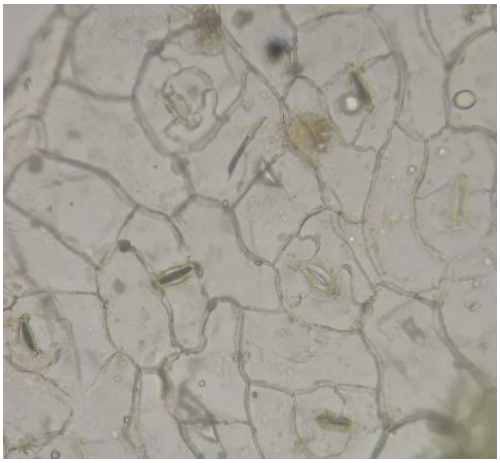
***Nyctanthes arbor-tristis***



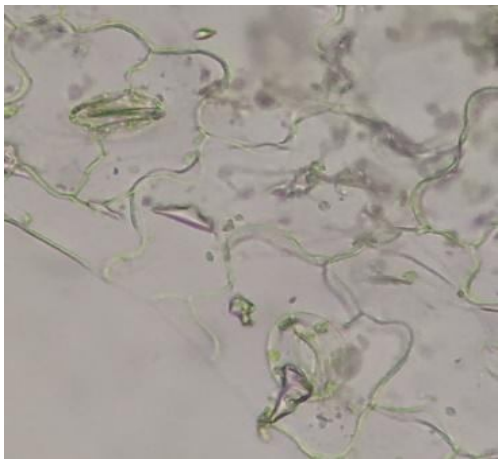
***Citrus limon***



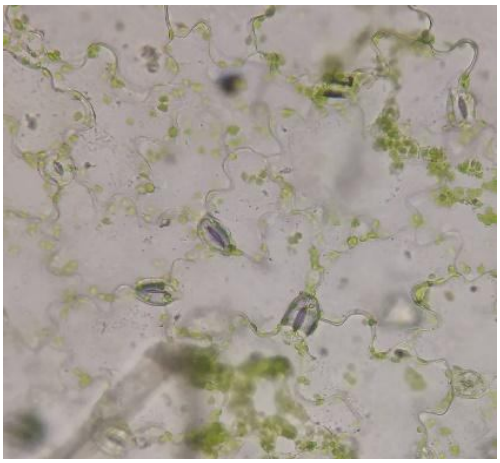
***Mesua ferrea***



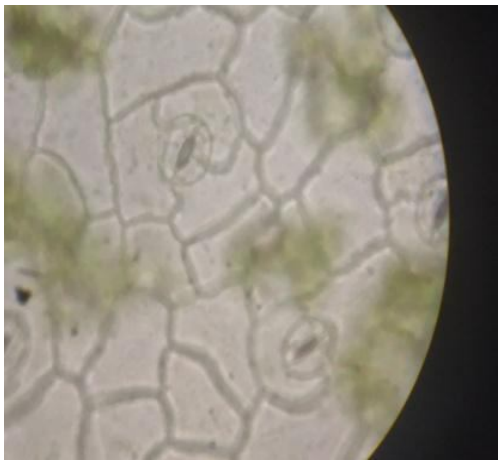
***Centella asiatica***



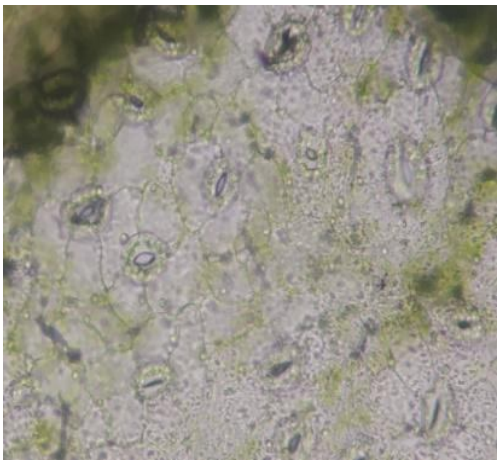
***Hydrocotyle sibthorpioides***



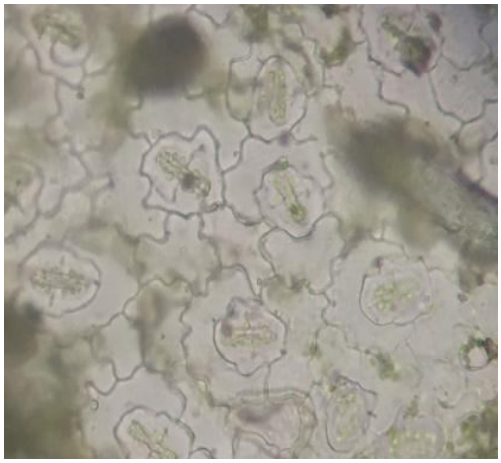
***Oxalia corniculata***



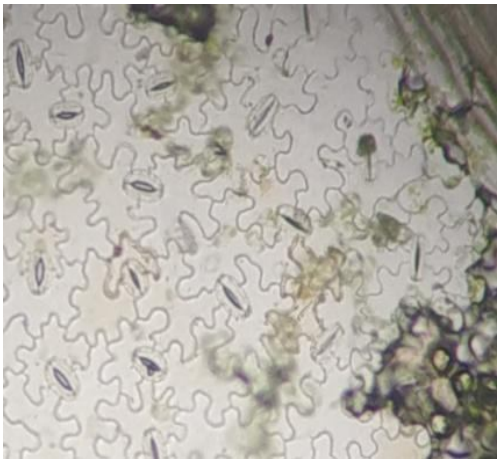
***Alternanthera sessile***



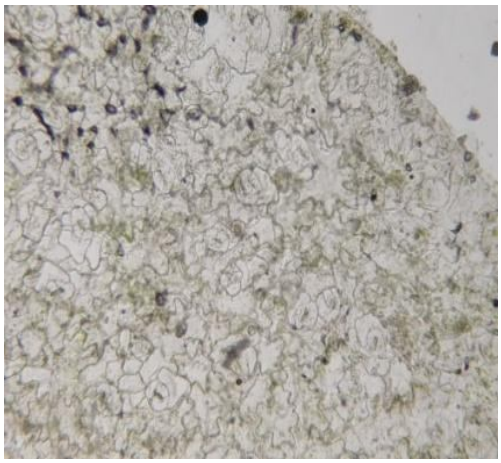
***Moringa oleifera***



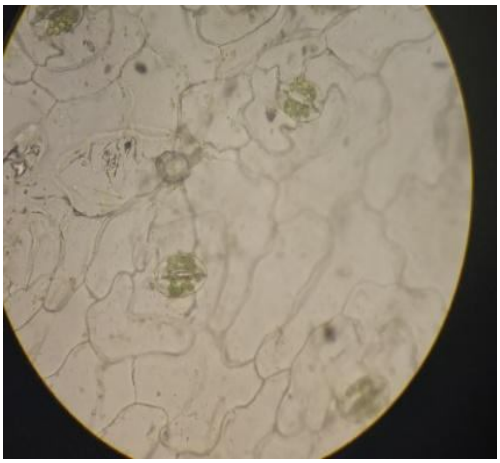
***Swertia chirata***



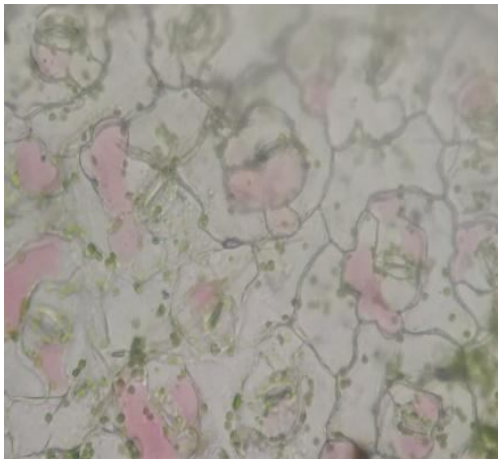
***Acmella paniculata***



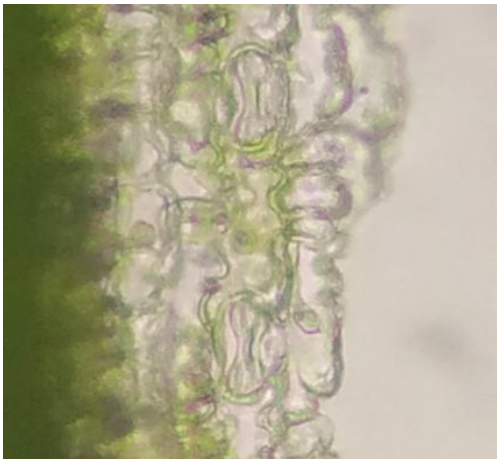
***Bryophyllum***



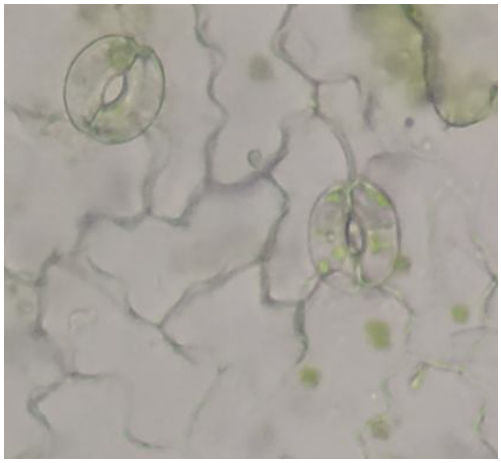
***Peperomia pellucida***



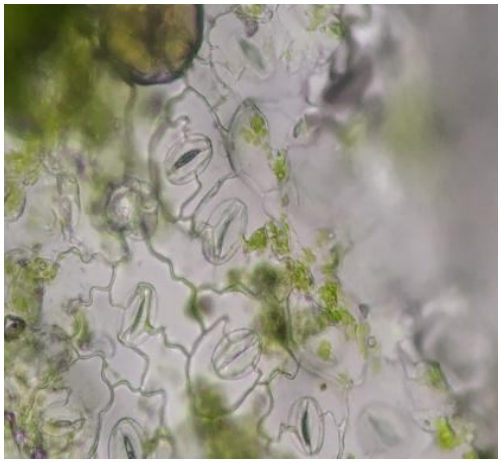
***Hibiscus acetosella***



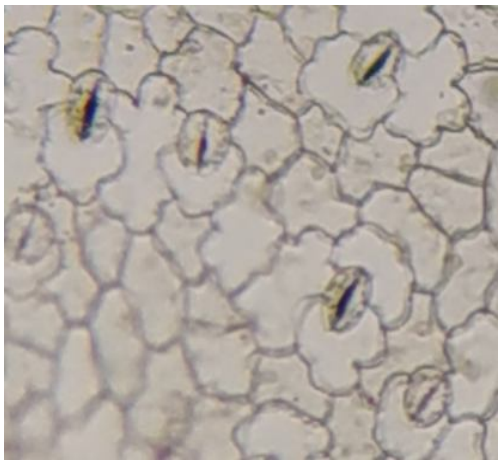
***Cynodon dyctylon***



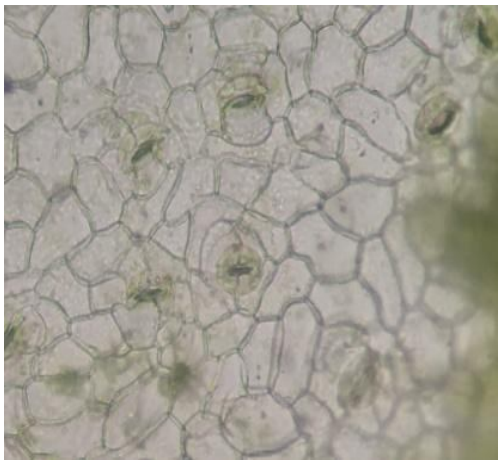
***Catharanthus roseus***



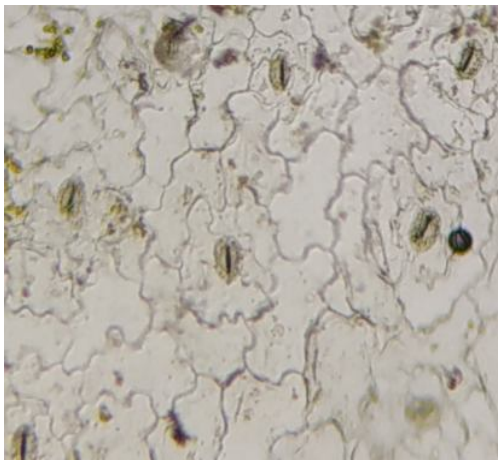
***Leucas aspera***



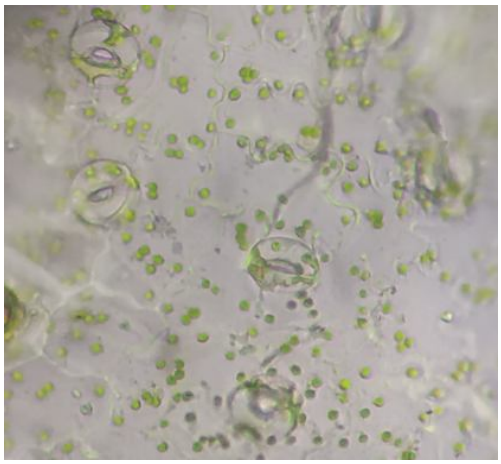
***Bacopa monnieri***



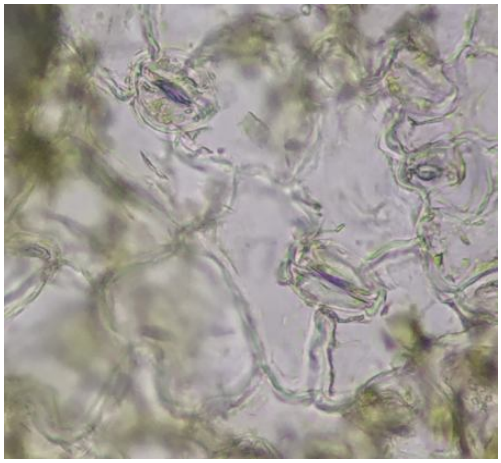
***Murraya koenigii***



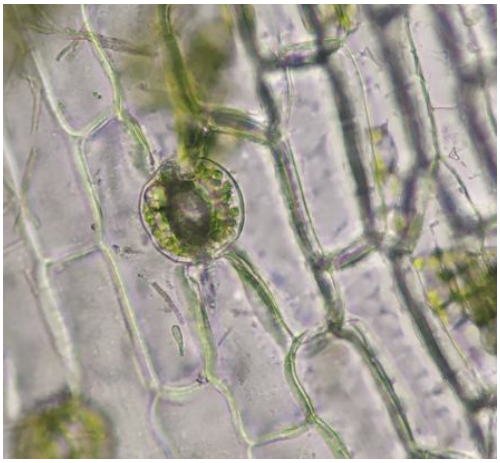
***Polygonum chinese***



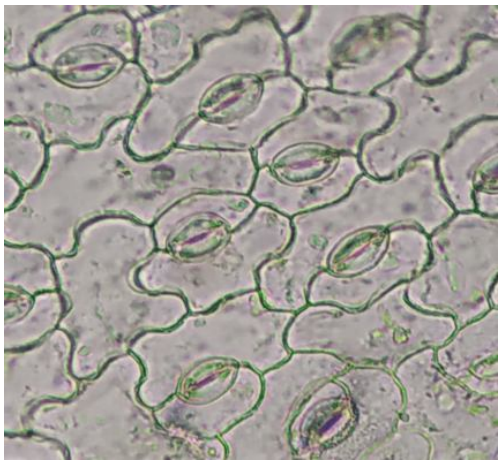
***Brassica juncea***



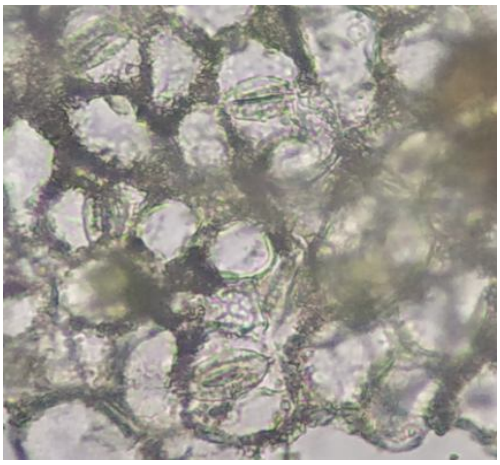
***Amaranthus bicolor***



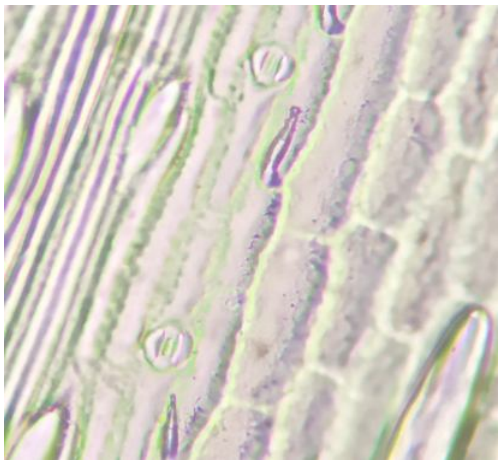
***Blechnum orientale***



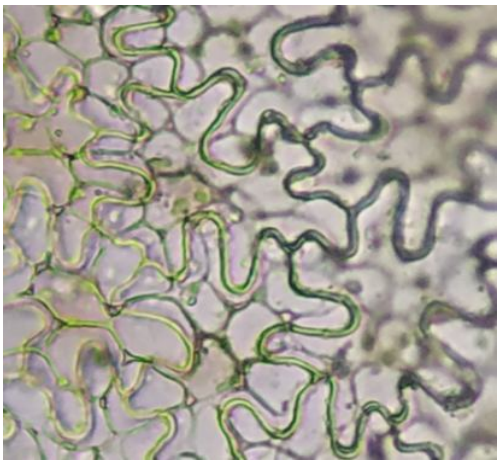
***Mimosa pudica***



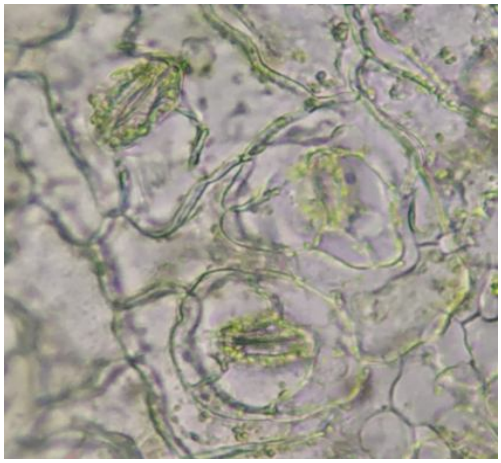
***Emblica officinalis***



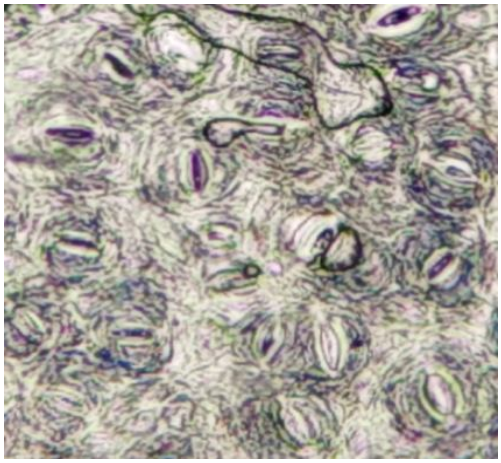
***Cymbopogon***



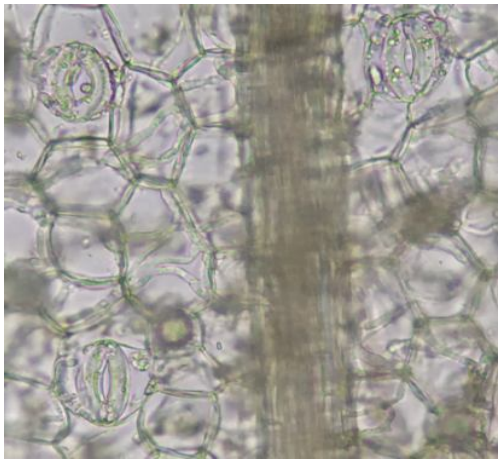
***Ocimum gratissimum***



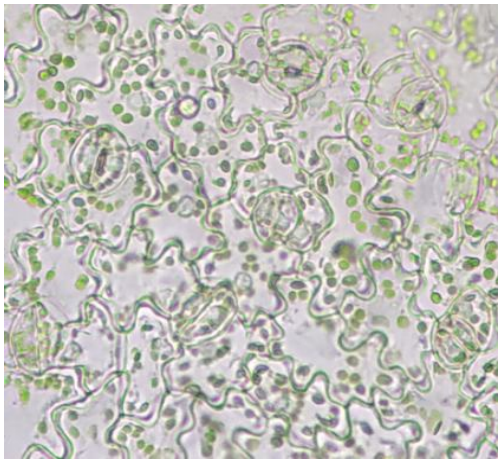
***Hibiscus rosa sinensis***



***Plumeria alba***



***Ziziber officinalis***



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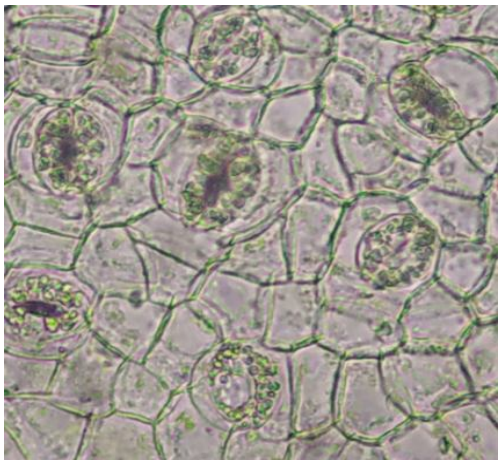
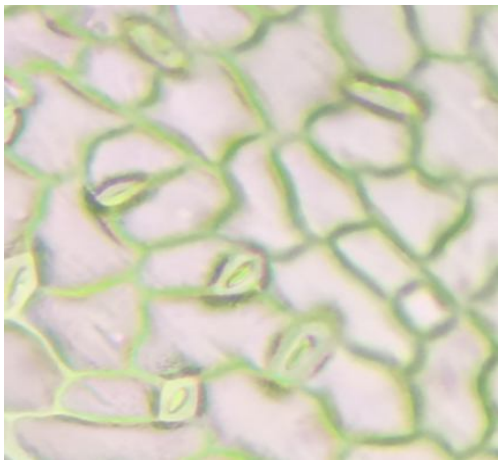
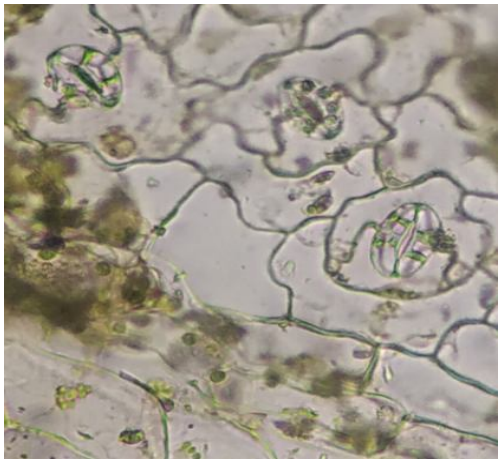


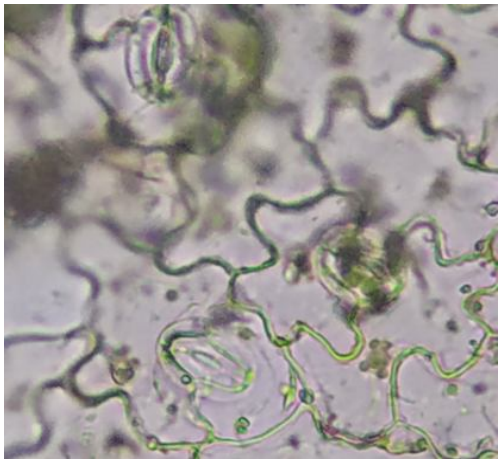
***Tabernaemontana divaricata***



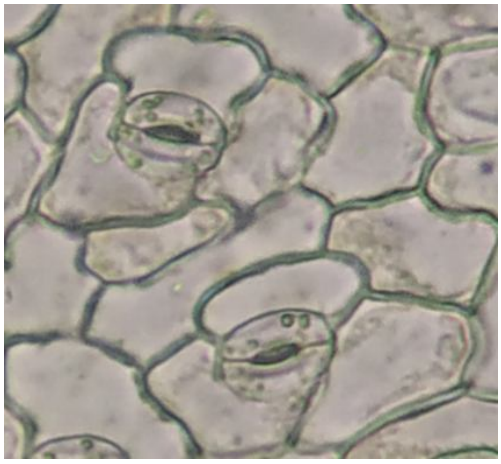
***Carica papaya***



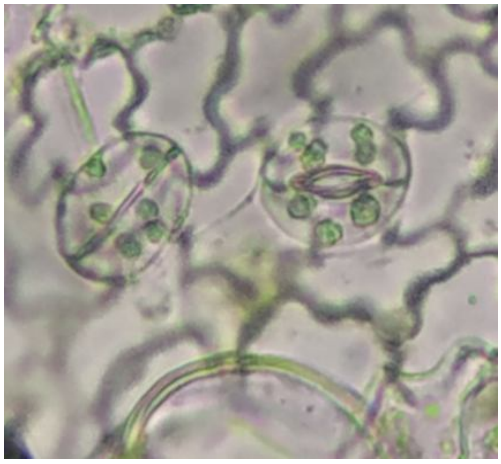
***Oscimum sanctum***



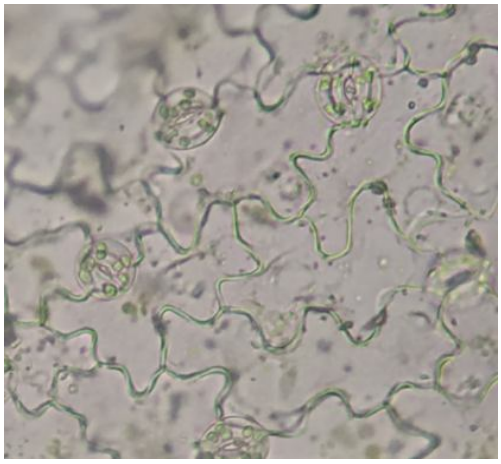
***Ocimum basilicum***



***Momordica charantia***



***Spinacia oleracea***



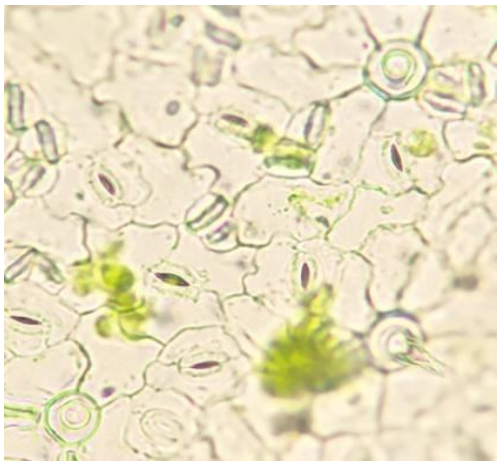
***Amaranthus spinosus***

# Stomatal Index

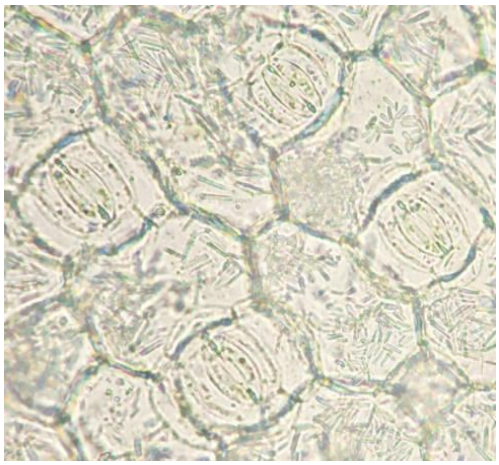
| Plant Name | Stomata Number | Epidermal Cell | Stomatal Index ( Percentage ) |
|---|---|---|---|
| *Poostemon benghalensis* | 50 | 210 | 19.23 |
| *Bauhinia purpurea* | 35 | 200 | 14.89 |
| *Houttuynia cordata* | 40 | 320 | 11.11 |
| *Paederia scandens* | 20 | 90 | 18.18 |
| *Nyctanthes arbor-tristis* | 210 | 815 | 20.48 |
| *Mesua ferrea* | 60 | 240 | 20.00 |
| *Citrus limon* | 80 | 360 | 18.18 |
| *Centella asiatica* | 20 | 70 | 22.22 |
| *Hydrocotyle sibthorpioides* | 10 | 50 | 16.66 |
| *Oxalis corniculata* | 70 | 170 | 29.16 |
| *Alternanthera sessile* | 50 | 320 | 13.51 |
| *Moringa oleifera* | 45 | 810 | 5.26 |
| *Swertia chirata* | 40 | 155 | 20.51 |
| *Acmella paniculata* | 20 | 56 | 26.31 |
| *Vitex negundo* | 45 | 180 | 20.00 |
| *Bryophyllum* | 50 | 500 | 09.09 |
| *Peperomia pellucida* | 20 | 116 | 10.20 |
| *Hibiscus acetosella* | 80 | 480 | 14.28 |
| *Cynodon dyctylon* | 180 | 1350 | 11.76 |
| *Catharanthus roseus* | 240 | 1200 | 16.66 |
| *Leucas aspera* | 105 | 410 | 20.38 |
| *Bacopa monnieri* | 10 | 110 | 8.33 |
| *Murraya koenigi* | 220 | 1400 | 13.58 |
| *Casia fistula* | 360 | 2160 | 14.63 |
| *Polygonum chinese* | 30 | 120 | 20.00 |
| *Psidium guajava* | 210 | 860 | 19.62 |

| | | | |
|---|---|---|---|
| *Brassica juncea* | 20 | 40 | 33.33 |
| *Amaranthus bicolor* | 20 | 90 | 18.18 |
| *Lawsomia inermis* | 10 | 33 | 23.25 |
| *Blechnum orientale* | 20 | 90 | 18.18 |
| *Asparagus racemosus* | 160 | 600 | 21.05 |
| *Pteridium aquilinum* | 40 | 80 | 40.00 |
| *Mimosa pudica* | 600 | 1800 | 25.00 |
| *Emblica officinalis* | 100 | 390 | 20.48 |
| *Cymbopogon* | 105 | 410 | 25.64 |
| *Ocimum gratissimum* | 20 | 80 | 20.00 |
| *Hibiscus rosa sinensis* | 300 | 1500 | 16.66 |
| *Plumeria alba* | 50 | 320 | 13.51 |
| *Ziziber officinalis* | 20 | 90 | 18.18 |
| *Capsicum annuum* | 20 | 59 | 25.31 |
| *Tabernaemontana divaricata* | 700 | 5600 | 11.11 |
| *Carica papaya* | 80 | 240 | 25.00 |
| *Oscimum sanctum* | 50 | 200 | 20.00 |
| *Ocimum basilicum* | 20 | 48 | 29.41 |
| *Eryngium foetidum* | 20 | 70 | 22.22 |
| *Momordica charantia* | 10 | 60 | 14.28 |
| *Lagenaria siceraria* | 10 | 65 | 13.33 |
| *Spinacia oleracea* | 10 | 50 | 16.67 |
| *Amaranthus spinosus* | 10 | 32 | 23.80 |
| *Ziziphus mauritiana* | 15 | 60 | 20.00 |

