

**M.Sc. (Ag.) Horticulture
Semester-I**

**Course Title: Production Technology of Cool Season Vegetable Crops
Course Code: AG509
w.e.f. Session 2020-21**

3(2+1)

Theory

Introduction, botany and taxonomy, climatic and soil requirements, commercial varieties/hybrids, sowing/planting times and methods, seed rate and seed treatment, nutritional and irrigation requirements, intercultural operations, weed control, mulching, physiological disorders, harvesting, post-harvest management, plant protection measures and seed production of:

Unit I

Potato

Unit II

Cole crops: cabbage, cauliflower, knoll kohl, sprouting broccoli, Brussels sprout

Unit III

Root crops: carrot, radish, turnip and beetroot

Unit IV

Bulb crops: onion and garlic

Unit V

Peas and broad bean, green leafy cool season vegetables

Practical

Cultural operations (fertilizer application, sowing, mulching, irrigation, weed control) of winter vegetable crops and their economics; Experiments to demonstrate the role of mineral elements, plant growth substances and herbicides; study of physiological disorders; preparation of cropping scheme for commercial farms; visit to commercial greenhouse/ polyhouse.

Suggested Readings:

- Rana MK. 2008. Olericulture in India. Kalyani Publication.
- Rana MK. 2008. Scientific Cultivation of Vegetables. Kalyani Publication.
- Singh DK. 2007. Modern Vegetable Varieties and Production Technology. International Book Distributing Co.
- Gopalakrishanan TR. 2007. Vegetable Crops. New India Publ. Agency.
- Bose TK, Kabir J, Maity TK, Parthasarathy VA & Som MG. 2003. Vegetable Crops. Volume: I-III. Naya Udyog.
- Chadha KL. (Ed.). 2002. Hand Book of Horticulture. ICAR.
- Bose TK, Som G & Kabir J. (Eds.). 2002. Vegetable Crops. Naya Prokash.
- Chadha KL & Kalloo G. (Eds.). 1993-94. Advances in Horticulture Vols. V-X. Malhotra Publ. House.
- Fageria MS, Choudhary BR & Dhaka RS. 2000. Vegetable Crops: Production Technology. Vol. II. Kalyani.

COURSE OBJECTIVE:

- To know about Soil and Climate requirement of Cool Season Vegetables
- Familiar with different varieties and methods of sowing in different vegetables.
- Knowledge of Seed production technology of cool season vegetable
- Knowledge of crop protection measure in different crops

COURSE OUTCOMES:

After completion of course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Able to know what are the basic criteria for selection of soil and climate for vegetable crops
CO2	Can use the basic knowledge regarding different cultural practices followed for cool season vegetables
CO3	Students are able to know about sowing time of different varieties according to temperature
CO4	Study of irrigation and nutrient management and their applications in production vegetables
CO5	By the end of course students will be able to control of different insect pests.

CO-PO MAPPING

CO	PO1 Basic horticulture knowledge	PO2 Problem Solving	PO3 Field Experimentations	PO4 Scientific Skills	PO5 Adoption of Advanced technology	PO6 Plant protection measures	PO7 Environment and sustainability	PO8 Ethics	PO9 Individual and team work	PO10 Communication	PO11 Lifelong learning
CO1	Able to know what are the basic criteria for selection of soil and climate for vegetable crops	3	3	2	2	3	3		1	1	3
CO2	Can use the basic knowledge regarding different cultural practices followed for cool season vegetables	3	3	3	2	3	3	3			2
CO3	Students are able to know about sowing time of different varieties according to temperature	3	3	2		3	1	3			3
CO4	Study of irrigation and nutrient management and their applications in production vegetables	3	3	3	3		2	3			3
CO5	By the end of course students will be able to control of different insect pests.	3	3	3	3	1	3	3	1		3
3: Strong contribution, 2: average contribution, 1: Low contribution											

**M.Sc. (Ag.) Horticulture
SEMESTER-I**

Course Title: Production Technology of Underexploited Vegetable Crops

Course Code: AG505

w.e.f. Session 2018-19

3(2+1)

Theory

Introduction, botany and taxonomy, climatic and soil requirements, commercial varieties/hybrids, sowing/planting times and methods, seed rate and seed treatment, nutritional and irrigation requirements, intercultural operations, weed control, mulching, physiological disorders, harvesting, post-harvest management, plant protection measures and seed production of:

Unit I

Asparagus, artichoke and leek

Unit II

Brussels's sprout, Chinese cabbage, broccoli, kale and artichoke.

Unit III

Amaranth, celery, parsley, parsnip, lettuce, rhubarb, spinach, basella, bathu (chenopods) and chekurmanis.

