

PRINCIPLES OF CROP PRODUCTION

ABT-320

(3 CREDIT HOURS)

LECTURE 1

LECTURE-WISE COURSE BREAKUP

**AGRICULTURE,
IMPORTANCE OF AGRICULTURE,
CROP PRODUCTION,
ART, SCIENCE AND BUSINESS,
FACTORS AFFECTING CROP PRODUCTION**

LECTURE-WISE COURSE BREAKUP

LECTURE 1: AGRICULTURE, IMPORTANCE OF AGRICULTURE, CROP PRODUCTION ART, SCIENCE AND BUSINESS, FACTORS AFFECTING CROP PRODUCTION

LECTURE 2: CLASSIFICATION OF CROPS BASED ON THEIR UTILITY AND SEASONS OF GROWING, MAJOR AND PRINCIPAL CROPS OF THE COUNTRY, INTRODUCTION TO MAJOR FRUITS, VEGETABLES AND FLOWER CROPS OF COUNTRY

LECTURE 3: CROP ROTATION, PRINCIPLES OF CROP ROTATION, ADVANTAGES OF CROP ROTATION AND ROTATIONAL INTENSITY

LECTURE 4: CROPPING SCHEME AND PRINCIPLES OF CROPPING SCHEME, CROPPING INTENSITY, SYSTEMS OF CROPPING VIZ. MIXED CROPPING AND INTENSIVE CROPPING, PRINCIPLES OF MIXED CROPPING AND ITS ADVANTAGES

LECTURE-WISE COURSE BREAKUP

LECTURE 5: PRE-REQUISITIES OF INTENSIVE CROPPING AND METHODS OF INTENSIVE CROPPING VIZ. MULTIPLE AND INTERCROPPING, CROP DIVERSIFICATION

LECTURE 6: TILLAGE, DEFINITION, FUNCTION AND IMPORTANCE OF TILLAGE, TYPES AND METHODS OF TILLAGE

LECTURE 7: EFFECTS OF TILLAGE ON THE SOIL CHARACTERISTICS AND NUTRIENT AVAILABILITY IN SOIL, SELECTION OF TILLAGE METHODS

LECTURE 8: CHARACTERISTICS OF GOOD SEED, TYPES OF SEEDS VIZ BREEDER'S, NUCLEUS AND FOUNDATION AND CERTIFIED SEEDS

LECTURE 9: SEED TREATMENT, FACTORS AFFECTING SEED GERMINATION, DIFFERENT METHODS OF SEED PLACEMENT IN THE SOIL AND SELECTION CRITERIA METHODS, TIME OF SOWING

LECTURE-WISE COURSE BREAKUP

LECTURE 10: IMPORTANCE OF WATER FOR PLANTS, NECESSITY OF WATER APPLICATION, CRITICAL GROWTH STAGES OF WATER APPLICATION

LECTURE 11: SOURCES OF IRRIGATION WATER, METHODS OF IRRIGATION, FACTORS AFFECTING SELECTION OF METHOD VIZ CROP, SOIL, SOURCE OF WATER

LECTURE 12: IMPORTANCE OF INTERCULTURAL OPERATIONS IN CROP PRODUCTION, INTRODUCTION WITH THE METHODS, TOOLS AND EQUIPMENT REQUIRED FOR INTERCULTURE, WEED, ITS CHARACTERISTICS, CLASSIFICATION, USEFUL AND HARMFUL EFFECTS

LECTURE 13: MEDIUM OF WEED SEED DISPERSAL, METHODS OF WEED CONTROL VIZ. MECHANICAL, BIOLOGICAL, AGRONMICAL (CROP COMPETITION AND ROTATION), FIRING AND CHEMICAL