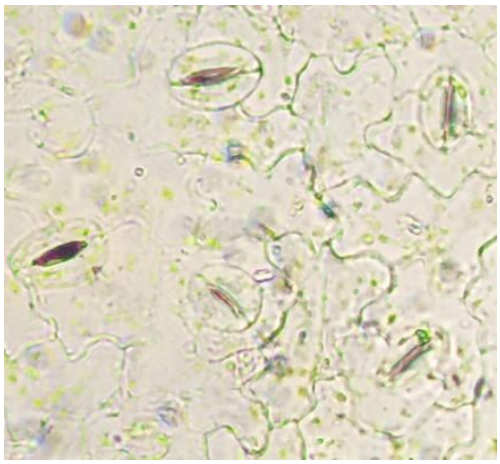
# Anjangaon Surji Region Collection



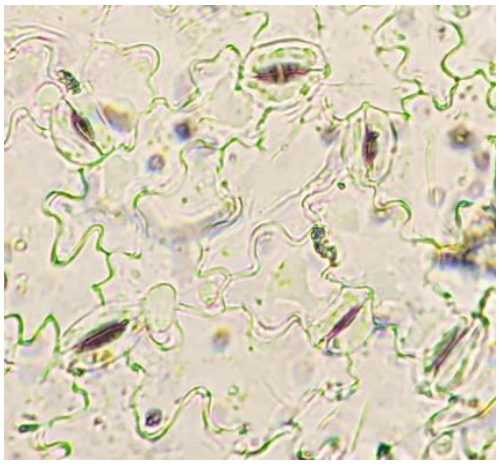
***Boerhavia diffusa***



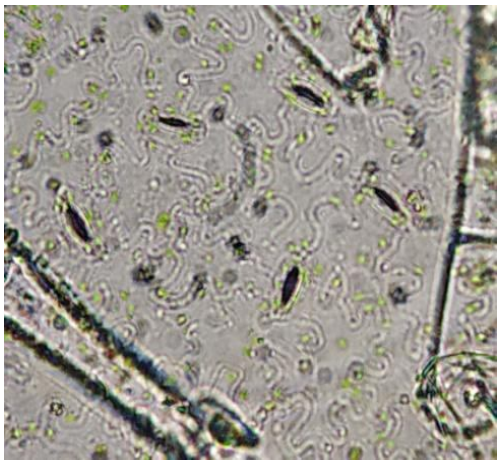
***Commelina sp***



***Aerva sp***



***Cucumis sativus***



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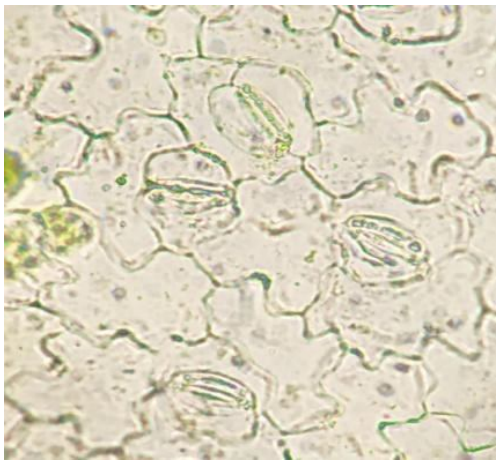
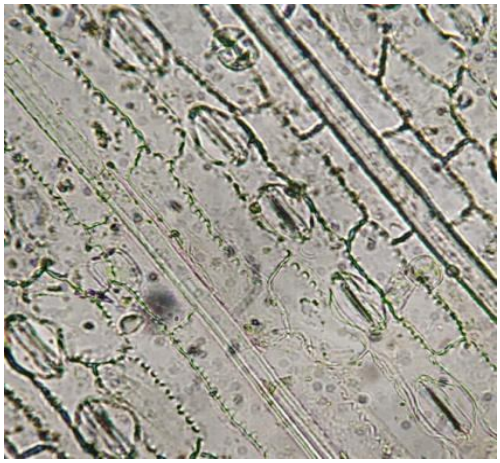
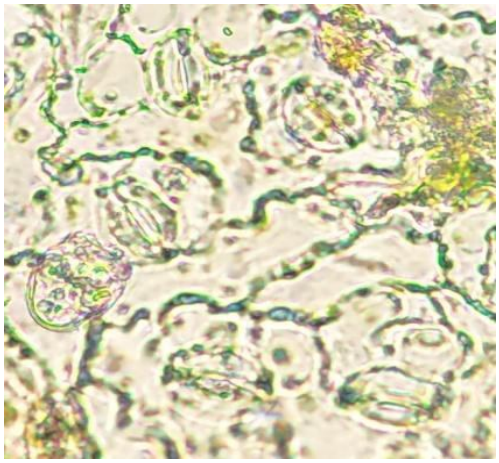


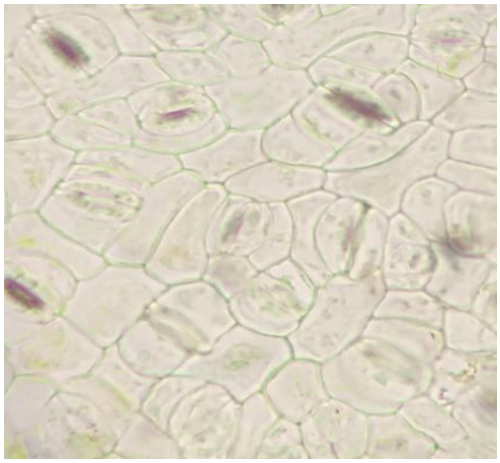
***Ipomea sp***



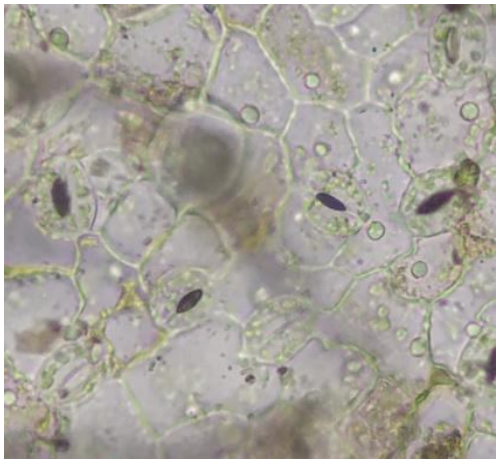
***Cyperus rotundus***



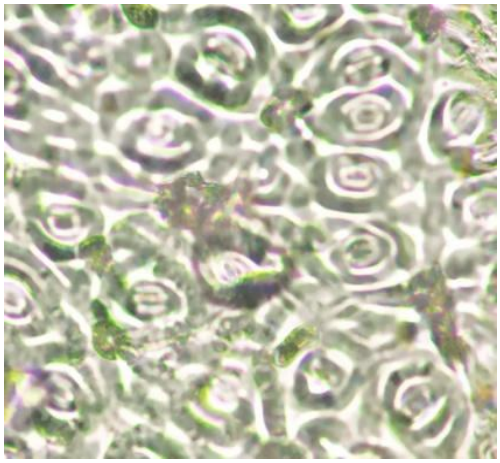
***Malvastrum sp***



***Hemidesmus sp.***

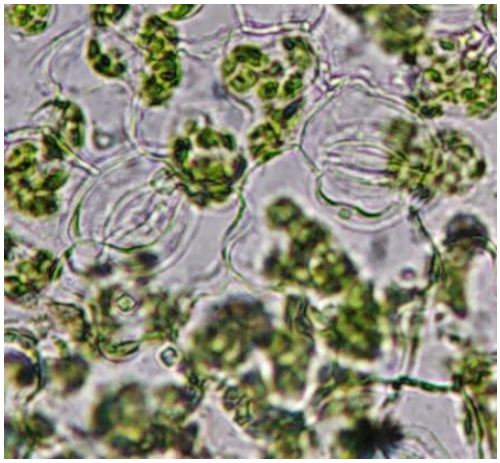


***Withania somnifera***



***Boerhavia sp.***

***Cocculus hirsutus***



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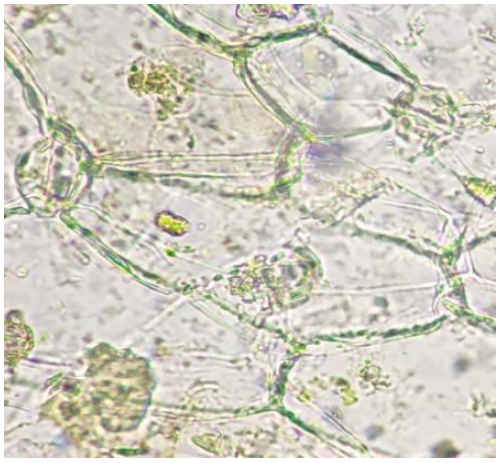
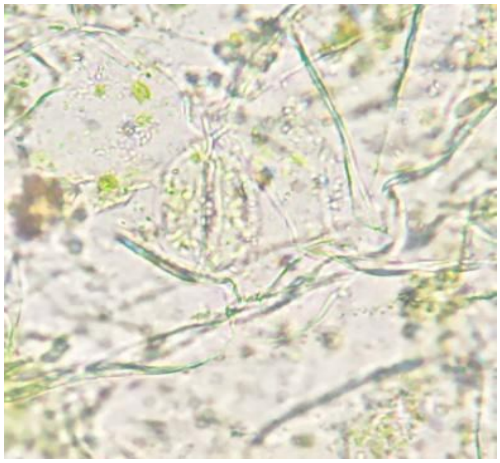
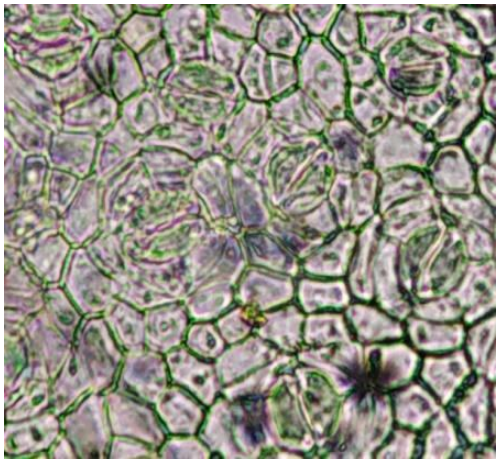


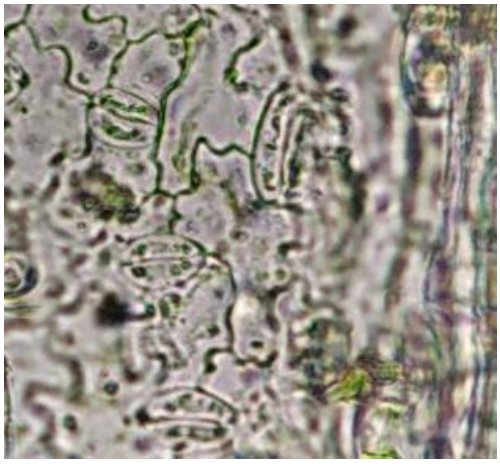
***Argimom mexicana***



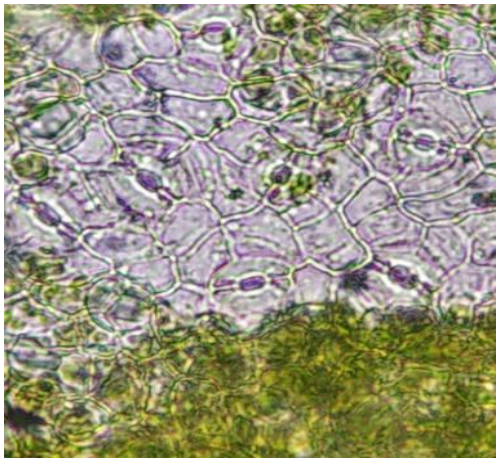
***Trianthema portulacastrum***



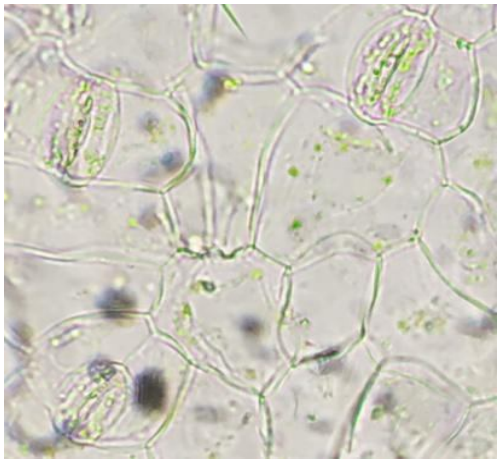
***Balanites aegyptiaca***



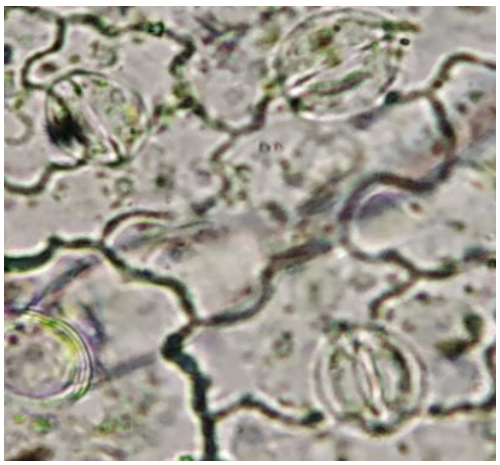
***Mariyumus marginata***



***Citrus sinesis***



***Calotropis procera***



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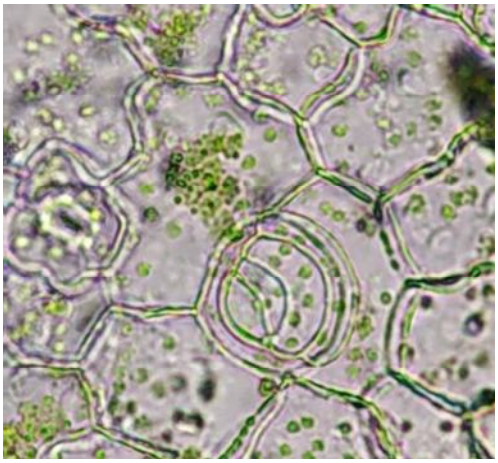
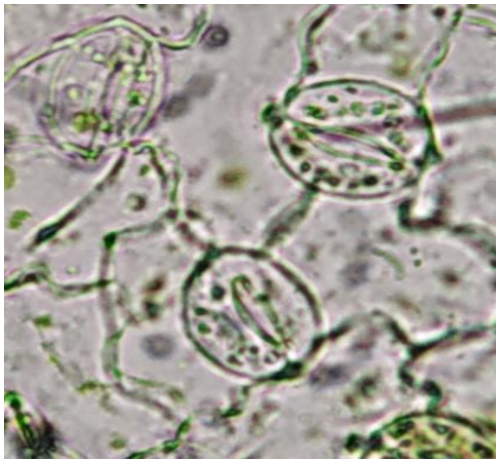
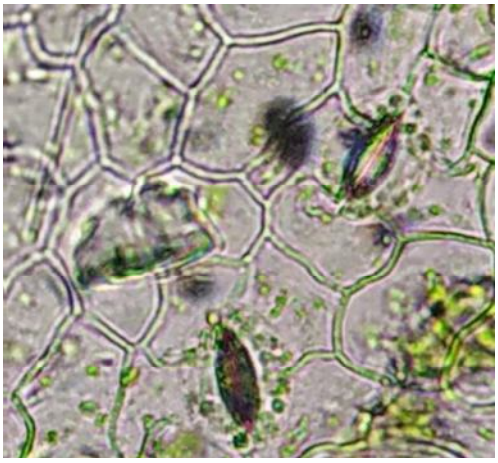


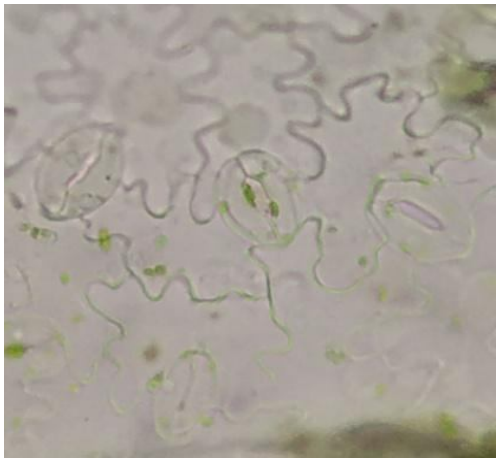
***Solanum incanum***



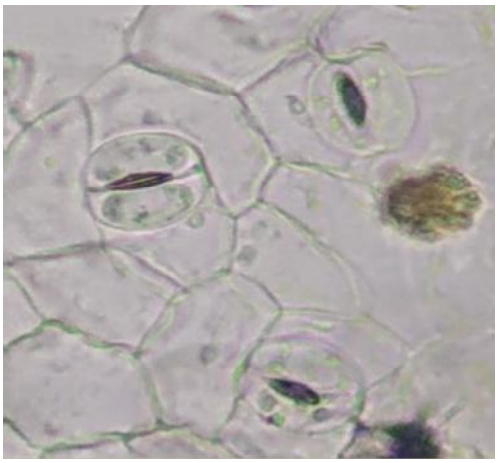
***Lantana camara***



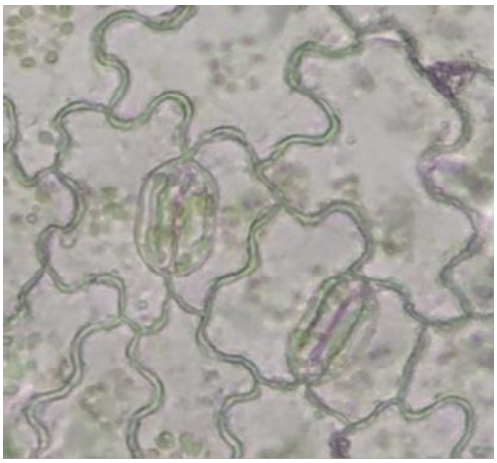
***Colebrookea oppositifolia***



***Cassia hirsuta***

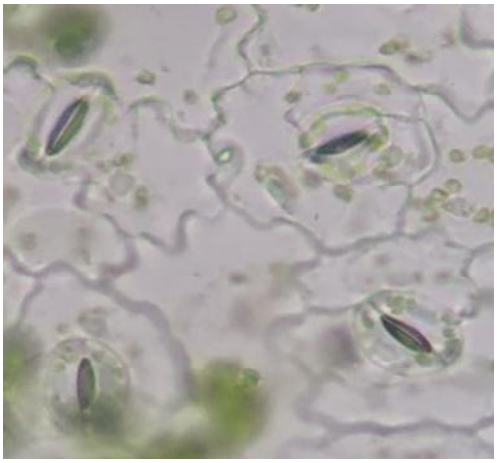


***Achyranthes aspera***

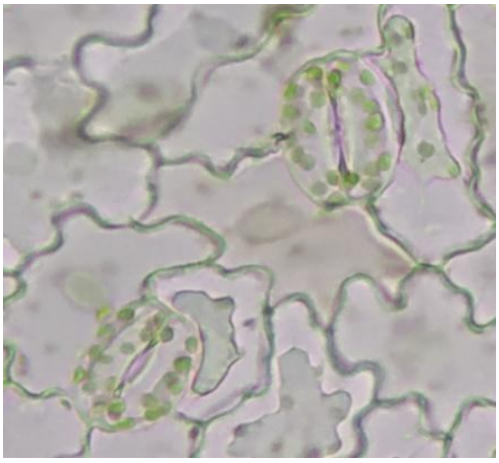


***Capparis sepiaria***

***Dicrostachys cinerea***



***Rouvolfia tetraphylla***



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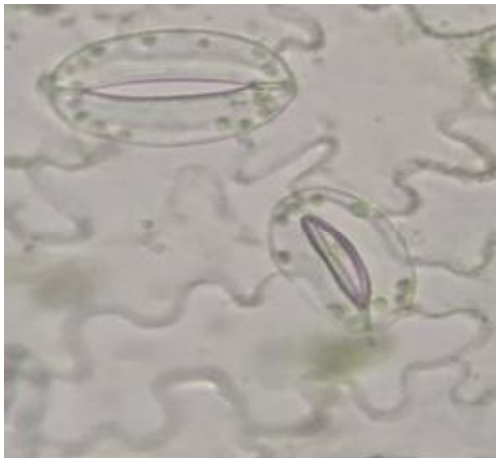
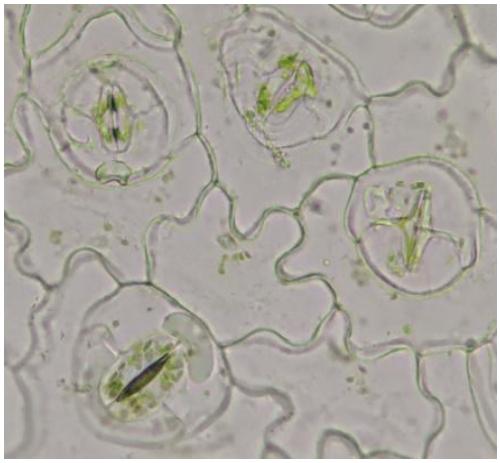
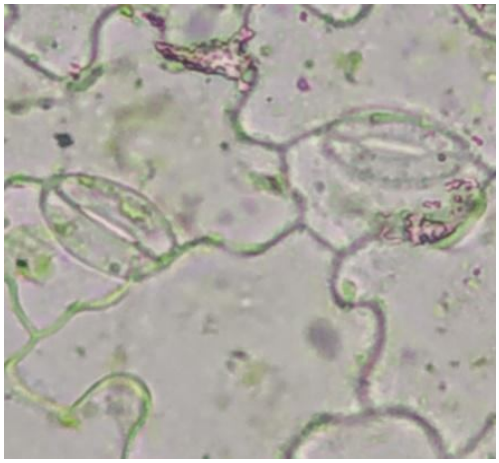