Unit IV

Elephant foot yam, lima bean, winged bean, vegetable pigeon pea, jack bean and sword bean.

Unit V

Sweet gourd, spine gourd, pointed gourd, Oriental pickling melon and little gourd (kundru).

Practical

Identification of seeds; botanical description of plants; layout and planting; cultural practices; short-term experiments of underexploited vegetables.

Suggested Readings

1. Bhat KL. 2001. Minor Vegetables - Untapped Potential. Kalyani.
2. Indira P & Peter KV. 1984. Unexploited Tropical Vegetables. Kerala Agricultural University, Kerala.
3. Peter KV. (Ed.). 2007-08. Underutilized and Underexploited Horticultural Crops. Vols. I-IV. New India Publ. Agency.
4. Rubatzky VE & Yamaguchi M. (Eds.). 1997. World Vegetables: Principles, Production and Nutritive Values. Chapman & Hall.

COURSE OBJECTIVE:

- To know about origin, geographical distribution, soil and climate requirement of underexploited vegetable crops.
- Familiar with different improved varieties and methods of sowing in different under exploited vegetables.
- Knowledge of various inter cultural operations and their management for under exploited vegetable crops.
- Knowledge of crop protection measure in different under exploited vegetables.

COURSE OUTCOME:

After completion of course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Able to understand about the basic criteria for selection of under exploited vegetable crops on the basis of soil and climate requirement.
CO2	Learn the basic knowledge regarding different cultural practices followed for underutilized vegetable crops
CO3	Able to know about sowing time of specific varieties for different under exploited vegetables according to region and season.
CO4	Study of irrigation and nutrient management and their applications in production of under exploited vegetable crops
CO5	By the end of course students will be able to know different physiological disorders of under exploited vegetables and can control different insect pests and diseases.

CO-PO mapping

CO	DESCRIPTION	PO										
		PO1 Basic horticulture knowledge	PO2 Problem Solving	PO3 Field Experimentations	PO4 Scientific Skills	PO5 Adoption of Advanced technology	PO6 Plant protection measures	PO7 Environment and sustainability	PO8 Ethics	PO9 Individual and team work	PO10 Communication	PO11 Lifelong learning
CO1	Able to understand about the basic criteria for selection of under exploited vegetable crops on the basis of soil and climate requirement.	3	3	2	3	2		3				3
CO2	Learn the basic knowledge regarding different cultural practices followed for underutilized vegetable crops	2	2	1	2	2		2				2
CO3	Able to know about sowing time of specific varieties for different under exploited vegetables according to region and season.	3	3	2		2	1	3				3
CO4	Study of irrigation and nutrient management and their applications in production of under exploited vegetable crops	3	2	2	2	2	2	2				1
CO5	By the end of course students will be able to know different physiological disorders of under exploited vegetables and can control different insect pests and diseases.	3	3	3	1	2	1	3				3
3: Strong contribution, 2: average contribution, 1: Low contribution												

M.Sc. (Ag.) Horticulture
SEMESTER-I
Course Title: Principles of Fruit Production
Course Code: HT501
w.e.f. Session 2020-21

3(2+1)

Unit I

Importance of fruit production. Soil and climate in relation to fruit production. Water requirement, uptake, movement and influence on root distribution, response of plants to varying soil moisture regimes, pathological conditions associated with excess and deficiencies in soil moisture; irrigation methods.

Unit II

Soil management methods and techniques of moisture conservation. Temperature relations, winter injury and hardiness. Light relations- thermal, photosynthetic and phototropic influences. Plant nutrients, absorption, role, deficiencies and surpluses, application of fertilizers.

Unit III

Phases of plant growth- initiation of reproductive processes and fruiting habits. Systems of planting, high density orcharding and inter and cover cropping in fruit production. Concepts in Hi-tech horticulture. Pruning and training methods, season and physiology. Flowering physiology and factors involved in fruit-set, unfruitfulness, fruit-growth and development.

Unit IV

Important physiological disorders and their management. Alternate bearing – causes and remedies. Maturity indices, harvesting, packing, transport and marketing systems of major fruit and plantation crops.

Practical: Study of soil characters in relation to growing of fruits and plantation crops. Soil moisture determination. Root distribution pattern of major crops. Systems of irrigation. Methods and placement of plant nutrients. Methods of pruning and training adopted in different crops. Floral biology, fruit-set, fruit-growth and fruit drop. Studies on maturity indices and techniques of harvesting. Physiological disorders of major fruit and plantation crops. Survey of local fruit markets to study grading, packing and marketing of different crops.

