



Courses which focuses on Professional Ethics, Gender, Human Values, Environment & Sustainability and other value framework

Department : *Biotechnology*

Programme Name : *B.Sc.*

Academic Year : 2021-2022

Courses which focuses on Professional Ethics, Gender, Human Values, Environment & Sustainability and other value framework:

Sr. No.	Course Code	Name of the Course
01.	BTUATG1	Bioethics and Biosafety
02.	BTUALG1	Laboratory-GE1 based on GE-1
03.	BTUATA1	Biotechnology and Human Welfare
04.	BTUBTA1	Bio-management of environment
05.	BTUCTG1	Food Biotechnology
06.	BTUCLG1	Laboratory-GE3 (based on GE-3)
07.	BTUCTA1	Intellectual property rights and entrepreneurship
08.	BTUDTG1	Scientific Writing
09.	BTUDLG1	Laboratory-GE4 based on GE-4
10.	BTUETA1	Biotechnology in Societal Welfare
11.	BTUFTD2	Biodiversity and Bio-prospecting

गुरु घासीदास विश्वविद्यालय
(केंद्रीय विश्वविद्यालय अधिनियम 2009 डा. 25 के अंतर्गत स्थापित केंद्रीय विश्वविद्यालय)
कोनी, बिलासपुर - 495009 (छ.ग.)



Guru Ghasidas Vishwavidyalaya
(A Central University Established by the Central Universities Act 2009 No. 25 of 2009)
Koni, Bilaspur - 495009 (C.G.)

Scheme and Syllabus



Scheme for Choice Based Credit System (CBCS) in B.Sc. Honours Biotechnology

Course	Course Code	Name of the course	Credit	
Semester-I				
Core (C)	C1 Theory	BTUATT1	Cell Biology	3
	C1 Practical	BTUALT1	Laboratory-1 based on core-1	2
	C2 Theory	BTUATT2	Biochemistry	3
	C2 Practical	BTUALT2	Laboratory-2 based on core-2	2
Generic Elective-1 (GE-1)	GE-1 Theory	BTUATG1	Bioethics and Biosafety	3
	GE-1 Practical	BTUALG1	Laboratory-GE1 based on GE-1	2
Ability Enhancement Course (AEC)	AEC1	BTUATA1	Biotechnology and Human Welfare	2
Skill Enhancement Course	SEC1	BTUATL1	Plant Tissue Culture	2
Additional Credit Course As per University Notification			TOTAL	19
Semester-II				
Core (C)	C3 Theory	BTUBTT1	General Microbiology	3
	C3 Practical	BTUBLT1	Laboratory-3 (based on core-3)	2
	C4 Theory	BTUBTT2	Genetics	3
	C4 Practical	BTUBLT2	Laboratory-4 (based on core-4)	2
Generic Elective-2 (GE-2)	GE-2 Theory	BTUBTG1	Biostatistics	3
	GE-2 Practical	BTUBLG1	Laboratory (based on GE-2)	2
Ability Enhancement Course (AEC)	AEC2	BTUBTA1	Bio-management of environment	2
Skill Enhancement Course	SEC2	BTUBTL1	Animal Tissue Culture	2
Additional Credit Course As per University Notification			Total	19
Semester-III				
Core (C)	Core5 Theory	BTUCTT1	Molecular Biology	3
	Core 5 Practical	BTUCLT1	Laboratory-5 (based on core-5)	2
	Core 6 Theory	BTUCTT2	Recombinant DNA Technology	3
	Core 6 Practical	BTUCLT2	Laboratory-6 (based on core-6)	2
	Core 7 Theory	BTUCTT3	Chemistry-1	3
	Core 7 Practical	BTUCLT3	Laboratory-7 (based on core-7)	2
Generic Elective-3 (GE-3)	GE-3 Theory	BTUCTG1	Food Biotechnology	3
	GE-3 Practical	BTUCLG1	Laboratory-GE3 (based on GE-3)	2
Ability Enhancement Course (AEC)	AEC3	BTUCTA1	Intellectual property rights and entrepreneurship	2
Additional Credit Course As per University Notification			Total	22
Semester IV				
Core (C)	Core-8 Theory	BTUDTT1	Bio-analytical Tools	3
	Core -8 Practical	BTUDLT1	Laboratory-8 based on core-8	2
	Core -9 Theory	BTUDTT2	Immunology	3
	Core -9 Practical	BTUDLT2	Laboratory-9 based on core-9	2
	Core 10 Theory	BTUDTT3	Chemistry-2	3
	Core 10 Practical	BTUDLT3	Laboratory-10 based on core-10	2
Generic Elective-4 (GE-4)	GE-4 Theory	BTUDTG1	Scientific Writing	3
	GE-4 Practical	BTUDLG1	Laboratory-GE4 based on GE-4	2
Ability Enhancement Course (AEC)	AEC4	BTUDTA1	Molecular techniques in disease diagnosis	2
Additional Credit Course As per University Notification			TOTAL	22
SUMMER Internship: at least 15 days				06
Semester V				
Core (C)	Core-11 Theory	BTUETT1	Bioprocess Technology	3
	Core11 Practical	BTUEL1	Laboratory-11 based on core-11	2
	Core12 Theory	BTUETT2	Plant and Animal Biotechnology	3
	Core12 Practical	BTUEL2	Laboratory-12 based on core-12	2