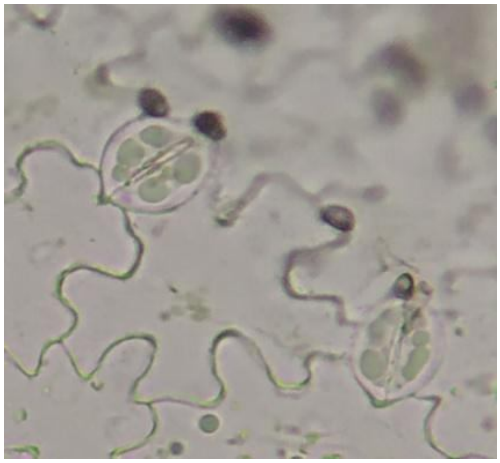
***Ziziphus nummularia***



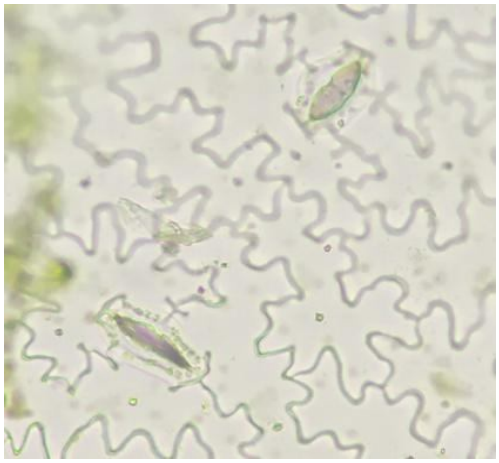
***Seshania grandiflora***



***Acacia jacqemontii***

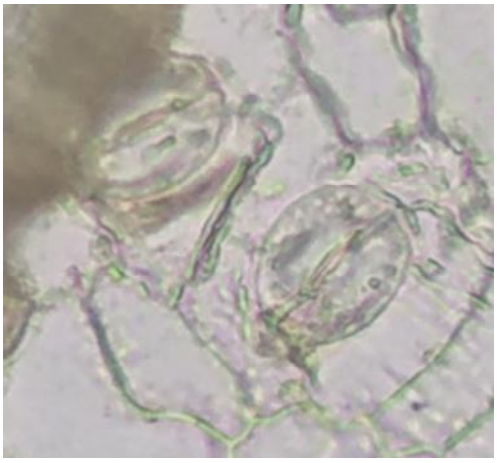


***Opuntia elatior***

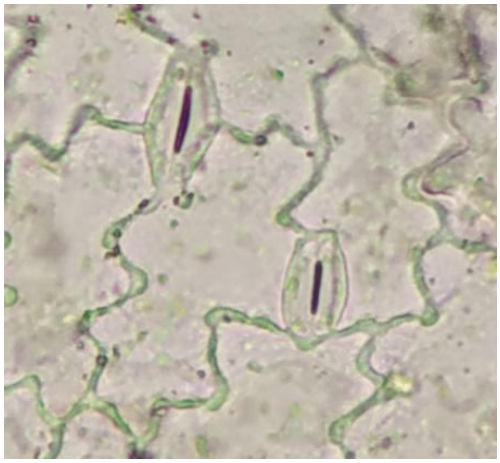


***Cansjera rheedi***

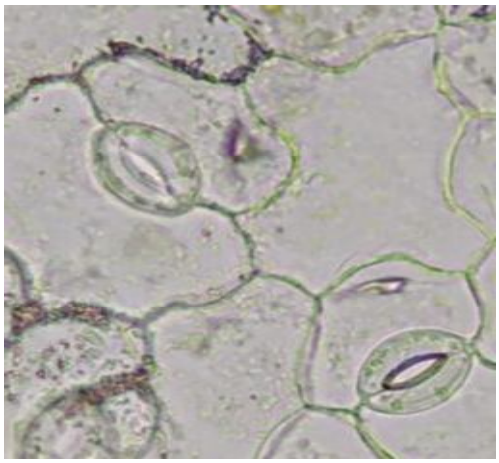
***Alianthus excelsa***



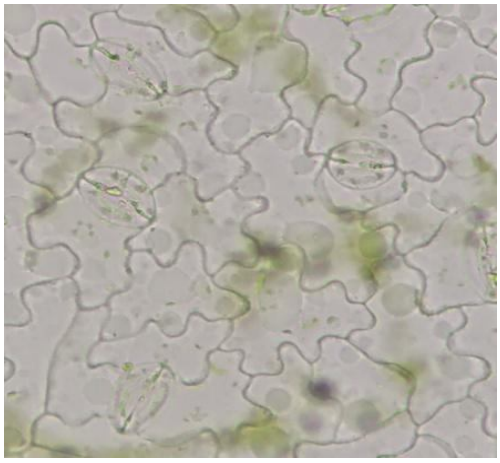
***Zizipus mauritiana***



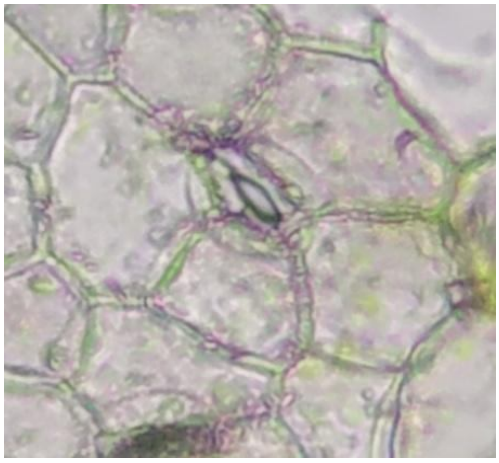
***Butea monosperma***



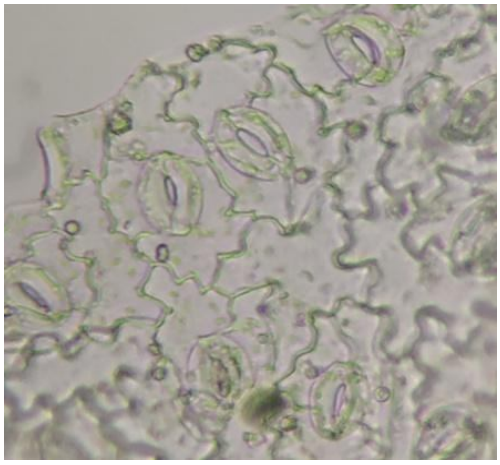
***Erythrina suberosa***



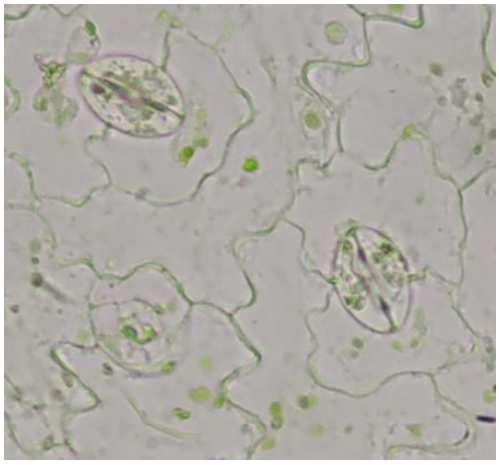
***Pterocarpus marsupiu***



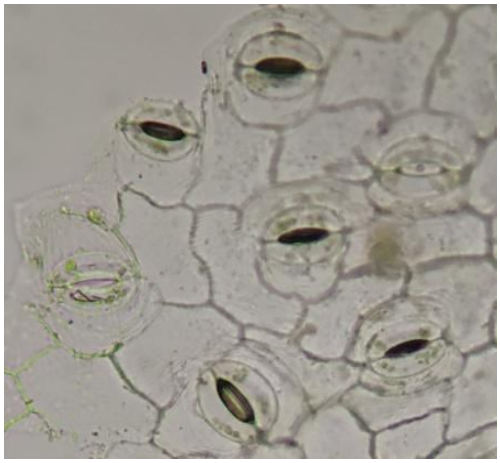
***Bauhinia sp.***



***Bauhinia racemose***



***Acacia catecha***



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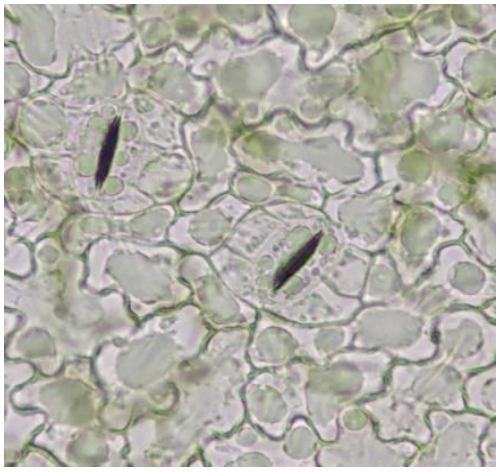
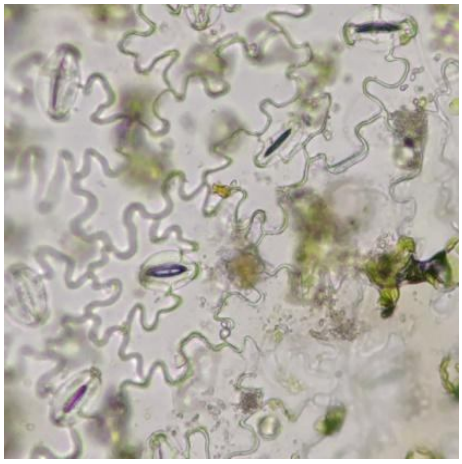


***Anogeissus latifolia***



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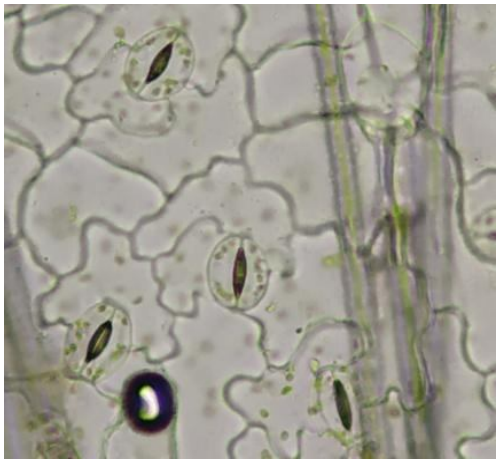
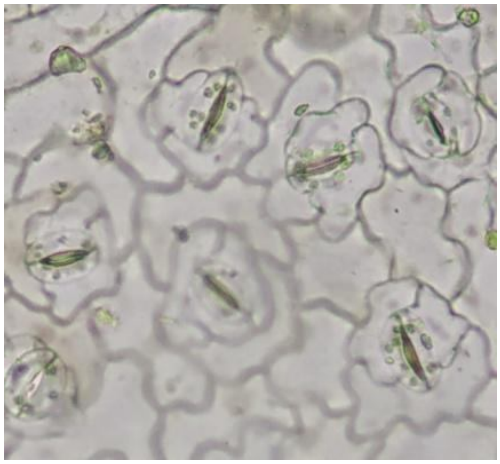
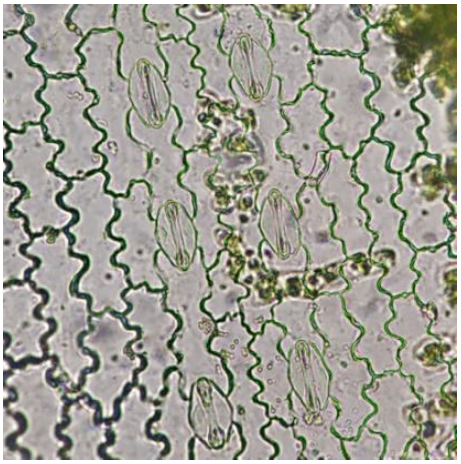


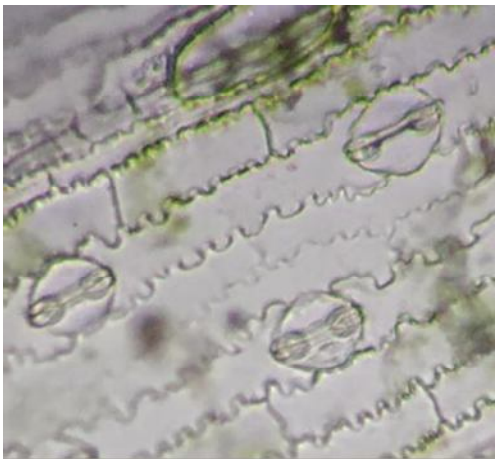
***Tectona grandis***



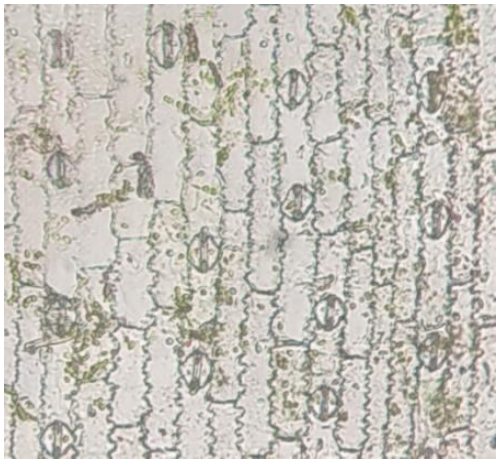
***Limmonia acidissma***



***Sorghum retrofolia***



*Sorghum retrofolia*



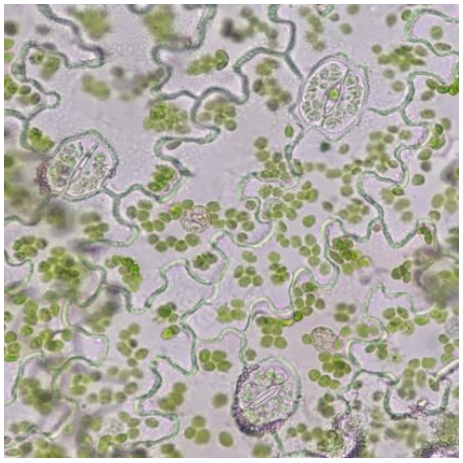
*Eulalia trispicata*

# Stomatal Index

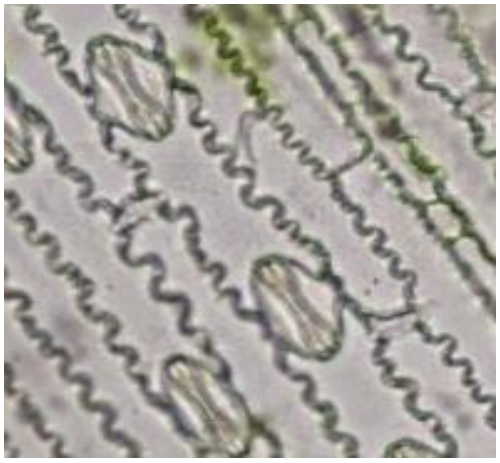
| Plant Name | Stomata Number | Epidermal Cell | Stomatal Index ( Percent ) |
|---|---|---|---|
| *Boerhavia diffusa* | 60 | 260 | 18.75 |
| *Commelina sp* | 90 | 360 | 25.71 |
| *Aerva sp* | 120 | 240 | 33.33 |
| *Cucumis sativus* | 81 | 270 | 23.07 |
| *Cucurbitaceae sp* | 60 | 210 | 22.22 |
| *Ipomea sp* | 150 | 450 | 25.00 |
| *Cyperus rotundus* | 21 | 60 | 25.92 |
| *Malvastrum sp* | 68 | 300 | 18.47 |
| *Hemidesmus* | 100 | 510 | 16.39 |
| *Withania somnifera* | 120 | 490 | 19.67 |
| *Boerhavia sp* | 60 | 260 | 18.75 |
| *Cocculus hirsutus* | 80 | 360 | 18.18 |
| *Ipomea lacunosa* | 40 | 200 | 16.66 |
| *Argimom mexicana* | 150 | 580 | 20.54 |
| *Trianthema portulacastrum* | 30 | 140 | 17.64 |
| *Balanites aegyptiaca* | 150 | 1150 | 11.53 |
| *Mariyumus marginata* | 30 | 140 | 17.64 |

| | | | |
|---|---|---|---|
| *Citrus sinesis* | 20 | 120 | 14.28 |
| *Calotropis procera* | 20 | 85 | 19.04 |
| *Datura metal* | 30 | 130 | 18.75 |
| *Solanum incanum* | 30 | 140 | 17.64 |
| *Lantana camara* | 30 | 185 | 26.08 |
| *Colebrookea oppositifolia* | 40 | 165 | 19.51 |
| *Cassia hirsuta* | 20 | 85 | 19.04 |
| *Achyranthes aspera* | 30 | 130 | 18.75 |
| *Capparis sepiaria* | 30 | 95 | 24.00 |
| *Dicrostachys cinerea* | 20 | 120 | 14.28 |
| *Rouvolfia tetraphylla* | 30 | 170 | 15.00 |
| *Sida cordifolia* | 30 | 180 | 14.28 |
| *Ziziphus nummularia* | 20 | 125 | 13.79 |
| *Seshania grandiflora* | 40 | 160 | 20.00 |
| *Acacia jacqemontii* | 30 | 120 | 20.00 |
| *Opuntia elatior* | 20 | 145 | 12.12 |
| *Cansjera rheedi* | 30 | 180 | 14.28 |
| *Alianthus excelsa* | 30 | 125 | 19.35 |
| *Zizipus mauritiana* | 20 | 120 | 14.28 |
| *Butea monosperma* | 10 | 60 | 14.28 |
| *Erythrina suberosa* | 15 | 80 | 15.78 |
| *Pterocarpus marsupium* | 20 | 100 | 16.67 |
| *Bauhinia sp.* | 30 | 190 | 13.63 |
| *Bauhinia racemose* | 40 | 230 | 14.81 |
| *Acacia catecha* | 20 | 80 | 20.00 |
| *Albizia lebbeck* | 20 | 110 | 15.38 |
| *Anogeissus latifolia* | 20 | 120 | 14.28 |
| *Syzygium cumini* | 30 | 160 | 15.78 |
| *Tectona grandis* | 10 | 60 | 14.28 |
| *Limmonia acidissma* | 30 | 150 | 16.67 |
| *Sorghum nitidium* | 10 | 30 | 33.33 |
| *Sorghum retrofolia* | 20 | 60 | 25.00 |
| *Eulalia trispicata* | 15 | 45 | 25.00 |

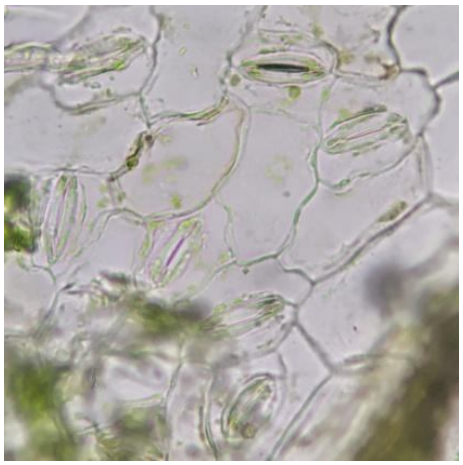
# Melghat Collection



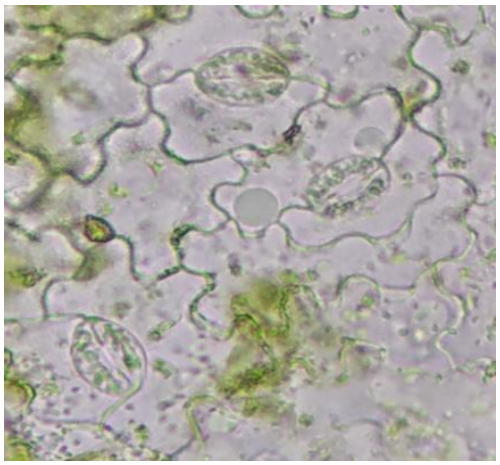
*Adiantum sp.*



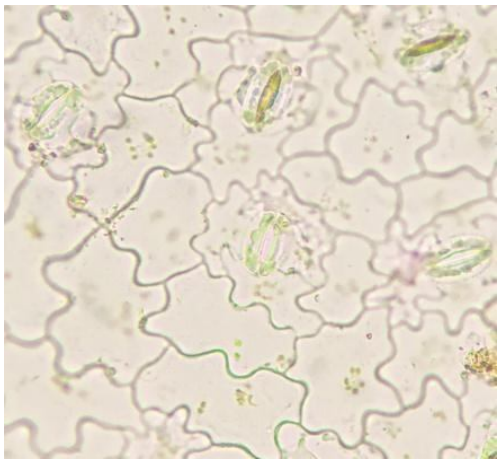
*Poaceae sp.*



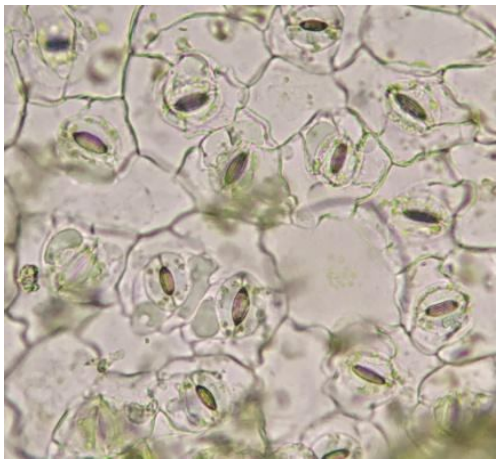
*Cornus sp.*



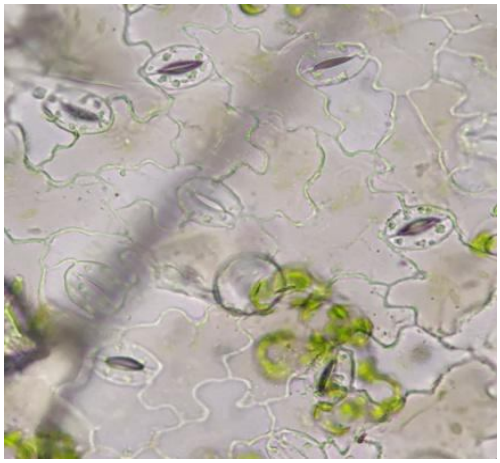
*Lathyrus sp.*



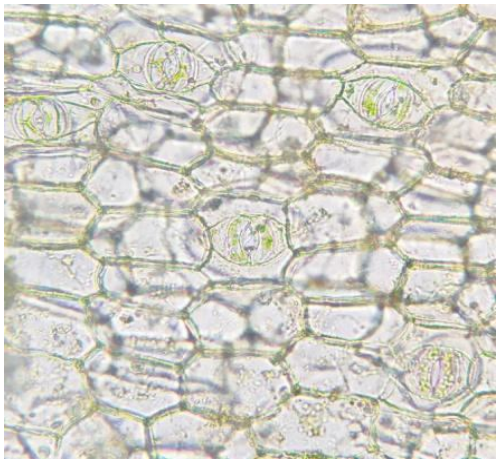
*Vitis sp.*



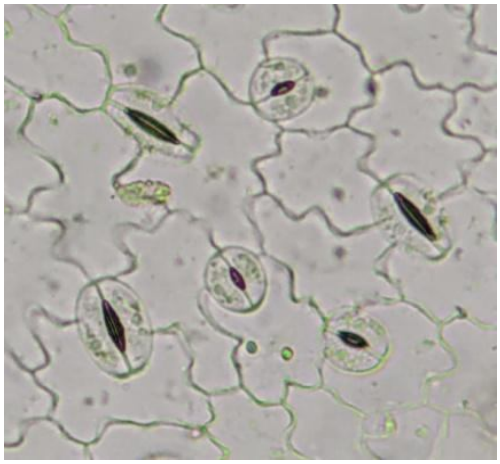
*Abelmoschus manihot*



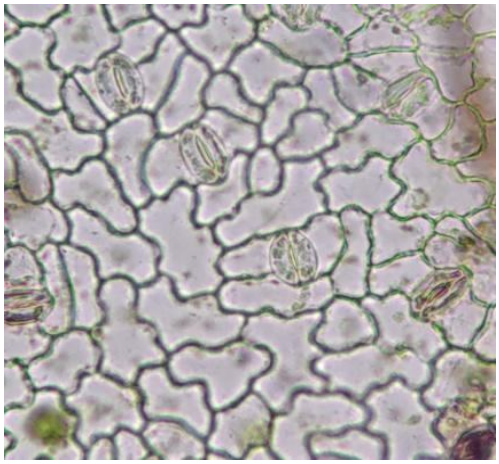
***Silene latifolia***



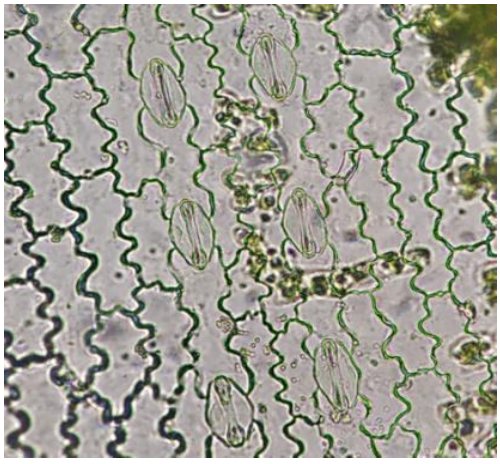
***Curcuma sp.***



***Asystasia gangetica***



***Fagus sp.***



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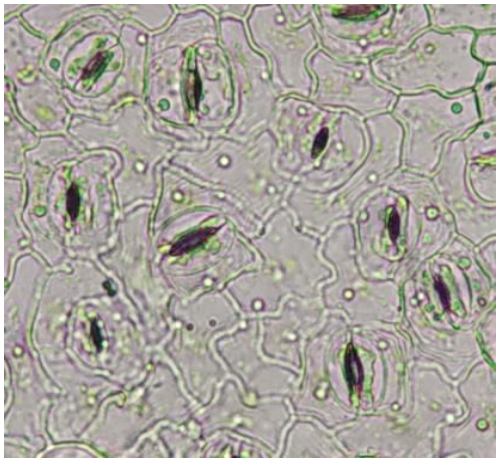
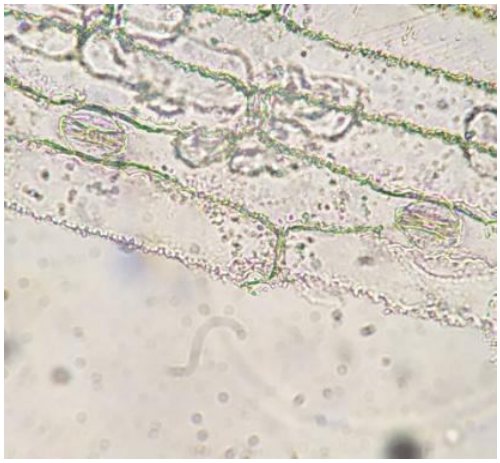
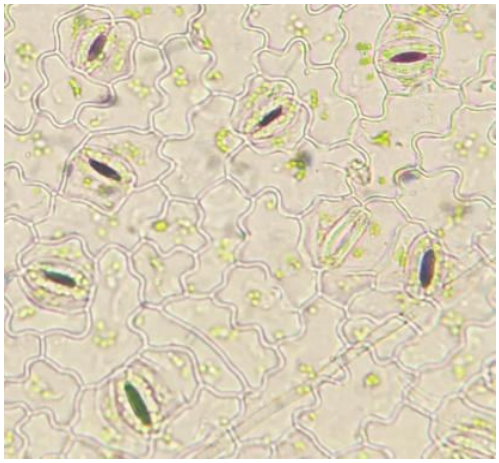


***Prunus sp.***



***Carex hirta***



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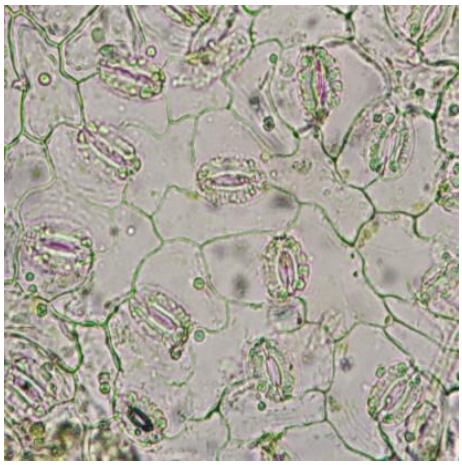
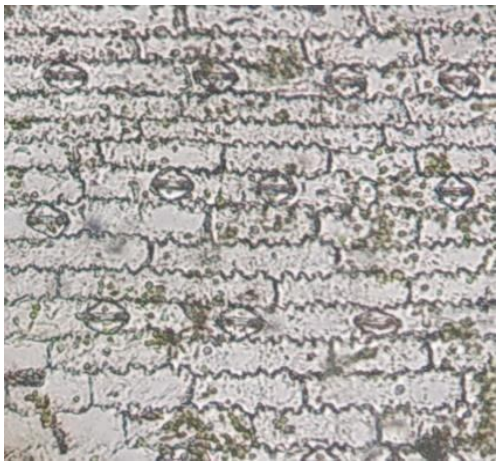
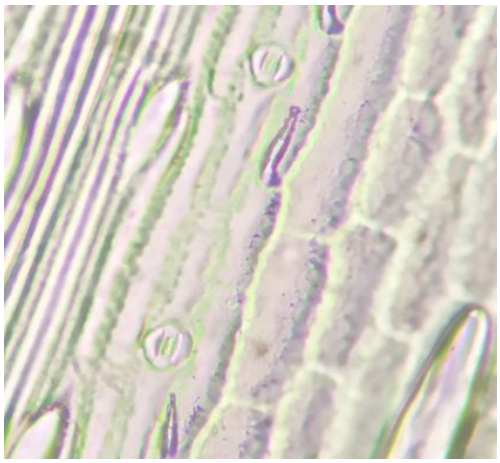


