MS Syllabus for Department of Horticulture

January-June Semester

Compulsory Courses

Elective Courses: Any two of the following

July-December Semester

Compulsory Courses

Elective Courses: Any two of the following

Each course contains 2 (two) credit hours

Department of Horticulture
Patuakhali Science and Technology University
Course Title: Spices, Medicinal Plants and Plantation Crops Management
Course Code: HRT 5101, Credit Hours: 2
Semester: January-June, Lectures: 32
Marks: 100 (Class Tests: 20+20; Assignments: 20; Final Examination: 40)

Introduction: History, importance, nutritional aspects and classification of spices, medicinal plants and plantation crops.

Importance, ecophysiology, cultural management, processing and used plant parts of the followings-

a) **Spices:** Onion, Garlic, turmeric, ginger, Chilli, black & white pepper, cardamom and cumin
b) **Medicinal plants:** Camphor, pepper mint, sensitive plants, moringa, vitex, sarpa gandha, ulatchandal, ulatkombal, asparagus, arjun, clove, cinnamon, hortoki, bohera, aonla, datura, gritakumari, thankuni, nishinda, papaver, neem, chirata, saffron, tamarind, bael
c) **Plantation crops:** Rubber, tea, oil palm and bamboo.

Extracts and/products prepared from different spices, medicinal plants and plantation crops with their properties, preparation and preservation, use for control of diseases.

Importance and prospects of some minor spices, medicinal plant and plantation crops-

a) **Spices:** Coriander, fenugreek, aniseed, black cumin and Indian cassia.
b) **Medicinal plants:** Peacock flower, ixora, balsam apple, almond, colchicin, kalomegh, akanda, arnica, quinine, devil's tree, ajwan, gritakumari, muktajhurigandha fenugreek, fennel, lemon, aniseed, caraway
c) **Plantation crops:** Tea, rubber, bamboo, **c**offee, betel nut and betel leaf

Books Recommended:

Azad, M.A.K. 1994. Arthonaytic Udvidbidya (Economic Botany). Bangla Academy.

Basu, B. D. 1980. Indian Medicinal Plants. Plates, Part IV, Bisen Singh, Mohendra

Chanchalowe, N. 1993. Medicianal and Aromatic Plants Constitions and Utilization in Asia. Proc. Medicinal and Aromatic Plants in Asia. FAO/RAPA Publication, Maliwan.

Daster, J. F. 1990. Medicinal Plants of India and Pakistan. UPL Ltd.

De Padua, L. S. 1989. Herbal Medicine and Generies. UPLB, College, Manila, Phillipine.

Ghani, A. 1995. Bheshaja Bignan (in Bangla). Bangla Academy, Dhaka.

Gorley, R. H. V; J J Hardon and B. J. Wood. 1976. Oil Palm Research. Elsevier Scientific Pub. Co., Amsterdam, The Netherlands.

Hassan, A. 1994. Bangladesher Veshoje Udvid. Bangla Academy, Dhaka.

Kumar, N.; J.B.M.M. A Khader, P. Rangaswami and I. Irulappan.1997. Spices, Plantation Cros, Medicinal and Aromatic Plants. Oxford & IBH Pub. Co. Pvt. Ltd. New Delhi, India

Opeke, L.K. 1982. Tropical Tree Crops. John Wiley and Sons. New York.

Polhamus, L. G. 1962. Rubber: Botany, Production and Cultivation. Leonard Hill, London.

Pruthi, J.S. 1986. Spices and Condiments. National Book Trust, New Delhi, India.

Pureglove, J.W; E. G. Brown; C. L. Green and S.R.J. Robbins. 1981. Spices, Vol I & II. Longman Group UK Ltd. London.

Department of Horticulture
Patuakhali Science and Technology University
Course Title: Postharvest Technology of Horticultural Crops
Course Code: HRT 5102, Credit Hours: 2
Semester: January-June, Lectures: 32
Marks: 100 (Class Tests: 20+20; Assignments: 20; Final Examination: 40)

Introduction: Concept, present status and improvement of post-harvest management of fruits and vegetables in Bangladesh.

Quality of horticultural crops: Modern concept of quality criteria determination of horticultural crops. Factors affecting quality of horticultural crops.

Harvesting and post-harvest handling: Maturity, harvesting, cooling, curing, cleaning, sorting, grading, packing, transportation and marketing of horticultural crops.

Post-harvest physiology of horticultural crops: Changes associated with maturity and ripening of horticultural crops; ethylene production; factors causing physio-chemical changes.

Post-harvest spoilage: Causes of spoilage and their remedies. Post harvest disorders, diseases, pests and their ways of minimisation.

Technology of storage: Principles, methods of storage and maintenance of conditions in storehouses with particular emphasis on ventilated storage, refrigerated storage, CA storage, MA storage, semi-underground and underground storage. Environmental requirements for storage of horticultural crops.

Processing and preservation: Importance, principles and techniques of processing and preservation of horticultural crops. Quality control of processed horticultural crops and value added products.

Books Recommended:

Champa, B.R., E, Highley, and G.I. Johnson. 1994. Postharvest Handling Technology for Tropical Fruits. ACIAR Australia.

FAO. 1998. Fruits and Vegetable Processing. Intl. Book Distribution Co. UP, India.

Johnson. G.I. and E. Highley. 1994. Development of Postharvest Handling Technology for Tropical Fruits. ACIAR Australia.

Johnson. G.I. and E. Highley. 1994. Development of Technology for Extension of Shelf life of Tropical Fruits. ACIAR Australia.

Kader, A. 1992. Postharvest Technology. Pub. No. 3311. Univ. of California, Div. of Agriculture and Naturul Resources.