LECTURE-WISE COURSE BREAKUP

LECTURE 14: PLANT NUTRIENT ELEMENTS, THEIR CLASSIFICATION VIZ. MACRO, SECONDARY AND MICRO AND THEIR IMPORTANCE

LECTURE 15: SOIL FERTILITY, TYPES OF FERTILIZERS AND MANNERS USED TO MAINTAIN SOIL FERTILITY, METHODS OF APPLICATION, TIPS FOR SAFE STORAGE AND BETTER HANDLING OF FERTILIZERS, AMOUNT AND TIME/STAGES OF FERTILIZER APPLICATION, ORGANIC FERTILIZERS AND THEIR ADVANTAGE

LECTURE 16: ECOFRIENDLY PEST MANAGEMENT PRACTICES AND THE CHEMICALS USED FOR CONTROL OF DISEASES, BIO-PESTICIDES

LECTURE 17: VARIOUS METHODS OF HARVESTING OF DIFFERENT CROPS, FACTORS OF HARVESTING VIZ. TIME OF MATURITY, MOISTURE CONTENTS, CLIMATE FACTORS ETC.

LECTURE-WISE COURSE BREAKUP

LECTURE 18:	PRACTICES/CULTIVATION TECHNIQUES FOR RAISING MAIZE	DETAILS/IMPORTANT	MODERN
LECTURE 19:	PRACTICES/CULTIVATION TECHNIQUES FOR RAISING MUSTARD	DETAILS/IMPORTANT	MODERN
LECTURE 20:	PRACTICES/CULTIVATION TECHNIQUES FOR RAISING COTTON	DETAILS/IMPORTANT	MODERN
LECTURE 21:	PRACTICES/CULTIVATION TECHNIQUES FOR RAISING SUGARCANE	DETAILS/IMPORTANT	MODERN
LECTURE 22-24:	PRACTICES/CULTIVATION TECHNIQUES FOR RAISING WHEAT	DETAILS/IMPORTANT	MODERN

EXAMINATION

SESSIONAL-1 : AFTER 10 LECTURES (15 MARKS)

SESSIONAL-2: AFTER NEXT 10 LECTURES (15 MARKS)

QUIZ-1: AFTER 4 LECTURES (20 Blanks)

QUIZ-2: AFTER 8 LECTURES (20 Blanks)

QUIZ-3: AFTER 12 LECTURES (20 Blanks)

QUIZ-4: AFTER 16 LECTURES (20 Blanks)

QUIZ-5: AFTER 20 LECTURES (20 Blanks)

QUIZ-6: AFTER 24 LECTURES (20 Blanks)

FINAL EXAM: ALL LECTURES (50 MARKS)

ASSIGNMENT: REVIEW CHAPTER AS PER TOPIC

BOOKS & REFERENCE MATERIAL

**BIOTECHNOLOGY FOR AGRICULTURAL BREEDING by
S. K. MANGAL**

**AGRICULTURAL BIOTECHNOLOGY by
HEMANT RAWAT**

**BIOTECHNOLOGY AND FOOD SECURITY by
SUJATA K. DAS**

**MOLECULAR MARKERS AND PLANT BIOTECHNOLOGY by
RUKAM S. TOMAR, MANOJ V. PARAKHIA, SUNIL V. PATEL, B. A.
GOLAKIYA**

BOOKS & REFERENCE MATERIAL

**BIOTECHNOLOGY IN PLANT IMPROVEMENT by
P. C. TRIVEDI**

**AGRICULTURE, FOOD SECURITY, AND RURAL DEVELOPMENT
ASIAN DEVELOPMENT BANK, OXFORD**

**AGRICULTURAL BIOTECHNOLOGY by
S. S. PUROHIT**

AGRICULTURE

the science, art, or occupation concerned with cultivating land, raising crops, and feeding, breeding, and raising livestock.

