Minutes of the 12th Meeting of the Board of Studies of Department of Botany Central University of Jammu

Venue : Office of Head, Department of Botany, CUJ, Bagla

Date :Monday, 1st Novemeber, 2021

Time : 11:00 am

1.11.21 1/11/2021 01.11.2021

1/11/21

Department of Botany
Central University of Jammu

No.CUJ/BOT/2021/1560 Date: 1st November, 2021

MINUTES OF THE 12th MEETING OF BOARD OF STUDIES (BOS) OF DEPARTMENT OF BOTANY

11.1 Minutes of the 12th meeting of theBoard of Studies of Department of Botany held on 1st November, 2021at 11.00 am in Office of Head, Department of Botany,Central University of Jammu.

11.2 The following members attended the meeting:

Name	Affiliation	
Prof. B. S. Bhau,	Head, Department of Botany, CUJ	Chairman
Prof. A.K. Wakhlu(Retd.)	Department of Botany, University of Jammu, Jammu	External Expert Member
Prof. NamrataSharma	Department of Botany, University of Jammu, Jammu	External Expert Member
Dr. S. Vaishnavi	Assistant Professor, Department of Botany, CUJ	Member Secretary
Dr. V. Srivastava	Assistant Professor, Department of Botany, CUJ	Special invitee
Dr. D. Bhardwaj	Assistant Professor, Department of Botany, CUJ	Special invitee

Prof. VeenuKoul, Department of Botany, University of Jammu and Dr. A. Bhat, Assistant Professor, Centre for Molecular Biology, CUJ were unable to attend the meeting because of unavoidable circumstances.

11.3 Opening remarks by the Chair

The Chairman welcomed all the members andthanked themfor making it convenient to attend this meeting and providinginvaluable inputs.

1.11.21 1/11/2021 01.11.2021 1.11.21

11.4 To consider and approve the draft course contents of 'Basics of Computer Literacy' as a Skill Enhancement Course to be offered tosemester III of the Integrated B.Sc. (Hons.) and M. Sc. in Botany program (AY 2021-22) consequent to adoption of CBCS guidelines.

The course structure and contents as approved by the Board are placed atAnnexure – 1.

11.5 To consider and approve the modification in course contents of Applied Phycology and Bryology Lab offered to Integrated B.Sc. (Hons.) and M. Sc. in Botany program semester VII.

The Board considered and approved the modifications made in the course Applied Phycology and Bryology Lab and the revised course is placed at Annexure – 2.

11.6 To consider and approve courses Plant Kingdom: Diversity in Form, Structure, Plant Kingdom: Diversity in Form, Structure and Reproduction Lab, Plants in Human Welfare and Plants in Human Welfare Lab to also be offered as generic electives.

The Board approved offering of Plant Kingdom: Diversity in Form, Structure and Reproduction, Plant Kingdom: Diversity in Form, Structure and Reproduction Lab, Plants in Human Welfare and Plants in Human Welfare Lab as generic electives, and recommended elective course code ICBOTXE001T and ICBOTXE001L may then be used for Plant Kingdom: Diversity in Form, Structure and Reproduction theory and lab course, respectively, and ICBOTXE002T and ICBOTXE002L for Plants in Human Welfare theory and lab course, respectively, where X stands for semester in which taught.

11.7 To consider and approve the minutes of meeting of DRC held on 13/09/2021

Minutes of meeting of the DRC held on 01/02/2021were approved with the following observations:

1. The thesis titles to be put in running case unless otherwise required.

   Correct titles in running format are

   i) Ameliorative effects of PGPR (Plant Growth Promoting Rhizobia) under water deficit conditions and their molecular insights using modelling and docking in the common bean (*Phaseolus vulgaris* L.)- Research scholar- Ms. Shreya Proch

   ii) Biological control of Anthracnose in *Phaseolus vulgaris* L. using PGPR's and *Trichoderma* spp. Aided with protein-ligand docking using *in silico* methods. - Research scholar- Ms.Barkha Parihar

2. The word 'plants' be removed, and 'of' be replaced with 'from' to make the title as 'Molecular characterisation of *Bacopa monnieri* L. Westt. from Jammu region'for Ph.D. thesis of Ms. Komal Sharma (Roll. no. 0351719).