Lal G., Siddappa GS & Tandon GL. 1998. Preservation of Fruits and Vegetables. ICAR, India.

Pabtastucim E.B. 1975. Postharvest Physiology, Handling and Utilization of Tropical and Subtropical Fruits and Vegetables. AVI, Westport, USA

Salunkhe, D. K. and B. D. Desai. 1984. Postharvest Biotechnology of Fruits. Vol. I & II CRC Press. Inc., Boca Raton, Florida.

Singh, A. 1986. Fruit Physiology and Production. New Delhi.

Srivastava RP & Kumar S. 1998. Fruit and Vegetable preservation-Principles & Practices. Intl. Book Distribution Co. UP, India.

Tai, E.A. 1977. Ecophysiology of Tropical Fruits. London.

Wills, R.B.H, T.H. Lee, D. Graham, W.B. McGlasson and E.G. Hall. 1989. Postharvest: An introduction to the Physiology and Handling of Fruits and Vegetables. N.S.W. Australia 2033.

Department of Horticulture
Patuakhali Science and Technology University
Course Title: Advanced Seed Technology of Horticultural crops
Course Code: HRT 5103, Credit Hours: 2
Semester: January-June, Lectures: 32
Marks: 100 (Class Tests: 20+20; Assignments: 20; Final Examination: 40)

Functions of a seed industry: Breeding and variety assessment, growing of seed crops, processing of seed, marketing of seed, legislative control, quarantine, seed extension.
Development of the seed industry in Bangladesh: Development of vegetable seed industry in the public and private sectors in Bangladesh; background, present status, scope and opportunities.
Different classes of seeds: Breeder's seed, foundation seed, certified seed, truthfully labeled seed and farmers' seed. Quality standard for different classes of seeds.
Seed formation and maturation process: Flower induction, initiation, anthesis, microsporogenesis, megasporogenesis, fertilization; embroy development; filling of the grains in monocot; establishment of cotyledon reserves in dicots; energy supply in maturing seeds; hormone and seed development.
Seed dormancy: Types of dormancy, causes and breaking of dormancy.
Seed viability and vigour: Definitions and estimation.
Seed quality and its control: Modern concepts of seed quality; characteristics of good seed; field inspection, seed testing, seed certification.
Post-harvest technology: Use of machinery for threshing/extraction, cleaning, drying, grading and packaging of seeds in seed processing centre.
Hybrid seed production technology: General principles; hybrid seed production technology for tomato, brinjal, onion, TPS and cucurbitaceous vegetables; present status and future prospects.
Joint venture seed production Custom seed production Biotech seeds (Tissue culture and GM seeds)
Organized production and marketing of horticultural seeds in Bangladesh: Contract growing, import and marketing of vegetable and flower seeds including seed potatoes in the public and private sectors. Agri-business opportunities in vegetable seeds.
Seed policy and seed rules: National seed policy and seed rules, responsibilities and activities of the seed related institutes, organizations, agencies and projects.

Books Recommended

Agrawal, R.L. 1980. Seed Technology. Oxford & IBH Publishing Co., New Delhi, India. 685 p.

AVRDC. 1996. Vegetable Crops Agribusiness. AVRDC, Shanhua, Taiwan. 223 p.

Copeland, L.O. 1976. Principles of Seed Science and Technology. Burgess Publishing Company, USA.

Copeland, L.O. 1988. Principles of Seed Science and Technology. First Indian Report. Burgen Publishering Company, U.S.A.

George, R.A.T. 1980. Technical Guidelines for Vegetable Seed Technology. FAO, Rome.

Hartman, H.T.; D.E. Kester and F.T. Davies. 1990. Plant Propagation Principles and Practices. Prentice Hall International Edition Inc. New York, USA

Heydecker, W. 1973. Seed Ecology. Butter Worths. London.

Khan, A.A. 1978. The Physiology and Biochemistry of Seed Dormancy and Germination. Elsiviers, North Holland. Biomedical Prog., Amsterdam, The Netherlands.

Mayer, A.M. and A Poljakoff-Mayber. 1975. The Germination of Seeds. Pergamon Press.

Roberts, E.H. 1974. Viability of Seeds. Champan and Hall Ltd., London.

Wareing, P.F. and I.D.J. Phillips. 1976. The Control of Growth and Differentiation in Plants. Pergamon Press Ltd., Headington Hill Hall, Oxford, England.

Department of Horticulture
Patuakhali Science and Technology University
Course Title: Plant Growth Regulators in Horticulture
Course Code: HRT 5104, Credit Hours: 2
Semester: January-June, Lectures: 32
Marks: 100 (Class Tests: 20+20; Assignments: 20; Final Examination: 40)

Classification of plant growth regulators: Plant growth regulators (PGR), hormone, phytohormone, growth retardants, synergistis, antagonists and epinastic.
Mode of action of PGRs: Biochemical nature and structure of PGRs, biological activities, site of biosynthesis, transport, accumulation, influence on nucleic acid and protein metabolisms. Gene expression and secondary messenger hypothesis. Physiological actions of different PGRs on plants.
PGRs on plant growth, development and advanced propagation systems: Plant height control, apical and lateral dominance, prolonging cut flower life,bud dormancy, sprouting, micropropagation, differentiation, regeneration, organogenesisand morphogenesis
Organ and fruit formation: Plant growth regulators in development, parthenocarpy, fruit size, pruning and fruit thinning, control of biennial bearing, abscission, fruit ripening , senescence of plant parts, shelf life, tuberization, sex expression, male sterility
Actions on biotic and abiotic factors: Resistance to salt, drought, low temperature, lodging, insect pest and disease.
Herbicidal activities: Application methods and concentrations
Preparation and methods of application: Preparation and methods of application, trade names and formulations of commonly used PGRs with their specific uses horticultural crops.

