

Course Title: Recent Trends In Vegetable Production
Course Code: VSC 601
Credit Hours: 3 (3+0)

THEORY

Present status and prospects of vegetable cultivation; nutritional, antioxidant and medicinal values; climate and soil as critical factors in vegetable production; choice of varieties; Hi-tech nursery management; modern concepts in water and weed management; physiological basis of growth, yield and quality as influenced by chemicals and growth regulators; role of organic manures, inorganic fertilizers, micronutrients and biofertilizers; response of genotypes to low and high nutrient management, nutritional deficiencies/disorders and correction methods; different cropping systems; mulching; Protected cultivation of vegetables, containerized culture for year round vegetable production; low cost polyhouse; nethouse production; crop modelling, organic gardening; vegetable production for pigments, export and processing of:

UNIT-I:

Solanaceous crops: Tomato, brinjal, chilli, sweet pepper and potato.

UNIT-II:

Cole crops: Cabbage, cauliflower and knol-khol, sprouting broccoli.

UNIT-III:

Okra, onion, peas and beans, amaranth and drumstick.

UNIT-IV:

Root crops and cucurbits: Carrot, beet root, turnip and radish and cucurbits
UNIT-V: *Tuber crops:*
Sweet potato, Cassava, elephant foot yam, Dioscorea and taro.

RESOURCES :

1. Bose, T.K. and Som, N.G., 1986, Vegetable crops of India. Naya prokash.
2. Bose, T.K., Kabir, J., Maity, T.K., Parthasarathy, V.A. and Som, M.G., 2003, Vegetablecrops. Vols. I-III. Naya Udyog.
3. Brewster, J.L., 1994, Onions and other vegetable alliums. CABI.
4. Chadha, K.L. and Kalloo, G. (Eds.), 1993-94, Advances in horticulture Vols. V-X. Malhotra Publ. House.
5. Chadha, K.L. (Ed.), 2002, Hand book of horticulture. ICAR.
6. Chauhan, D.V.S. (Ed.), 1986, Vegetable production in India. Ram prasad and Sons.
7. Fageria, M.S., Choudhary, B.R. and Dhaka, R.S., 2000, Vegetable crops: production technology. Vol. II. Kalyani.
8. FFTC., Improved vegetable production in Asia. Book Series No. 36.
9. Ghosh, S.P., Ramanujam, T., Jos, J.S., Moorthy, S.N. and Nair, R.G., 1988, Tuber crops. Oxford and IBH.

10. Gopalakrishanan, T.R., 2007, Vegetable crops. New India Publ. Agency.
11. Hazra, P. and Som, M.G., 2015, Seed production and hybrid technology of vegetable crops. Kalyani publishers, Ludhiana.
12. Hazra, P., 2016, Vegetable science. 2ndedn, Kalyani publishers, Ludhiana.
13. Hazra, P., 2019, Vegetable production and technology. New India publishing agency, New Delhi.
14. Kallo, G. and Singh, K. (Ed.), 2001, Emerging scenario in vegetable research and development. Research periodicals and Book Publ. House.
15. Kurup, G.T., Palanisami, M.S., Potty, V.P., Padmaja, G., Kabeerathuma, S. and Pallai, S.V., 1996, Tropical tuber crops, problems, prospects and future strategies. Oxford and IBH.
16. Rana, M.K., 2008, Olericulture in India. Kalyani Publ.
17. Rana, M.K., 2008, Scientific cultivation of vegetables. Kalyani Publ.
18. Rubatzky, V.E. and Yamaguchi, M. (Eds.), 1997, World vegetables: principles, production and nutritive values. Chapman and Hall.
19. Saini, G.S., 2001, A Text Book of oleri and flori culture. Aman Publishing House.
20. Salunkhe, D.K. and Kadam, S.S. (Ed.), 1998, Hand book of vegetable science and technology: production, composition, storage and processing. Marcel Dekker.
21. Shanmugavelu, K.G., 1989, Production technology of vegetable crops. Oxford and IBH. Sin
22. M.T. and Onwueme, I.C., 1978, The tropical tuber crops. John Wiley and Sons.
23. Singh, D.K., 2007, Modern vegetable varieties and production technology. International book distributing Co.
24. Singh, N.P., Bhardwaj, A.K., Kumar, A. and Singh, K.M., 2004, Modern technology on Vegetable production. International book distr. Co.
25. Singh, P.K., Dasgupta, S.K. and Tripathi, S.K., 2006, Hybrid vegetable development. International book distr. Co.
26. Singh, S.P. (Ed.), 1989, Production technology of vegetable crops. Agril. Comm. Res. Centre.
27. Thamburaj, S. and Singh, N. (Eds.). 2004, Vegetables, tuber crops and spices. ICAR. Thompson, H.C. and Kelly, W.C. (Eds.), 1978, Vegetable crops. Tata McGraw-Hill.