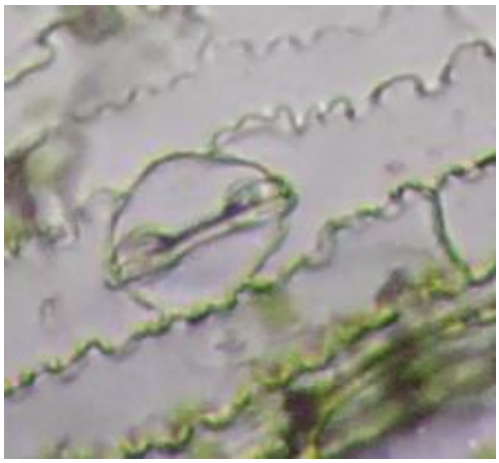
***Allamanda cathartica***



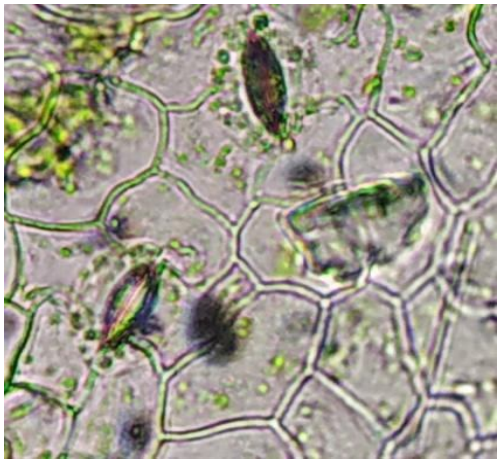
***Acrachane racemosa***



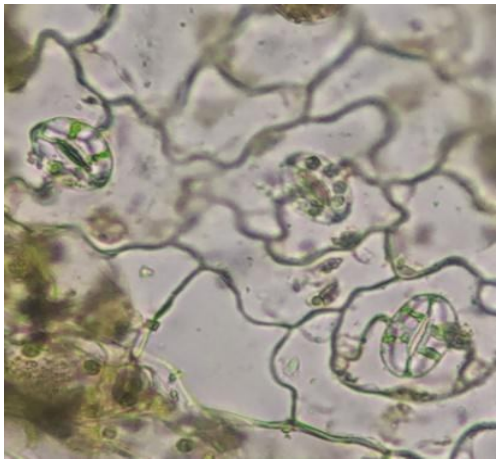
***Andropogon pumilus***



***Apluda mutica***



***Cissampelos pareira***



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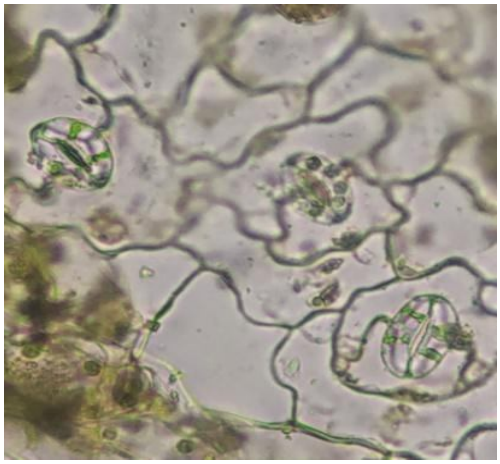
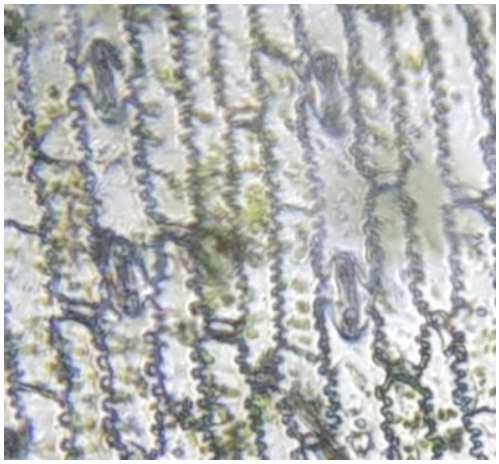
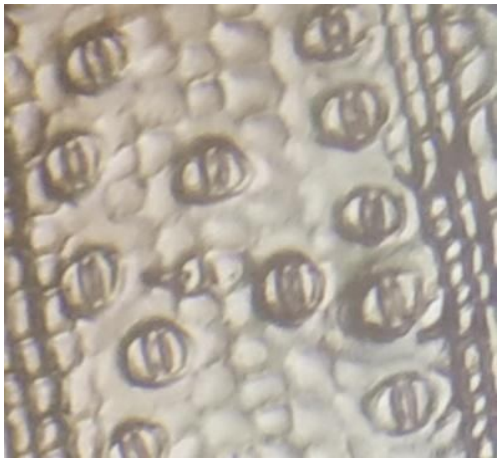


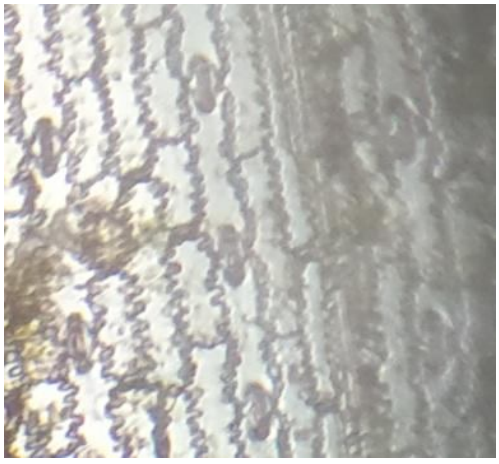
***Butea superba***



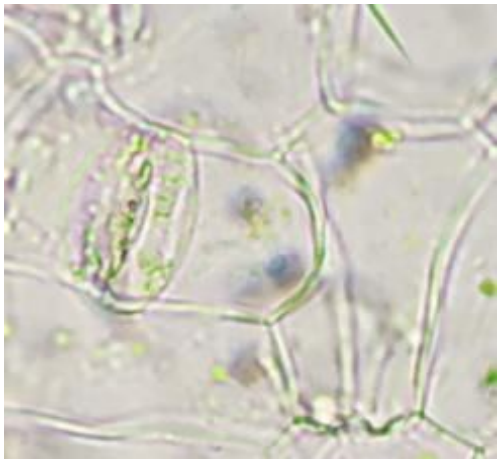
***Aristida reducta***



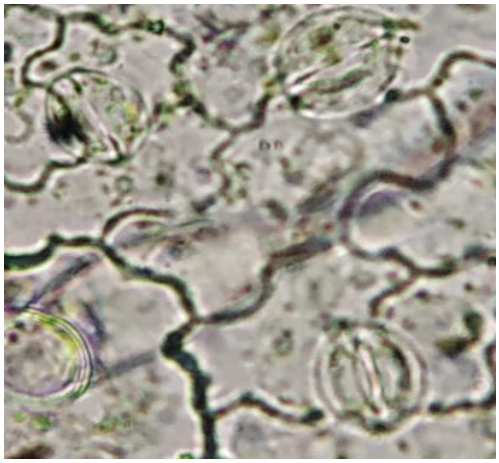
***Aristida depressa***



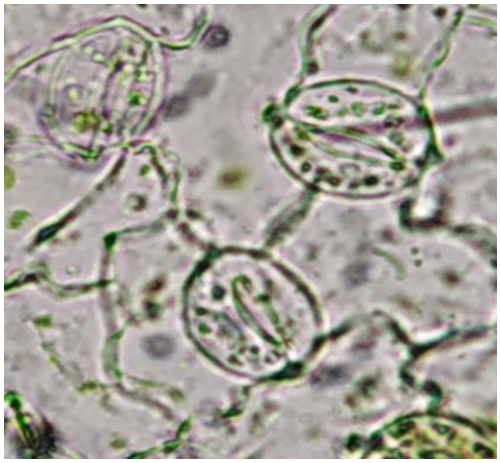
***Bothriochba sp.***



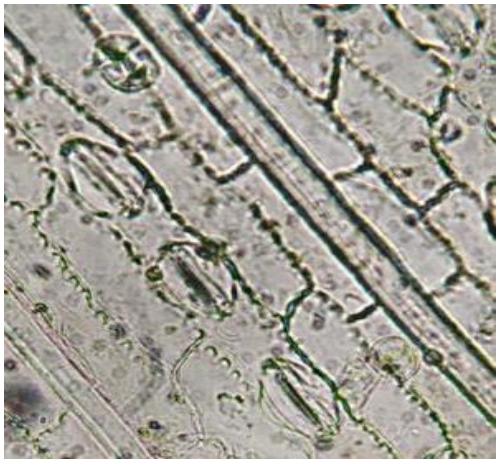
***Crotalaria sp.***



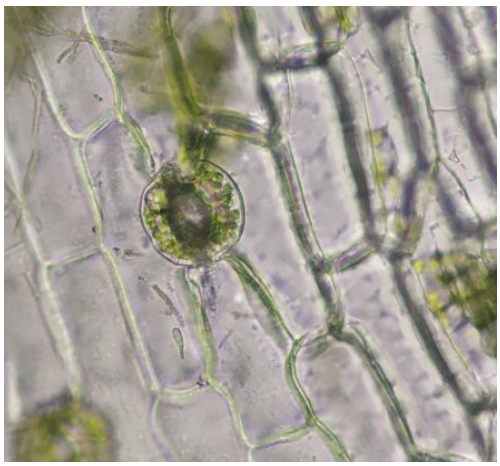
***Hamiltonia sp.***



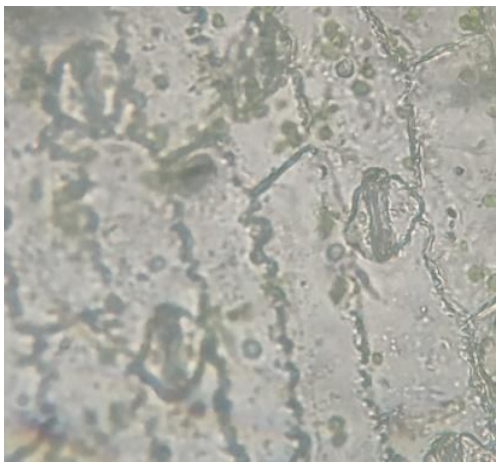
***Embelia ribes***



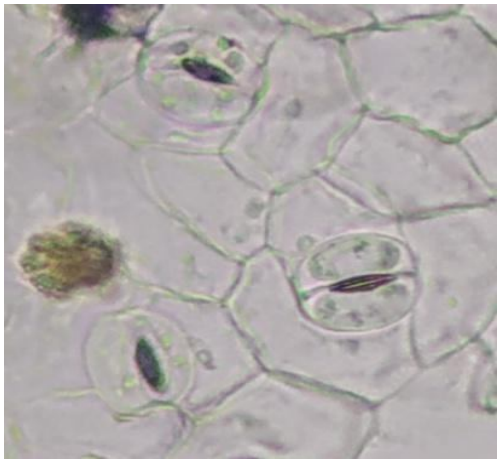
***Brachiaria deflexa***



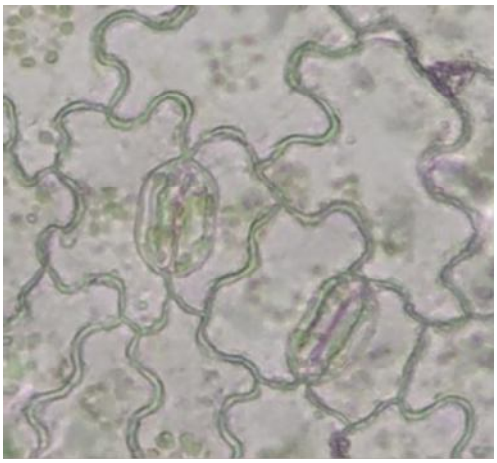
***Brachiaria reptans***



***Brachiaria ramosa***

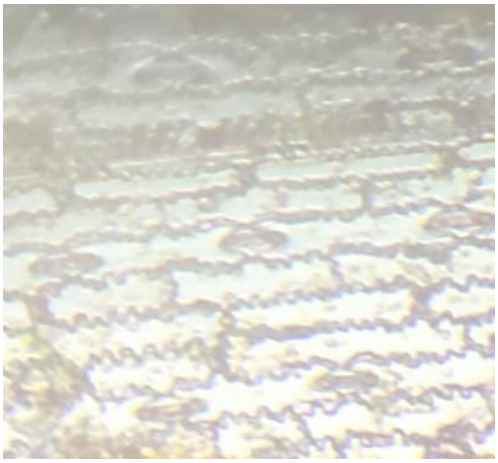


***Ctenolepsis sp.***

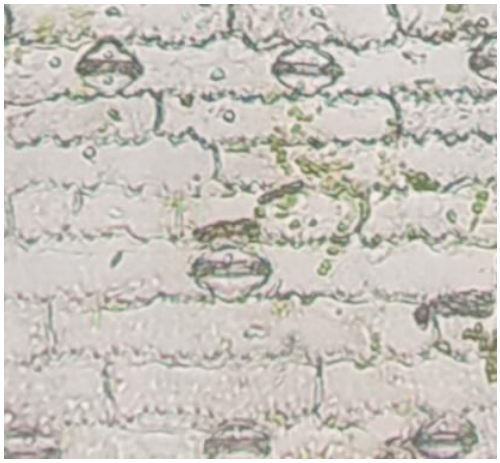


***Pergularia sp.***

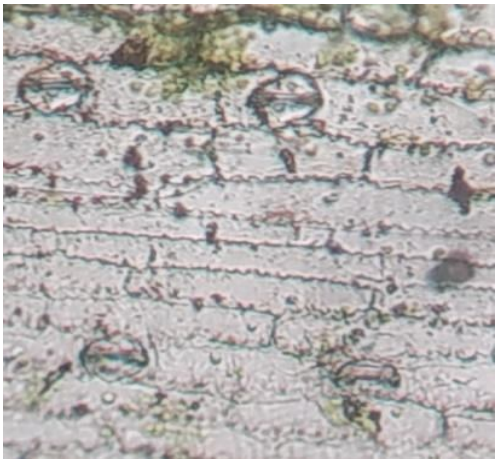
***Ipomea quamoclit***



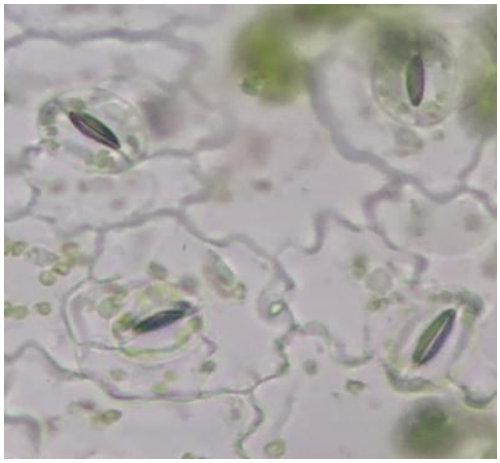
***Brachiaria eruciformis***



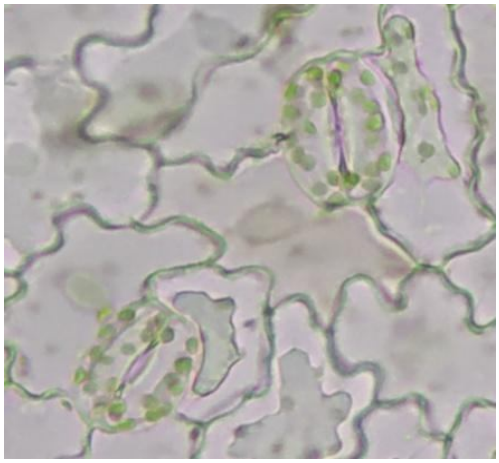
***Brachiaria setigera***



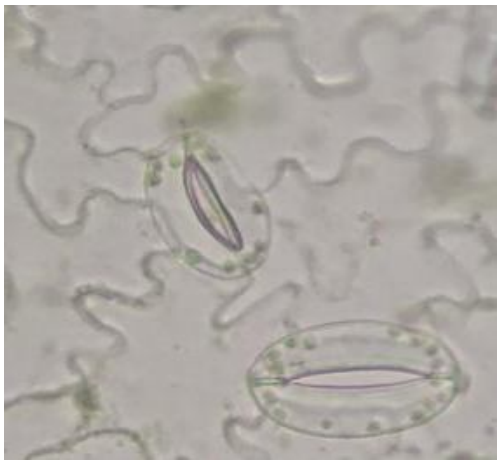
***Bambusa arundinaceae***



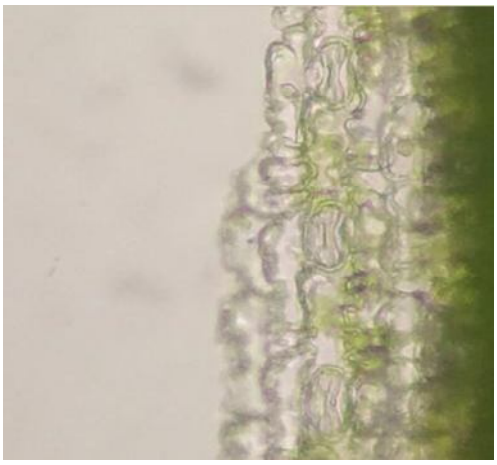
***Ipomea sepiaria***



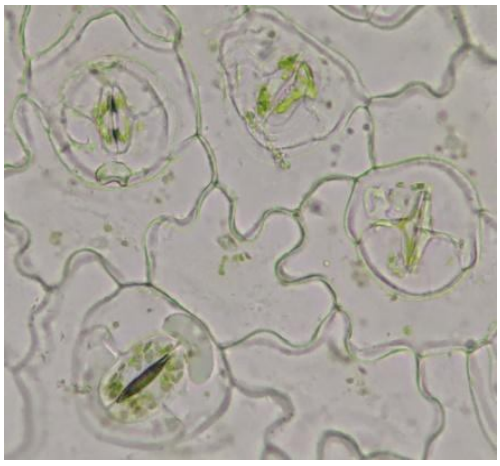
***Merremia sp.***



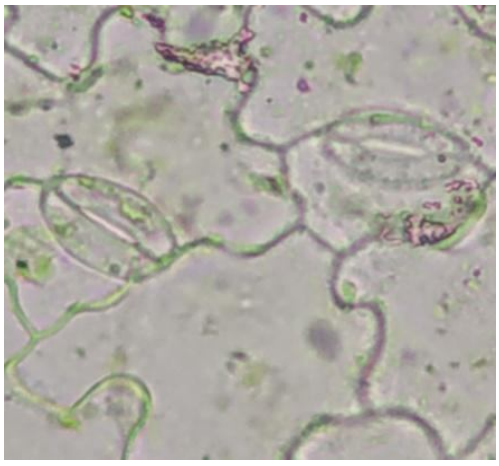
***Cucumis sp.***



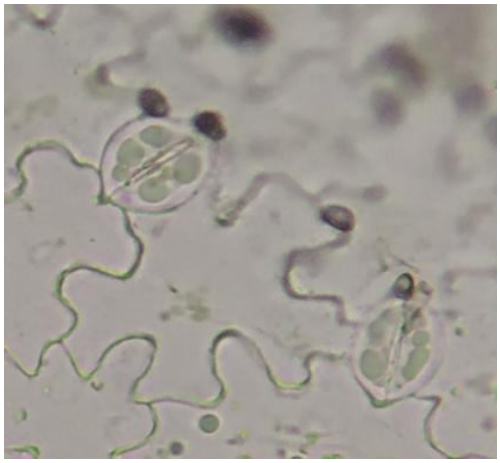
***Dendrocalamus strictus***



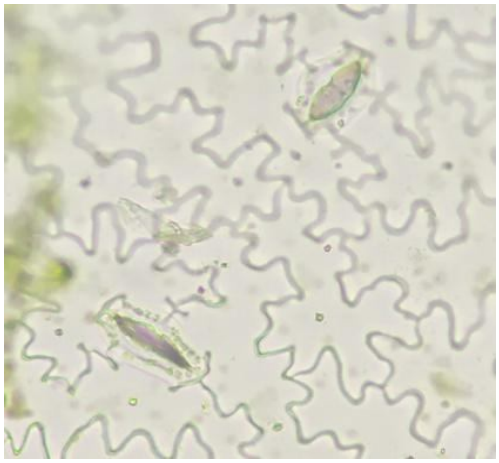
***Cocculus hirsutus***



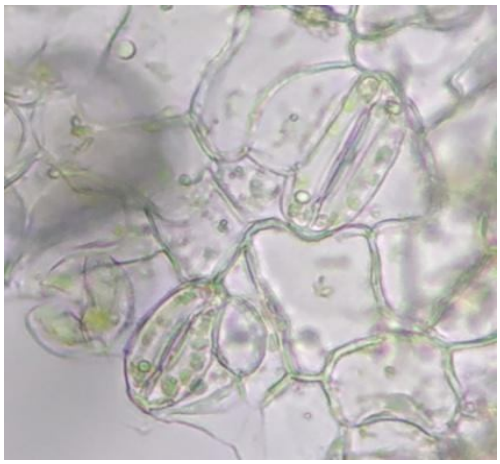
***Abutilon indicum***



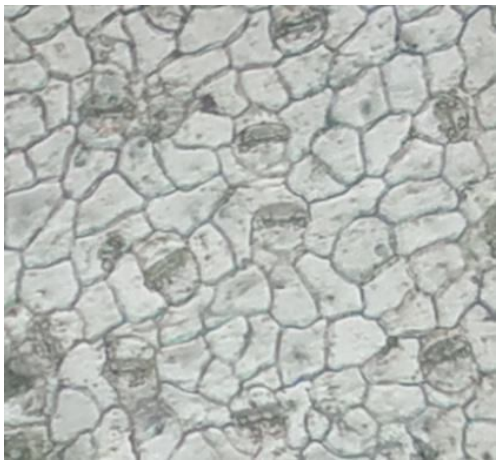
***Canavilia sp.***



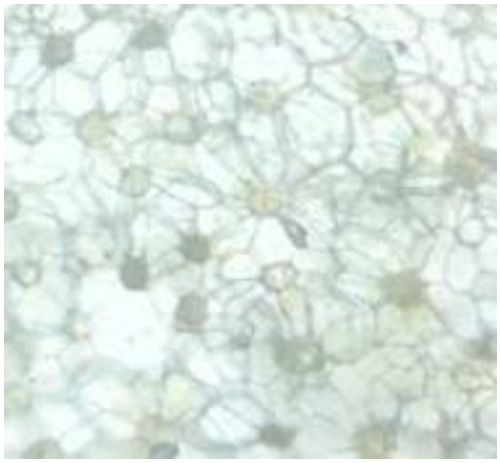
***Teramnus labilis***



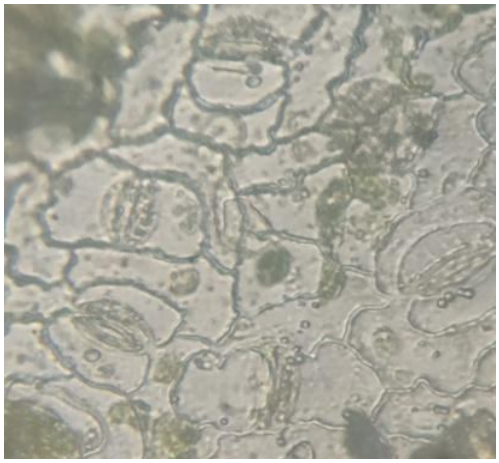
***Combretum sp.***



***Azanza sp.***

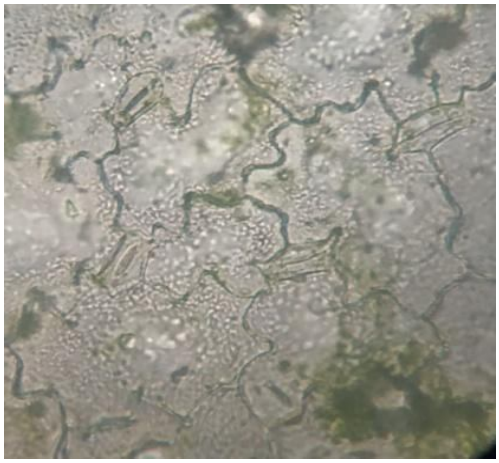


***Hibiscus ovalifolius***



***Sido sp.***

***Urena sp.***



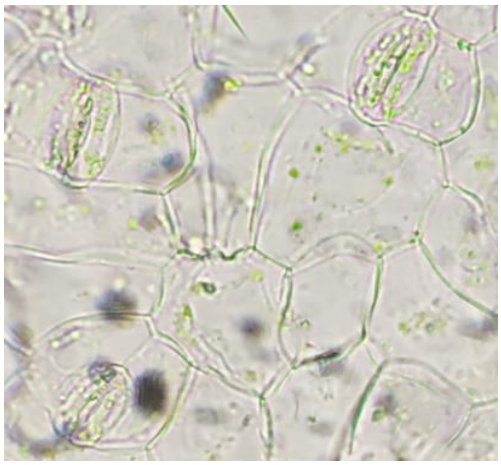
***Waltheria sp.***

## Stomatal Index

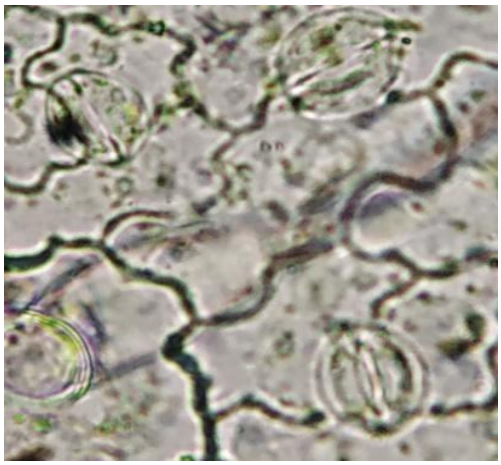
| Plant name | Stomata number | Epidermal cell | Stomatal index ( percentage ) |
|---|---|---|---|
| *Adiantum sp* | 20 | 70 | 28.57 |
| *Poaceae sp* | 20 | 60 | 25.00 |
| *Cornus sp* | 30 | 100 | 23.07 |
| *Lathyrus sp* | 20 | 80 | 20 |
| *Vitis sp.* | 90 | 450 | 16.67 |
| *Abelmoschus manihot* | 30 | 120 | 20.00 |
| *Silene latifolia* | 40 | 120 | 25.00 |
| *Curcuma sp* | 50 | 500 | 9.09 |
| *Asystasia gangetica* | 50 | 150 | 25.00 |
| *Fagus sp* | 15 | 100 | 13.04 |
| *Cyphochlaena sp* | 10 | 60 | 14.28 |
| *Prunus sp* | 50 | 150 | 25.00 |
| *Carex hirta* | 20 | 70 | 22.2 |
| *Jatropa sp* | 40 | 180 | 18.18 |
| *Allamanda cathartica* | 60 | 120 | 33.33 |
| *Acrachane racemosa* | 40 | 120 | 25.00 |
| *Andropogon pumilus* | 30 | 90 | 25.00 |
| *Apluda mutica* | 10 | 30 | 25.00 |

| | | | |
|---|---|---|---|
| *Cissampelos pareira* | 40 | 150 | 21.05 |
| *Ventilago denticulate* | 30 | 180 | 14.28 |
| *Butea superba* | 20 | 120 | 14.28 |
| *Aristida reducta* | 40 | 120 | 25.00 |
| *Aristida depressa* | 20 | 70 | 22.22 |
| *Bothriochba sp.* | 15 | 45 | 25.00 |
| *Crotalaria sp.* | 20 | 80 | 20.00 |
| *Hamiltonia sp.* | 30 | 125 | 19.35 |
| *Embelia ribes* | 20 | 120 | 14.28 |
| *Brachiaria deflexa* | 30 | 85 | 26.08 |
| *Brachiaria reptans* | 10 | 30 | 25.00 |
| *Brachiaria ramosa* | 20 | 60 | 25.00 |
| *Ctenolepsis sp.* | 30 | 120 | 20.00 |
| *Pergularia sp.* | 40 | 155 | 20.51 |
| *Ipomea quamoclit* | 20 | 70 | 22.22 |
| *Brachiaria eruciformis* | 30 | 90 | 25.00 |
| *Brachiaria setigera* | 10 | 30 | 25.00 |
| *Bambusa arundinaceae* | 40 | 125 | 24.24 |
| *Ipomea sepiaria* | 40 | 120 | 25.00 |
| *Merremia sp.* | 60 | 180 | 25.00 |
| *Cucumis sp.* | 40 | 160 | 20.00 |
| *Dendrocalamus strictus* | 30 | 90 | 25.00 |
| *Cocculus hirsutus* | 20 | 100 | 16.67 |
| *Abutilon indicum* | 30 | 120 | 20.00 |
| *Canavilia sp.* | 20 | 60 | 25.00 |
| *Teramnus labilis* | 40 | 160 | 20.00 |
| *Combretum sp.* | 50 | 200 | 20.00 |
| *Azanza sp.* | 40 | 200 | 16.67 |
| *Hibiscus ovalifolius* | 30 | 120 | 20.00 |
| *Sido sp.* | 30 | 120 | 20.00 |
| *Urena sp.* | 50 | 200 | 20.00 |
| *Waltheria sp.* | 30 | 180 | 14.28 |