Books Recommended:

Audus, L.J. 1963. Plant Growth Substances. Interscience Pub. Co., New York.

Bhujball, H.B.1999. Plant Hormones. Int. Book Distr. Co. U.P, India

Bose, T.K., S.K. Mitra and M.K Sadhu. 1986. Propagation of Tropical and Subtropical Horticultural Crops. Naya Prokash, 206 Bidhan Sarani, Calcutta-6, India.

Hartmann, H.T.; D.E. Kester and F.T. Davies Jr. 1990. Plant Propagation: Principles and Practices. Prentice Hall International Inc.

Janick J. 1963. Horticultural Science. W.H. Freeman and Co. Leopold, A.C. and P.E. Kriedman,

Prashad S. And Kumar, U. 1999. Principles of Horticulrure. Agro Botanica Pub. Bikaner, India.

Randhawa G.S. and Mukhopadhyay A. 1994. Floriculature of India. Allied Pub. New Delhi, India.

Ryugo K. 1988. Fruit Culture –its Science and Art. John Wiley and Sons, New York.

Weaver, R.J.1972. Plant Growth Substances in Agriculture. Freeman and Co. New Delhi, India.

Department of Horticulture
Patuakhali Science and Technology University
Course Title: Physiology of Horticultural Crops
Course Code: HRT 5105, Credit Hours: 2
Semester: January-June, Lectures: 32
Marks: 100 (Class Tests: 20+20; Assignments: 20; Final Examination: 40)

Phases of crop growth: Juvenile, mature and senescent phases and their impacts on yield.
Resources for crop growth and yield: Light energy, carbon dioxide, water and minerals and their interaction and impacts on crop growth and yield.
Analysis of growth and yield: Techniques of analyzing crop growth, crop yield, biological and economic yield.
Determinants of yield: Specific leaf area, leaf area index, leaf area duration, crop duration, ability of intercepting solar radiation, efficiency of dry matter production, maintenance respiration crop growth rate, relative growth rate, net assimilation rate, light saturation and compensation points, leaf orientation and architecture, measurement and calculation of the above variables.
Dry matter production: Relationship between dry matter production at different stages of root and shoot growth, diurnal and seasonal variations in dry matter production in different horticultural crops.
Dry matter partitioning: Source-sink relationship, dry matter partitioning and storage within the plant, factors affecting dry matter partitioning, storage and sink activity, physiological causes of variations between theoretical and actual levels of dry matter production of horticultural crops.

Books Recommended:

Charles-Edwards, D.A. 1982. Physiological Determinants of Crop Growth. Academic Press. New York, London.

Evans, L.T.; Peacock, W.J and Johnson, C.B. 1981. Physiological Progresses Limiting Plant Productivity. Butterworths. London.

Estin, J.D., Haskins, F.A., Sullivan,. C.Y. and Bavel, C.HM. Van. 1969. Physiological aspects of Crop Yield. ASA and CSSA.

Hurd, R.G., Biscoe, P.V. and Dennis, C. 1980. Opportunities for Increasing Crop Yields. Pitman, London.

Milthorpe, F.L. and J. Moorby 1979. An Introduction to Crop Physiology. 2nd ed., Cambridge University Press. London.

Rees, A.R., Cockshull, K.E., Hand, D.W. and Hurd, R.H. 1972. Crop Processes in Controlled Environments. Academic Press. London.

Squire, G.R. 1990. The Physiology of Tropical Crop Production. CAB International, UK.

Walpole, P. 1978. Crops and Their Environment. The Open University Press UK.

Wien, W.C. 1997. Physiology of Vegetable Crops. CAB International . N.Y.

Department of Horticulture
Patuakhali Science and Technology University
Course Title: Homestead Horticulture
Course Code: HRT 5106, Credit Hours: 2
Semester: January-June, Lectures: 32
Marks: 100 (Class Tests: 20+20; Assignments: 20; Final Examination: 40)

Homestead horticultural practices in Bangladesh: Introduction, scope, importance and present status. Components of homestead horticulture of rural and urban area, regional differences in respect of soil type, topography of land, flooding and natural vegetation. Research and development in respect of homestead production of horticultural crops in Bangladesh.

Homestead gardening: Principles of homestead gardening (Family choice, market value, nutritional aspects), Concept, objectives-social and aesthetic, economic, nutritional, food, crop diversification, utilization of homestead and involvement of female and family members.

Establishment and management of homestead production of horticultural crops:

a) Species selection according to growth habit, use, agro-ecological zones, soil strata, profitability and component combinations.
b) Principles, planning and layout;
c) Planting and care of fruit and other trees;
d) Management of kitchen garden;
e) Development and maintenance of a homestead nursery.

Different category homestead horticultural practices: Definition and examples of homestead horticultural practices, multilayer tree garden, multiple cropping, multipurpose trees on vegetable fields and homestead; plantation, shelterbelt, windbreaks, soil conservation and water shed management.

Multipurpose (MPTs) trees of horticulture in homestead: Importance, uses, productive and service role of different types of MPTs of horticulture in homestead. Selection and choice of MPTs, morphology, phenology, physiology, eco-physiology of MPTs, seed collection and storage

Books Recommended:

Abedin, A.Z.; C. K. Lai and M.D. Ali.1990. Homestead Plantation and Agroforestry in Bangladesh. BARI and Winrock International.

Dwivedi, A.P.1992. Agroforestry: Principles and Practices. Oxford and IBH Pub. New Delhi, India.

Douflas, J.J. 1982. Consumption and supply of wood and Bamboo in Bangladesh. Field Document No. 2. UNDP FAO project BGD/78/010, Dhaka.