3. The word 'plantation' be removed, and 'of' be replaced with 'from' to make the title as 'Biodiversity of arbuscular mycorrhizal fungi in medicinally important *Justicia adathoda*from Jammu region and its effects on the levels of Vasicine and Vasicione' for Ph.D. thesis of Ms. Jyoti Priya (Roll.no. 0251719).

11.8 To discuss requirement of additional faculty positions for smooth and satisfactory running of the 5-year Integrated B.Sc. (Hons.) and M. Sc. in Botanyprogramme

The Board discussed the fact that the Integrated B.Sc. (Hons.) and M. Sc. in Botany programme which started in AY 2016-17 is presently havingall five batches running with student intake being 45 + EWS + payment seats (as per prospectus) taking the total intake to more than 50/batch. The Department has a sanctioned faculty strength of only seven (1+2+4) posts, and of these just 5 are filled, with one faculty member on lien. All members took cognizance of the fact that UGC guidelines make it mandatory for universities to have at least one teacher for every 10 students for Sciences for PG programmes, and one teacher for every 25 students for UG programmes making the faculty requirement for the Department as 16 which is far more than the sanctioned number.Considering the above, and the fact that sister Universities in adjoining areas have a sanctioned strength of 1:10, it is strongly recommended that additional faculty positions be created for smooth and satisfactory running of the programme.

11.9 To consider and approve the modification in course contents of Gymnosperm and Palaeobotany theory offered to B.Sc. (Hons.) and M.Sc. in Botany programme in semester IV.

The Board considered and approved the deletion of family Araucariaceae from Unit III of the original course content of Gymnosperms and Palaeobotany. The modified course is attached at annexure –3.

11.10 The Meeting ended with a vote of thanks to the Chair.

Prof. B. S. Bhau 1/11/2021

Prof. A. K. Wakhlu 1/11/21

Prof. NamrataSharma 1/11/21

Dr. S. Vaishnavi 1/11/2021

Dr. V. Srivastava 01.11.2021

Dr. D. Bhardwaj

Annexure - I

BASICS OF COMPUTER LITERACY

Course Code:

Course Title: BASICS OF COMPUTER LITERACY

Semester:

Credits: 2

Rationale:

This will acquaint students with a basic understanding of the fundamental concepts of computer systems and computer application software. Also, it provides the scope to students where they can use the packages of word processing, spreadsheet, and powerpoint in detail to develop the skill of using computer application software for solving problems.

Contents	No. of Lectures
Unit - I Introduction to Computers, Classification of Computers, Components of Computer System, Input/Output Devices, Memory and its Types, Storage Devices, hardware/software, Computer Languages, Basics of Operating System. Basic of Computer Networks, LAN, WAN, the concept of Internet, Network Topologies, web browsers, search engines, URL, Domain Mapping, Internet Protocols.	10
Unit - II Introduction to MS-Word and its features, Formatting text and paragraph, Page Formatting, Find and Replace, footnotes, endnotes, auto text, pictures, tables, Drawing Shapes, Mail Merge, Spelling & Grammar, Thesaurus, Report writing. Introduction to MS-PowerPoint, Slide Layouts, Slide Designs, Task Pane, Slide Show, Slide Transition, Slide Animation, Customize show, Rehearse Timing.	10
Unit -III Introduction to MS-excel, Cell-Referencing-relative and absolute, Entering Data and Formula, Excel Workbook, Inserting and Renaming Sheets, Automatic Calculation and Recalculation, Formatting Cells, Rows, Columns, and Sheets, Sorting and Filtering Data, Formulas-Mathematical, Statistical and Logical Functioning, Preparing Charts and Analysing Data.	10

COURSE OUTCOMES

Upon successful completion, of the course, candidates will be able to:

- Understand the basic concepts of computer systems.
- Describe the organization and operation of computer processors, peripheral devices and to give computer specifications.
- Utilize the Internet web resources.
- Use Microsoft Office programs to create personal, academic, and business documents.

Text /Reference books

1. Pardeep K. Sinha & Priti Sinha, "Computer Fundamentals", BPB Publications, 6/e, 2014.
2. Aggarwal Saurabh, "Fundamentals of Computers", SBPD Publishing House, 2020.
3. Alexander John Anderson, "Foundations of Computer Technology", CRC Press,2020.
4. Reema Thareja, "Fundamentals of Computers", Oxford University Press, 2014.

