



Shri Vaishnav Vidyapeeth Vishwavidyalaya
Shri Vaishnav Institute of Agriculture, Indore
Ph.D. (Hort.) in Vegetable Science, I semester

Syllabus

Course Code	Course Name	TEACHING & EVALUATION SCHEME							
		Theory			Practical		Credits		
		END SEM University Exam	Mid term exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*	L	P	Total
PHDAS 101	Research Methodology	60	00	40	00	00	3	0	3

1. **Legends:** L - Lecture; P – Practical

2. *Teacher Assessment shall be based on following components: Quiz / Assignment / Project / Participation in Class.

A1. Research Methodology (PHDAS101)

Module 1: Introduction to Research Methods: Role and objectives of research, types of research and various research design (exploratory, descriptive, experimental and diagnostic research), research process: Overview, Problems encountered by researcher. Experimental research design will comprise of Completely Randomized Design, Latin Square Design and Factorial Design. Limitations of RM: Ethics in Research, Philosophical issues in Research.

Module 2: Data and their Collection: Collection, Organization, Presentation, Analysis and Interrelation of Primary and Secondary Data. Measurement in research, measurement scales, sources of errors in measurement, Techniques of developing measurement tools, classification and testing (reliability, verification and validity) scales, Designing questionnaires and interviews Sampling, Sampling Methods, Sampling Plans, Sampling Error, Sampling Distributions: Theory and Design of Sample Survey, Census Vs Sample Enumerations, Objectives and Principles of Sampling, Types of Sampling, Sampling and Non-Sampling Errors.

Module 3: Numerical Methods and Statistical Analysis Curve fitting (least square), solution of polynomial equation, numerical integration (Trapezoidal rule, Simpson's rule, Gaussian quadrature), solution of ordinary differential equations (Euler's method, Runge-Kutta method, predictor-corrector method), matrix multiplication, inversion and diagonalization.

References

- Kumar, R. (2006). Research Methodology-A Step- By- Step Guide for Beginners, Delhi: Pearson Education.
- Montgomery, D. C. (2007). Design & Analysis of Experiments. India: Wiley.
- Kothari, C. R. (2004). Research Methodology: Methods and Techniques. New Delhi: New Age International.

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PHDA 102	Review of literature	00	00	00	60	40	0	2	2

Legends: L - Lecture; P – Practical

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A.2. Review of Literature (PHDA102)

Course Overview: The objective of this course is to help the candidate to comprehend his/her broad field of research and be academically sound to carry out his research work. Understand the basic philosophical assumptions underlying research literature reviews for different purposes, including what, why, when, for whom, and how? Be able to manage the process of conducting a literature review, including reading, note taking strategies, coding/reference management, synthesizing and writing literature results. Be able to write a quality literature review with variations in references.

Examination Scheme:

The candidate is required to write a Review paper based on the review of literature on his/her area of research in consultation with his supervisor. The paper has to be evaluated and approved by the panel constituted by Faculty of Doctoral studies and Research besides the assignments.

Course Content

Module 1: Understanding Review of literature: Relevance, Approach and Applications; Developing an outline for the literature review; Formulate key questions for a review. Organizing a literature search: Identify which literature bases to search; Developing the theoretical basis for the Research Question; Searching for, locating and organizing relevant professional literature.

Module 2: Conducting the Review: Abstract relevant information from appropriate studies in a systematic manner; critically reviewing the literature; Rate the scientific quality of each study and the level of evidence for each question.

Module 3: Synthesizing the Review: Create evidence tables and summary tables; interpret the pattern of evidence in terms of strength and consistency; Summarize the studies' findings. Writing the review: Writing a first draft; Writing references and citations; Obtaining, giving, and making productive use of feedback; the redrafting process; Professional formatting.

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PHDA 103	Computer Applications	00	00	00	60	40	0	2	2

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A.3. Computer Applications (PHDA103)

Course Overview: The candidate should gain sufficient practical knowledge for use of computer and computer software for use in research work.