Lai, C.K. ed. 1987. Participatory Forestry in Bangladesh: Concept, Experience and Recommendation, Dhaka.

Nair, P.K.R. 1983. Intensive Multiple Cropping with Coconuts in India. Verlag Paul Parey, Berlin and Hamburg.

UNICEF. 1981. Home Graden: Handbook for People Promoting Gardening in the Humid Tropics. New York, UN.

Yang, Y.H. 1976. Home Gardens as a Nutrition Interventions. Leauge for International Food Science, UN.

Department of Horticulture
Patuakhali Science and Technology University
Course Title: Horticulture and Human Nutrition
Course Code: HRT 5107, Credit Hours: 2
Semester: January-June, Lectures: 32
Marks: 100 (Class Tests: 20+20; Assignments: 20; Final Examination: 40)

Introduction to Human Nutrition: Nutritional requirements of human beings, malnutrition problem of Bangladesh, strategies for improvement of nutrition through horticultural crops. Role of Govt. and Non-Govt. organization to overcome malnutrition problem.

Nutrition of Horticultural Crops: Nutritional and medicinal value of the horticultural crops related to human health- Fruits, vegetables, flowers, spices and condiments, Medicinal plants and plantation crops.

Role of Horticultural Nutrition: Role of essential nutrition with special reference to human health, deficiency symptoms of horticultural nutrition of human being.

Factors Affecting Nutritional Value of Horticultural Crops: Environmental and soil factors, stresses, and hormones/growth regulators.

Steps to Improve the Nutritional status of Horticultural Commodities: During the production in the field, post-harvest management, storage condition and during the consumption.

Books Recommended:

Basu, B. D. 1980. Indian Medicinal Plants. Plates, Part IV, Bisen Singh, Mohendra

Bose, T. K. and L. P. Yadav. 1989. Commercial Flowers. Naya Prakash. Calcutta. India.

Bose, T.K. and M.G. Som. 1990.Vegetable Crops in India. Naya Prokash, Calcutta, India.

Bose, T.K. and S.K. Mitra. 1990. Fruits: Tropical and Subtropical. Naya Prokash, Calcutta, India.

Bose, T.K. Mineral Nutrition of Fruit Crops. 1995. Naya Prokash, Calcutta, India.

Bose, T.K. Tropical Garden Plants. Naya Prokash, Calcutta, India

Levitt, J. 1972. Response of Plants to Environmental Stresses. Academic Press, NY.

Mitra, S,K., T.K. Bose and M.K. Sadhu 1990. Nutrition of Vegetable Crops. Naya Prokash, Calcatta, India.

Nagg, S. and P.E. Shaw. 1980. Tropical and Sub-tropical Fruits; Composition, Properties and Uses. USA.

Opeke, L.K. 1982. Tropical Tree Crops. John Wiley and Sons. New York.

Pruthi, J.S. 1986. Spices and Condiments. National Book Trust, New Delhi, India.

Department of Horticulture
Patuakhali Science and Technology University
Course Title: Organic Farming of Horticultural Crops
Course Code: HRT 5108, Credit Hours: 2
Semester: January-June, Lectures: 32
Marks: 100 (Class Tests: 20+20; Assignments: 20; Final Examination: 40)

Introduction: Concept of organic farming, importance and prospect of organic horticultural farming, problems behind the organic farming.

Organic Horticulture farming system: Modern technologies- Fertilizer, pest and disease management and post-harvest management.

Requirements and legal aspects for growing and marketing of organic horticultural commodities

Impact of agricultural chemicals on environment and human health: Fertilizers, insecticides, pesticides, fungicides, weedicides, acaricides, rodenticides, various chemicals and PGRs that used during cultivation and post harvest management.

Organic Horticultural Farming in Bangladesh: Scope, steps taken by the govt. and non-govt. organization with their status behind it.

Organic versus Inorganic Horticulture Farming: Comparison between organic and inorganic farming in respect of socio-economic importance of various horticultural crops-flowers, fruits, vegetables, spices, condiments, medicinal plants and plantation crops.

Books Recommended:

Basu, B. D. 1980. Indian Medicinal Plants. Plates, Part IV, Bisen Singh, Mohendra

Bose, T. K. and L. P. Yadav. 1989. Commercial Flowers. Naya Prakash. Calcutta. India.

Bose, T.K. and M.G. Som. 1990.Vegetable Crops in India. Naya Prokash, Calcutta, India.

Bose, T.K. and S.K. Mitra. 1990. Fruits: Tropical and Subtropical. Naya Prokash, Calcutta, India.

Bose, T.K. Mineral Nutrition of Fruit Crops. 1995. Naya Prokash, Calcutta, India.

Bose, T.K. Tropical Garden Plants. Naya Prokash, Calcutta, India

Levitt, J. 1972. Response of Plants to Environmental Stresses. Academic Press, NY.

Mitra, S,K., T.K. Bose and M.K. Sadhu 1990. Nutrition of Vegetable Crops. Naya Prokash, Calcatta, India.

Nagg, S. and P.E. Shaw. 1980. Tropical and Sub-tropical Fruits; Composition, Properties and Uses. USA.

Opeke, L.K. 1982. Tropical Tree Crops. John Wiley and Sons. New York.

Pruthi, J.S. 1986. Spices and Condiments. National Book Trust, New Delhi, India.

Department of Horticulture
Patuakhali Science and Technology University
Course Title: Advanced Fruit Production
Course Code: HRT 5201, Credit Hours: 2
Semester: July-December, Lectures: 32
Marks: 100 (Class Tests: 20+20; Assignments: 20; Final Examination: 40)

Ecophysiology of fruit crops: Environmental factors affecting distribution of fruit crops. Ecophysiology related to growth, development, flowering, fruiting, and productivity of the following fruit crops: mango, banana, papaya, citrus, jackfruit, pineapple, litchi, guava and coconut.