Annexure-I

BASICS OF COMPUTER LITERACY

Course Code:

Course Title: BASICS OF COMPUTER LITERACY

Semester:

Credits: 2

Rationale:

This will acquaint students with a basic understanding of the fundamental concepts of computer systems and computer application software. Also, it provides the scope to students where they can use the packages of word processing, spreadsheet, and powerpoint in detail to develop the skill of using computer application software for solving problems.

Contents	No. of Lectures
Unit - I Introduction to Computers, Classification of Computers, Components of Computer System, Input/Output Devices, Memory and its Types, Storage Devices, hardware/software, Computer Languages, Basics of Operating System. Basic of Computer Networks, LAN, WAN, the concept of Internet, Network Topologies, web browsers, search engines, URL, Domain Mapping, Internet Protocols.	**10**
Unit - II Introduction to MS-Word and its features, Formatting text and paragraph, Page Formatting, Find and Replace, footnotes, endnotes, auto text, pictures, tables, Drawing Shapes, Mail Merge, Spelling & Grammar, Thesaurus, Report writing. Introduction to MS-PowerPoint, Slide Layouts, Slide Designs, Task Pane, Slide Show, Slide Transition, Slide Animation, Customize show, Rehearse Timing.	**10**
Unit -III Introduction to MS-excel, Cell-Referencing-relative and absolute, Entering Data and Formula, Excel Workbook, Inserting and Renaming Sheets, Automatic Calculation and Recalculation, Formatting Cells, Rows, Columns, and Sheets, Sorting and Filtering Data, Formulas-Mathematical, Statistical and Logical Functioning, Preparing Charts and Analysing Data.	**10**

COURSE OUTCOMES

Upon successful completion, of the course, candidates will be able to:

- Understand the basic concepts of computer systems.
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Text /Reference books

1. Pardeep K. Sinha & Priti Sinha, "Computer Fundamentals", BPB Publications, 6/e, 2014.
2. Aggarwal Saurabh, "Fundamentals of Computers", SBPD Publishing House, 2020.
3. Alexander John Anderson, "Foundations of Computer Technology", CRC Press,2020.
4. Reema Thareja, "Fundamentals of Computers", Oxford University Press, 2014.

Annexure-2

Applied Phycology and Bryology Lab

Assessment	
Max. Mark	50
Continuous Internal Assessment (CIA)	25
End Semester Exam (ESE)	25
Passing Marks	25

Isolation and Culture of Algae

1. Sampling and collection of algae/bryophytes
2. Quantitative determinations of algal density and growth
3. Preservation of algal samples
4. Periphyton analysis
5. Sample preparation methods for diatoms
6. Limnological studies of water bodies w.r.t. physical chemical and biological analysis
7. Extraction of DNA from algae & bryophytes
8. Study of cyanophyta; chlorophyta & charophyta; phaeophyta; rhodophyta
9. Algal indices
10. Qualitative estimation of photosynthetic pigments in algae/bryophytes
11. Qualitative analysis of flavonoid content in algae/bryophytes

SUGGESTED READINGS:

1. Shaw AJ and B Goffinet (2000) Bryophyte Biology. Cambridge University Press.
2. Geissler and Greene SW (1982) Bryophyte Taxonomy, methods, practices and floristic exploration. J Cramer, Germany.
3. Dyer AF (Ed) (1979) The experimental Biology of Ferns. Academic London.
4. Richardson DHS (1981) The Biology of mosses. John Wiley & Sons, Inc New York.
5. Bhatnagar SP and Moitra A (1996) Gymnosperms. New Age International (P) Limited, Publishers, New Delhi
6. Singh Hardev (1978) Embryology of Gymnosperms. Encyclopedia of Plant Anatomy. Vol X Gebruder Borntraegrl, Berlin, Stuttgart.
7. Vanderpoorten, A. & B. Goffinet. 2009. *Introduction to Bryophyte Biology*. 303 p. Cambridge University Press. Cambridge, UK
8. Goffinet, B. and A.J. Shaw (eds.). 2009. *Bryophyte Biology* (2nd edition). 565 p. Cambridge University Press.

9. Goffinet, B., V. Hollowell & R. Magill (eds.). 2004. *Molecular Systematic of Bryophytes*. Monographs in Systematic Botany from the Missouri Botanical Garden 98: 1-448

10. The Families and Genera of Vascular Plants, Vol 1- Pteridophytes and Gymnosperms (1990) Editors: Professor Dr. Karl Ulrich Kramer and P. S. Green

11. Chopra, R.N. and Bhatia S.C. (1990). Bryophyte development:physiology and biochemistry. CRC Press, by Taylor & Francis Group.