Examination Scheme:

The faculty member will award internal marks out of 40 based on the assignments and minor project. The end semester examination will be 60 marks with weightage of (online exams 40% + practical 60%)

Contents

Module 1: Basic knowledge of application software's in MS- Office with focus on MS Word- its features and applications related to presentation of text in decent format and saving the same for further use. The practical knowledge of this software should enable the candidate to type and prepare the thesis in a presentable format. MS-Excel- construction of worksheet and inserting data according to its characteristics, use of statistical tools and their presentation in the form of charts and graphs.

Module 2: Use of Internet for research work and exploring various websites and search engines for collecting quality literature review and secondary data etc. related to thesis work.

Module 3: MS- Power point – create power point presentation on a topic related to the theme of thesis and use of different presentation techniques. Use of SPSS – method of preparing data sheet and entering data according to its characteristics, use of various statistical tools on SPSS.

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PHDA 104	Research and Publication Ethics	60	00	40	00	00	2	0	2

1. **Legends:** L - Lecture; P – Practical

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A.4. Research and Publication Ethics (PHDA104)

Module 1: Philosophy and Ethics-Introduction to philosophy: definition, nature and scope, concept, branches. Ethics: definition, moral philosophy, nature of moral judgments and reactions. **Scientific Conduct**- Ethics with respect to science and research. Intellectual honesty and research integrity. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP). Redundant publications: duplicate and overlapping publications, salami slicing. Selective reporting and misrepresentation of data

Module 2: Publication Ethics-Publication ethics: Definition, introduction and importance. Best practices / standards setting initiatives and guidelines: COPE, WAME, etc. Conflicts of interest. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types. Violation of publication ethics, authorship and contributor ship. Identification of publication misconduct, complaints and appeals. Predatory publishers and journals. **Open Access Publishing**- Open access publications and initiatives. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies. Software tool to identify predatory publications developed by SPPU. Journal finder / journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggested, etc.

Module 3: Publication Misconduct, Group Discussions-Subject specific ethical issues, FFP, authorship. Conflicts of interest. Complaints and appeals: examples and fraud from India and abroad. Software tools- Use of plagiarism software like Turnitin, Urkund and Other Open-Source Software Tools. Data Bases and Research Metrics, Databases- Indexing databases Citation databases: Web of Science, Scopus, etc. Research Metrics- Impact Factor of journal as per Journal Citation Report, SNIP, SIR, IPP, Cite Score. Metrics: h-index, g index, i10 index, altimetric.

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PHDVSC 101: RECENT TRENDS IN VEGETABLE PRODUCTION (3+0)

Course code	Course Name	TEACHING & EVALUATION SCHEME							
		THEORY			PRACTICAL		L	P	CREDITS
		End Sem University Exam	Mid Term Exam	Teachers Assessment*	End Sem University Exam	Teacher's Assessment*			
PHDVSC 101	Recent Trends in Vegetable Production	60	00	40	00	00	3	0	3

Legends: L - Lecture; P – Practical;

*Teacher Assessment shall be based on following components: Quiz / Assignment / Project / Participation in Class etc.

Objective

To keep abreast with latest developments and trends in production technology of vegetable crops.

Theory

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

Suggested Readings

- Bose TK and Som NG. 1986. Vegetable crops of India. Naya Prakash.
- Bose TK, Kabir J, Maity TK, Parthasarathy VA and Som MG. 2003. Vegetable crops. Vols. I & III. Naya Udyog.
- Brewster JL. 1994. Onions and other vegetable alliums. CABI.
- Chadha KL and Kalloo G (Eds.). 1993-94. Advances in horticulture Vols. V-X. Malhotra Publ. House.