Nutrition of fruit crops: Role of nutrients on fruit crops. Absorption and uptake, deficiency symptoms and nutritional requirements of major fruit crops.

Stress physiology of fruit crops: Physiological basis of plant injury, effects and mechanism of survival during temperature, water, radiation, salt and other environmental stresses.

Orchard floor management: Maintenance of organic matter, organic recycling and wastematter management, mulching, intercropping and multiple cropping.

Off-season production of fruits: Introduction, factor involved in off-season flowering, care of flowers and fruitlets. Induction of off-season flowering.

Exotic and minor fruits: Present status, importance and scope of exotic and minor fruits of Bangladesh.

Pest and disease management of fruit crops: Important insect pests and diseases, their symptoms and control.

Books Recommended:

Bose, T.K. and S.K. Mitra. 1990. Fruits: Tropical and Subtropical. Naya Prokash, Calcutta, India.

Bose, T.K. Mineral Nutrition of Fruit Crops. 1995. Naya Prokash, Calcutta, India.

Chadha KL, Reddy BMC & Shikhamany SD. 1998. Pineapple. ICAR, India

Edmond JB, Senn. TL, Andrews FS & Halfacre. RG. 1995. Fundamentals of Horticulture. Tata McGraw Hill Pub. New Delhi, Inida.

Georges, B., Jean, M K and Roy, M.S. 1991. The Physiology of Flowering. CRC Press, USA.

Janick J. 1963. Horticultural Science. W.H. Freeman and Co., U.S.A.

Levitt, J. 1972. Response of Plants to Environmental Stresses. Academic Press, NY.

Mondal, R.C. 1997. Cashew Production and Processing Technology. Agro Botanica. India.

Nagg, S. and P.E. Shaw. 1980. Tropical and Sub-tropical Fruits; Composition, Properties and Uses. USA.

Prashad, S. and U. Kumar. 1999. Principles of Horticulture. Agro Botanica, India.

Rao, KM. 1995. Textbook of Horticulture. Macmillan India Ltd.

Rao, VNM. 1998. Mango. ICAR, India.

Reddy GS & Murti VD. 1996. Citrus: Diseases and Their Control. ICAR, India.

Ryugo. K. 1988. Fruit Culture, its Science and Arts. John Wiley & Sons, NY.

Salaria AS. 1999. Horticulture at a Glance, Jain Bros. New Delhi, India.

Samson, J.A. 1986. Tropical Fruits. Longman Group UK Ltd.

Singh RN. 1996. Mango, ICAR, India.

Singh, A. 1986. Fruit Physiology and Production. New Delhi, India.

Srivastava, RP. 1997. Management of Mango. Intl. Book Distribution Co. UP, India.

Srivastava, RP. 1997. Mango: Insect Pest Management. Intl. Book Distribution Co. UP, India.

Wilkins, M.B. 1989. Advanced Plant Physiology. Longman UK Ltd.

Department of Horticulture
Patuakhali Science and Technology University
Course Title: Advanced Vegetable Production
Course Code: HRT 5202, Credit Hours: 2
Semester: July-December, Lectures: 32
Marks: 100 (Class Tests: 20+20; Assignments: 20; Final Examination: 40)

Ecophysiology of vegetable crops: Effects of temperature, light, air, water and soil on the productivity of vegetable crops. Production of the following vegetables in relation to environmental factors: potato, sweet potato, carrot, tomato, brinjal, cole crops, cucurbits, beans, onion, radish, lady's finger and leafy vegetables.

Nutrition of vegetable crops: Deficiency symptom and nutrient requirements of roots, fruit and leafy vegetables. Organic farming, nutrient film technique in vegetable production.

Stress physiology of vegetable crops: Water, salinity, temperature, radiation, gaseous toxicity and ionic toxicity affecting vegetable production and their remedies.

Production and storage of vegetable seeds: Factors affecting production of quality seed in the field, irrigations and fertilizer requirement of vegetable seed crop, factors influencing seeds in storage. Methods of seed storage.

Special vegetable production systems: Protective cropping system, hydroponics and off-season vegetable production.

Intensification and diversification of vegetable crops: Concept, advantages and disadvantages of planning and adaptation of the systems of intercropping, mixed cropping, multiple cropping and relay cropping in vegetables.

Production of minor vegetable crops: Scope, climatic requirement and production practices of mushroom, *Dioscorea* (yam), sweet corn, asparagus, red sorrel, drum stick, french bean, vegetable soybean, kohlrabi.

Pest and disease management of vegetable crops: Important insects and diseases, their symptoms and control measures.

Books Recommended:

Agarwal, R.L. 1980. Seed Technology. Oxford and IBH Publishers, Delhi.

Anonymous, 1995. Vegetable and Spice Production, Hort. Res. and Dev. Project. FAO/UNDP/ADP Project No. BGD/87 025.

Audus, L.J. 1963. Plant Growth Substances. Interscience Pub. Co., New York.

Bose, T.K. and M.G. Som. 1990.Vegetable Crops in India. Naya Prokash, Calcutta, India.

Briggs, F.N. and P.F. Knowles. 1967. Introduction to Plant Breeding. Reinhold Pub. Co., USA.

Copeland, L.O. 1976. Principles of Seed Science and Technology. Burgen Publishing Company Minneapolis, Minnesota, U.S.A.

Mitra, S,K., T.K. Bose and M.K. Sadhu 1990. Nutrition of Vegetable Crops. Naya Prokash, Calcatta, India.