Discipline Specific Elective (DSE-1)	DSE-1	BTUETD1	MOOC courses* to be selected/opted from SWAYAM portal [from a basket of course approved by BOS from time to time]	2-5*
Discipline Specific Elective (DSE-2)	DSE-2	BTUEED2	Review writing/case studies	5
Ability Enhancement Course (AEC)	AEC5	BTUETA1	Biotechnology in Societal Welfare	2
Additional Credit Course As per University Notification				
TOTAL				22*
Semester VI				
Core (C)	Core13 Theory	BTUFT1	Statistics in Biological Research	3
	Core13 Practical	BTUFL1	Laboratory-13 based on core-13	2
	Core14 Theory	BTUFT2	Bioinformatics	3
	Core14 Practical	BTUFL2	Laboratory-14 based on core-14	2
Discipline Specific Elective (DSE-3)	DSE-3 Theory (Any one)	BTUFTD1	Microbial Technology	3
		BTUFTD2	Biodiversity and Bio-prospecting	
		BTUFTD3	Genomics and Proteomics	
		BTUFTD4	Molecular Diagnostics	
	DSE-3 Practical (Any one)	BTUFLD1	Laboratory (based on DSE-3 BTUFTD1)	2
		BTUFLD2	Laboratory (based on DSE-3 BTUFTD2)	
		BTUFLD3	Laboratory (based on DSE-3 BTUFTD3)	
		BTUFLD4	Laboratory (based on DSE-3 BTUFTD4)	
Dissertation	Dissertation	BTUFPD1	Dissertation/project	7
Seminar	Seminar	BTUFPS1	Seminar	2
Additional Credit Course As per University Notification				
Total				24

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COURSE: Generic Elective-1 (GE- 1)

Bioethics and Biosafety (BTUATG1)

CREDITS: 3

Course Objective

This course aims at introducing the importance of the basic concepts of bioethics and biosafety and their relationship with several fields such as ecology, agriculture, medicine, chemistry and advances brought about in the field of biology and medicine. The course deals with answers to ethical questions that arise in the relationships among life sciences and their importance in the field of biotechnology.

Course Learning Outcomes

- On the successful completion of the course, students will be able to understand importance of general safety measures in laboratories and biosafety guidelines.
- Justify the design of confinement facilities at different Biosafety levels.
- Implement good laboratory practices.
- Describe the standard operating procedures for disposal of various types of wastes from the Biotechnology laboratory.

Course contents

Unit I

Bioethics: Necessity of Bioethics, different paradigms of Bioethics: National & International, Universal Declaration on Bioethics and Human Rights, Ethical issues against the molecular technologies.

Unit II

Biosafety: Introduction, different levels, applications, protocol (UN Cartagena Biosafety Protocol) and health hazards related to Biotechnology, guidelines of Biosafety in India.

Unit III

Introduction to the concept of containment level and Good Manufacturing Practices (GMP), OECD guidelines of Good Laboratory Practices (GLP), Quality assurance programme, apparatus material and reagents used for GLP.

