



Established by Govt. of Arunachal Pradesh vide Act 9 of 2012, the Arunachal University of Studies Act, 2012 Recognized as per u/s 2(f) of University Grants Commission Act, 1956
NH-52, Namsai, Arunachal Pradesh -792103

MASTER OF SCIENCE (HORTICULTURE- VEGETABLE SCIENCE) – THIRD SEMESTER

Third Semester			
S. No.	Name of Subject	Credits	Total Marks
1	Systematics of Vegetable Crops	5	100
2	Fundamentals of Processing of Vegetables	5	100
3	Research-III	9	100
4	Research Methodology	5	100
Total		24	

Subject Name: SYSTEMATICS OF VEGETABLE CROPS

UNIT I

Principles of classification; different methods of classification; salient features of international code of nomenclature of vegetable crops.

UNIT II

Origin, history, evolution and distribution of vegetable crops, botanical description of families, genera and species covering various tropical, subtropical and temperate vegetables.

UNIT III

Cytological level of various vegetable crops; descriptive keys for important vegetables.

UNIT IV

Importance of molecular markers in evolution of vegetable crops; molecular markers as an aid in characterization and taxonomy of vegetable crops.

Practical

Identification, description, classification and maintenance of vegetable species and varieties; survey, collection of allied species and genera locally available; preparation of keys to the species and varieties; methods of preparation of herbarium and specimens.

Suggested Readings

1. Chopra GL. 1968. Angiosperms - Systematics and Life Cycle. S. Nagin
2. Dutta AC. 1986. A Class Book of Botany. Oxford Univ. Press.
3. Pandey BP. 1999. Taxonomy of Angiosperm. S. Chand & Co.
4. Peter KV & Pradeepkumar T. 2008. Genetics and Breeding of Vegetables. (Revised), ICAR.
5. Soule J. 1985. Glossary for Horticultural Crops. John Wiley & Sons.
6. Srivastava U, Mahajan RK, Gangopadyay KK, Singh M & Dhillon BS. 2001. Minimal Descriptors of Agri-Horticultural Crops. Part-II: Vegetable Crops. NBPGR, New Delhi.
7. Vasistha. 1998. Taxonomy of Angiosperm. Kalyani.
8. Vincent ER & Yamaguchi M. 1997. World Vegetables. 2nd Ed. Chapman & Hall.

Subject Name: FUNDAMENTALS OF PROCESSING OF VEGETABLES

UNIT I

History of food preservation. Present status and future prospects of vegetable preservation industry in India.

UNIT II

Spoilage of fresh and processed horticultural produce; biochemical changes and enzymes associated with spoilage of horticultural produce; principal spoilage organisms, food poisoning and their control measures. Role of microorganisms in food preservation.

UNIT III

Raw materials for processing. Primary and minimal processing; processing equipments; Layout and establishment of processing industry, FPO licence. Importance of hygiene; Plant sanitation.

UNIT IV

Quality assurance and quality control, TQM, GMP. Food standards – FPO, PFA, etc. Food laws and regulations.

UNIT V

Food safety – Hazard analysis and critical control points (HACCP). Labeling and labeling act, nutrition labeling.

UNIT VI

Major value added products from vegetables. Utilization of byproducts of vegetable processing industry; Management of waste from processing factory.

UNIT VII

Investment analysis. Principles and methods of sensory evaluation of fresh and processed vegetables.

Practical

Study of machinery and equipments used in processing of horticultural produce; Chemical analysis for nutritive value of fresh and processed vegetables; Study of different types of spoilages in fresh as well as processed horticultural produce; Classification and identification of spoilage organisms; Study of biochemical changes and enzymes associated with spoilage; Laboratory examination of vegetable products; Sensory evaluation of fresh and processed vegetables; Study of food standards – National, international, CODEX Alimentarius; Visit to processing units to study the layout, equipments, hygiene, sanitation and residual / waste management.

Suggested Readings

1. Arthey D & Dennis C. 1996. Vegetable Processing. Blackie/Springer Verlag.
2. Chadha DS. 2006. The Prevention of Food Adulteration Act. Confed. of Indian Industry.
3. Desrosier NW. 1977. Elements and Technology. AVI Publ. Co.
4. FAO. 1997. Fruit and Vegetable Processing. FAO.
5. FAO. CODEX Alimentarius: Joint FAO/WHO Food Standards Programme. 2 nd Ed. Vol. VB. Tropical Fresh Fruits and Vegetables. FAO.
6. FAO. Food Quality and Safety Systems – Training Manual on Food Hygiene and HACCP. FAO.
7. Fellow's P. 1988. Food Processing Technology. Ellis Horwood International.
8. Frazier WC & Westhoff DC. 1995. Food Microbiology. 4th Ed. Tata McGraw Hill.
9. Giridharilal GS, Siddappa & Tandon GL. 1986. Preservation of Fruits and Vegetables. ICAR.
10. Gisela J. 1985. Sensory Evaluation of Food – Theory and Practices. Ellis Horwood.
11. Graham HD. 1980. Safety of Foods. AVI Publ. Co.