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- Chadha KL (Ed.). 2002. Handbook of horticulture, ICAR.
- Chauhan DVS (Ed.). 1986. Vegetable production in India. Ram prasad and Sons.
- Fageria MS, Choudhary BR and Dhaka RS. 2000. Vegetable crops: production technology. Vol. II. Kalyani.
- FFTC. Improved vegetable production in Asia. Book Series No. 36.
- Ghosh SP, Ramanujam T, Jos JS, Moorthy SN and Nair RG. 1988. Tuber crops. Oxford and IBH.
- Gopalakrishanan TR. 2007. Vegetable crops. New India Publ. Agency.
- Hazra P and Som MG. 2015. Seed production and hybrid technology of vegetable crops. Kalyani publishers, Ludhiana.
- Hazra P. 2016. Vegetable science. 2nd edn, Kalyani publishers, Ludhiana.
- Hazra P. 2019. Vegetable production and technology. New India publishing agency, New Delhi.
- Kallo G and Singh K. (Ed.). 2001. Emerging scenario in vegetable research and development. Research periodicals and Book Publ. House.
- Kurup GT, Palanisami MS, Potty VP, Padmaja G, Kabeerathuma S and Pallai SV. 1996. Tropical tuber crops, problems, prospects and future strategies. Oxford and IBH.
- Rana MK. 2008. Olericulture in India. Kalyani Publishers, New Delhi.
- Rana MK. 2008. Scientific cultivation of vegetables. Kalyani Publishers, New Delhi.
- Rubatzky VE and Yamaguchi M. (Eds.). 1997. World vegetables: principles, production and nutritive values. Chapman and Hall.
- Saini GS. 2001. A Textbook of oleri and flori culture. Aman Publishing House.
- Salunkhe DK and Kadam SS. (Ed.). 1998. Handbook of vegetable science and technology: production, composition, storage and processing. Marcel Dekker.
- Shanmugavelu KG. 1989. Production technology of vegetable crops. Oxford and IBH.
- Sin MT and Onwueme IC. 1978. The tropical tuber crops. John Wiley and Sons.
- Singh DK. 2007. Modern vegetable varieties and production technology. International book distributing Co.
- Singh NP, Bhardwaj AK, Kumar A and Singh KM. 2004. Modern technology on Vegetable production. International book distr. Co.
- Singh PK, Dasgupta SK and Tripathi SK. 2006. Hybrid vegetable development. International book distr. Co.
- Singh SP. (Ed.). 1989. Production technology of vegetable crops. Agril. Comm. Res. Centre.
- Thamburaj S and Singh N. (Eds.). 2004. Vegetables, tuber crops and spices. ICAR.
- Thompson HC and Kelly WC. (Eds.). 1978. Vegetable crops. Tata McGraw-Hill.

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PHDVSC102: ADVANCES IN BREEDING OF VEGETABLE CROPS (3+0)

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		THEORY			PRACTICAL		L	P	CREDITS
		End Sem University Exam	Mid Term Exam	Teachers Assessment*	End Sem University Exam	Teacher's Assessment*			
PHDVSC 102	Advances in Breeding of Vegetable Crops	60	00	40	00	00	3	0	3

Legends: L - Lecture; **P** – Practical;

*Teacher Assessment shall be based on following components: Quiz / Assignment / Project / Participation in Class etc.

Objective

To impart knowledge on the recent research trends and advances in breeding of vegetable crops.

Theory

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 and Lettuce

UNIT IV

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

UNIT V

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

Suggested Readings

- Allard RW. 1999. Principle of plant breeding. John Willey and Sons, USA.
- Basset MJ. (Ed.). 1986. Breeding vegetable crops. AVI Publ.
- Dhillon BS, Tyagi RK, Saxena S and Randhawa GJ. 2005. Plant genetic resources: horticultural crops. Narosa Publ. House.
- Fageria MS, Arya PS and Choudhary AK. 2000. Vegetable crops: Breeding and seed production. Vol. I. Kalyani.
- Gardner EJ. 1975. Principles of genetics. John Wiley and Sons.