Suggested Readings:

1. Singh, J. 2014 (4th Rev.). Basic Horticulture. Kalyani Publishers
2. Singh, A. & Kumar, A. 2014. Fruit Production Technology. Pointer Publishers
3. Bose, T.K., Mitra, S.K. & Sanyol, D. (Eds.). 2002. Fruits of India – Tropical and Sub-tropical. 3rd Ed. Vols. I, II. Naya Udyog.
4. Chadha, K.L. & Pareek, O.P. 1996. (Eds.). Advances in Horticulture. Vol. I. Malhotra Publ. House.
5. Peter, K.V. 2008. (Ed.) Basics of Horticulture. New India Publ. Agency.
6. Singh H.P., Negi, J.P. & Samuel J.C. (Eds.). 2002. Approaches for Sustainable Development of Horticulture. National Horticultural Board.

COURSE OBJECTIVE:

- Importance of fruit production, its classification, soil and climate in relation to fruit production.
- Knowledge about advanced technologies used to grow intensively high quality fruit crops for enhancing the crop production.
- Familiar the students about climate, soil and varieties for fruit crops.
- Knowing the principles and methods of orchard establishment, training, pruning and other horticultural practices needed for fruit production.

COURSE OUTCOMES:

After completion of course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Aware about soil management methods and techniques for moisture conservation in fruit crops.
CO2	Students aware about cultural practices for the cultivation of fruit crops
CO3	Students also aware about the flowering physiology and factors involved in fruit-set, unfruitfulness, fruit growth and development.
CO4	Familiar with the important physiological disorders and management.
CO5	Aware about the different propagation techniques applied in horticultural crops including micro-propagation.

CO		PO1 Basic horticulture knowledge	PO2 Problem Solving	PO3 Field Experimentations	PO4 Scientific Skills	PO5 Adoption of Advanced technology	PO6 Plant protection measures	PO7 Environment and sustainability	PO8 Ethics	PO9 Individual and team work	PO10 Communication	PO11 Lifelong learning
CO1	Aware about soil management methods and techniques for moisture conservation in fruit crops.	3	2	1	3	3		3				3
CO2	Students aware about cultural practices for the cultivation of fruit crops	2	3	1	2	3		2				2
CO3	Students also aware about the flowering physiology and factors involved in fruit-set, unfruitfulness, fruit growth and development.	3	2			3	1	3				3
CO4	Familiar with the important physiological disorders and management.	3	2	1	3	3	2	2				1
CO5	Aware about the different propagation techniques applied in horticultural crops including micro-propagation.	3	2	3	3	3	1	1		2	1	2

3: Strong contribution, 2: average contribution, 1: Low contribution

M.Sc. (Ag.) Horticulture
SEMESTER-I
Course Title: Fruit Plant Propagation and Nursery Management
Course Code: HT502
w.e.f. Session 2020-21

3(2+1)

Unit I

Principles of plant propagation, sexual and asexual methods of propagation. Anatomical and physiological aspects of propagation through cottage, layerage and graftage; role of callus in propagation through cuttage and graftage. Etiolation and physiology of root formation and graft union.

Unit II

Role of rootstock in propagation. Physiology of dwarfing rootstock and dwarf rootstock of important fruit trees. Role of plant growth regulators in raising of seedlings and rooting of cuttings and layers. Role of nucellar embryony, apomixes and tissue culture.

Unit III

Techniques of cutting, layering, budding, grafting and micro grafting (STG). Planning of a nursery unit. Raising of nursery plants and their after care. Selection, certification and maintenance of mother plants and budwood nurseries.

Unit IV

Use of modern propagation structures like mist chambers, low cost polyhouse, low tunnels and study of bottom heat techniques. Media/soil mixture, containers and soil sterilization. Lifting, packing transportation and marketing of nursery plants. Economics of raising nursery of fruit and plantation crops and Nursery Acts.

Practical: Media/soil mixture, containers and soil sterilization. Use of chemicals for seed treatment and sowing. Preparation of nursery beds, poly bags, seed pans thumb-pots for raising seedlings. Raising of seedlings. Stratification and scarification of seeds and use of tetrazolium salts for germination tests. Identification of nucellar seedlings. Practice of different asexual methods of propagation viz., cutting, layering, budding, approach, veneer and softwood grafting. Use of plant growth regulators in propagation of plant materials. Use of mist chambers, modern propagation structures, low cost poly houses, low tunnels and bottom heat techniques. Selection, lifting, packing, transportation and marketing of nursery plants. Economics of raising nurseries. Visit to local commercial/private nurseries.