12. Hildegrade H & Lawless HT. 1997. Sensory Evaluation of Food. CBS. Joslyn M & Heid. Food Processing Operations. AVI Publ. Co.
13. Mahindru SN. 2004. Food Safety: Concepts and Reality. APH Publ. Corp.
14. Ranganna S. 1986. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. 2nd Ed. Tata-McGraw Hill.
15. Shapiro R. 1995. Nutrition Labeling Handbook. Marcel Dekker.
16. Srivastava RP & Kumar S. 2003. Fruit and Vegetable Preservation: Principles and Practices. 3rd Ed. International Book Distri. Co.
17. Tressler & Joslyn MA. 1971. Fruit and Vegetable Juice Processing Technology. AVI Publ. Co.
18. Verma LR & Joshi VK. 2000. Post-harvest Technology of Fruits and Vegetables: Handling, Processing, Fermentation and Waste Management. Indus Publ. Co.

Subject Name: RESEARCH-III

Subject Name: RESEARCH METHODOLOGY

UNIT I

Research – Meaning, importance, characteristics. Behavioural sciences research – Meaning, concept and problems in behavioural sciences research. Types and methods of Research – Fundamental, Applied and Action research, Exploratory, Descriptive, Diagnostic, Evaluation, Experimental, Analytical, Historical, Survey and Case Study. Review of literature – Need, Search Procedure, Sources of literature, Planning the review work. Research problem – Selection and Formulation of research problem and guiding principles in the choice of research problem, Factors and criteria in selection of research problem, statement of research problem and development of theoretical orientation of the research problem.

UNIT II

Objectives – Meaning, types and criteria for judging the objectives. Concept and Construct – Meaning, role of concepts in research and Conceptual frame work development in research. Variable – Meaning, types and their role in research. Definition – Meaning, characteristics of workable definitions, types and their role in research. Hypothesis – Meaning, importance and functions of hypothesis in research, Types of hypothesis, linkages, sources, problems in formulation and criteria for judging a workable hypothesis. Measurement – Meaning, postulates and levels of measurement, Use of appropriate statistics at different levels of measurement, criteria for judging the measuring instrument and importance of measurement in research. Validity – Meaning and methods of testing. Reliability – Meaning and methods of testing. Sampling – Universe, Sample and Sampling-Meaning, basis for sampling, advantages

and limitations, size and factors affecting the size of the sample and sampling errors – Methods of elimination and minimizing, Maximincon Principle, Sampling – Types of sampling and sampling procedures.

UNIT III

Research Designs – Meaning, purpose and criteria for research design, Types, advantages and limitations of each design. Experimental design – Advantages and limitations. Data Collection devices - Interview – Meaning, purpose, types, techniques of interviewing and advantages and limitations. Enquiry forms and Schedules – Meaning, types of questions used, steps in construction and advantages and limitations in its use. Questionnaires – Meaning, difference between schedule and questionnaire, types of questions to be used, pre – testing of the questionnaires or schedules and advantages and limitations. Check lists – Meaning, steps in construction, advantages and limitations in its use. Rating scales – Meaning, types, limits in construction, advantages and limitations in its use. Observation – Meaning, types, tips in observation, advantages and limitations in its use. Case studies – Meaning, types, steps in conducting, advantages and limitations in its use. Social survey – Meaning, objectives, types and steps in conducting, advantages and limitations.

UNIT IV

Data processing – Meaning, coding, preparation of master code sheet, analysis and tabulation of data, Statistical Package for Social Sciences (SPSS) choosing appropriate statistics for data analysis based on the level of measurement of variables. Report writing – Meaning, guidelines to be followed in scientific report writing, References in reporting.

Practical

Selection and formulation of research problem - Formulation of objectives and hypothesis- Selection of variables based on objectives-Developing the conceptual framework of research. Operationally defining the selected variablesDevelopment of data collection devices.-Testing the validity and reliability of the data collection instruments.- Pre-testing of the data collection instrument-Techniques of interviewing and collection of data using the data collection instruments-Data processing, hands on experiences on SPSS, coding, tabulation and analysis. Formulation of secondary tables based on objectives of research.Writing report, Writing of thesis and research articles-Presentation of reports.

Suggested Readings

1. Chandrakandan K, Venkatapirabu J, Sekar V & Anand Kumar V. 2000. Tests and Measurements in Social Research. APH Publ.
2. Kerlinger FN. 1973. Foundations of Behavioural Research. Holt Rhinehart. Kothari CR.1984. Research Methodology, Methods and Techniques.Chaitanya Publ. House.
3. Krishnaswami OR & Ranganatham M. 2005. Methodology of Research in Social Sciences. Himalaya Publ. House.
4. Mulay S & Sabaratnam VE.1983. Research Methods in Extension Education.Manasavan.
5. Ranjit Kumar. 1999. Research Methodology - A Step by Step Guide forBeginners. Sage Publ.
6. Ray GL & Sagar Mondal. 1999. Research methods in Social Sciences and Extension Education. Naya Prokash.
7. Wilkinson TS & Bhandarkar PC.1993. Methodology and Techniques of Social Research. Himalaya Publ.Home.