Rashid, M.M. 1999. Sabji biggan (2nd Edition). 94, Rashid Pub. House, Old DOHS, Banani, Dhaka-1206.

Salunkhe, D.K.; B.B. Desai and N.R.Bhatt. 1988. Vegetable and Flower Seed Production. Agricole Publishing Academy, New Delhi. India.

Sanmugavelu, K.G. 1989. Production Technology of Vegetable Crops. Oxford & IBH Publishing Co., Pvt. Ltd. New Delhi.

Shanmugavelu, K.G.1989. Production Technology of Vegetable Crops. Oxford and IBH Pub. Co. Pvt. Ltd. New Delhi, India

Sharfuddin, A.F.M. and M.A. Siddique. 1985. Shabji Biggan. Mrs. Hasina Akhter Beauty. E-26/2, Staff Qrt., BAU, Mymensingh.

Tindal, H.D. 1988. Vegetables in the Tropics. McMillan Edn. Ltd. UK.

Department of Horticulture
Patuakhali Science and Technology University
Course Title: Advanced Research Methodology
Course Code: HRT 5203, Credit Hours: 2
Semester: July-December, Lectures: 32
Marks: 100 (Class Tests: 20+20; Assignments: 20; Final Examination: 40)

Identification and prioritisation of researchable problems: Guidelines, planning and development of horticultural research projects and their evaluation.

Research procedures and statistical analysis of horticultural crops:

a) Field plot techniques
b) Design of experiments and analysis of data
c) Comparison among means
d) Correlation and regression analyses

Presentation and interpretation of experimental results:

Scientific report writing
a) Types of scientific reports
b) Contents of scientific reports
c) Techniques of presentation

Horticultural Research in Bangladesh: Horticultural research and development systems in different organisations of Bangladesh, including visit of activities of the organisations.

Research coordination through public private partnership

Books Recommended:

Anonymous. 1977. A Handbook for Research Report Writing. College of Education, Univ. of the Philippines. 93.p.

Anonymous. 1964. Style Manual for Biological Journals. American Institute of Biological Sciences, Washington, D.C.117 p.

Gomez, K.A. and A.A. Gomez. 1984. Statistical Procedures for Agricultural Research. (2nd Ed.), John Wiley & Sons, New York. 680 p.

Little, T.M. and F.J. Hills. 1978. Agricultural Experimentation: Design and Analysis. John Wiley and Sons, New York. 350 p.

Siddique, M.A. 1985. Practical Aspects of Thesis Writing. Mrs. Hena Siddique, BAU, Mymensingh. 36 p.

Steel, R.G.D. and J. H. Torrie. 1960. Principles and Procedures of Statistics with Special Reference to the Biological Sciences. McGraw Hill Book Co., Inc., New York.

Zaman, S.M.H.; K. Rahim and M. Howladar. 1982. Simple Lesson from Biometry. Bangladesh Rice Research Institute, Joydebpur, Dhaka.

Department of Horticulture
Patuakhali Science and Technology University
Course Title: Ornamental and Landscape Horticulture
Course Code: HRT 5204, Credit Hours: 2
Semester: July-December, Lectures: 32
Marks: 100 (Class Tests: 20+20; Assignments: 20; Final Examination: 40)

Production and management of flowers & ornamental plants: Ecophysiology and commercial production of roses, chrysanthemum, carnation, dahlia, tuberose, gladiolus, marigold, orchids, and cacti.

Cut flower management: Harvesting, selection and arrangement of flowers. Post harvest changes in cut flowers, their handling and marketing. Techniques of dry flower preparation

Special structures of ornamental plants: Arches, pergolas, bonsai, topiary and ikebana.

Turf management: Development and maintenance of lawn.

Landscape management: Planning, design and management of a landscape. Ecological principles applied to the design and management of a landscape with reference to tropical environment. Landscape management in relation to recreation, reclamation, social forestry, arboriculture and nature conservation.

Ornamental Plants and horticultural therapy

Exhibition of ornamental plants: Preparation and management for flower show and garden competition.

Books Recommended:

Bose, T. K. and L. P. Yadav. 1989. Commercial Flowers. Naya Prakash. Calcutta. India.

Bose, T.K. Tropical Garden Plants. Naya Prokash, Calcutta, India

Grindal, E.W. 1960. Everyday Gardening in India. D. A. Tara, Porevala Sons & Co. Bombay.

Hartler, A. N. 1962. The Garden in the Plains. Oxford University Press, London.

Kuck and Tongg. 1960. The Modern Tropical Garden. Tongg Pub. Co., Honolulu, Hawai, USA.

Laurie, A. D. C. Kiplinger and K. S. Nelson. 1979. Commercial Flower Forcing. McGraw Hill Co., New York.

Rashid, M.M. 1990. Cultivation of Flowers (in Bangla). Bangla Academy, Dhaka.

Stuart O. and H. Raymore. 1962. Colour and Design for Every Garden. M Barrows and Company.

Department of Horticulture
Patuakhali Science and Technology University
Course Title: Horticultural Plant Biotechnology
Course Code: HRT 5205, Credit Hours: 2
Semester: July-December, Lectures: 32
Marks: 100 (Class Tests: 20+20; Assignments: 20; Final Examination: 40)

Introduction to biotechnology: Importance, prospects, possibilities and limitations of biotechnology in horticulture

Laboratory facilities and culture media: Basic organization and facilities, asepsis, controlled environment, media composition, growth regulators.

Plant regeneration: Tissue differentiation, cytodifferentiation, organogenesis, somatic embrygenesis. Regeneration of potato, papaya, banana, orchid, Allium, thuja, and other important horticultural crops.