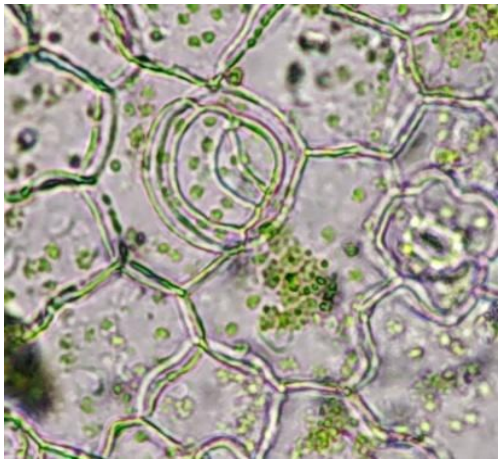
# Second Report Amravati Collection



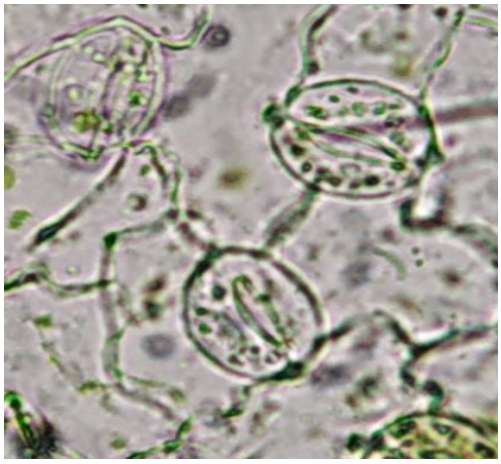
*Antagonon lectopus*



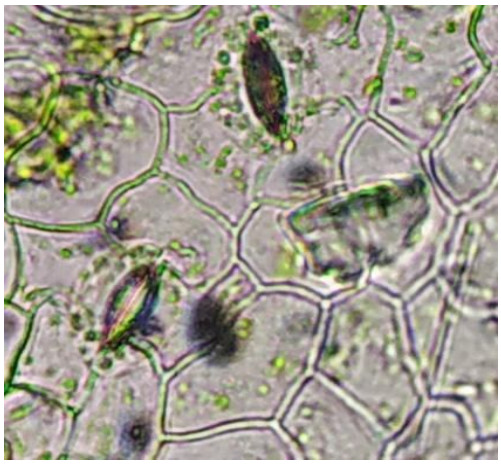
*Datura stromanum*



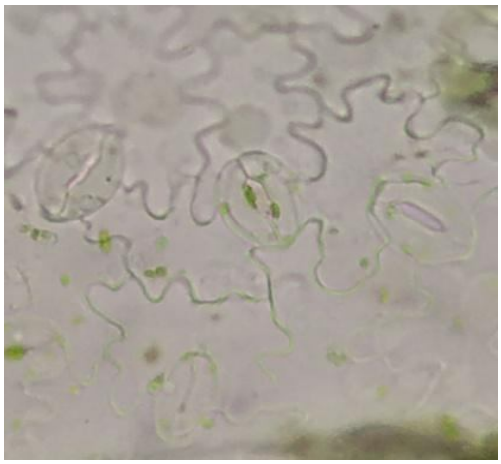
*Acalifa indica*



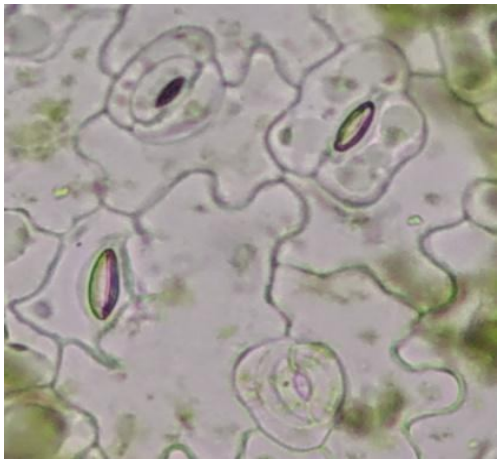
*Mirabilis jalapa*



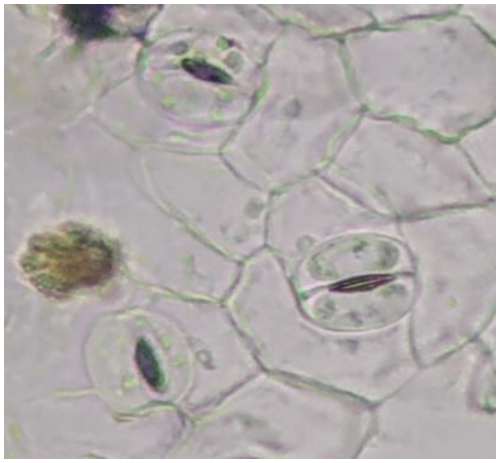
*Hedera helix*



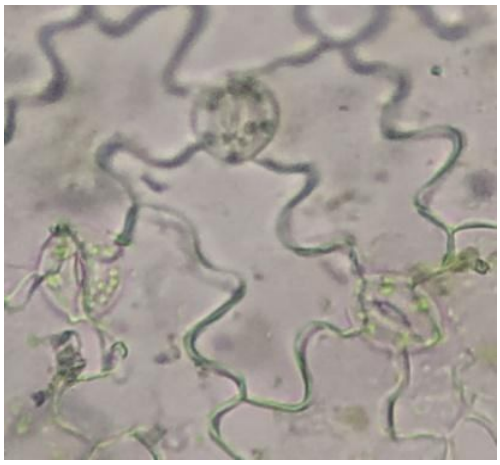
*Imptiens balsemina*



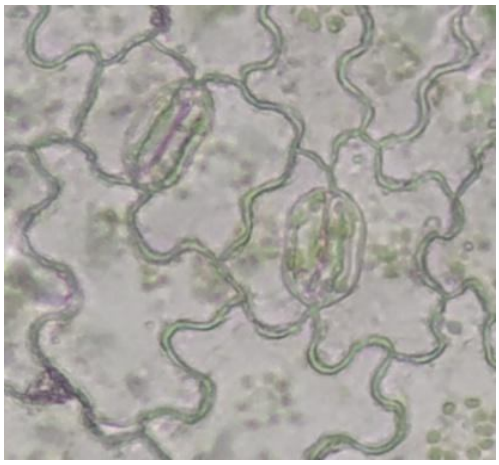
***Gmelina philipensis***



***Dichanthelium acuminatum***

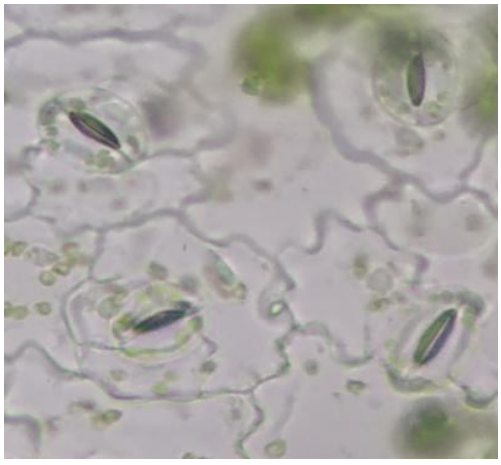


***Pithecellobium dulce***

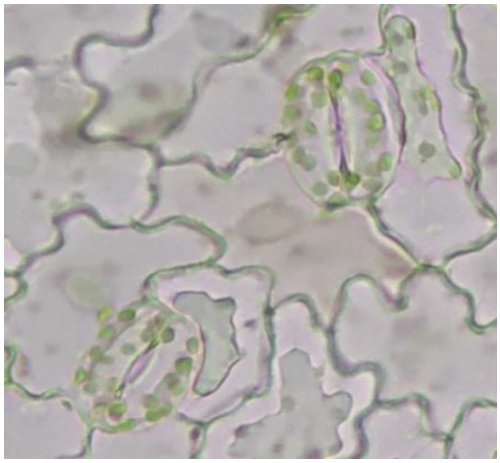


***Alternanthera pungens***

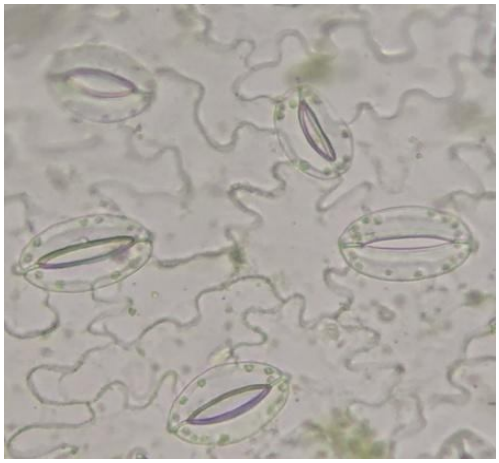
***Betula sp.***



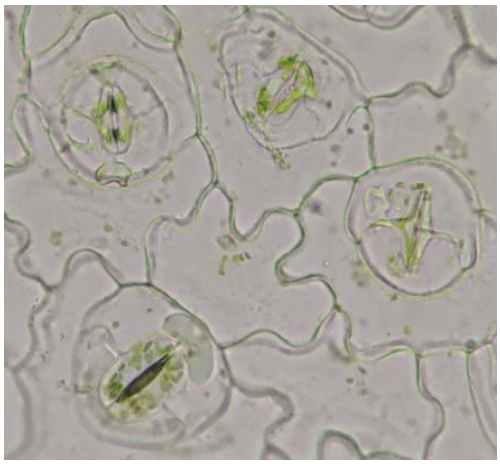
***Artocarpus heterophyllus***



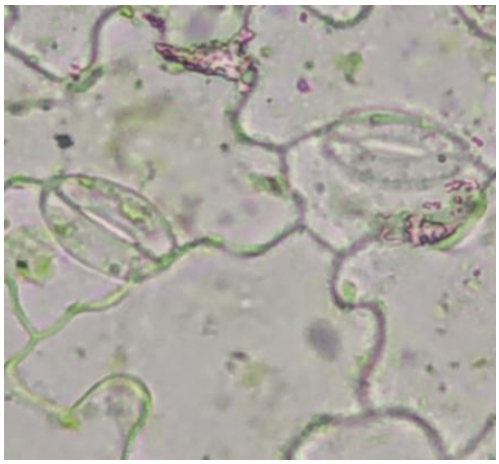
***Helianthus annus***



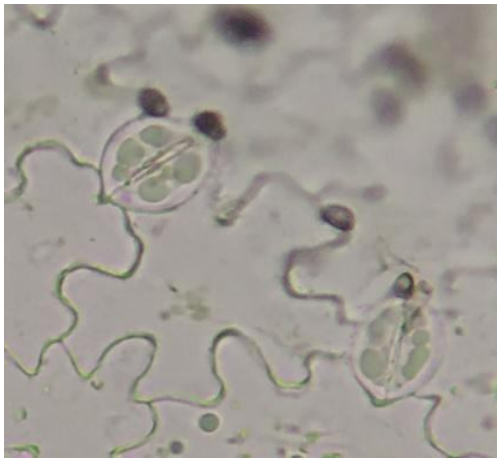
***Thunbergia grandiflora***



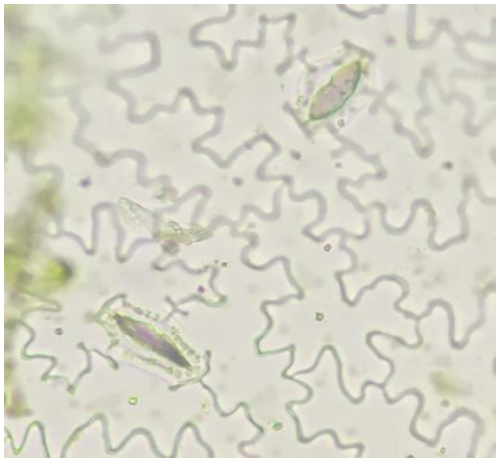
***Phyllanthus niruri***



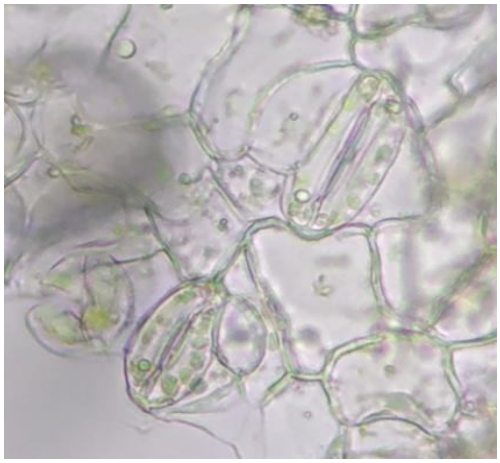
***Cleome viscosa***



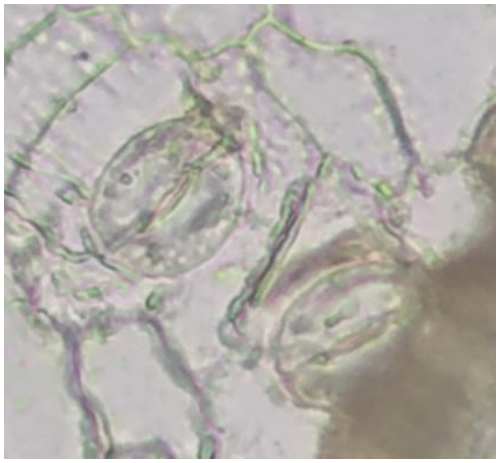
***Centratherum anthelminticum***



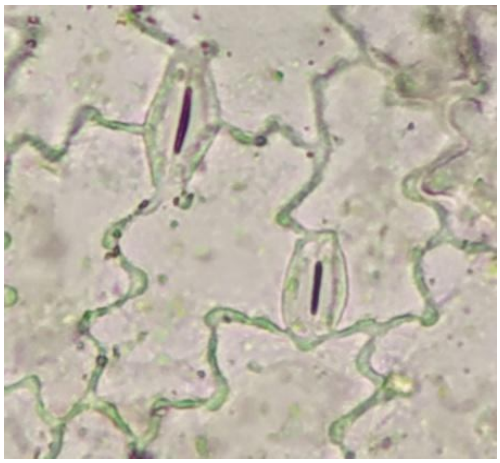
***Rauvolfia tetraphylla***



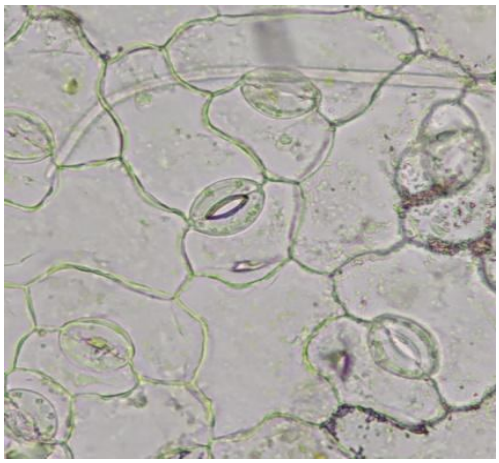
***Dolichindron falcuta***



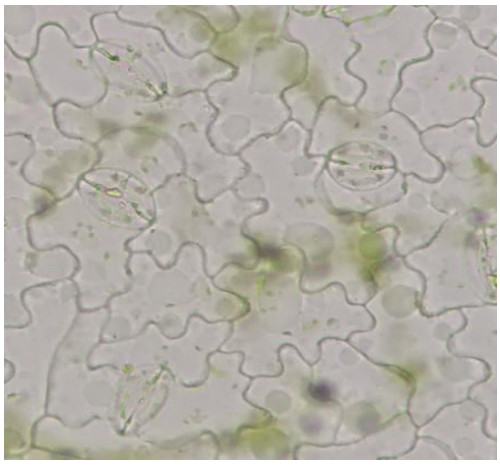
***Purslene sp.***



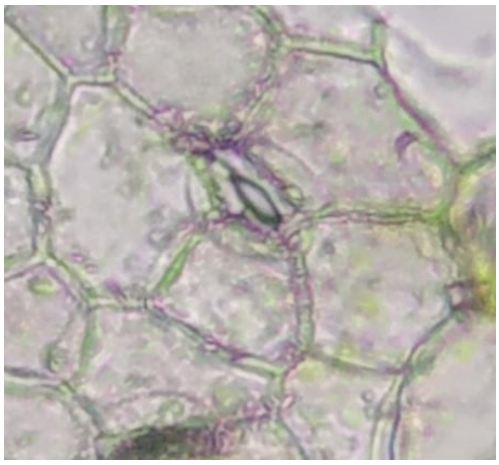
***Cassia tora***



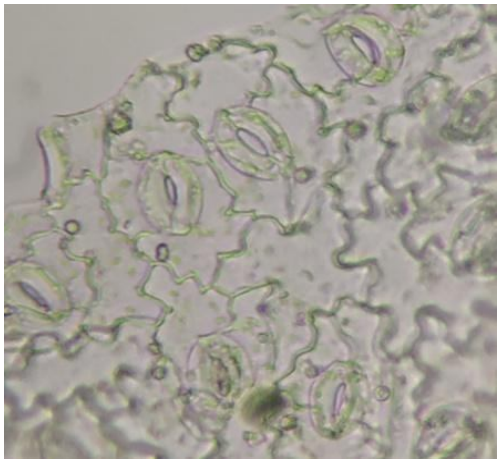
***Tinospora sp.***



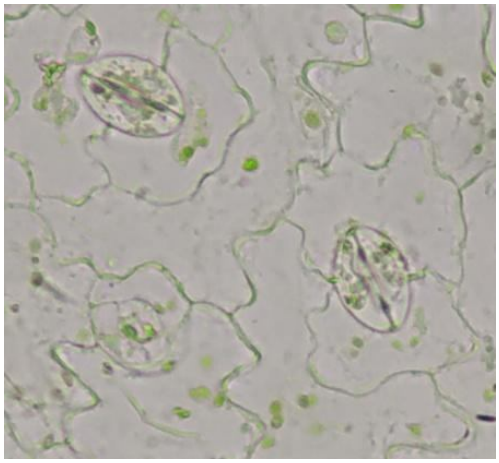
***Hippocrepis emerus***



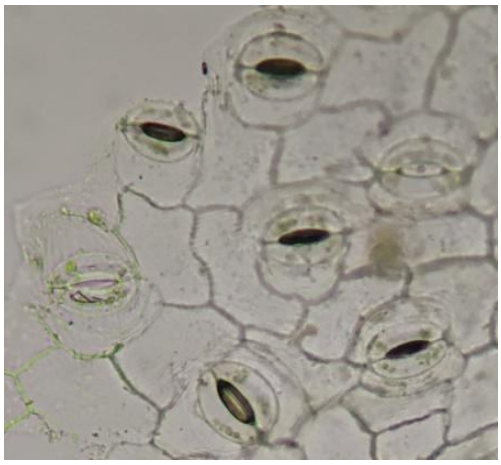
***Malvastrum cromandelium***



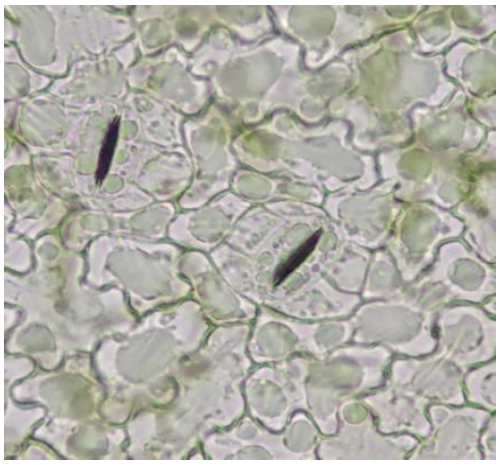
***Alternanthera sessilis***



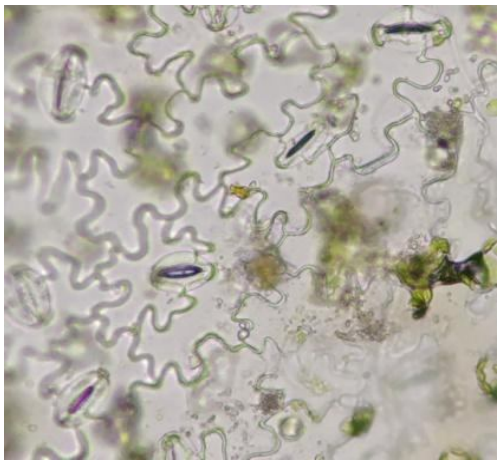
***Jatropa sp.***



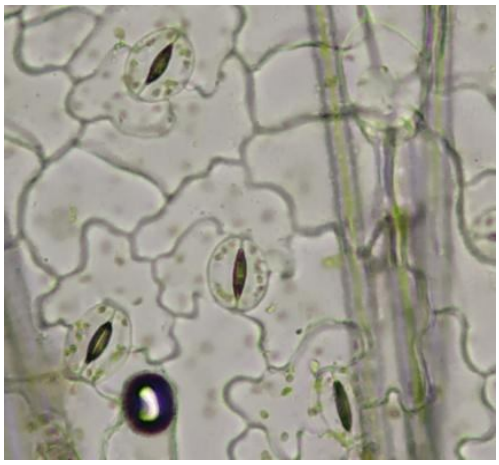
***Morinda citrifolia***



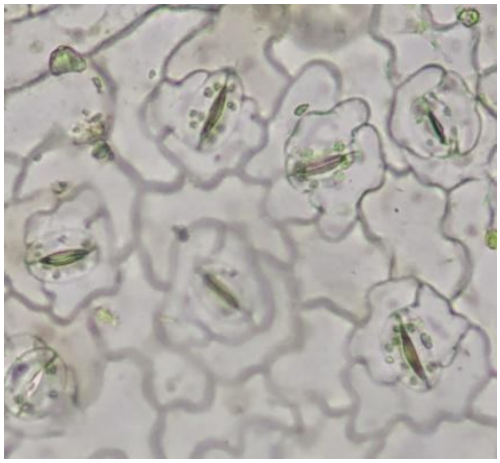
***Hyptis lorentziana***



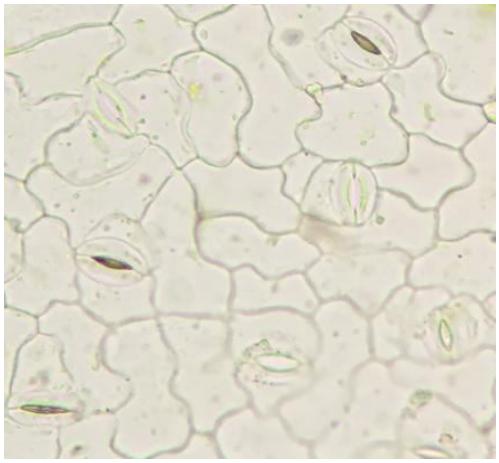
***Achyranthes aspera***



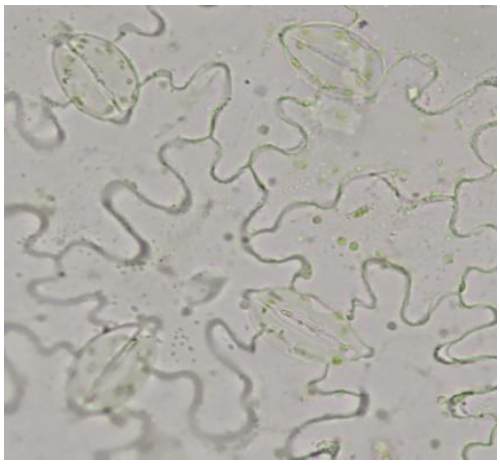
***Boehmeria nivea***



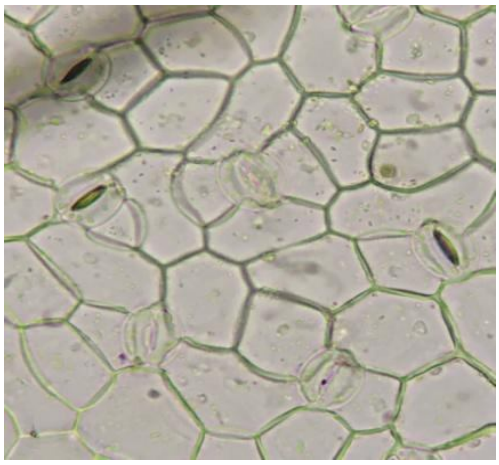
***Calotropis procera***



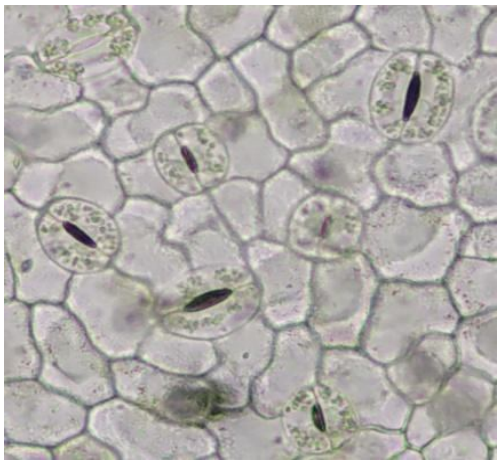
***Persicuria verginiana***



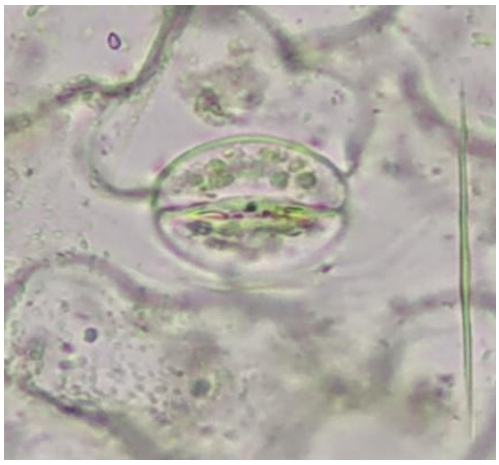
***Tribulus terrestris***



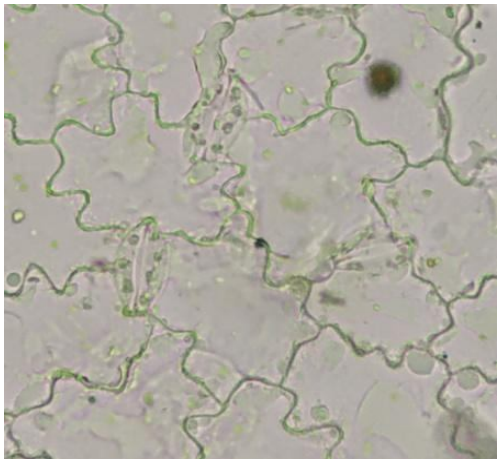
***Ipomoea obscura***



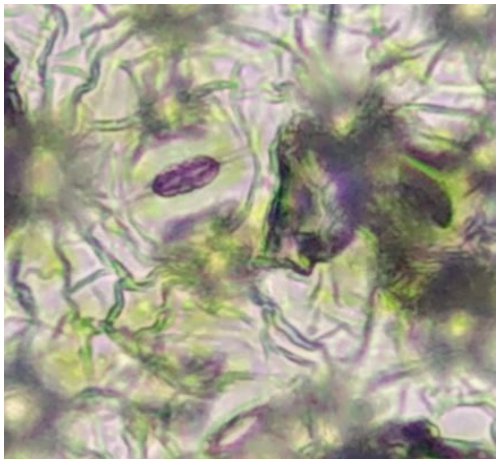
***Boerhavia erecta***



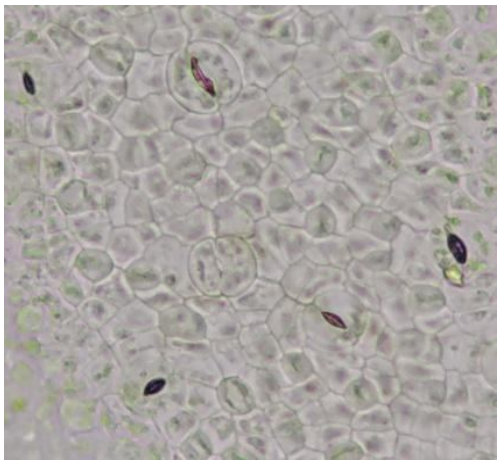
***Euphorbia geniculata***



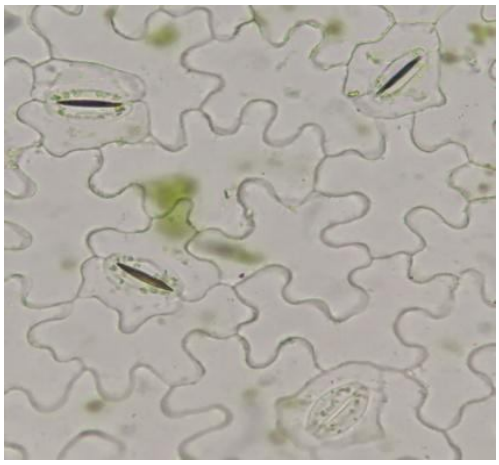
***Alstonia scholaris***



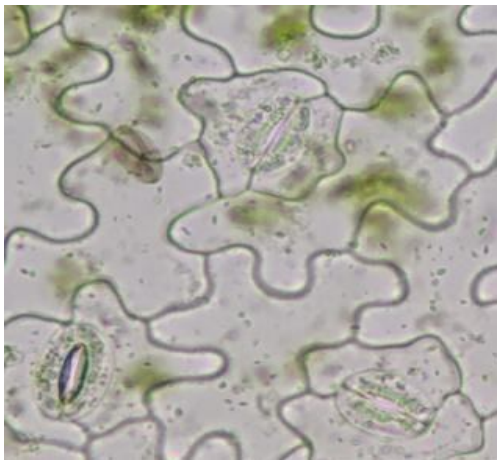
***Bryonia cretica***



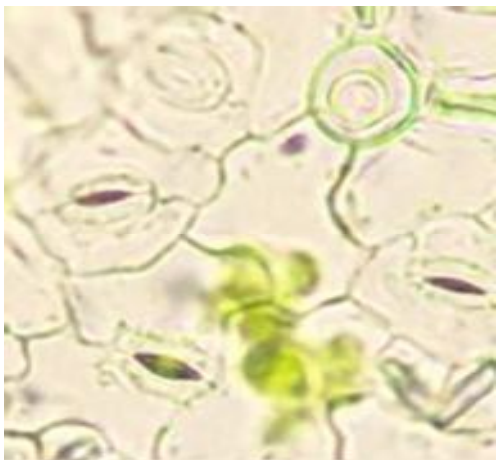
***Ipomea hederifolia***



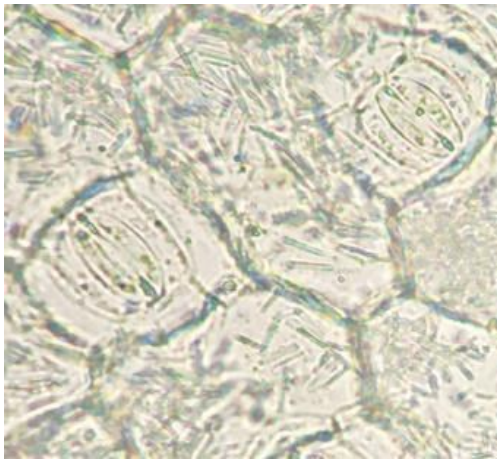
***Centrosema sp.***



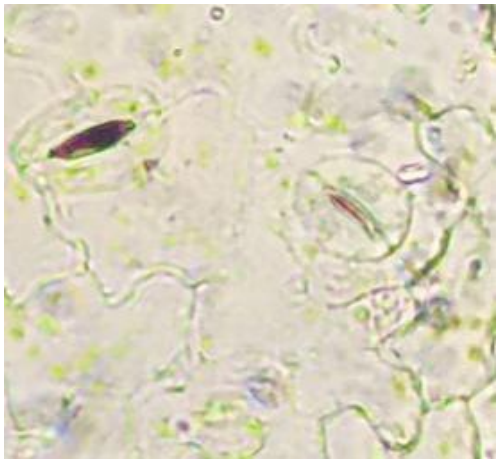
***Cardiospermum lalicbum***



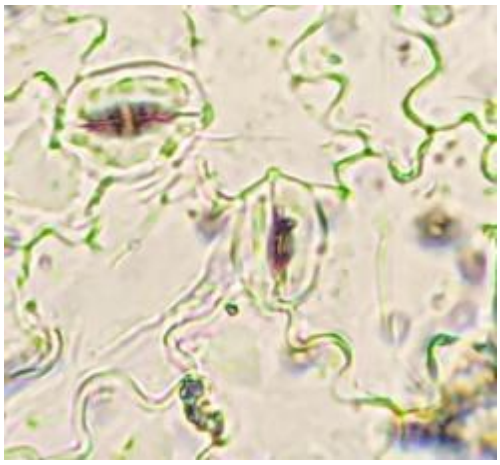
***Bauhinia vahili***



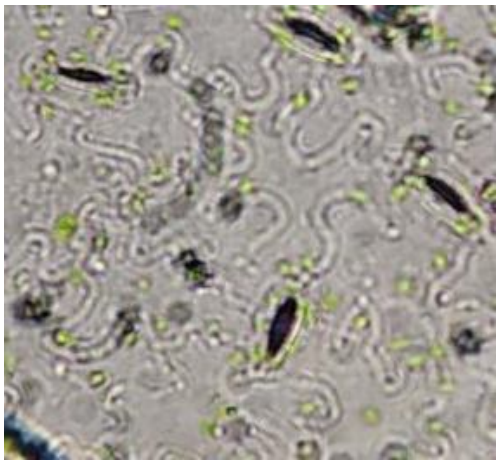
***Acacia torta***



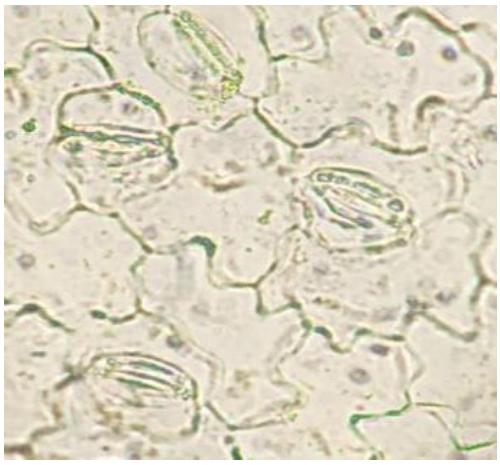
***Coccinia grandis***



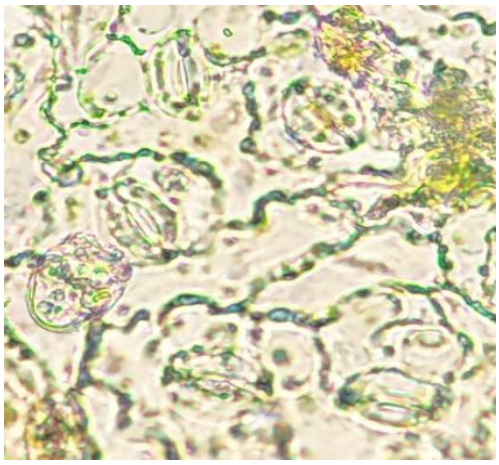
***Diplocyclos palmatus***



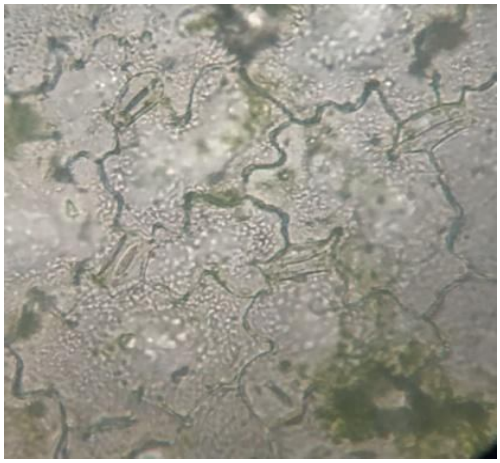
***Lufa acutangola***



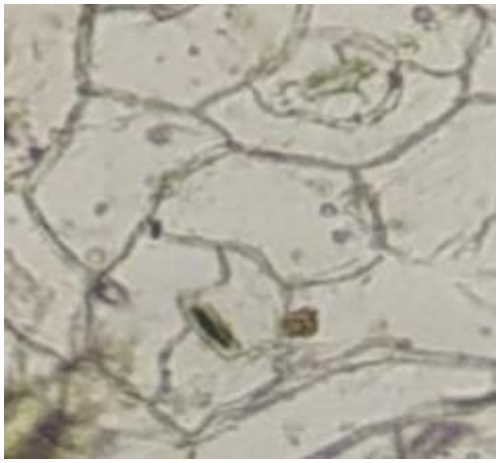
***Momordica diocia***



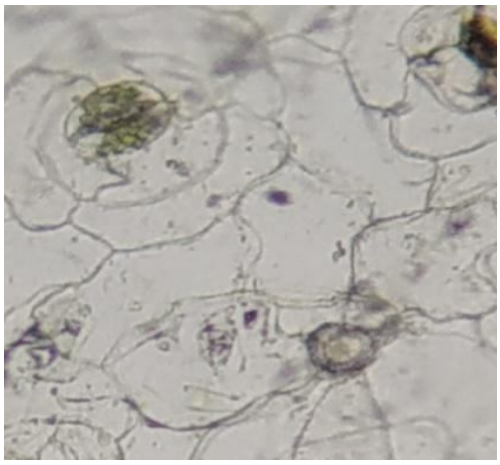
***Mukia sp.***



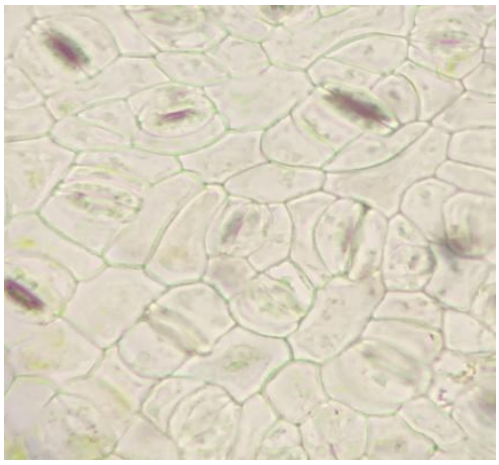
***Argyreia sp.***



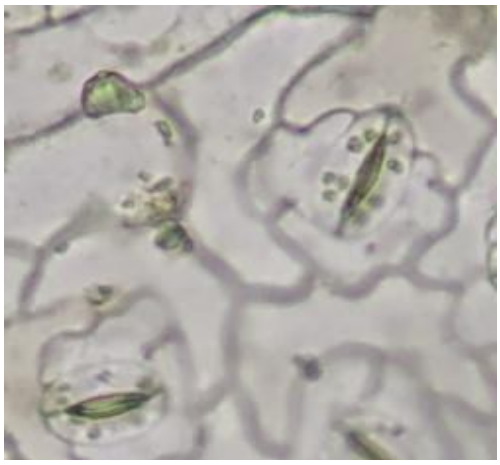
***Ipomea nil***



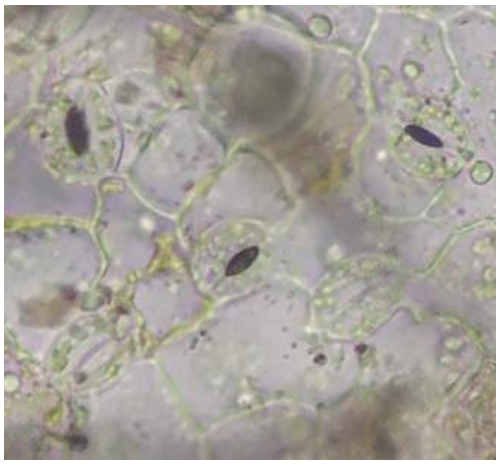
***Ipomea sinesis***



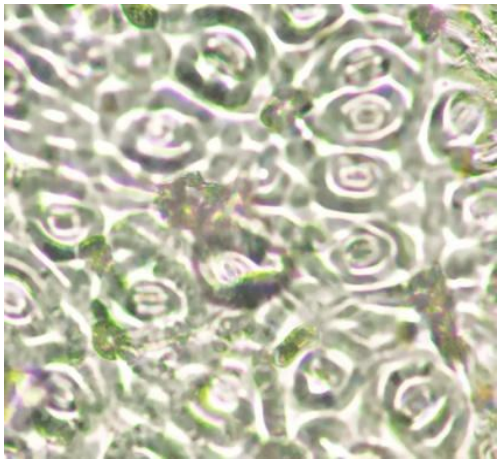
***Momordica balsemina***



***Tricosanthes cucumerina***

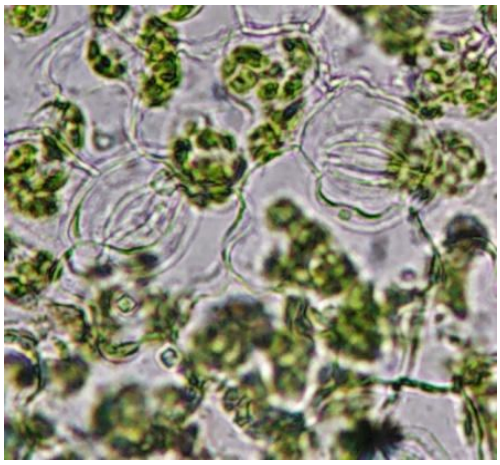


***Ipomea archnosperma***

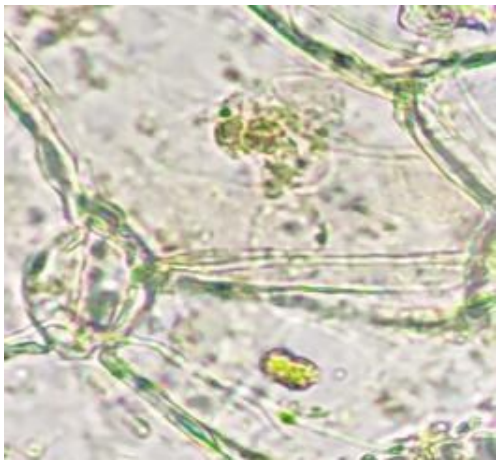


***Abrus precatorius***

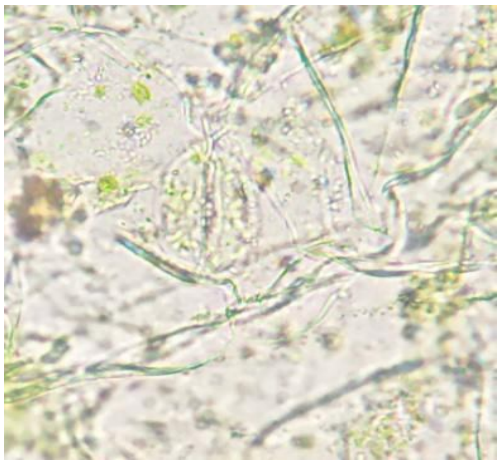
***Cassia obtusifolia***



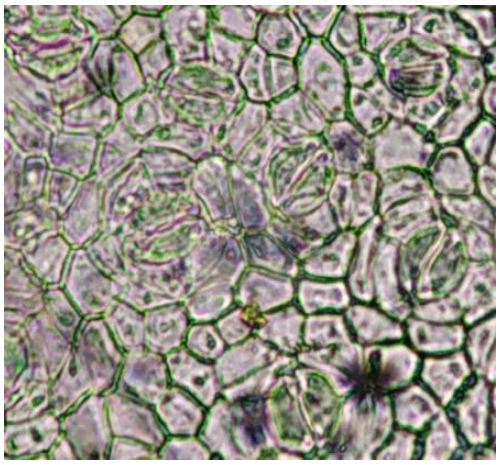
***Cassia occidentalis***



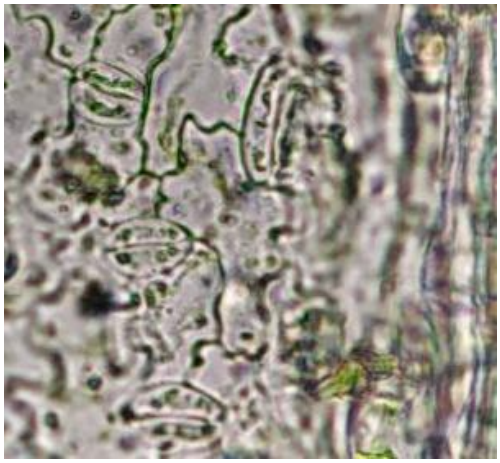
***Acacia pennata***



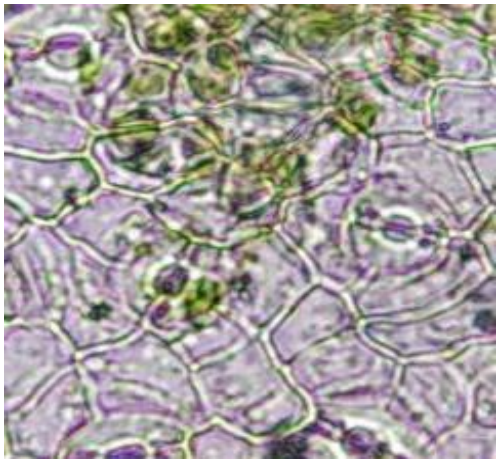
***Mimosa hamata***



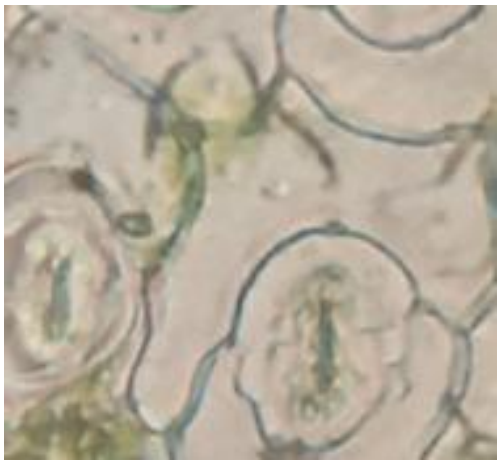
***Artemisia vulgaris***



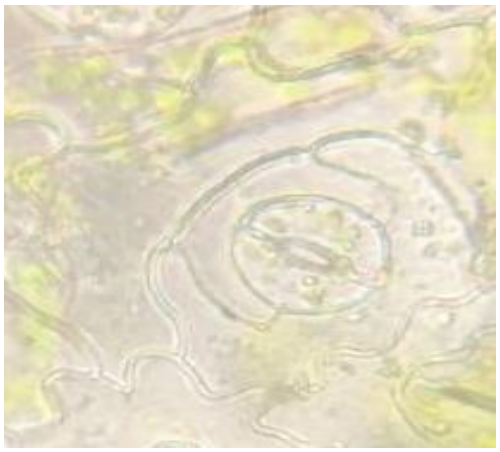
***Calotripis gigantea***



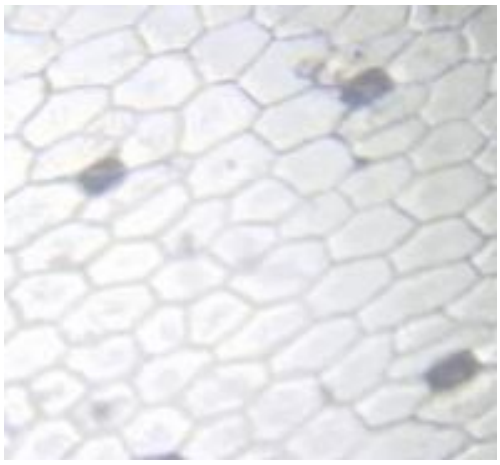
***Datura innoxia***



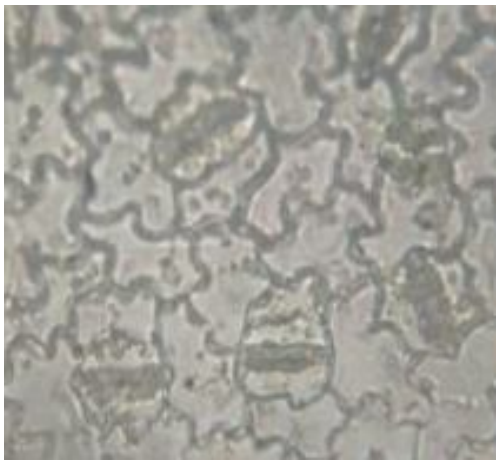
***Solanum violaceum***



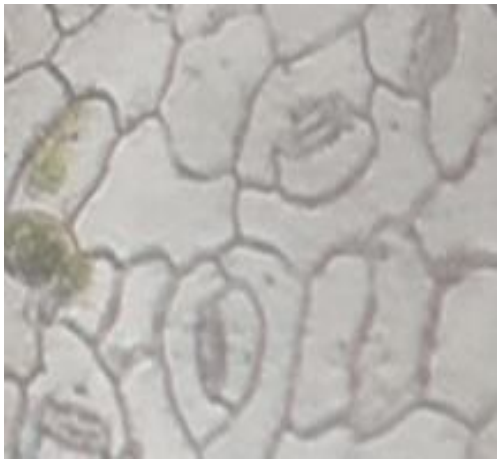
***Barleria prionitis***



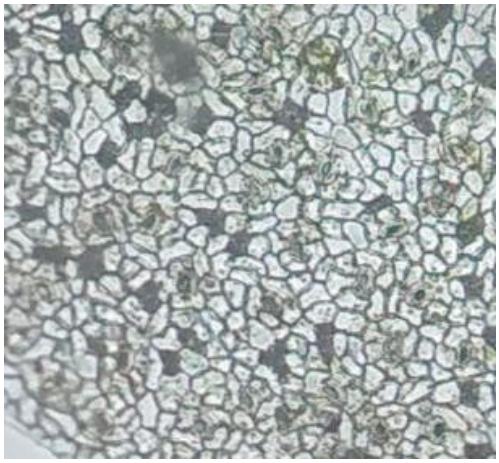
***Clerodendrum sp.***



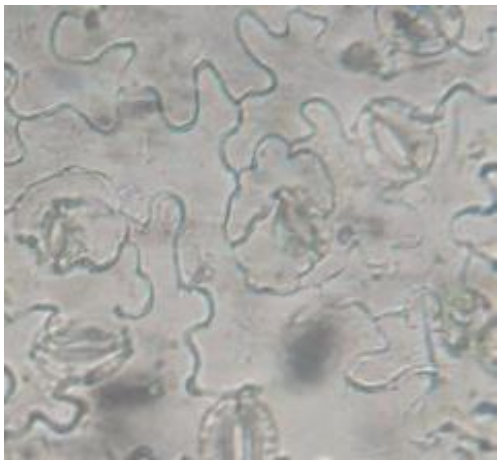
***Anisomelis indica***



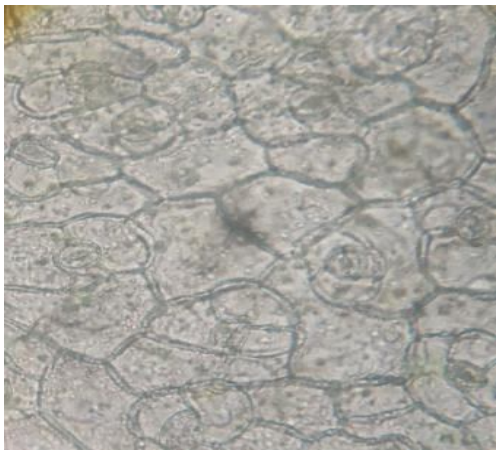
***Hyptis suaveolens***



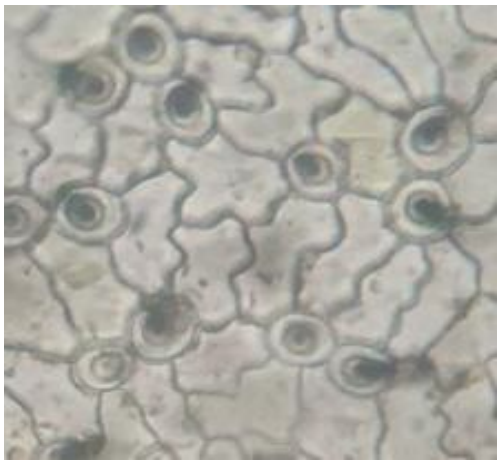
***Pogostemon benghalensis***



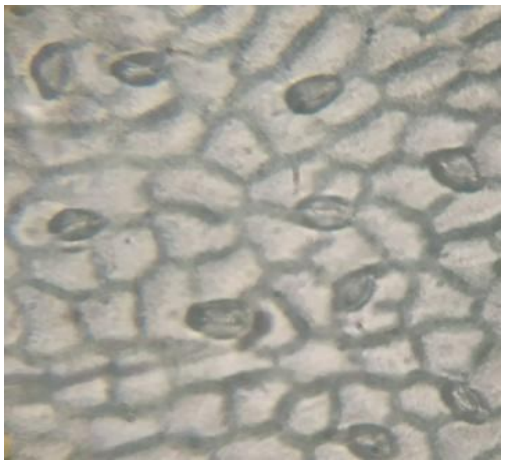