Course Title: Advances In Breeding Of Vegetable Crops

Course Code: VSC 602

Credit Hours: 3 (3 +0)

THEORY

Evolution, distribution, cytogenetics, Genetics and genetic resources, wild relatives, genetic divergence, hybridization, inheritance of qualitative and quantitative traits, heterosis breeding, plant idotype concept and selection indices, breeding mechanisms, pre breeding, mutation breeding, ploidy breeding, breeding for biotic and abiotic stresses, breeding techniques for improving quality and processing characters, bio-fortification, *in – vitro* breeding, marker assisted breeding, haploidy, development of transgenic.

UNIT-I:

Solanaceous crops - Tomato, Brinjal, Hot Peeper, Sweet Pepper, Okra and Potato

UNIT-II: Cucurbits and Cole crops

UNIT-III:

Legumes and leafy vegetables : Peas and Beans, Amaranth, Palak, Chenopods andLettuce.

UNIT-IV:

Root crops and onion : Carrot, Beetroot, Radish, Turnip, Onion

UNIT-V:

Tuber crops : Sweet potato, Tapioca, Elephant foot yam, Colocasia, Dioscorea

RESOURCES

1. Allard, R.W., 1999, Principle of plant breeding. John Willey and Sons, USA. Basset, M.J. (Ed.), 1986, Breeding vegetable crops. AVI Publ.
2. Dhillon, B.S., Tyagi, R.K., Saxena, S. and Randhawa, G.J., 2005, Plant genetic resources:horticultural crops. Narosa Publ. House.
3. Fageria, M.S., Arya, P.S. and Choudhary, A.K., 2000, Vegetable crops: Breeding and seedproduction. Vol. I. Kalyani.
4. Gardner, E.J., 1975, Principles of genetics. John Wiley and Sons.
5. Hayes, H.K., Immer, F.R. and Smith, D.C., 1955, Methods of plant breeding. McGraw-Hill.
6. Hayward, M.D., Bosemark, N.O. and Romagosa, I. (Eds.), 1993, Plant Breeding-principlesand prospects. Chapman and Hall.
7. Hazra, P. and Som, M.G., 2015, Vegetable science (Second revised edition), Kalyani publishers, Ludhiana, 598 p
8. Hazra, P. and Som, M.G., 2016, Vegetable seed production and hybrid technology(Secondrevised edition), Kalyani Publishers, Ludhiana, 459 p
9. Kallou, G., 1988, Vegetable breeding (Vol. I, II, III). CRC Press, Fl, USA. Kallou, G., 1988, Vegetable breeding. Vols. I-III. CRC Press.

10. Kalloo, G., 1998, Vegetable breeding. Vols. I-III (Combined Ed.). Panima Edu. Book Agency.
11. Kumar, J.C. and Dhaliwal, M.S., 1990, Techniques of developing hybrids in vegetable crops. Agro Botanical Publ.
12. Paroda, R.S. and Kalloo, G. (Eds.), 1995, Vegetable research with special reference to hybrid technology in Asia-Pacific Region. FAO.
13. Peter, K.V. and Pradeepkumar, T., 2008, Genetics and breeding of vegetables. Revised, ICAR.
14. Peter, K.V. and Hazra, P. (Eds), 2012, Hand book of vegetables. Studium press LLC, P.O. Box 722200, Houston, Texas 77072, USA, 678p
15. Peter, K.V. and Hazra, P. (Eds), 2015, Hand book of vegetables Volume II. Studium Press LLC, P.O. Box 722200, Houston, Texas 77072, USA, 509 p.
16. Peter, K.V. and Hazra, P. (Eds), 2015, Hand book of vegetables Volume III. Studium Press LLC, P.O. Box 722200, Houston, Texas 77072, USA, 634 p.
17. Rai, N. and Rai, M., 2006, Heterosis breeding in vegetable crops. New India Publ. Agency.
18. Ram, H.H., 1998, Vegetable breeding: principles and practices. Kalyani Publ.
19. Simmonds, N.W., 1978, Principles of crop improvement. Longman. Singh B.D. 1983. Plant Breeding. Kalyani Publ.
20. Singh, B.D., 1983, Plant breeding. Kalyani Publ.
21. Singh, P.K., Dasgupta, S.K. and Tripathi, S.K., 2004, Hybrid vegetable development. International Book Distributing Co.
22. Swarup, V., 1976, Breeding procedure for cross-pollinated vegetable crops. ICAR.

Course Title: Abiotic Stress Management In Vegetable Crops

Course Code: VSC 603

Credit Hours: 3 (2+1)

THEORY

Block 1: Abiotic stress management in vegetable crops

UNIT I:

Environmental stress : its types, soil parameters including pH, classification of vegetable crops based on susceptibility and tolerance to various types of stress.

UNIT II:

Mechanism and measurements :

tolerance to drought, water logging, soil salinity, frost and heat stress in vegetable crops.

UNIT III:

Soil-plant-water relations : under different stress conditions in vegetable crops production and their management practices.

UNIT IV:

Techniques of vegetable growing under water deficit, water logging, salinity and sodicity.

