8. Familiarizing GENBANK, DDBJ, ENA, SWISS-PROT and PDB databases (Demonstration only).
9. Analysis of structural features of proteins using RASMOL.
10. Local alignment of sequences using BLAST (Demonstration only).
11. Retrieving a few research papers related to genetic engineering from PubMed (Demonstration only).

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6. C R Cantor, C L Smith. Genomics: The Science and Technology behind the Human Genome Project. John Wiley and Sons.
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PROGRAMME ELECTIVE COURSES

Programme elective course 1 Code: BO6PET01

AGRIBUSINESS

(Theory 54 hours; Credit 3)

Objectives:

- Inculcate and impart an idea about the business opportunities in the field of plant sciences.
- Develop an entrepreneurial mindset and also to stick on to the core subject among the Botany students.
- Give an idea about the need of sustainable development and organic farming.
- Harness the opportunities and potentials in the field of ecotourism, processing technology and food sciences.

Module 1: Entrepreneurship (2 hrs)

Basic qualities of an Entrepreneur. Financial assistance from Banks, role of Institutions like MSME Training Institute, Khadi and village industries board, self help groups, Co-operative sector, Kudumbasree projects and microenterprises.

Module 2: Value added food products (8 hrs)

Preparation and preservation techniques, causes of spoilage of food. Principles of preservation - asepsis, removal of microorganisms, anaerobic situation and special methods - drying, thermal processing - pasteurization, sterilization and canning - low temperature, use of chemical preservatives

and food additives. Preparation of wine, vinegar, pickles, jam, jelly, syrups, sauce, dry fruits, dairy products - cheese, butter, yoghurt, paneer.

Module 3: Processing techniques (8 hrs)

Processing of latex: centrifuged latex products and galvanized rubber products. Processing, storage and marketing of Cocoa, Coconut (Copra ,Coir and Tender coconut), Rice (par boiled, raw rice and rice flour), Pepper, Cardamom, Ginger, Arrowroot, Tapioca, Cashew, Mango, Jack fruit, Guava, Grapes, Lemon, Papaya, Musa, Garcinia.

Module 4: Nursery management (6 hrs)

Preparation of potting mixtures, polybags. Plant growing structures - green houses, shaded houses, polyshed, mist chamber, sprinkling system, drip irrigation. Modern strategies in propagation by root initiation of cutting, layering technique, budding and grafting technique; micropropagation. Planting, transplanting and hardening of seedlings, after care of seedlings. Packing and transport of seedlings.

Module 5: Organic farming and composting techniques (6 hrs)

Organic manures and fertilizers, composition of fertilizers. NPK content of various fertilizers and preparation of fertilizer mixtures. Common organic manures - bone meal, cow dung, poultry waste, oil cakes, organic mixtures and compost. Preparation of compost - aerobic and anaerobic - advantages and limitations. Vermicompost - preparation; Vermiwash - preparation. Biofertilizers - definition and preparation of different types - Trichoderma, Rhizobium, PGPR, PSB, mycorrhiza. Application of biofertilizers. Biopesticides, Tobacco and Neem decoction. Biological control of disease and pests.

Module 6: Cultivation of vegetables, fruits and medicinal plants (6 hrs)

Types - home gardening, market gardening and truck gardening. Packing and transporting of vegetables. Organic farming of fruit crops - packing and transporting of fruits. Induction of flowering and weed control. Cultivation of medicinal and aromatic plants of common use and great demand.

Module 7: Floriculture and Apiculture (6 hrs)

Floriculture: problems and prospects of floriculture in Kerala. Scope of growing Anthurium, Orchids and Jasmine in Kerala. Common cut flowers - Rose, Gerbera, Gladiolus, Aster, *Chrysanthemum*, Anthurium and Orchids. Common leaves used in flower arrangement - *Cyprus, Podocarpus*, *Asparagus*, Palms, Cycads and Ferns.

Apiculture: scope and significance. Structure, installation and maintenance of an Apiarium. Extraction, processing, preservation and marketing of honey.

Module 8: Flower arrangement (4 hrs)

Types - Western, Eastern (Japanese/ Ikebana) and modern. Wases, flower holders and floral foam. Wase life of flowers and leaves. After care of flower arrangements – Bouquets. Packing and maintenance of flowers and leaves.

Module 9: Ornamental garden designing (4 hrs)

Garden components. Lawn preparation by seeds, seedling and turfing. Maintenance of garden by Irrigation, Pruning, Repotting. Disease and Pest control.

Module 10: Mushroom cultivation and farming (4 hrs)

Mushrooms: significance, nutritive value. Types of Mushrooms – Button – *Pleurotus, Volvorella*. Spawn production, storage and marketing. Growth of Mushrooms on paddy straw and saw dust by poly bag. Mushroom growing structures and maintenance of humidity. Pests and defects of mushrooms. Storage, transporting and marketing of mushrooms.

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Programme elective course 2 Code: BO6PET02

PLANT GENETIC RESOURCES MANAGEMENT

(Theory 54 hours; Credit 3)

Objectives:

- Acquaint the student with the history and evolution of crop plants, and their diversity.
- Familiarize the student with the available plant genetic wealth and the measures adopted for the conservation of these resources.
- Help the student to identify the crop plants and their wild relatives.
- Help the student to explore the potentialities of various underutilized plants to project as the future food prospects.
- Understand the significance of modern technology to locate the distribution of endangered species.

Module 1: Introduction (5 hrs)

Introduction - historical developments in crop botany, Centers of origin - Vavilovian concept - primary and secondary centers. Exploration and collection of genetic resources - importance of wild relatives of crop plants and their genetic diversity in crop improvement.

Module 2: Plant genetic resources (10 hrs)

Major threats to the genetic resources: human interference and deforestation, alien invasive plants, over exploitation of resources. Endemism and biodiversity hot spots. Conservation of genetic resources: in situ - biosphere reserves, national parks and wildlife sanctuaries; ex situ - in vivo - botanic gardens, field gene banks; in vitro - seed banks - short term, medium term and long term storage of seeds, tissue culture storage and cryopreservation.

Module 3: Study of biodiversity (5 hrs)