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- Hayes HK, Immer FR and Smith DC. 1955. Methods of plant breeding. McGraw-Hill.
- Hayward MD, Bosemark NO and Romagosa I. (Eds.). 1993. Plant Breeding-principles and prospects. Chapman and Hall.
- Hazra P and Som MG. 2015. Vegetable science (Second revised edition), Kalyani publishers, Ludhiana, 598 p
- Hazra P and Som MG. 2016. Vegetable seed production and hybrid technology (Second revised edition), Kalyani Publishers, Ludhiana, 459 p
- Kalloo G. 1988. Vegetable breeding (Vol. I, II, III). CRC Press, FI, USA.
- Kalloo G. 1998. Vegetable breeding. Vols. I-III (Combined Ed.). Panima Edu. Book Agency.
- Kumar JC and Dhaliwal MS. 1990. Techniques of developing hybrids in vegetable crops. Agro Botanical Publ.
- Paroda RS and Kalloo G. (Eds.). 1995. Vegetable research with special reference to hybrid technology in Asia-Pacific Region. FAO.
- Peter KV and Pradeepkumar T. 2008. Genetics and breeding of vegetables. Revised, ICAR.
- Peter KV and Hazra P. (Eds). 2012. Hand book of vegetables. Studium press LLC, P.O. Box 722200, Houston, Texas 77072, USA, 678p.
- Peter KV and Hazra P. (Eds). 2015. Hand book of vegetables Volume II. Studium Press LLC, P.O. Box 722200, Houston, Texas 77072, USA, 509p.
- Peter KV and Hazra P. (Eds). 2015. Hand book of vegetables Volume III. Studium Press LLC, P.O. Box 722200, Houston, Texas 77072, USA, 634p.
- Rai N and Rai M. 2006. Heterosis breeding in vegetable crops. New India Publ. Agency.
- Ram HH. 1998. Vegetable breeding: principles and practices. Kalyani Publishers, New Delhi.
- Simmonds NW. 1978. Principles of crop improvement. Longman. Singh BD. 1983. Plant Breeding. Kalyani Publishers, New Delhi.
- Singh BD. 1983. Plant breeding. Kalyani Publishers, New Delhi.
- Singh PK, Dasgupta SK and Tripathi SK. 2004. Hybrid vegetable development. International Book Distributing Co.
- Swarup V. 1976. Breeding procedure for cross-pollinated vegetable crops. ICAR.

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PHDFSC103: Arid and Dryland Fruit Production (2+0)

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		THEORY			THEORY		L	P	CREDITS
		End Sem University Exam	Mid Term Exam	Teachers Assessment*	End Sem University Exam	Teacher's Assessment*			
PHDFSC 103	Arid and Dryland Fruit Production	60	00	40	00	00	2	0	2

Legends: L - Lecture; P – Practical;

*Teacher Assessment shall be based on following components: Quiz / Assignment / Project / Participation in Class etc.

Objective

To keep abreast with latest developments and trends in production technology of arid and dryland fruit crops.

Theory

Unit I:

General Concepts and Current Scenario: Characteristics features and major constraints of the arid and dryland region, distinguishing features of the fruit species trees for adaptation in adapting to the region.

Unit II

Nutritional and pharmaceutical importance, national problems

Unit III

Propagation, Planting Systems and Crop Regulation: Recent advances in propagation – root stocks, planting systems, High density planting, crop modelling, Precision farming, decision support systems.

Unit IV:

Aspects of crop regulation- physical and chemical regulation, effects on physiology and development, influence of stress factors.

Unit V:

Stress Mitigation and Integrated Approaches: Strategies to overcome stress effects, integrated and modern approaches in water and nutrient management, total quality management (TQM) – Current topics.



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Crops

Aonla, Annonas, ber, bael, jamun, date palm, cactus pear, khejri, kair, pilu, lasoda, manila, tamarind, monkey jack, mahua, khirni, amra, seabuckthorn, chilgoza, cafel, rhododendron, box myrtle, chironji, phalsa,

Suggested Reading

Hiwale S. 2015. *Sustainable Horticulture in Semiarid Drylands*. Springer.

Krishna H and Sharma RR. 2017. *Fruit Production – Minor Fruits*. Daya Publishing House, Delhi.

More T A, Singh RS, Bhargava R and Sharma BD. 2012. *Arid Horticulture for Nutrition and Livelihood*. Agrotech Publishing Academy, Udaipur (Rajasthan).

Pareek OP, Sharma S and Arora RK. 2007. *Underutilised Edible Fruits and Nuts*, IPGRI, Rome.

Peter K.V. 2010. *Underutilized and Underexploited Horticultural Crops*. NIPA, New Delhi.

Saroj PL, Dhandar DG and Vashishta BB. 2004. *Advances in Arid Horticulture, Vol.-1 Present Status*. IBDC, Lucknow.

Saroj P L and Awasthi OP. 2005. *Advances in Arid Horticulture, Vol: II: Production Technology of Arid and Semiarid Fruits*. IBDC, Lucknow.

Sontakke MB. 2014. *Production and Management of Fruit crops in Arid/ Drylands*. Agrotech Publishing Academy, Udaipur (Rajasthan).

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