IMPORTANCE OF AGRICULTURE

- **People depend on a wide range of agricultural products in almost all aspects of life, e.g,**
 - **nutrition is a key determinant of human health**
 - **provider of energy-fuel-wood and medicinal plants**
 - **Fiber**
- **Agriculture is key to a healthy biosphere.**
- **Agriculture is a key economic driver. It is central to:**
 - **Individual livelihoods**
 - **Poverty alleviation**
 - **Nation's economic growth, e.g., agriculture contributes between 40 and 60% of the GDP of many African countries.**

CROP PRODUCTION; ART, SCIENCE AND BUSINESS

Crop Production is the art and science of the genetic improvement of crops to produce new varieties with increased productivity and quality.

The advanced genetic and molecular techniques have resulted in new varieties of crop plants, medicinal plants and ornamentals.

MAJOR CROP RESEARCH CENTERS

- **The Consultative Group for International Agricultural Research (CGIAR), an organization established under FAO, co-ordinates agricultural research on a global basis. Under CGIAR, the following international research institutes are functioning presently:**
- **IRRI-International Rice Research Institute, Manila, The Philippines.**
- **CIMMYT-International Wheat and Maize Improvement Center, Elbaton, Mexico.**
- **ICRISAT-International Crop Research Institute for Semi-Arid Tropics, Hyderabad, India**
- **IITA-International Institute for Tropical Agriculture, Ibadan, Nigeria**
- **CIAT-International Center for Tropical Agriculture, Palmira, Colombia**
- **CIP-International Potato Center, Lima, Peru**
- **WARDA- West African Rice Development Research Station, Monrovia, Liberia**
- **BIODIVERSITY INTERNATIONAL-Biodiversity International, Rome, Italy**
- **ICARDA-International Center for Agricultural Research in Dry Areas, Lebanon, Syria.**

METHODS OF PLANT BREEDING

1. DOMESTICATION OF PLANTS

In nature, the origin of plants took place in the wild conditions. During the course of evolution of agricultural practices, man began to grow some plants under his control. This process of bringing wild plants under cultivation is called plant domestication.

2. INTRODUCTION OF PLANTS

Introduction of plants from other continents, countries, geographical regions etc to new areas of cultivation is an important process in plant breeding. The process of introducing new plants from the place of its origin or cultivation to a place with different climatic conditions is called plant introduction.

3. ACCLIMATIZATION

The physiological adaptation of plants to climatic or environmental changes such as light, soil, temperature or altitude is known as acclimatization.

4. SELECTION OF PLANTS

Plants, both domesticated as well as introduced, show considerable degrees of variations with respect to different characters. Some of these plants are superior whereas the others are inferior in performance. The process of selection of superior plants is an important method for the improvement of cultivated plants, which lead to the development of new varieties with more advantageous and superior characters.

5. PLANT HYBRIDIZATION

Domestication, introduction, acclimatization and selection of plants help to locate the most promising cultivars from the available diversity. But superior and economically important characters are scattered in different cultivars. Hybridization is the technique of bringing superior characters into a single variety by way of cross-pollinating them artificially.

6. MUTATION BREEDING

Desirable characters that are scattered in different varieties can be brought together by hybridization. But, sometimes, induction of new variability (new characters and character forms) may become necessary since no cultivars with such traits are available. The most common method used to induce new variation is mutation breeding for which seeds or propagules of plants are treated with some chemicals or physical agents that are called mutagens.

7. POLYPLOIDY BREEDING

Usually, plants and animals carry chromosomes in pairs in their somatic cells. But, in some cases, more than two sets (multiple sets) of chromosomes (three sets, four sets, etc) can be seen. Such organisms are called polyploids and the condition is called polyploidy. In the case of some cultivated plants, polyploids show superiority in characters. Breeding of such cultivated plants is called polyploidy breeding.

8. BIOTECHNOLOGICAL BREEDING

Biotechnology is the latest branch of biology that makes use of enzymes as tools to accelerate or manipulate biochemical pathways so as to generate new goods and services based on life and biomolecules. *in vitro* culture technology, marker assisted selection, somatic hybridization, transgenesis and bioreactor technology are the major tools of biotechnology used in plant breeding.

THE END