Unit IV

Ethical, Legal and Social Implication program of Human Genome project, Bioethics in Biodiversity and resources management, genetically modified foods: steps for genetically modified food technology regulations, ethical issues and present scenario in consumption of Genetically Modified Organisms.

Suggested Reading

1. Sateesh MK Bioethics and Biosafety, I. K. International Pvt Ltd.
2. Sree Krishna V Bioethics and Biosafety in Biotechnology, New age international publishers

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COURSE: Generic Elective-1 (GE- 1) Practical

Laboratory (Based on GE-1) (BTUALG1)

CREDITS: 2

Course Objective

The objective of this course is to understand the good laboratory processes and practices. This course also helps to understand the health ethics, clinical trial of drug and medical errors.

Course Learning Outcomes

- Students will be aware of good laboratory processes.
- Have the knowledge of clinical trial of the drug
- Able to understand the medical error and negligence.
- Aware about the women health ethics

Course contents

1. To study the guidelines for good laboratory Practice
2. To identify the different hazardous symbols for different chemicals/reagents used in laboratory
3. A case study on clinical trials of drugs in India with emphasis on ethical issues
4. Case study on women health ethics
5. Case study on handling and disposal of radioactive waste
6. Case study on medical errors and negligence

Suggested Reading

1. Sateesh MK Bioethics and Biosafety, I. K. International Pvt Ltd.
2. Sree Krishna V Bioethics and Biosafety in Biotechnology, New age international Publishers
3. Fleming, D.A., Hunt, D.L., Biotechnology and Safety Assessment, Academic press.
4. Thomas, J.A., Fuch, R.L. Biotechnology and safety assessment CRC press, Washington. patents by Sibley. Butterworth publication
5. Biotechnology - A comprehensive treatise. Legal economic and ethical dimensions VCH.

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COURSE: Ability Enhancement Course - I (AEC - I)

Biotechnology and Human Welfare (BTUATA1)

CREDITS: 2

Course Objective

The objective of this course is to introduce the scope of biotechnology for human welfare.

Course Learning Outcomes

Learning outcomes on completion of this course the students will be able to;

- Understand industrial biotechnology related techniques.
- Understand agriculture and environmental biotechnology related techniques.
- Understand forensic science related technique
- Understand molecular diagnosis techniques.

Course contents

Unit I

Industry: protein engineering; enzyme and polysaccharide synthesis, activity and secretion, Enzyme immobilization: methods and application.

Unit II

Agriculture and Environments: Plant Tissue culture, N₂ fixation, transgenic plants; insect resistance, bacterial/ fungal stress tolerance, drought/salt tolerance, bioremediation, biofertilizers, biopesticides, biofuels and bioleaching.

Unit III

Forensic science: solving violent crimes such as murder and rape; solving claims of paternity and theft etc. using various methods of DNA finger printing, Polymerase chain reaction, Restriction fragment length polymorphism.

Unit IV

Health: development of non-toxic therapeutic agents, recombinant live and DNA vaccines, gene therapy, Molecular diagnosis: (monoclonal antibodies, DNA probes, Microarrays), transgenic animals.

Suggested Reading

1. Sateesh MK Bioethics and Biosafety, I. K. International Pvt Ltd.
2. Sree Krishna V Bioethics and Biosafety in Biotechnology, New age international publishers
3. Gupta, Elements of Biotechnology
4. Dubey, T. B. of Biotechnology
5. Kumar H. Modern Concept of Biotechnology
6. Jogdand, Advances in Biotechnology
7. Chatwal, T. B. of Biotechnology
8. Primrose, Molecular Biotechnology

Handwritten signatures and dates: "Rohit", "Abhatt 4/3/22", and "Kumar".



COURSE: Ability Enhancement Course – 2 (AEC - 2)

Bio-management of Environment (BTUBTA1)

CREDITS: 2

Course Objective

The aim of the course is to study the different techniques such as bioremediation (using microorganisms) and phytoremediation (using plants) techniques which is helpful for the degradation of environmental pollutants such as pesticides, heavy metals, radioactive substances etc. present in the soil, water and aquifers.

Course Learning Outcomes

- On the successful completion of the course, students are aware of the biomanagement of soil.
- Have knowledge about biomanagement of petroleum contaminant.
- Aware of the biomanagement of heavy metal.
- Have the knowledge of bioremediation (using microorganisms) and phytoremediation techniques.