***Pupalia lappaca***



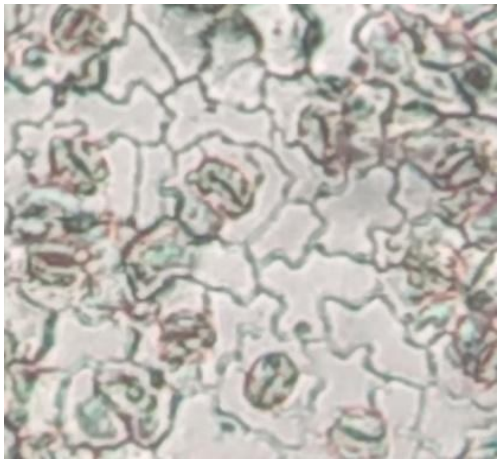
***Phyllanthus maderaspatensis***



***Lchnocarpus ovtifolius***

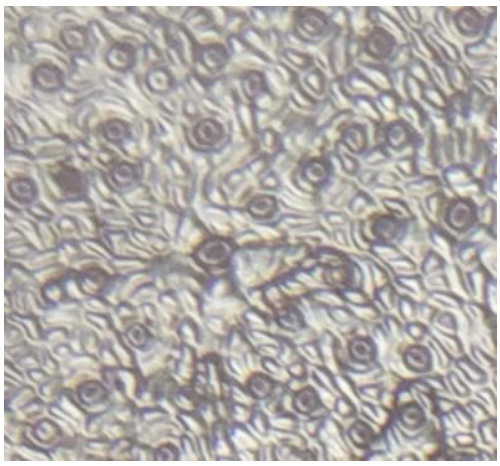


***Hibiscus punduroformis***

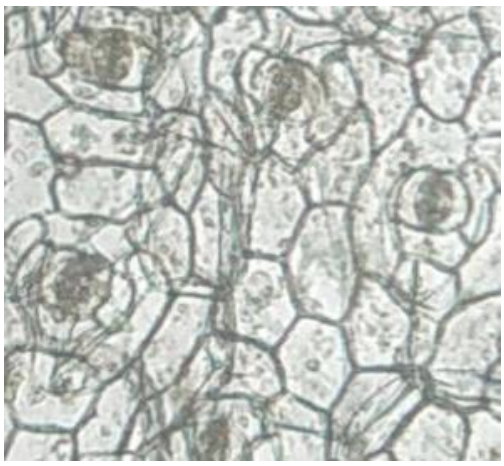


***Anisomeles heyneana***

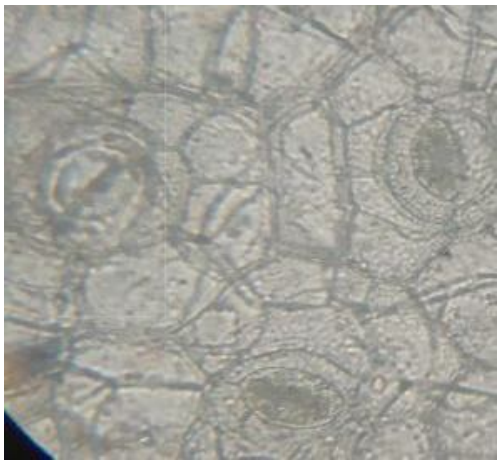
***Leonitis sp.***



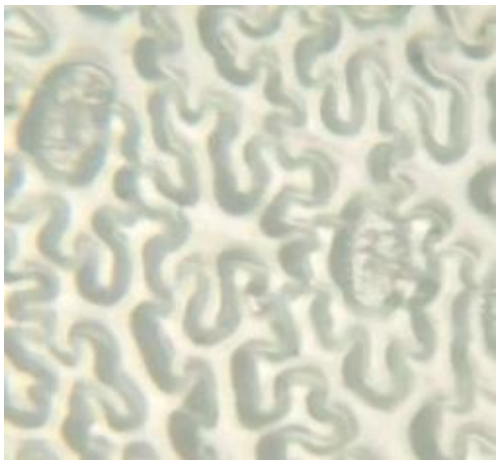
***Barleria strigosa***



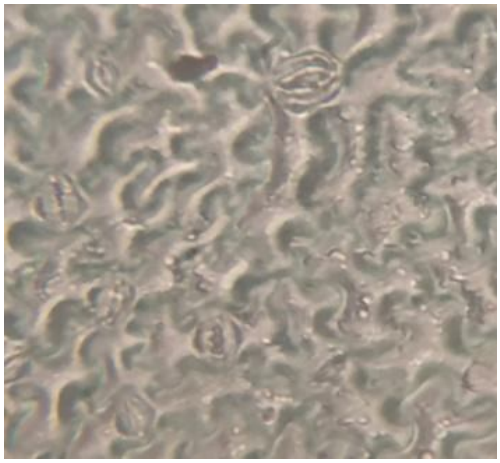
***Caesalpinia bondacella***



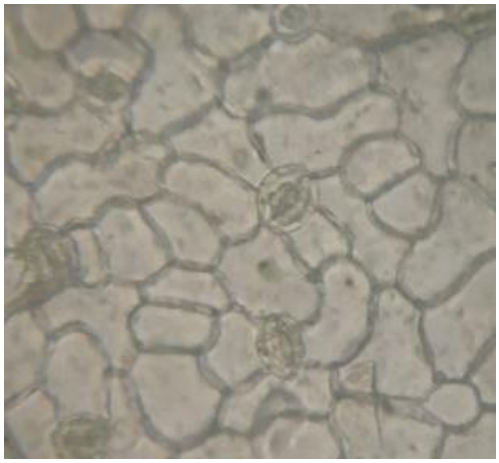
***Ceaselpinia pulcherima***



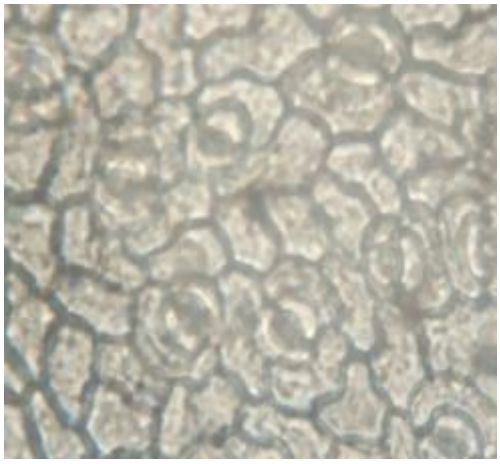
***Gardenia gummifera***



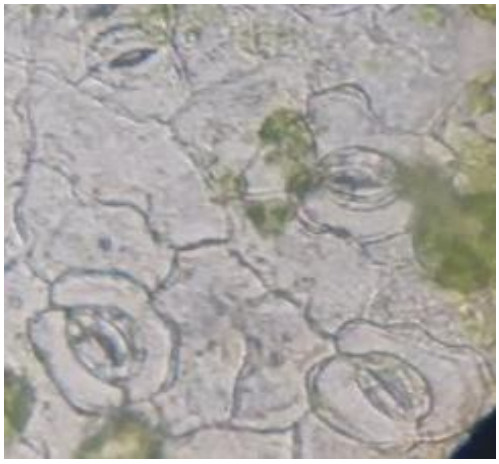
***Pavetta indica***



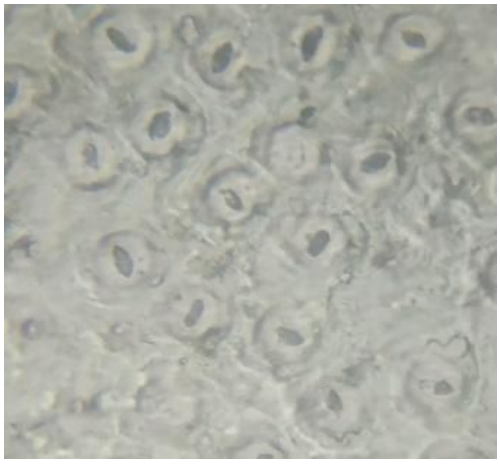
***Phyllanthus reticulates***



***Zizipus oenopolia***

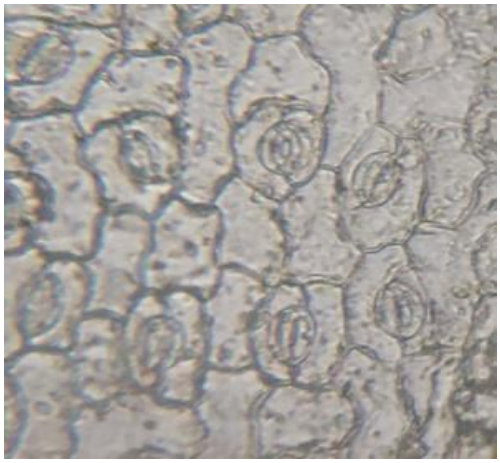


***Abutilon hirtum***

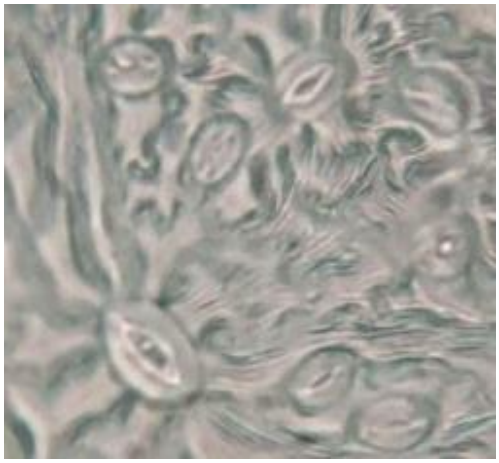


***Flacourtia sp.***

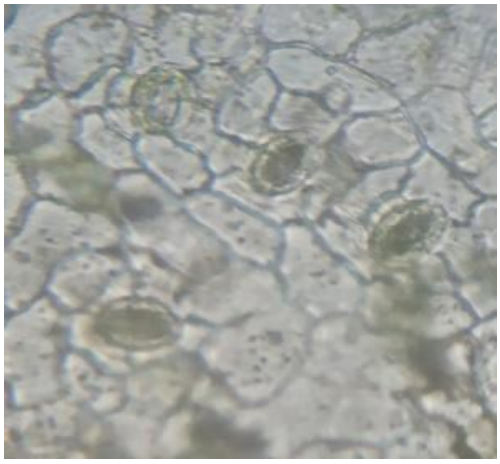
***Bombax ceiba***



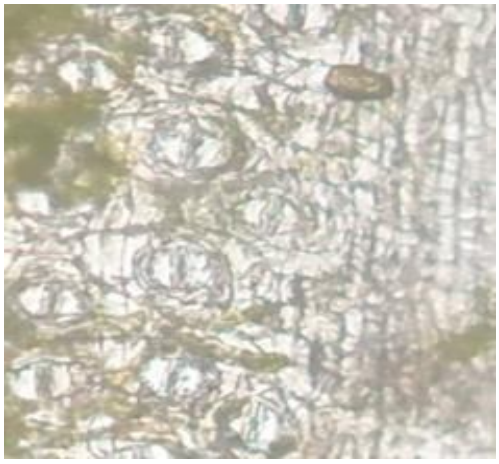
***Dalbergia sp.***



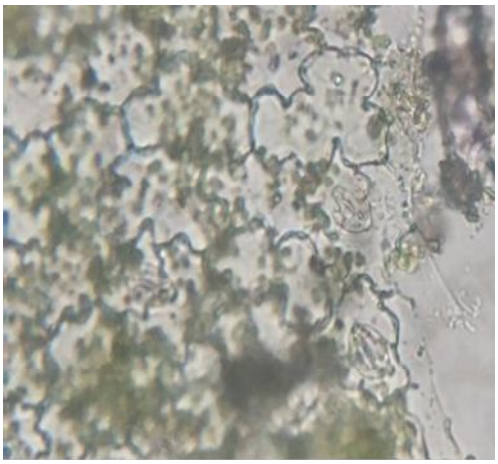
***Pongamia pinnata***



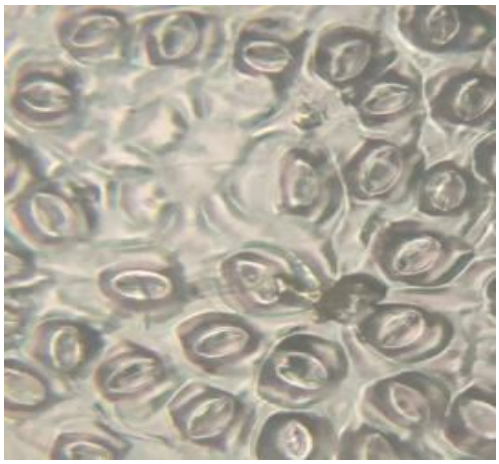
***Albizia procera***



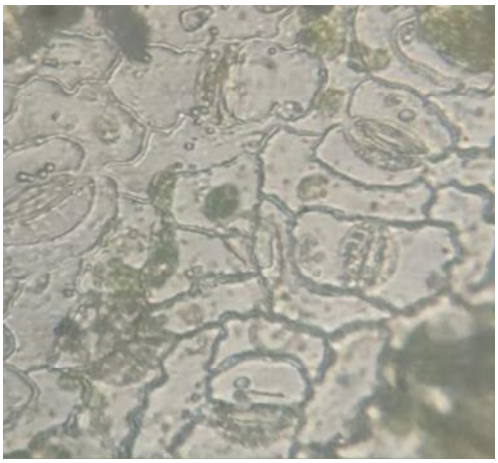
***Terminalia alata***



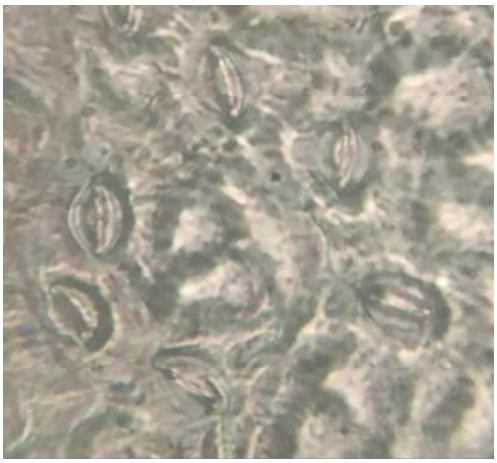
***Cordia dichotoma***



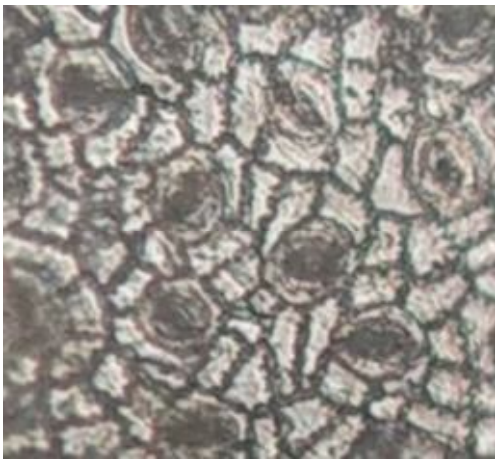
***Phoenix sylvestris***



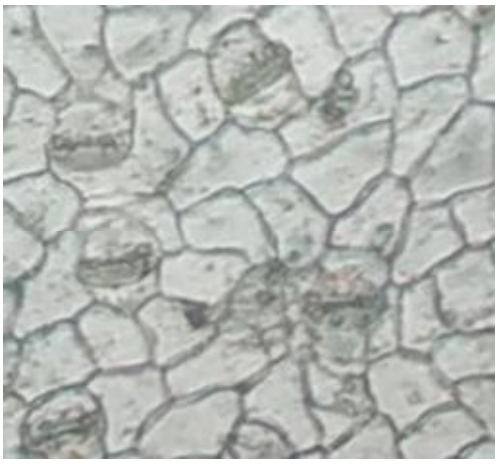
***Ixora arboria***



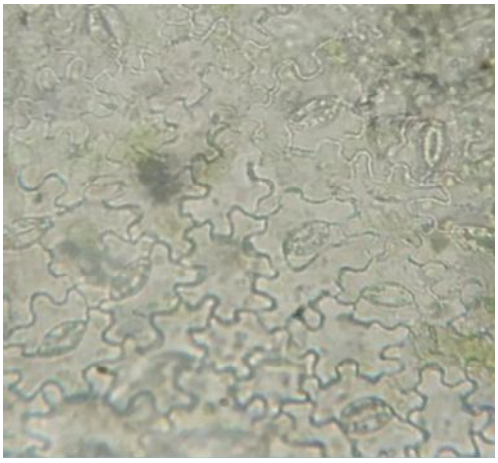
***Casuarina equisetifolia***



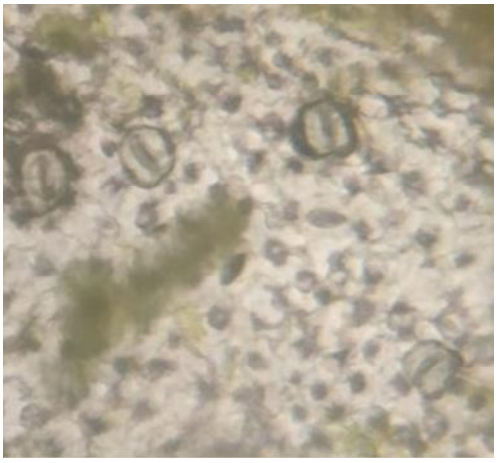
***Dalbergia sissoo***



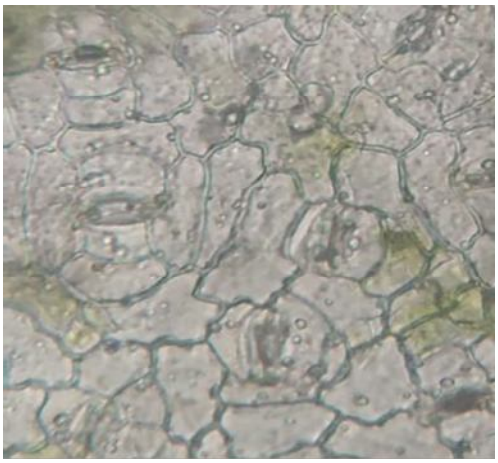
***Eucalyptus globulus***



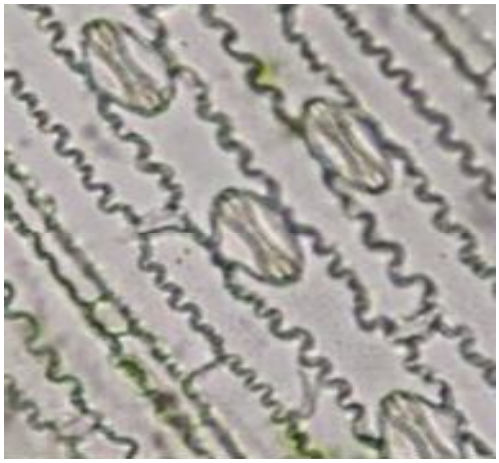
***Mesua ferrea***



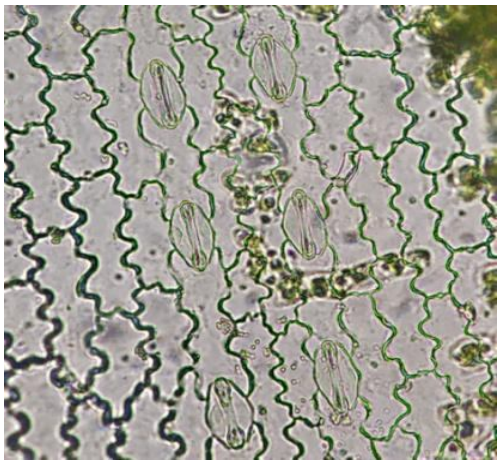
***Millingtonia hortensis***



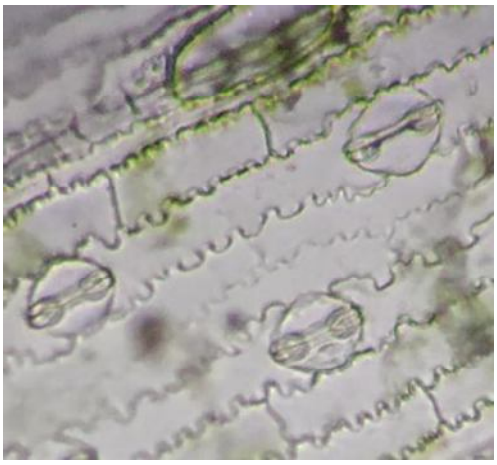
***Acacia lenticularis***



***Eragostis fatula***



***Echinichloe crusgelli***



***Dichonthium annulatum***

## Stomatal Index

| Plant Name | Stomata Number | Epidermal Cell | Stomatal Index (Percentage ) |
|---|---|---|---|
| *Antagono lectopus* | 120 | 605 | 16.55 |
| *Datura stramonium* | 80 | 240 | 25.00 |
| *Acalifa indic* | 10 | 35 | 22.20 |
| *Mirabilis jalapa* | 65 | 325 | 16.66 |
| *Hedera helix* | 20 | 120 | 14.28 |
| *Impatiens balsamina* | 40 | 150 | 26.66 |
| *Gmelina philippensis* | 50 | 170 | 22.72 |

| | | | |
|---|---|---|---|
| *Dichanthelium acuminatum* | 10 | 70 | 12.50 |
| *Pithecellobium dulce* | 60 | 280 | 17.64 |
| *Alternanthera pungens* | 40 | 150 | 21.05 |
| *Betula sp* | 60 | 220 | 21.42 |
| *Artocarpus heterophyllus* | 30 | 100 | 23.07 |
| *Helianthus annuus* | 40 | 120 | 22.22 |
| *Thunbergia grandiflora* | 70 | 320 | 17.94 |
| *Phyllanthus niruri* | 30 | 120 | 20.00 |
| *Cleome viscosa* | 70 | 286 | 19.66 |
| *Centratherum anthelminticum* | 40 | 210 | 16.00 |
| *Rauvolfia tetraphylla* | 20 | 43 | 31.74 |
| *Dolichindron falcuta* | 10 | 60 | 14.28 |
| *Purslene sp* | 25 | 130 | 16.12 |
| *Cassia tora* | 50 | 140 | 26.31 |
| *Tinosora sp* | 60 | 230 | 20.68 |
| *Hippocrepis emerus* | 10 | 45 | 18.18 |
| *Malvastrum coromandelianum* | 30 | 155 | 16.21 |
| *Alternanthera sessilis* | 50 | 155 | 24.39 |
| *Jatropha sp* | 40 | 170 | 19.04 |
| *Morinda citrifolia* | 150 | 950 | 13.67 |
| *Hyptis lorentziana* | 40 | 90 | 30.70 |
| *Achyranthes aspera* | 70 | 290 | 19.44 |
| *Boehmeria nivea* | 60 | 270 | 18.18 |
| *Calotropis procera* | 60 | 260 | 18.75 |
| *Persicuria verginiana* | 80 | 175 | 23.52 |
| *Tribulus terrestris* | 40 | 190 | 17.39 |
| *Ipomoea obscura* | 25 | 120 | 17.24 |
| *Boerhavia erecta* | 30 | 140 | 17.64 |
| *Euphorbia geniculata* | 40 | 160 | 20.00 |
| *Alstonia scholaris* | 10 | 50 | 16.66 |
| *Bryonia cretica* | 20 | 400 | 04.76 |

| | | | |
|---|---|---|---|
| *Ipomea hederifolia* | 40 | 150 | 21.05 |
| *Centrosema sp* | 40 | 140 | 22.22 |
| *Cardiospermum lalicbum* | 20 | 85 | 19.04 |
| *Bauhinia vahili* | 30 | 180 | 14.28 |
| *Acacia torta* | 20 | 60 | 25.00 |
| *Coccinia grandis* | 40 | 150 | 21.05 |
| *Diplocyclos palmatus* | 30 | 120 | 25.00 |
| *Lufa acutangola* | 40 | 120 | 25.00 |
| *Momordica dioica* | 50 | 200 | 20.00 |
| *Mukia sp.* | 20 | 80 | 20.00 |
| *Argyreia sp.* | 40 | 120 | 25.00 |
| *Ipomea nil* | 40 | 160 | 20.00 |
| *Ipomea sinesis* | 20 | 70 | 22.22 |
| *Momordica balsemina* | 40 | 160 | 20.00 |
| *Tricosanthes cucumerina* | 30 | 90 | 25.00 |
| *Ipomea archnosperma* | 20 | 90 | 18.18 |
| *Abrus precatorius* | 60 | 250 | 19.35 |
| *Cassia obtusifolia* | 30 | 120 | 20.00 |
| *Cassia occidentalis* | 40 | 165 | 21.62 |
| *Acacia pennata* | 40 | 200 | 16.67 |
| *Mimosa hamata* | 40 | 160 | 25.00 |