Different tissue culture techniques: Micropropagation**, a**nther, pollen, ovule, ovary culture; production and utilization of haploid in vegetable crops. Embryo culture of orchid and embryo rescue of cruciferous vegetables. Virus elimination and clean seed production of potato, sweet potato, yam, ginger, turmeric and other vegetatively propagated crops.

Somatic hybridization: Isolation and culture of protoplast, somatic and cytoplasmic hybridization in potato, papaya, cruciferous vegetables.

Genetic engineering for horticultural Crops: Cloning vehicles and strategies, restriction, digestion, ligation, genomic and cDNA library screening, isolation of genomic DNA and RNA from papaya, potato, tomato, plasmid DNA isolation, DNA sequencing. Use of DNA markers viz. RFLP, AFLP and RAPD in vegetables and fruits for genomic analysis. Gene transfer techniques and its detection through molecular techniques (Southern, Northern and Western blotting and PCR) and bioassay. Transfer of Bt, virus resistant and salinity and drought tolerant genes in papaya, potato, tomato, brinjal, okra and other important horticultural crops.

Books Recommended:

Bajaj, Y.P.S. 1986. Biotechnology in Agriculture and Forestry. Martinus Nijhof Pub., The Netherlands.

Bilgrami, K.S. and A.R. Pandey. 1992. Introduction to Biotechnology. CBS Publishers and Distributors, New Delhi.

De, K.K. 1992. An Introduction to Plant Tissue Culture. New Central Book Agency, Calcutta.

Gamborg O.L and G.C. Phillips. 1995. Plant Cell Tissue and Organ culture Fundamental Methods. Springer Verlag Berlin Heidelberg.

Gatechouse A.M.R., V.A. Hider and D. Boulter. 1992. Plant Genetic Manipulation for Crop Improvement. CAB International, UK.

George, E.F. and P.D. Sherrington. 1994. Plant Progatation by Tissue culture. Exegetics Limited, UK.

Gupta, P.K. 1998. Elements of Biotechnology. Rastogi Publications, Shivaji Rd. Menul.

Hammerschlag, F.A. and R.E. Litz. 1992. Biotechnology of Perennial Fruit Crops. CAB International, UK.

Mantell, S.H., Z.A. Matthews and R.A. Mckee. 1985. Principles of Plant Biotechnology. An introduction to Genetic Engineering in Plants. Blackwell Scientific Publications UK.

Reinert, J. and Y.P.S. Bajaj 1992. Applied and Fundamental Aspects of Plant Cell, Tissue and Organ Culture. Narosa Publishing House, New Delhi.

R.L.M Pierik. 1997. *In vitro* Cultre of Higher plants. Kluwer Academic publisher The Netherland.

Sambrook J, E.F. Fritsch and T. Manbalis. 1989. Molecular Cloning A Laboratory Manual. Cold Spring Tharbor Lab. Press, USA.

Department of Horticulture
Patuakhali Science and Technology University
Course Title: Advanced Nursery Management
Course Code: HRT 5206, Credit Hours: 2
Semester: July-December, Lectures: 32
Marks: 100 (Class Tests: 20+20; Assignments: 20; Final Examination: 40)

Structures of a modern nursery: Establishment and management of modern nursery structures- greenhouse, lath house, hotbed, cold frame, storehouse, packinghouse, net house, mist house, orchid house, fernery and rosary; microclimatic manipulations in the nursery structures.

Environmental manipulations in the nursery: Soil, light, water, temperature, humidity, gases, mineral nutrients; hydroponics and closed-case propagation systems.

Management of nursery beds and container plants: Raising of nursery plants; media and containers used for growing nursery plants. Management of nursery beds and container plants.

Collection and management of stock plants: Collection and maintenance of new clones and disease free clones.

Nursery practices: Propagation practices; modern grafting techniques. Methods of handling recalcitrant seeds. Post propagation cares of different nursery plants.

Transportation and marketing: Preparation, care and handling of nursery plant materials for transportation and marketing.

Use of growth regulators in the nursery: Use of growth regulators in plant propagation practices.

Books Recommended

Boodley, J.W. 1981. The Commercial Greenhouse Handbook. New York; USA.

Bunt, A.C. 1988. Media and Mixes for Container Grown Plants. (2nd Ed.). G. Allen & Unwin, London.

Davidson, H.,R. Meckienburg, and C. Peterson, 1994. Nursery management: Administration and Culture (3rd ed.). Englewood Cliffs, N.J. Prentice-Hall.

Hartmann, H.T., D.E. Kester, F.T. Davies and R.L. Geneve. 1997. Plant Propagation, Principles and Practices (6th Ed). Prentice-Hall of India Pvt. Ltd. New Delhi.

Landis, T.D., R.W. Tinus, S.E. Mcdonald, and J.P. Barnett. 1989. Seedling Nutrition and Irrigation: The Container Tree Nursery Manual Vol.4 Agril. Handbook. 674. Washington DC, USDA.

Landis, T.D., R.W. Tinus, S.E. Mcdonald, and J.P. Barnett. 1990. The Biological Component: Nursery Pests and Mycorrhizae Vol. 5 Agril. Handbk. 674. Washington DC, USDA.

Landis, T.D., R.W. Tinus, S.E. Mcdonald, and J.P. Barnett. 1995. Nursery Planning, Development and Management, Vol. 1 Agril. Handbk. 674. Washington DC, USDA.

Sandini, M.G. 1995. Training Manual of Plant Propagation and Nursery Management. HRD Project & DAE Khamarbari, Dhaka.

Mondal, M.F. 2000. Nursery and Plant Propagation.(in Bangla). Published by Mrs. Afia Mondal. BAU Campus Mymensingh.