Course contents

Unit I

Biomanagement of soil: An overview of global market and available technologies local gain, global loss: The Environmental cost of action, bioavailability of contaminants in soil, microbial remediation of metals in soils

Unit II

Biomanagement of Petroleum Contaminants: benzene-contaminated underground aquifers. Biomining, Bioleaching, Enrichment of ores by microorganisms (Gold, Copper and Uranium). Environmental significance of genetically modified microbes, plants and animals, Molecular aspects and applications in biotechnology

Unit III

Biosurfactants, strategies based on the use of fungal enzymes, anaerobic Metabolism and bioremediation of BTEX Hydrocarbons (Benzene, Toluene, Ethylbenzene, and Xylene), Treatment of municipal waste and Industrial effluents, Bio-fertilizers, Role of symbiotic and asymbiotic nitrogen fixing bacteria in the enrichment of soil, Algal and fungal biofertilizers (VAM)

Unit IV

Heavy metal phytoremediation: Microbial indicators of soil health for the assessment of remediation efficiency. Environment and the tools in rhizo- and bioremediation of contaminated soil molecular tools for monitoring and validating bioremediation, genetic engineering of bacteria and their potential for bioremediation

D. Shrivastava
4/13/22

Prof.
A. K. Verma



COURSE: Generic Elective-3 (GE- 3)

Food Biotechnology (BTUCTG1)

CREDITS: 3

Course Objective

The objective of the course is to make students knowledgeable about the application of Biotechnology in Food Science. This course will introduce them about role of Biotechnology in production, preservation, and packaging of food. The students will be taught about the biotechnological approaches for enhanced food production and nutritive values. The course will also cover the information about production of food items through alternative biotechnological approach including laboratory grown food items.

Course Learning Outcomes

After successful completion of course the students will able to:

- Describe the role of Biotechnology in Food production
- Define and understand the approaches for production of fermented food
- Explore the possible alternative foods
- Understand the concept of useful molecular methods for enhanced food production
- Design the strategies to increase nutritive value of food

Course Contents

Unit I: Food Science and Biotechnology

Overview of Biotechnology in food science, Food Processing Biotechnology, Food Processing Unit Operation, Quality parameters of Food. Regulations for food industries, Social ethics in food biotechnology.

Unit II: Fermentative production of food

Microbial fermentation; Starter cultures; Curdling products, Curd, Yoghurt, Cheese - principles of cheese making and their types, Fermented milk products, Fermented foods, Fermented vegetables: Sauer kraut, pickles, Olives, Kimchi, Fermented sausages, Alcoholic beverages: wine, brandy and beer etc.; Food additives: organic acid, amino acids, food flavoring agents and pigments.

Unit III: Food Preservation and Packaging

Microbial Biotechnology in Food Products, Role of microbes in food products, Microbial Food Spoilage; Use of microbes for production of food (Yeast; Bacteria and other microorganism-based process), Biotechnology in food preservation and packaging. Prevention of food deterioration.

Unit IV: Alternative food items and Molecular Method for Food production

Raw material for food and its modification, Bio conversion of food raw material, Conversion of food waste in value added products, Methods to increase nutrient values of food items. Alternative food products and their production: Microbes as food product, Mushrooms, Single

Q. Bhatt
4/3/22

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COURSE: Generic Elective-3 (GE- 3) Practical

Laboratory (Based on GE-3) (BTUCLG1)

CREDITS: 2

Course Objective

The objective of the course is to make students knowledgeable about the various methods in Food Biotechnology. This course will allow them to perform the analysis of food for their qualitative and quantitative parameters. This course intent to provide learning experience in laboratory about nutritive value of food, its contamination content, process of food production, preservation, etc.

Course Learning Outcomes

After successful completion of course the students will able to:

- Evaluate the nutritive value of food.
- Detect the food spoilage
- Preserve the food items
- Produce the food through biotechnological approaches

Course Contents

1. Detection of bacterial load in food items.
2. Determination of spoilage of milk through dye reduction test.
3. Determination of protein contents in food items by Bradford's Method.
4. Curdling of milk.
5. Determination of accuracy of blanching process for vegetable.
6. Production of alcoholic beverages and their distillation
7. Preservation of vegetables through pickling method.