Suggested Readings:

1. Rajan S & Baby LM. 2007. Propagation of Horticultural Crops. New India Publ. Agency.
2. Radha T & Mathew L. 2007. Fruit Crops. New India Publ. Agency.
3. Hartmann HT & Kester DE. 1989. Plant Propagation – Principles and Practices. Prentice Hall of India.
4. Bose T.K, Mitra SK & Sadhu MK. 1991. Propagation of Tropical and Subtropical Horticultural Crops. Naya Prokash.
5. Peter KV. (Ed.). 2008. Basics of Horticulture. New India Publ. Agency.
6. Singh SP. 1989 Mist Propagation. Metropolitan Book Co.

COURSE OBJECTIVE:

- To impart knowledge to the students on plant propagation by sexual and asexual method of propagation
- To impart knowledge to the students on physiological and anatomical aspects of plant propagation
- To impart basic knowledge of plant propagating structure
- To know about role of plant growth regulators on germination and rooting of cutting

COURSE OUTCOMES:

After completion of course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Study about the different methods of cutting, budding, layering and grafting
CO2	Learn about the process of graft union
CO3	Students are able to know about role of green house in propagation of plants
CO4	Students are able to know about role of plastic in propagating structure
CO5	Study about different rootstock used for budding and grafting

CO-PO mapping

CO	DESCRIPTION	PO										
		PO1 Basic horticulture knowledge	PO2 Problem Solving	PO3 Field Experimentations	PO4 Scientific Skills	PO5 Adoption of Advanced technology	PO6 Plant protection measures	PO7 Environment and sustainability	PO8 Ethics	PO9 Individual and team work	PO10 Communication	PO11 Lifelong learning
CO1	Study about the different methods of cutting, budding, layering and grafting	3	3	2	3	3		3				3
CO2	Learn about the process of graft union	2	2	1	2	3		2				2
CO3	Students are able to know about role of green house in propagation of plants	3	3	2		3	1	3				3
CO4	Students are able to know about role of plastic in propagating structure	3	2	2	3	3	2	2				1
CO5	Study about different rootstock used for budding and grafting	3	3	3	1	3	1	3				3
3: Strong contribution, 2: average contribution, 1: Low contribution												

**M.Sc. (Ag.)/MBA Agribusiness Management
Semester-III**

Course Title: Library and Information Services

Course Code: PGS501

w.e.f. Session 2019-20

1 (0+1)

Practical

Introduction to library and its services; Role of libraries in education, research and technology transfer; Classification systems and organization of library; Sources of information- Primary Sources, Secondary Sources and Tertiary Sources; Intricacies of abstracting and indexing services (Science Citation Index, Biological Abstracts, Chemical Abstracts, CABI Abstracts, etc.); Tracing information from reference sources; Literature survey; Citation techniques/Preparation of bibliography; Use of CD-ROM Databases, Online Public Access Catalogue and other computerized library services; Use of Internet including search engines and its resources; e-resources access methods.

Suggested Readings:

- Singh G. Information Sources, Services and Systems, 2013 Edition. Prentice Hall India Learning Private Limited
- Library Science, 2018 Edition. Ramesh Publishing House
- Subhankar Biswas, Durga Sankar Rath. Cataloguing in the New Era: Gazing through the Bodleian Catalogues to RDA, 2017 Edition. Ess Ess Publications

COURSE OBJECTIVES:

- To study about the role of library in education, research and technology
- Obtain idea of Intricacies of abstracting and indexing services
- To enlighten the students about the computerized library services
- To give the knowledge of e resources and search engines

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Students gain knowledge about the library importance in different sites.
CO2	They gain knowledge of Intricacies of abstracting and indexing services
CO3	They know about the computerized library services
CO4	To provide knowledge of e resources
CO5	To give basic information about search engines

CO-PO MAPPING:

CO	DESCRIPTION	PO											
		PO1 Basic Agriculture knowledge	PO2 Problem Solving	PO3 Field Experimentations	PO4 Modern implementation usage	PO5 Modern Agricultural/Horticultural implements	PO6 Modern plant protection implements	PO7 Extension Programme	PO8 Environment and sustainability	PO9 Ethics	PO10 Individual and team work	PO11 Communication	PO12 Lifelong learning
CO1	Students gain knowledge about the library importance in different sites.	3	3	1	1	1	3	3	3	2	3	1	3
CO2	They gain knowledge of Intricacies of abstracting and indexing services	3	3	1	3	3	3	1	3	2	3	3	2
CO3	They know about the computerized library services	3	2	1	3	3	2	1	3	2	1	2	3
CO4	To provide knowledge of e resources	3	2	1	3	3	3	1	3	2	2	3	3
CO5	To give basic information about search engines	3	1	1	3	3	3	1	3	2	2	3	3
3: Strong contribution, 2: average contribution, 1: Low contribution													