12. Borowitzka, M.A., Beardall, J., Raven, A.J.(2016). The physiology of Microalgae. Springer International Publishing Switzerland

13. Richmond, A., Hu, Qu. (2004). Handbook of Microalgal Culture Applied Phycology and Biotechnology, John Wiley & Sons, Ltd.

14. Barsanti, L., Gualtier, P. (2014). Algae: Anatomy, Biochemistry, and Biotechnology, CRC Press Taylor & Francis Group.

Annexure-3

Course Title: Gymnosperms and Palaeobotany

Course code: ICBOT4COO2T

Credits: 4 [4-0-0]

Assessment	Max. Mark
Continuous Internal Assessment	100
Mid Semester Exam (MSE)	25
End Semester Exam (ESE)	25
Passing Marks	50
	50

Course objectives

To understand the classification, life cycles and phylogeny of Gymnosperms. Palaeobotany will explain fossils and fossilization and help understand the geological time scale.

Unit 1: General Account of Gymnosperms

Classification of Gymnosperms (Sporne 1965). A general account of distribution, morphology, anatomy, reproduction, phylogeny and interrelationship of Gymnosperms.

Unit 2: Cycadopsida

Structure and reproduction of Pteridospermales- Lyginoperidaceae (*Lyginopteris*), Medullosaceae (*Medullosa*), Glossopteridceae (*Glossopteris*), Bennettitales-, Cycadeoidaceae (*Cycadeoidea*), Williamsoniaceae (*Williamsonia*); Pentoxylales, Pentoxylaceae (Pentoxylon); Cycadales- Cycadaceae (*Cycas*).

Unit 3: Coniferopsida

Structure and reproduction of Cordaitales- Cordaitaceae (*Cordaites*), Coniferales- Pinaceae (*Pinus*); Ginkgoales, Ginkgoaceae (*Ginkgo*)

Unit 4: Gnetopsida

Structure and reproduction of Gnetales- Gnetaceae (*Gnetum*), Ephedraceae (*Ephedra*). Economic importance of Gymnosperms.

Unit 5: Palaeobotany

Geological time scale, types of fossils and process of preservation; Methods of determining the geological ages of fossils; Techniques of fossil study - Acetolysis technique for spores and pollen grains.

Annexure-

Semester – I

Course title: Plant Kingdom Diversity in forms, structure and reproduction

Course code:	Credit: 4-0-0
Max. Marks: 100 marks	Total Teaching hours: 60
Continuous Internal Assessment (CIA)- 25	Time Allowed: 3 Hours
Mid Semester Exam (MSE): 25 marks	
End Semester Exam (ESE): 50 marks	
Pass Marks: 50% in Theory and Practical Separately	

Course Objectives

The objective of the plant diversity paper is to introduce young collegiate minds to myriad aspects of the plant world. The plant world ranging from the smallest blue green algae to the tallest Californian Sequoia is very vast and fascinating. This paper will give the overview of the plant kingdom and its subgroups such as thallophytes, cryptogams and phanerogams. It is interesting to notice that various subgroups are interlinked and follow evolutionary pathways.

This paper also has a section of microbes which does not come under kingdom plantae. The microbial world is also very vast and, to capture the interest of students, two groups of bacteria and viruses are covered in this section.

Theory

Unit 1: Introduction to plant diversity

General account of origin of life, origin of plants, Plant diversity–concept, Plant kingdom-Cryptogams and Phanerogams, Diversity in habit, habitat, duration of life and position of plants in five kingdom system.

Unit 2: Thallophytes

Algal diversity: Origin, occurrence, habitat, thallus, cell structure, pigment and reserve food material, general reproduction and life cycle patterns. Fungal diversity: occurrence, cell structure and general reproduction. Lichen diversity: morphology and reproduction, as pollution indicators.

Unit 3: Cryptogams

Bryophyte diversity: Origin (in brief), occurrence, thallus, reproduction and sporophyte diversity, Life cycle pattern. Pteridophyte diversity: Sporophyte, gametophyte and reproduction.