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COURSE: Ability Enhancement Course - 3 (AEC - 3)

Intellectual Property Right and Entrepreneurship (BTUCTA1)

CREDITS: 2

Course Objective

The objective of the course is to introduce the students about the basic knowledge on intellectual property rights and their implications in biological research and product development; students become familiar with India's IPR Policy; about concepts of entrepreneurship including identifying a winning business opportunity, gathering funding and launching a business, growing and nurturing the organization and harvesting there wards.

Course Learning Outcomes

Learning outcomes on completion of this course the students will be able to;

- Understand different types of intellectual property rights.
- Understand the protection of products derived from biotechnology research
- Understand Indian patent Act and issues related to application and obtaining patents.
- Understand entrepreneurial skills
- Understand role of entrepreneurship in developing economy

Course contents

Unit I

Introduction to Indian Patent Law, World Trade Organization and its related intellectual property provisions, Intellectual/Industrial property and its legal protection in research, design, development in Biotechnology

Unit II

Essential requirements for patenting, types of patent, things that are patentable and non-patentable, Drug patents in India, various types of patent application in India, patenting of living organism, traditional knowledge, commercial exploitation and protection.

Unit III

Concept of entrepreneur, nature of entrepreneur, entrepreneurial characteristics, functions of an entrepreneur, role of entrepreneurship in developing economy.

Unit IV

Entrepreneurship: Selection of a product, line, design and development processes, economics on material and energy requirement, stock the product and release the same for making etc. The basic regulations of excise: Demand for a given product, feasibility of its production under given constraints of raw material, energy input, financial situations export potential etc.

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COURSE: Generic Elective-4 (GE- 4)

Scientific Writing (BTUDTG1)

CREDITS: 3

Learning Objective:

On completion of this course, the students will be able to understand about:

- The features of communication
- The various writing skills
- The scientific and technical writings

Course Outcome

The Course aims at capacity building in:

- Acquiring knowledge about different aspects of scientific, technical writing and communication
- Hands on usage of related tools and techniques of scientific writing
- Effective manuscript, project and review writing

Course contents

Unit I: Communication and Writing Skills

Language and communication, Speech and writing: differences and distinct features, Selection of topic, developing the hypothesis, introductory, developmental, transitional and concluding paragraphs, linguistic unity, coherence and cohesion, descriptive, narrative, Overview of science writing, how is scientific writing different from general writing, know your audience, writing for general public, science reporting, Science news, explanatory writing, lengthy magazine article, popular articles and popular lectures. Reading material: Popular science magazine articles.

Unit II: Technical Writing

Scientific and technical subjects; formal and informal writings; formal writings/reports, handbooks, manuals, letters, memorandum, notices, agenda, minutes; common errors to be avoided. Authors, acknowledgements, reproducibility, plagiarism, Numbers, units, abbreviations and nomenclature used in scientific writing, Writing references, Power-point presentation. Poster presentation, IMRAD format.

Unit III : Publishing work

Publishing work: selection of journal, impact factors, h index, following author guidelines, on line submission, proof reading of a manuscript, understanding the symbols, reviewing of a manuscript, making corrections and answering reviewers query, galley proof reading, Writing research grant proposal, Book review, write up mini profiles of prominent scientists, letters to editor, opinion writing, interview of a scientist, career in scientific writing

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COURSE: Generic Elective-4 (GE- 4) Practical

Laboratory (Based on GE-4) (BTUDLG1)

CREDITS: 2

Learning Objective:

On completion of this course, the students will be able to understand about:

- The features of communication
- The various writing skills
- The scientific and technical writings

Course Outcome

The Course aims at capacity building in:

- Acquiring knowledge about different aspects of scientific, technical writing and communication
- Hands on usage of related tools and techniques of scientific writing
- Effective manuscript, project and review writing

Course contents

1. Searching relevant scientific documents using appropriate keywords
2. Observing and reading various scientific documents (original research article, review article, graphical review etc.)
3. Detection of text similarity and plagiarism
4. Abstract Writing
5. Poster and graphical abstract preparation
6. Reference/bibliography styling

Q. Bhatt
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COURSE: Ability Enhancement Course – 5 (AEC - 5)

Biotechnology in Societal Welfare (BTUETA1)

CREDITS: 2

Course Objective

The objective of this course is to understand the basic concepts of advanced and emerging issues in biotechnology pertaining to societal welfare. The students will also understand the utility of biotechnology in solving societal issues.