Nelson, P.V. 1991. Greenhouse Operation and Management (4th Ed.) Englewood Cliffs, N.J. Prentice-Hall.

Department of Horticulture
Patuakhali Science and Technology University
Course Title: Minor Fruits of Bangladesh
Course Code: HRT 5207, Credit Hours: 2
Semester: July-December, Lectures: 32
Marks: 100 (Class Tests: 20+20; Assignments: 20; Final Examination: 40)

Introduction: Importance, present status and scope for improvement of minor fruits in Bangladesh.

Problems Associated with Growing Minor Fruits and Necessary Solutions to Overcome Them: Socio-economic problems, environmental problems, lack of govt. policy, and stress problems. Maintenance and conservation of minor fruit germplasms.

Production Method of Some Minor Fruits: Nutritional value, uses, variety, propagation, nutritional and environmental requirement, and cultural, pest and disease management of the following minor fruits.

Hogpalm, bael, sapota, monkey jack, wood apple, indian velvet, black berry, indian gooseberry, rose apple, palmyara palm, date palm, carambola, indian olive, tamarind, indian dillenia, pomegranate.

Post-Harvest Management of Minor Fruits: Handling, cleaning, packaging, processing, storage, transporting and marketing.

Books Recommended:

Bose, T.K. and S.K. Mitra. 1990. Fruits: Tropical and Subtropical. Naya Prokash, Calcutta, India.

Bose, T.K. Mineral Nutrition of Fruit Crops. 1995. Naya Prokash, Calcutta, India.

Edmond JB, Senn. TL, Andrews FS & Halfacre. RG. 1995. Fundamentals of Horticulture. Tata McGraw Hill Pub. New Delhi, Inida.

Georges, B., Jean, M K and Roy, M.S. 1991. The Physiology of Flowering. CRC Press, USA.

Janick J. 1963. Horticultural Science. W.H. Freeman and Co., U.S.A.

Levitt, J. 1972. Response of Plants to Environmental Stresses. Academic Press, NY.

Nagg, S. and P.E. Shaw. 1980. Tropical and Sub-tropical Fruits; Composition, Properties and Uses. USA.

Prashad, S. and U. Kumar. 1999. Principles of Horticulture. Agro Botanica, India.

Rao, KM. 1995. Textbook of Horticulture. Macmillan India Ltd.

Ryugo. K. 1988. Fruit Culture, its Science and Arts. John Wiley & Sons, NY.

Salaria AS. 1999. Horticulture at a Glance, Jain Bros. New Delhi, India.

Samson, J.A. 1986. Tropical Fruits. Longman Group UK Ltd.

Singh, A. 1986. Fruit Physiology and Production. New Delhi, India.

Wilkins, M.B. 1989. Advanced Plant Physiology. Longman UK Ltd.

Department of Horticulture
Patuakhali Science and Technology University
Course Title: Processing of Horticultural Crops
Course Code: HRT 5208, Credit Hours: 2
Semester: July-December, Lectures: 32
Marks: 100 (Class Tests: 20+20; Assignments: 20; Final Examination: 40)

Introduction: Present status and postharvest losses of horticultural crops. Postharvest deterioration knowledge in Bangladesh. Role of processing in our national economy.

Improvement of: (i) Fundamental Principles (ii) Basic Processing and (iii) Preservation Techniques and product development.

Different Types of Processing Tools and Equipments: Structure, uses, and benefits. Processing of the following export oriented horticultural commodities-

i. Flowers- orchid, rose, tuberose, gladiolus, marigold, chrysanthemum, carnation
ii. Fruits- mango, pineapple, banana, papaya, jackfruit, coconut, litchi, water melon
iii. Vegetables- mushroom, winter and summer vegetables, aroid, lettuce
iv. Spices & Medicinal Plants- ginger, turmeric, onion, garlic, black pepper, neem, aloe Vera
v. Plantation Crops- tea, rubber, betel leaf

Pre and Post-harvest Precautions should be Considered for Successful Processing of Horticultural Crops: Cultural factors, harvesting factors, handling, cleaning, grading, storing, transport and marketing.

Books Recommended:

Basu, B. D. 1980. Indian Medicinal Plants. Plates, Part IV, Bisen Singh, Mohendra

Bose, T. K. and L. P. Yadav. 1989. Commercial Flowers. Naya Prakash. Calcutta. India.

FAO. 1998. Fruits and Vegetable Processing. Intl. Book Distribution Co. UP, India.

Johnson. G.I. and E. Highley. 1994. Development of Postharvest Handling Technology for Tropical Fruits. ACIAR Australia.

Johnson. G.I. and E. Highley. 1994. Development of Technology for Extension of Shelf life of Tropical Fruits. ACIAR Australia.

Kader, A. 1992. Postharvest Technology. Pub. No. 3311. Univ. of California, Div. of Agriculture and Naturul Resources.

Lal G., Siddappa GS & Tandon GL. 1998. Preservation of Fruits and Vegetables. ICAR, India.

Opeke, L.K. 1982. Tropical Tree Crops. John Wiley and Sons. New York.

Pabtastucim E.B. 1975. Postharvest Physiology, Handling and Utilization of Tropical and Subtropical Fruits and Vegetables. AVI, Westport, USA

Pruthi, J.S. 1986. Spices and Condiments. National Book Trust, New Delhi, India.

Salunkhe, D. K. and B. D. Desai. 1984. Postharvest Biotechnology of Fruits. Vol. I & II CRC Press. Inc., Boca Raton, Florida.

Srivastava RP & Kumar S. 1998. Fruit and Vegetable preservation-Principles & Practices. Intl. Book Distribution Co. UP, India.