UNIT V:

Use of chemicals - techniques of vegetable growing under high and low temperature conditions, use of chemicals and antitranspirants in alleviation of different stresses.

PRACTICAL

1. Identification of susceptibility and tolerance symptoms to various types of stress in vegetable crops measurement of tolerance to various stresses in vegetable crops,
2. short term experiments on growing vegetable under water deficit, water logging, salinity and sodicity, high and low temperature conditions, Use of chemicals for alleviation of different stresses.

RESOURCES :

1. Dhillon, B.S., Tyagi, R.K., Saxena, S. and Randhawa, G.J., 2005, Plant genetic resources: horticultural crops. Narosa Publ. House.
2. Dwivedi, P. and Dwivedi, R.S., 2005, Physiology of abiotic stress in plants. Agrobios. Janick, J.J., 1986, Horticultural science. 4th Ed. WH Freeman and Co.
3. Kaloo, G. and Singh, K., 2001, Emerging scenario in vegetable research and development. Research periodicals and book publ. house.
4. Kaloo, G., 1994, Vegetable breeding. Vols. I-III. Vedams eBooks.
5. Lerner, H.R. (Eds.), 1999, Plant responses to environmental stresses.
6. Decker. Maloo, S.R., 2003, Abiotic stresses and crop productivity. Agrotech Publ. Academy.
7. Narendra, T. *et al.*, 2012, Improving crops resistance to abiotic stress. Wiley and Sons.US.
8. Peter, K.V. and Pradeep Kumar, T., 2008, Genetics and breeding of vegetables. (Revised Ed.). ICAR.
9. Peter, K.V. and Hazra, P. (Eds), 2015, Hand book of vegetables volume II. Studium Press LLC, P.O. Box 722200, Houston, Texas 77072, USA, 509 p.
10. Peter, K.V. and Hazra, P. (Eds), 2015, Hand book of vegetables volume III. Studium Press LLC, P.O. Box 722200, Houston, Texas 77072, USA, 634 p.
11. Ram, H.H., 2001, Vegetable breeding. Kalyani.
12. Rao, N.K. (Eds.), 2016, Abiotic stress physiology of horticultural crops. Springer publication.

Course Title: Seed Certification, Processing And Storage of Vegetable Seeds

Course Code: VSC 604

Credit Hours: 3 (2+1)

THEORY

Block 1: Seed Certification, Processing and Storage of Vegetable Seeds.

Unit I:

Seed certification, history, concepts and objectives, seed certification agency, phases of seed certification, Indian Minimum seed Certification standards, Planning and management of seed certification programmes.

Unit II:

Principles and procedures of field inspection, seed sampling, testing and granting certification, OECD certification Schemes.

Unit III:

Principles of seed processing, Methods of seed drying and cleaning, seed processing plant- Layout and design, seed treatment, seed quality enhancement, packaging and marketing.

Unit IV:

Principles of Seed Storage, orthodox/ recalcitrant seeds, types of storage (open, bulk, controlled, germplasm, cryopreservation), factors affecting seed longevity in storage (Pre and post harvest factors).

Unit V: Seed aging and deterioration, maintenance of seed viability and vigor during storage, storage methods, storage structures, transportation and marketing of seeds.

PRACTICAL

1. General procedures of seed certification
2. Field inspection and standards
3. Isolation and rouging
4. Inspection and sampling at harvesting, threshing and processing
5. Testing physical purity, germination and moisture, grow-out test
6. Visit to regulatory seed testing and plant quarantine laboratories
7. Seed processing plants and commercial seed stores

RESOURCES

1. Agarwal, P. K. and Anuradha, V., 2018, Fundamentals of seed science and technology. Brilliant publications, New Delhi.
2. Basra, A. S., 2000, Hybrid seed production in vegetables. CRC press, Florida, USA.
3. Bench, A.L.R. and Sanchez, R.A., 2004, Handbook of seed physiology. Food products press, NY/ London.
4. Chakraborty, S. K., Prakash, S., Sharma, S.P. and Dadlani, M., 2002, Testing of distinctiveness, uniformity and stability for plant variety protection. IARI, New Delhi
5. Copland, L.O. and McDonald, M.B., 2004, Seed science and technology, Kluwer academic press.
6. Fageria, M.S., Arya, P.S. and Choudhry, A.K., 2000, Vegetable crops: breeding and seed production Vol 1. Kalyani publishers, New Delhi.
7. George, R.A.T., 1999, Vegetable seed production (2nd Edition). CAB International.
8. Hazra, P. and Som, M.G., 2016, Vegetable seed production and hybrid technology (Second revised edition), Kalyani publishers, Ludhiana, 459 p
9. Kalloo, G., Jain, S.K., Vari, A.K. and Srivastava, U., 2006, Seed: A global perspective. Associated publishing company, New Delhi.
10. Singhal, N.C., 2003, Hybrid seed production. Kalyani publishers, New Delhi.