Unit 4: Phanerogams

Gymnosperm diversity: Origin (in brief), sporophyte, gametophyte, reproduction (in general), affinities with pteridophytes and angiosperms. Angiosperms: Introduction and evolution, dicots and monocots, basic mode of reproduction, sporophyte diversity with respect to habitat, mesophytes, xerophytes and hydrophytes.

Unit 5: Microbes

Viruses: Discovery, general structure, replication (general account), DNA (T-phage) and RNA virus (TMV), Lytic and lysogenic cycle, RNA virus (TMV). Bacteria: Discovery, general characteristics and cell structure, reproduction – vegetative, asexual and sexual (conjugation, transformation and transduction) modes.

Practical's

Max. Marks: 50 marks	Total Teaching hours:
Continuous Internal Assessment (CIA): 25 marks	Time Allowed: 4 Hours
End Semester Exam (ESE): 25 marks	
Pass Marks: 50% in Theory and Practical Separately	

1) Study of different thallus forms of algae: Cyanophyceae, Chlorophyceae, Phaeophyceae and Rhodophyceae through specimens/photographs.
2) Study on local algal biodiversity through temporary mounts.
3) Identification of various types of fungi through temporary mounts/photographs.
4) Identification of various types of Lichens.
5) Identification of various types of Bryophytes using specimens/photographs
6) Identification of various types of Pteridophytes using specimens/photographs
7) Identification of various types of Gymnosperms with the help of specimens/photographs.
8) Identification of various forms of angiosperms with reference to monocots and dicots from the local area.
9) Electron micrographs/Models of viruses – T-Phage and TMV, Line drawing/Photograph of Lytic and Lysogenic Cycle
10) Types of Bacteria from temporary/permanent slides/photographs, electron micrographs of bacterial reproduction, Binary Fission, Conjugation.

Suggested Readings:

1. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition.
2. Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10th edition.
3. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4th edition.
4. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R., (2005). Biology. Tata McGraw Hill, Delhi, India.

5. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
6. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.
7. Andersen RA (2005). Algal Culturing Techniques. Physiological Society of America. Elsevier Academic Press, USA.
8. Cole KM and Sheath RG (1990). Biology of the Red Algae. Cambridge Univ. Press, Cambridge.
9. Fritsch FE (1945). The Structure and Reproduction of Algae. Vol. II. Cambridge Univ. Press. Cambridge, London.
10. Isabella A. Abbott, George J and Hollenberg (1993). Marine Algae of California. Stanford University Press. USA.
11. Lee RE (1989). Phycology. Vol. II. Cambridge Univ. Press. Cambridge, USA.
12. Sahoo D & Qasim SZ (Eds), (2002). "Sustainable Aquaculture". APH Publishing Corporation, New Delhi, India.
13. South GR and Whittick A. (1987). Introduction to Phycology. Blackwell Scientific Publications. London.
14. **Journals**: Journal of Applied Phycology, Journal of Phycology, European Journal of Phycology, Phycologia, Botanica Marina.
15. Shaw AJ and B Goffinet (2000) Bryophyte Biology. Cambridge University Press.
16. Geissler and Greene SW (1982) Bryophyte Taxonomy, methods, practices and floristic exploration. J Cramer, Germany.
17. Dyer AF (Ed) (1979) The experimental Biology of Ferns. Academic London.
18. Richardson DHS (1981) The Biology of mosses. John Wiley & Sons, Inc New York.
19. Singh Hardev (1978) Embryology of Gymnosperms. Encyclopedia of Plant Anatomy. Vol X Gebruder Borntraegrl, Berlin, Stuttgart.
20. Prescott L, Harley J, Klein D (2005) Microbiology, 6th edition, Mc Graw-Hill.
21. Singh VP and Stapleton RD (Eds.) (2002) Biotransformations: Bioremediation Technology for Health and Environmental Protection. "Progress in Industrial Microbiology Vol. 36", Elsevier Science.
22. Subba Rao NS (1982) Advances in Agriculture Microbiology, Butterworth-Heinemann.
23. Subba Rao NS and Dommergues YR (Eds.) (2001) Microbial Interactions in Agriculture and Forestry Vol. 2, Science Pub. Inc.
24. Waites MJ, Morgan NL, Rockey JS, Higton G (2001) Industrial Microbiology: An Introduction, Wiley-Blackwell.