| *Artemisia vulgaris* | 30 | 150 | 16.67 |
| *Calotripis gigantea* | 20 | 80 | 20.00 |
| *Datura innoxia* | 30 | 130 | 18.75 |
| *Solanum violaceum* | 30 | 150 | 16.67 |
| *Barleria prionitis* | 40 | 180 | 18.18 |
| *Clerodendrum sp.* | 30 | 120 | 20.00 |
| *Anisomelis indica* | 40 | 200 | 16.67 |
| *Hyptis suaveolens* | 30 | 150 | 16.67 |
| *Pogostemon benghalensis* | 20 | 110 | 15.38 |
| *Pupalia lappaca* | 30 | 120 | 20.00 |

| | | | |
|---|---|---|---|
| *Phyllanthus maderaspatensis* | 25 | 100 | 20.00 |
| *Lchnocarpus ovatifolius* | 30 | 160 | 15.78 |
| *Hibiscus punduroformis* | 20 | 100 | 16.67 |
| *Anisomeles heyneana* | 20 | 60 | 25.00 |
| *Leonotis sp.* | 25 | 125 | 16.67 |
| *Barleria strigosa* | 40 | 160 | 20.00 |
| *Caesalpinia bondacella* | 30 | 120 | 20.00 |
| *Caesalpinia pulcherima* | 40 | 160 | 20.00 |
| *Gardenia gummifera* | 20 | 90 | 18.82 |
| *Pavetta indica* | 30 | 150 | 16.67 |
| *Phyllanthus reticulates* | 40 | 160 | 20.00 |
| *Zizipus oenopolia* | 30 | 180 | 14.28 |
| *Abutilon hirtum* | 30 | 120 | 20.00 |
| *Flacourtia sp.* | 10 | 60 | 14.28 |
| *Bombax ceiba* | 20 | 80 | 20.00 |
| *Dalbergia sp.* | 20 | 110 | 15.38 |
| *Pongamia pinnata* | 20 | 100 | 16.67 |
| *Albizia procera* | 20 | 80 | 20.00 |
| *Terminalia alata* | 30 | 170 | 17.64 |
| *Cordia dichotoma* | 20 | 80 | 20.00 |
| *Phoenix sylvestris* | 10 | 70 | 12.50 |
| *Ixora arboria* | 15 | 45 | 25.00 |
| *Casuarina equisetifolia* | 10 | 50 | 16.67 |
| *Dalbergia sissoo* | 20 | 120 | 14.28 |
| *Eucalyptus globulus* | 20 | 140 | 12.50 |
| *Mesua ferrea* | 30 | 150 | 16.67 |
| *Millingtonia hortensis* | 40 | 160 | 25.00 |
| *Acacia lenticularis* | 30 | 150 | 16.67 |
| *Eragostis fatula* | 15 | 45 | 25.00 |
| *Echinichloe crusgelli* | 20 | 60 | 25.00 |
| *Dichanthium annulatum* | 15 | 45 | 25.00 |

**Appendix - III**

**Major relevant pictures taken during workshop conducted to promote the use of Foldscope**


Project Launching on 22nd August 2018, one day foldscope outreach program was arranged in department of Botany. The theme was "Exploration of Minuscule World through Foldscope".


5th September 2018, Nature Lovers visited the Neevam School, Amravati

6th Sep 2018, Minuscule Explorers Group visited to Takhatmal English School, Amravati

7th Sep 2018, Micromilitia Group visited to Indira Gandhi Kanya Vidyalaya, Amravati


23rd Sep 2018, Micromilitia Group visited to Prashnachinha Adivasi Ashram School, Mangrul (Chavala)

24th Sep 2018, Team Biotech Group visited to Late Babasaheb Warhade High School, Amravati


24th Sep 2018, One day workshop was organized for students by Team Biotech Group in Shri. Vyankatraoji Nirmal Vidyalaya, Walgoan.

26th Sep 2018, Nature Warrior visited to Kanya Vidyalay, Amravati

26th Sep 2018, Team Wild Explorers Group visited to Adarsh School, Amravati

27th Sep 2018, Team Spartans Group visited to Gadge Maharaj Vidya Mandir, Amravati

27th Sep 2018, Team Micromilitia Group visited to Shashwat Concept School, Amravati

27th Sep 2018, Team Microworld Group visited to Jilha Parishad Girls High School, Amravati

28th Sep 2018, Microworld Group visited to Golden Kids English High School, Amravati and Spartans Group visited to Golden Kids English School, Amravati

On 5th Oct 2018, Nature Lovers Group visited to Vinayak Nagar Panchvati, Amravati

## Student Exchange Program

## November 27th – 28th, 2018

The group of students participating in the "Students' Exchange Programme' at Amravati

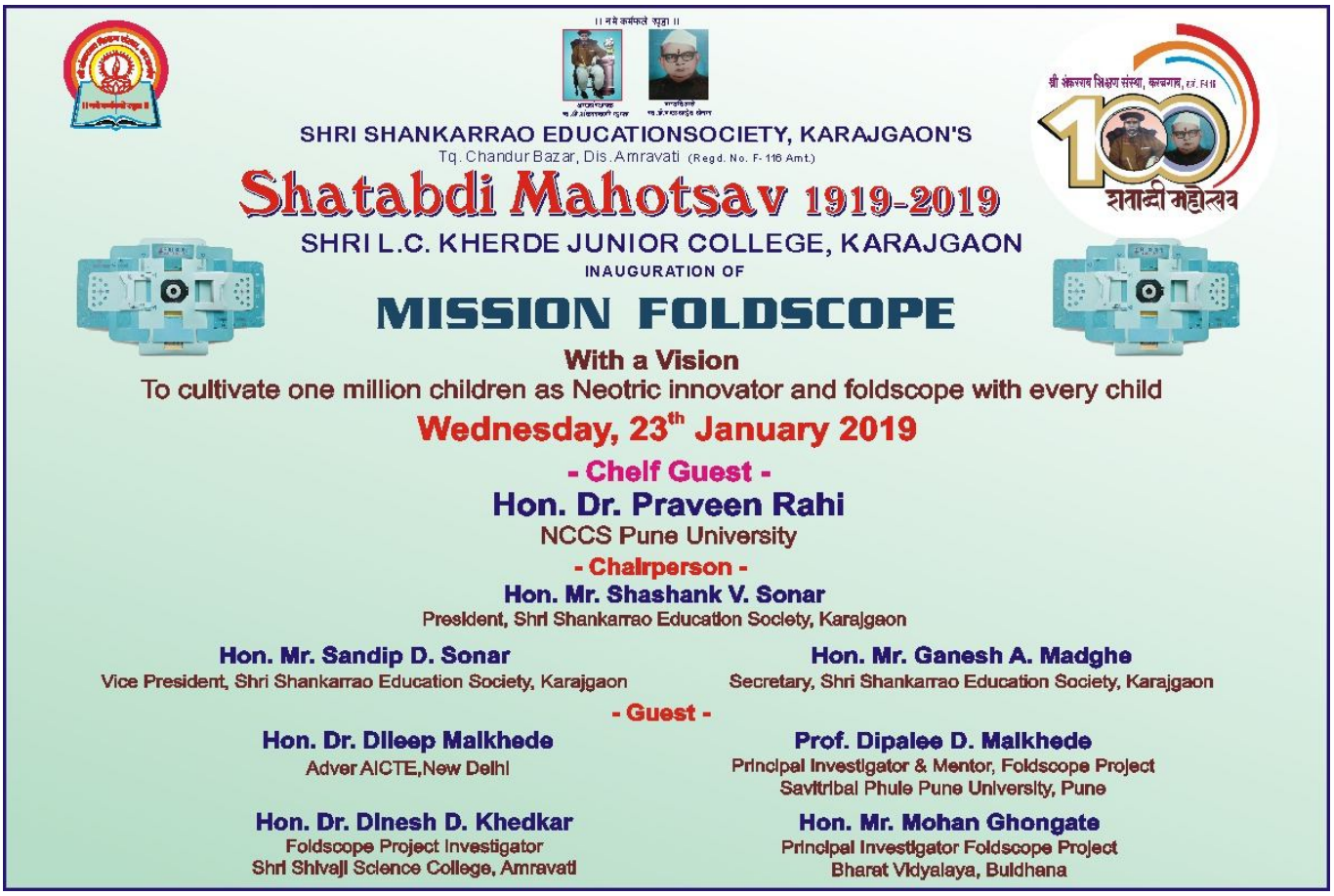
Dr. Anupama Harshal, K. C. College, Mumbai conducting Session on Research Opportunities


Students Participated in Exchange Programme at Nagaon

Group of Students at ICAR

Students at ICAR Shillong Lab with Dr. Krishnappa

## Mission Foldscope




One day national seminar cum workshop on Foldscope Assembling, Imaging and Applications at Muthsyammal College, Rasipuram, Tamilnadu
On 26-27/09/2019

## PRESENTATIONS OF RESEARCH PAPERS AT NAGPUR


**Appendix – IV**

**Following are the unique outcomes of the project -**

1. Students are exploring many ways to use the foldscope.
2. The critical approach of the students is developing through this project leading them towards better research.
3. Conducting research at undergraduate level is an outstanding concept came up out of the project.
4. Students' Exchange programme with the North East partner of the project resulted into exchange of thoughts between students of remote places.
5. The scientific publications to the credit of the UG students will be exceptional thing in the lives of the students and history of the institution.
6. Research papers presentation at National level conference.