Course Learning Outcomes

- Upon successful completion of the course, the student will be able to understand the basic concepts of advanced and emerging issues in biotechnology
- Analyze, and evaluate social and ethical issues in the conduct of biological research and application of biological knowledge
- Analyze the scientific method by formulating hypotheses, proposing testable predictions and then testing to reach supportable conclusions about biological processes and systems, and articulate the relevance of modern biology to society.
- Apply responsibilities to promote societal health and safety, upholding the trust given to the profession by the society.

Course Contents

Unit I

History of Biotechnology, Basic concepts of genes, Genetic engineering, Tools for manipulation of genes: introduction to recombinant DNA technology, Vectors and expression systems.

Unit II

Intellectual property rights, Recombinant DNA Debates, Biotechnology and Business, Patenting Life, Genetically Modified organisms and Genetically Modified Foods: Risk and Regulation.

Unit III

Assisted reproductive technologies: From the Pill to IVF, Cloning, Stem Cells, Eugenics, The Human Genome Project, Genetic Testing, Bioethics and Medicine.

Unit IV

Personalized medicine, Bioprospecting and Biocolonialism, Vaccines, Gene therapy, Clinical trials, Synthetic Biology and Bioterrorism, Organic farming: Biofertilisers and Biopesticides.

References:

1. Biotechnology and Society: An introduction. Hallam Stevens. University of Chicago Press. 2016.
2. W. Godbey, An Introduction to Biotechnology, The Science, Technology and Medical Applications, 1/e, Woodhead Publishing, 2014.
3. J.M. Walker and R. Rapley, Molecular Biology and Biotechnology, 5/e, Royal society of chemistry, 2009.
4. B.R.Glick, J.J.Pasternak, C.L.Patten. Molecular Biotechnology. ASM Press. 2009.

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COURSE: Discipline Specific Elective (DSE-3) Theory

Biodiversity and Bioprospecting (BTUFTD2)

CREDITS: 3

Course objective

The objective is to apprise students on various aspects of biodiversity and importance of its conservation. Students will also learn interrelation between biodiversity and bioprospecting and means to harness bioresources for industrial and therapeutic products. The course provides knowledge on components and importance of Biodiversity. It also gives a glimpse of principle and techniques of bioprospecting from various biological resources.

Course learning outcomes

- Students will acquire a fairly good understanding of the biodiversity and its components
- Students will get knowledge of the modern tools in the study, assessment and conservation of Biodiversity
- Students will acquire skills and information on bioprospecting from microbial, plant and animal resources

Course contents

Unit I

Components of biodiversity, Biodiversity crisis and biodiversity loss, Importance of biodiversity in daily life, Biodiversity and climate change, Types of Ecosystems, India as mega biodiversity Nation, Hot spots and biodiversity in India, Biodiversity and Ecosystem functioning, Plant and Animal systematic, Species concept in biodiversity studies

Unit II

Modern Tools in the study of Biodiversity, endemism, endemic plants and animals, assessment of mapping of biodiversity; GIS/Remote sensing; Biotechnology and Conservation, IUCN, Germplasm banks, National Parks, Botanical Gardens, Wild life Sanctuaries, Bioresources, Health and biodiversity

Unit III

Introduction to bioprospecting, bioprospecting from plants, plant derived drugs, botanicals for biocontrol, bioprospecting from animal sources, scope and examples

Unit IV

Bio-prospecting from microbes, micro-organisms as a source of novel enzymes, antibiotics, antiviral agents, immunosuppressive agents and other therapeutic agents

Suggested Reading

1. Aber, J.D. and Melillo J.M., Terrestrial Ecosystems, W.B.Saunders
2. Ingrowille, M Diversity and Evolution of land plants chapman and Hall
3. Arora, R.K. and Nayar, E.R. Wild relatives of crop plants in India, NBPGR Science

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