Course title: Plants in Human Welfare

Course code: ICBOT2C002T **Credits: 4** [4-0-0]

Assessment	
Max. Mark	100
Continuous Internal Assessment (CIA)	25
Mid Semester Exam (MSE)	25
End Semester Exam (ESE)	50
Passing Marks	50

Course objectives

The course aims at making student realize the importance of plants to humankind and introduce them to the history of plant domestication and evolution of agriculture.

Unit 1: Plants as part of human culture

Origin and role of agriculture in shaping human history; Centers of origin of plants; Evolution of plants during domestication and production of new varieties.

Unit 2: Food, spices and beverages

Origin, morphology and uses of cereals (rice, wheat and maize); pulses (gram and pea); vegetables (potato and tomato); spices (ginger, black pepper and cloves) and beverages (tea and coffee). Processing of tea and coffee.

Unit 3: Fruits, nuts and medicinal plants

Origin, morphology and uses of fruits (apple, banana and mango) and nuts (almond and walnut). General features and uses of medicinal plants (*Cinchona*, *Rauwolfia*, *Catharanthus*, *Papaver*, *Cannabis* and *Azadirachta*).

Unit 4: Timber, fibers, oil, sugar and rubber

Botanical description and uses of timber (teak and deodar); oils (groundnut, mustard and coconut); essential oils (rose and lemon grass); fibers (cotton, jute and flax); rubber (*Hevea brasilensis* and *Ficus elastica*) and sugar (sugarcane).

Unit 5: Lower plants & microbes

Utilization of algae, fungi, lichens, bryophytes and pteridophytes in agriculture, in medicine and as food products. Their role in nitrogen fixation, treatment of waste and as pollution indicators.

Suggested Readings

1. Chrispeels M.J. and Sadava D.E. (2003) Plants, Genes and Agriculture. Jones & Bartlett.
2. Clifton A. (1950) Introduction to Bacteria, McGraw – Hill.
3. Gangulee S. C., Das K.S, Dutta C.D. and Kar A.K. (1968) College Botany Vol. I.
4. Kochhar S.L. (2012) Economic Botany in Tropics, MacMillan & Co. New Delhi, India.

5. Kumaresan V. and Annie R. (2013) Taxonomy-Systematic Botany, Economic Botany, Ethnobotany. Saras Publication Nagercoil.
6. Pandey B.P. (2010) College Botany (Vol. I). S. Chand and Company Ltd. New Delhi.
7. Rashid A. (1998). An Introduction to Bryophyta. Vikas Publishing House (P) Ltd., New Delhi.
8. Srivastava H.N. (1998) Gymnosperms. Pradeep Publications, Jalandhar.
9. Vasishta B.R., Sinha A.K. and Kumar A. (2010) Botany for Degree Students - Pteridophyta. S. Chand and Company Ltd., New Delhi.

Course title: Plants in Human Welfare Lab

Course code: ICBOT2C002L **Credits: 2** [0-0-4]

Assessment	
Max. Mark	50
Continuous Internal Assessment (CIA)	25
End Semester Exam (ESE)	25
Passing Marks	25

1. Cereals: Study of habit, L.S./T.S. of grain, starch grains and microchemical tests of rice and wheat.
2. Legumes: Study of habit, fruit, seed structure, micro-chemical tests of pea and groundnut.
3. Sugars: Study of habit of sugarbeet and sugarcane
4. Spices: Study of habit and sections of black pepper, fennel, clove and cumin seeds.
5. Beverages: Study of morphology of tea and coffee plants.
6. Oils and fats: Coconut - T.S. of mature fruit, Mustard – plant and seed morphology, and microchemical tests of crushed seeds.
7. Essential oil yielding plants: Study of morphology of *Rosa*, *Vetiveria*, *Cymbopogon*, *Santalum* and *Eucalyptus* (specimens/photographs).
8. Rubber: Study of plant morphology using specimen or photograph, model of tapping, samples of rubber products.
9. Drug-yielding plants: Study of specimens of *Digitalis*, *Rauwolfia*, *Papaver* and *Cannabis*.
10. Woods: Study of specimens and section of young stem of *Tectona*, *Dalbergia sisso* and *Pinus*.
11. Fibre-yielding plants: Cotton (specimen, whole mount of seed to show lint and fuzz fibres, whole mount of fibre and test for cellulose), Jute (specimen, test for lignin on transverse section of stem and fibre).