**Appendix – IV**

## List of the Workshops Conducted and number of Students benefitted

| S.N. | DETAILS | Date | No of Students Trained |
|---|---|---|---|
| 1 | WORKSHOP AT SHRI SHIVAJI SCIENCE COLLEGE, AMRAVATI | 22/08/2018 | 87 |
| 2 | NEEVAM THE SCHOOL, AMRAVATI | 05/09/2018 | 48 |
| 3 | TAKHATMAL ENGLISH HIGH SCHOOL, AMRAVATI | 06/09/2018 | 64 |
| 4 | INDIRA GANDHI KANYA VIDHYALAYA, GADGE NAGAR, AMRAVATI | 07/09/2018 | 54 |
| 5 | "PRASHNACHINH ?" ADIVASHI ASHRAM SCHHOL, MANGROOL CHAVHALA, NANDGAO (KH), AMRAVATI | 23/09/2018 | 51 |
| 6 | SHRI VYANKATESH NIRMAL VIDYALAYA,WALGAON | 24/09/2018 | 67 |
| 7 | LATE BABASAHEB WARHADE HIGHSCHOOL,WALGAON | 24/09/2018 | 38 |
| 8 | NEW ENGLISH SCHOOL, BELPURA | 25/09/2018 | 54 |
| 9 | KANYA VIDYALAYA, AMRAVATI (MORNING) | 26/09/2018 | 45 |
| 10 | KANYA VIDYALAYA, AMRAVATI (AFTERNOON) | 26/09/2018 | 49 |
| 11 | ADRASH PARTAMIK SCHOOL AMRAVATI | 26/09/2018 | 51 |
| 12 | SHASHWAT CONCEPT SCHOOL , AMRAVATI | 27/09/2018 | 55 |
| 13 | GANESHDAS RATHI SCHOOL, AMRAVATI | 27/09/2018 | 67 |
| 14 | JILA PARISHAD GIRLS HIGH SCHOOL, AMRAVATI | 27/09/2018 | 55 |
| 15 | JAGADAMBA SOCIETY, AMRAVATI | 27/09/2018 | 18 |
| 16 | SHAHEED SMRUTI VIDYALAYA, WALGAON | 28/09/2018 | 40 |
| 17 | GOLDEN KIDS ENGLISH HIGH SCHOOL, AMRAVATI | 28/09/2018 | 82 |
| 18 | SANT GADGE BABA ASHRAM SHALA,NAGARWADI,AMRAVATI | 29/09/2018 | 44 |
| 19 | CHILDREN'S FELLOWSHIP OF INDIA,NAYA AKOLA | 02/10/2018 | 38 |
| 20 | SAMBRAT ASHOK SCHOOL, MANJARI MHASALA | 03/10/2018 | 66 |
| 21 | VINAYAK SOCIETY, GADGE NAGAR,AMRAVATI | 05/10/2018 | 24 |
| 22 | TWINNING WORKSHOP AT AMRAVATI | 09/10/2018 | 93 |
| 23 | STUDENT EXCHANGE AT ASSAM AND MEGHALAYA | 24/10/2018 | 102 |
| 24 | PRESENTATIONS OF RESEARCH PAPERS AT NAGPUR | 6 - 7/01/2019 | 4 |
| 25 | FOLDSCOPE MISSION, KARAJGAON | 23/01/2019 | 145 |
| 26 | ONE DAY NATIONAL SEMINAR CUM WORKSHOP ON FOLDSCOPE ASSEMBLING, IMAGING AND APPLICATIONS AT MUTHAYAMMAL COLLEGE, RASIPURAM, TAMILNADU | 26-27/09/2019 | 280 |
| | **Total No. of Students trained** | | **1721** |

**Appendix V**

**Any specific new observations made If yes, details thereof-**

In the foldscope activity, students worked in society. Total nine groups of students explored and exhibited microscopic aspects of Algae, fungi, Bryophyte, Pteridophyte, Gymnosperm and Angiosperm. Every workshop was conducted by seeking official permission of the school administration. The pre and post feedback of the workshop was collected to assess its impact. School administration was also asked to provide genuine remarks to improvise the course of actions.

In the preworkshop feedback students expressed their curiosity and excitement to see the microscopic world. They were also very eager to use the handy tool like foldscope to know detailed structure of miniscule world in their home. Many of the students accepted that they have not seen any microscopic structures. Few sample feedbacks are attached here –

Shri Shivaji Education Society, Amravati's
SHRI SHIVAJI SCIENCE COLLEGE, AMRAVATI
NAAC Accredited by Grade A (Third Cycle), UGC Awarded Status of College with Potential for Excellence
Identified by DST, GoI for FIST and Sant Gadge Baba Amravati University as Lead College
One Day Foldscope Outreach Workshop on
Exploration of Minuscule World
Through Foldscope

Pre-Workshop Feedback

A. Personal Details

1. Name of the Students: निखिता निरंजन निनावरे
2. School: वसंतराव नाईक विद्यालय Class: 10 वा
3. Parent's Contact No.: 9767363956

B. Pre-workshop Experience

4. Have you seen anything through microscope: नाही
5. Have you seen any microorganism: नाही
6. Which microorganisms you know (Tick): Bacteria / Algae / Fungi / Pollen grains / Cells नाही
7. Do you know how the internal structure of plant is: होय
8. Would you like to see this miniature world: होय
9. At home have you seen anything microscopic: होय
10. Will it be possible to see microscopic things at home: नाही

3/10/2018
Date:

N. N. Nitnaware
Signature of student

Shri Shivaji Education Society, Amravati's
SHRI SHIVAJI SCIENCE COLLEGE, AMRAVATI
NAAC Accredited by Grade A (Third Cycle), UGC Awarded Status of College with Potential for Excellence
Identified by DST, GoI for FIST and Sant Gadge Baba Amravati University as Lead College
One Day Foldscope Outreach Workshop on
Exploration of Minuscule World
Through Foldscope

Pre-Workshop Feedback

A. Personal Details

1. Name of the Students: Jawan S. Dahu
2. School: Jawaharlal English High school Class: 9th A
3. Parent's Contact No.: 9373039204 / 8087285790

B. Pre-workshop Experience

4. Have you seen anything through microscope: No
5. Have you seen any microorganism: No
6. Which microorganisms you know (Tick): Bacteria / Algae / Fungi / Pollen grains / Cells
7. Do you know how the internal structure of plant is: No
8. Would you like to see this miniature world: Yes
9. At home have you seen anything microscopic: No
10. Will it be possible to see microscopic things at home: No

Date: 6/7/18

Signature of student

Shri Shivaji Education Society, Amravati's
SHRI SHIVAJI SCIENCE COLLEGE, AMRAVATI
NAAC Accredited by Grade A (Third Cycle), UGC Awarded Status of College with Potential for Excellence
Identified by DST, GoI for FIST and Sant Gadge Baba Amravati University as Lead College

One Day Foldscope Outreach Workshop on
Exploration of Minuscule World
Through Foldscope

**Pre-Workshop Feedback**

**A. Personal Details**

1. Name of the Students: Ku. monaek s. Lonare.
2. School: kanya vidhyalay vivekanand colony road Class: 10th
3. Parent's Contact No.: 9657474262

**B. Pre-workshop Experience**

4. Have you seen anything through microscope: Yes
5. Have you seen any microorganism: NO
6. Which microorganisms you know (Tick): Bacteria / Algae / Fungi / Pollen grains / Cells Fungi
7. Do you know how the internal structure of plant is: NO
8. Would you like to see this miniature world: No
9. At home have you seen anything microscopic: No
10. Will it be possible to see microscopic things at home: NO

Date: 26-09-18

Signature of student

Shri Shivaji Education Society, Amravati's
SHRI SHIVAJI SCIENCE COLLEGE, AMRAVATI
NAAC Accredited by Grade A (Third Cycle), UGC Awarded Status of College with Potential for Excellence
Identified by DST, GoI for FIST and Sant Gadge Baba Amravati University as Lead College

One Day Foldscope Outreach Workshop on
Exploration of Minuscule World
Through Foldscope

**Pre-Workshop Feedback**

**A. Personal Details**

1. Name of the Students: कु. मोहिश्वरी गेजानिनराव शुरणकर
2. School: डॉक्टर जोही कन्या विद्यालय, अमरावती. Class: 9 वी
3. Parent's Contact No.: Mo-9049331327

**B. Pre-workshop Experience**

4. Have you seen anything through microscope: नाही.
5. Have you seen any microorganism: नाही
6. Which microorganisms you know (Tick): Bacteria / Algae / Fungi / Pollen grains / Cells
7. Do you know how the internal structure of plant is: नाही.
8. Would you like to see this miniature world: होय.
9. At home have you seen anything microscopic: होमी जेवाक पोटला.
10. Will it be possible to see microscopic things at home: ~~नाही~~ हेजावय नाही.

Date: 7-9-18

Signature of student

## Foldscope Project: Study of Leaf Surface Diversity in the plants in and around city of Amravati

The feedback collected after conducting workshops in the various areas great fascination and satisfaction was reported by almost all the participating students. They want to learn much more by using foldscope. They are more eager to see many structures available at their home. The appreciations from the school children and social sections motivated volunteers to work further. Some of the feedbacks are as follows –

**POST-Workshop Feedback**

1. Have you seen microscopic things through Foldscope: Yes.
2. What you have seen: I have seen a Spirogyra, Pollen grains, fungi and the various structure of butterfly, cotton thread and various thing it look very attractive
3. Can you identify among Bacteria / Algae / Fungi / Pollen grains / Cells yes.
4. How you can use this Foldscope at your home? I can use foldscope at our home like a microscope and I can see the
5. Do you think that its important to see microscopic things? yes; because it look very attractive and gives us the various information
6. Where the microscopic things can be seen at your home? At the walls, tomatoes and various Places like a well, near a pot etc and I see ~~like a~~ various organism like bacteria etc
7. In your school would you like to have Foldscope? yes.
8. Do you find the demonstrators suitable and informative, say something about them?
   yes, I find various information and it gives us the positive feeling and I can perfectly buy it and I always say to everyone it is very useful.
9. How was your experience during this workshop: I can experience a various things like a Pollen grain and it very clearly.
10. Would you like to continue to study through Foldscope? In what way?
    yes, I like to continue to study through foldscope in various ways like seeing a Polluted water and ~~#~~ I like very much because it gives us information used in Science field.

**POST-Workshop Feedback**

1. Have you seen microscopic things through Foldscope: होय.
2. What you have seen: परागकण, कांद्याची साल मधील सूक्ष्मजीव, बुरशी, डुक्कु, शेवाल, लॅक्टोबॉसीलाय.
3. Can you identify among Bacteria / Algae / Fungi / Pollen grains / Cells Pollen grains, Fungi
4. How you can use this Foldscope at your home? लॅक्टोबॉसीलाय, परागकण, शेवाल, बुरशी.
5. Do you think that its important to see microscopic things? होय.
6. Where the microscopic things can be seen at your home? भिंतीवर, पाण्याच्या टाक्यामध्ये, पाणी साठवले असेल तेथे,
7. In your school would you like to have Foldscope? होय.
8. 
9. Do you find the demonstrators suitable and informative, say something about them?
   यामधून वाहितलेले जिवाणू, विषाणू, किटाणू, यांच्यामुळे होणारे आजार टाळू शकतो. ~~हे आम्हाला ~~या माहिती~~
10. How was your experience during this workshop: ही सूक्ष्मदर्शिका आम्हाला खूप वेगळी वाटली. आणि त्याचा वापर सुद्धा सोप्या रीतीने करता येतो. त्यामुळे आम्हाला असे वाटते की ही सूक्ष्मदर्शिका शाळेत असावी.
11. Would you like to continue to study through Foldscope? In what way?
    होय. कारण- १०वी नंतर आम्हीजर विज्ञान हा विषय निवडला की यामध्ये आम्हाला खूप काही माहिती मिळू शकते.

**POST-Workshop Feedback**

1. Have you seen microscopic things through Foldscope: yes
2. What you have seen: Spirogyra, Rhizopus and pollenia Housefly
3. Can you identify among Bacteria / Algae / Fungi / Pollen grains / Cells
4. How you can use this Foldscope at your home? To see the bacteria of our spoil bread and spoil other vegetables and fruits.
5. Do you think that its important to see microscopic things? yes, I think that the importantant to see microscopic things Because I see any bacteria and spoil things.
6. Where the microscopic things can be seen at your home? Kitchen, Sink, washroom, dustbin old utensils.
7. In your school would you like to have Foldscope? yes
8. Do you find the demonstrators suitable and informative, say something about them? yes, that the demonstrators are very suitable and information. They told us so much about microbs and other organisms.
9. How was your experience during this workshop: Its a very good experience for me and I ful good
10. Would you like to continue to study through Foldscope? In what way? yes I like to continue to study through foldscope.

**POST-Workshop Feedback**

1. Have you seen microscopic things through Foldscope: yes
2. What you have seen: Spirogyra, Rhizopus, Pollenia.
3. Can you identify among Bacteria / Algae / Fungi / Pollen grains / Cells
4. How you can use this Foldscope at your home? To see the bacteria. our bread spoil bread and spoil other vegtables.
5. Do you think that its important to see microscopic things? yes, Its important to see microphopic things to because Its easy to learn them and study them.
6. Where the microscopic things can be seen at your home? Kitchen, washrooms, our of our flower pots, Dustbin, utensils.
7. In your school would you like to have Foldscope? Yes
8. Do you find the demonstrators suitable and informative, say something about them? yes, the demonstrators is very informative for us. Its go the Demonstrators show us the Rhizopus and and other micro-organisms
9. How was your experience during this workshop: Its a good expiriene for me.
10. Would you like to continue to study through Foldscope? In what way? Yes, I like to continue to study through foldscope its very intresting to see anything from foldscope than our textbooks

The school principal, in charge teachers, and other staff members had also shown keen interest in the foldscope and assured to extend the activity further. The volunteer students received great acknowledgement for hosting workshop. Few feedbacks –

**Feedback from Head of the Institution (In Marathi or Hindi or English)**

To,

Dr. D. D. Khedkar
Project Investigator (Foldscope)
Shri Shivaji Science College, Amravati

Dear Dr.,

The students of Shri Shivaji Science College, Amravati working under Foldscope project conducted workshop on "Exploration of Minuscule World Through Foldscope" on 26/09/18 at our school Swami Vivekanand Girls High School Amravati
Regarding the workshop please find the feedback as below:

1. Comment about overall Workshop: All students arrange the nice workship in the School
2. How was the approach of the Student Demonstrators: ~~Std~~ ~~School~~ Students Demonstrators theire Project very well.
3. Comment about the subject knowledge of the demonstrators: They have very good knowledge of theire subject and Project.
4. How was the response of the school students during conference: All School student giving all answer when they ask question.
5. Your suggestions to improve working under the projects: Frost thing when we going to school before we practic well in your collage
6. Rank to three students from the demonstrator group: 1) Pragati Ronghe. 2) Runali Bambal 3) Vaishanvi Bahekar
7. Open Feedback:

Date: 26/09/18

Name and Sign of Head of Institution with Seal
प्रयोगशाळक
कन्या विद्यालय (माध्यमिक)
विवेकानंद कॉलनी, अमरावती

**Feedback from Head of the Institution (In Marathi or Hindi or English)**

To,

Dr. D. D. Khedkar
Project Investigator (Foldscope)
Shri Shivaji Science College, Amravati

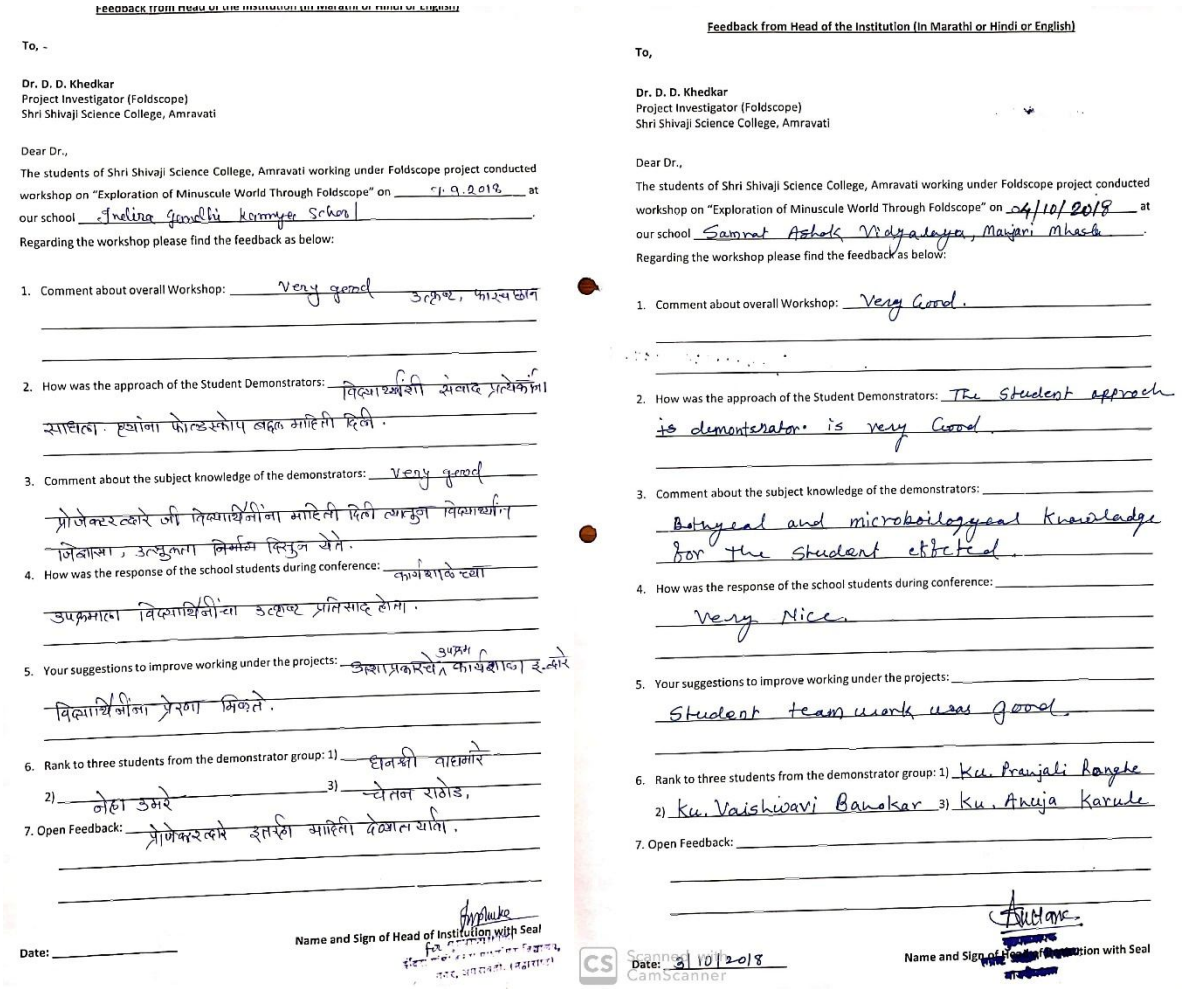
Dear Dr.,

The students of Shri Shivaji Science College, Amravati working under Foldscope project conducted workshop on "Exploration of Minuscule World Through Foldscope" on 23 sep at our school Prashnachinh Adivasi Ashram school, Mangrul C
Regarding the workshop please find the feedback as below:

1. Comment about overall Workshop: It was so informative and helping student and all of us. Every volunti on of Worshop had been taught student about foldsco and about it advancing advantages.
2. How was the approach of the Student Demonstrators: Every demonstr tor took active part in workshop. Every one was fully approached theme.
3. Comment about the subject knowledge of the demonstrators: Demonstrators were teaching about science and how the slides would been defined in foldscope better from microscope
4. How was the response of the school students during conference: Infact. The use of foldscope was new experience to student but after all demonstrator told them with enthusi asm.
5. Your suggestions to improve working under the projects: This very good attempt to improve awareness in student about foldscope, but it must be in every school and collages.
6. Rank to three students from the demonstrator group: 1) Sushil Telonge 2) Chetan Rathod 3) Ishwari Waghmare.
7. Open Feedback: From the opening we are using only costly microscope. that we can not easily keep with us. but the foldscope invention is very cheap and we can easily move it every wh re

Date: 23/9/2018

Name and Sign of Head of Institution with Seal
प्रयोगशाळक
पद्मश्री आदिवासी आश्रम शाळा
मंगरुळ चव्हाळा (कॉम्प)
ता. मोर्शी जि. अमरावती



Feedback from Head of the Institution (In Marathi or Hindi or English)

To, -

Dr. D. D. Khedkar
Project Investigator (Foldscope)
Shri Shivaji Science College, Amravati

Dear Dr.,

The students of Shri Shivaji Science College, Amravati working under Foldscope project conducted workshop on "Exploration of Minuscule World Through Foldscope" on 27.9.2018 at our school Indira Gandhi Kanya School.

Regarding the workshop please find the feedback as below:

1. Comment about overall Workshop: Very good उत्कृष्ट, फारच छान
2. How was the approach of the Student Demonstrators: विद्यार्थ्यांशी संवाद प्रत्येकाला साहित्य. हाताला फोल्डस्कोप बद्दल माहिती दिली.
3. Comment about the subject knowledge of the demonstrators: Very good प्रोजेक्टरद्वारे जी विद्यार्थ्यांना माहिती दिली त्यामुळे विद्यार्थ्यांना जिज्ञासा, उत्सुकता निर्माण झालेली दिसून येते.
4. How was the response of the school students during conference: कार्यशाळेच्या उपक्रमात विद्यार्थिनींचा उत्कृष्ट प्रतिसाद होता.
5. Your suggestions to improve working under the projects: अशाप्रकारचे उपक्रम कार्यशाळा इ.सारे विद्यार्थिनींना प्रेरणा मिळते.
6. Rank to three students from the demonstrator group: 1) दीपश्री वाहाणे 2) नोहा उमरे 3) चेतन राठोड,
7. Open Feedback: प्रोजेक्टरद्वारे इतरही माहिती देण्यात यावी.

Date: _____

Name and Sign of Head of Institution with Seal

For Principal
Shri Shivaji Science College,
Amravati (Maharashtra)

Feedback from Head of the Institution (In Marathi or Hindi or English)

To,

Dr. D. D. Khedkar
Project Investigator (Foldscope)
Shri Shivaji Science College, Amravati

Dear Dr.,

The students of Shri Shivaji Science College, Amravati working under Foldscope project conducted workshop on "Exploration of Minuscule World Through Foldscope" on 04/10/2018 at our school Sanmat Ashok Vidyalaya, Manjari Bhasta.

Regarding the workshop please find the feedback as below:

1. Comment about overall Workshop: Very Good.
2. How was the approach of the Student Demonstrators: The Student approach to demonstrator is very Good.
3. Comment about the subject knowledge of the demonstrators: Botnycal and microbiologycal Knowledge for the student effected.
4. How was the response of the school students during conference: Very Nice.
5. Your suggestions to improve working under the projects: Student team work was good.
6. Rank to three students from the demonstrator group: 1) Ku. Pranjali Rangte 2) Ku. Vaishnavi Bawakar 3) Ku. Anuja Karule
7. Open Feedback: _____

Date: 3/10/2018

Name and Sign of Head of Institution with Seal



**On completion of the activity the students worked in the project were asked for their learning experiences. They shared following attributes developed as achievements of this activity –**

- **Creativity/Creation,**
- **Time Consumption in Best Way**
- **Curation of societal Problems,**
- **Establishment of Connection with Society,**
- **Institutional Collaboration,**
- **Communication, and**
- **Critical Thinking.**

**Appendix VI**

**Number of pictures/videos posted on https://microcosmos.foldscope.com**

In the foldscope activity, students submitted foldscope slides photograph of various plants on microcosmos. Total nine groups of students worked on Algae, fungi, Bryophyte, Pteridophyte, Gymnosperm and Angiosperm. The work includes Transverse section, Longitudinal section, Structure and arrangement patterns of leaf surface etc. Student also studied cell structure, rhizoids section, spore, cell arrangement, pith, pollen grains and cell arrangement in vascular bundles.

All slides of plant section were observed under foldscope and photographs were taken by mobile phone. All the photographs were submitted on microcosmos foldscope website. There are total eight groups of students and each group submitted 10 to 15 photograph. More than 100 photographs submitted by students on microcosmos foldscope website.

| Sr. No. | Group Name | Foldscope ID | No of Pictures Uploaded |
|---|---|---|---|
| 1 | Nature Lover Group | 00023805E383 | 16 |
| 2 | Minuscule Explorers Group | 000028EE22CAE | 10 |
| 3 | Micromilitia Group | 00028E68832D | 25 |
| 4 | Biotech Group | 0002921F1B2C | 10 |
| 5 | Nature Warrior Group | 0002551E6ADC | 05 |
| 6 | Wild Explorers Group | 0002E008F23F | 13 |
| 7 | Spartans Group | 0002949AFAA3 | 10 |
| 8 | Micro world Group | 0028E729C8D | 12 |
| 9 | Research group | 00023CBCA291 | 10 |
| 10 | Project Fellow | 0002949AFAA3 | 30 |
| | | **Total** | **141** |

**Project has instilled value of research as an essential skill to learn science and disseminate knowledge from lab to the land –** *Principal Investigator*


An institutions successfully managing research in active academics are fostering students' learning in a creative educational environment, promisingly they are rocketing their students' towards making better society for future – **Dinesh Khedkar, Foldscope PI**