

**Lecture Schedule including Practical**  
**“Molecular breeding for higher productivity, quality, food colorants, nutraceutical and bioactive health compounds in vegetable crops”**  
**(February 13 to March 05, 2018)**

**Course Director: Dr. T. K. Behera, Professor, Div. of Vegetable Science, IARI, New Delhi**  
**Course Coordinator: Dr. Shrawan Singh, Scientist, Div. of Vegetable Science, IARI, New Delhi**

|       | <b>Date</b>  | <b>Time</b>                              | <b>Topic</b>  | <b>Resource Persons</b>  |  |
|-------|--|--|---|--|--|
| Day-1 | 13.02.2018<br>(Tuesday)                                | 9.30-10.30: Registration of participants |   |  |  |
|       |  | 10.30 – 11.30<br>(L)                     | Vegetable crop genetic resources and their relevance to trait specific molecular breeding           | Dr. Kuldeep Singh, Director, ICAR-NBPGR, New Delhi-110012  |  |
|       |  | 11.30-11.45                              | Tea break   |  |  |
|       |  | 11.45-13.00 (L)                          | Nutraceutical and bioactive health compounds in vegetable crops                                     | Dr. P. Kalia, Emeritus Scientist & Former Head, Division of Vegetable Science, IARI              |  |
|       |  | 13.00- 14.00: Lunch                      |   |  |  |
|       |  | 14.00-15.00 (L)                          | Inauguration  | Chief Guest Dr. A. K. Singh, DDG(Hort. Sciences), ICAR, New Delhi                                |  |
|       |  | 15.00-15.30                              | High Tea  |  |  |
|       |  | 15.30-16.30                              | Interaction with scientists of the Division of Vegetable Science, IARI, New Delhi                   | Dr. T. K. Behera, Professor, Division of Vegetable Science, IARI                                 |  |
| Day-2 | 14. 2.2018 (Wednesday): Mahashivratri (public holiday) |  |   |  |  |
| Day-3 | 15. 2.2018<br>(Thursday)                               | 10.00-11.15 (L)                          | An overview of vegetable research at IARI   | Dr. B. S. Tomar, Head, Division of Vegetable Science, IARI                                       |  |
|       |  | 11.15-11.30                              | Tea Break   |  |  |
|       |  | 11.30-13.00 (L)                          | National perspective on micro-nutrients deficiencies and their impact on health and productivity    | Dr. Kapil Yadav, MBBS, MD, Associate Professor, Centre for Community Medicine, AIIMS, New Delhi  |  |
|       |  | 13.00-14.00                              | Lunch Break   |  |  |
|       |  | 14.00-16.30 (P)                          | Hands on practice for DNA extraction in plant samples   | Dr. Gograj Singh, Mr. Boopalakrishnan and Dr. Shrawan Singh, Division of Vegetable Science, IARI |  |
| Day-4 | 16. 2.2018<br>(Friday)                                 | 10.00-11.15 (L)                          | Recent approaches for breeding vegetable crops for quality and rich in nutrients and nutraceuticals | Dr. T. K. Behera, Professor, Division of Vegetable Science, IARI                                 |  |
|       |  | 11.15 -11.30                             | Tea Break   |  |  |
|       |  | 11.30 -13.00 (L)                         | Quality enrichment in sweet corn through marker assisted selection                                  | Dr. Firoz Hossain, Senior Scientist, Div. of Genetics, IARI                                      |  |
|       |  | 13.00-14.00                              | Lunch Break   |  |  |
|       |  | 14.00-16.30 (P)                          | Hands on experience in molecular marker analysis in vegetable crops                                 | Dr. T. K. Behera and Dr. G. S. Jat, Div. of Vegetable Science, IARI                              |  |
| Day-5 | 17. 2.2018<br>(Saturday)                               | 10.00-11.15 (L)                          | Recent breeding approaches for productivity and quality improvement in onion and garlic             | Dr Anil Khar, Principal Scientist, Division of Vegetable Science, IARI                           |  |

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|        |                        | 11.15-11.30     | Tea Break  |   |
|        |                        | 11.30-13.00 (L) | Compositional data of vegetables and their importance in human diet and breeding                             | Dr. K. Bhaskarachary, Dy. Director/Scientist E and National Executive Member, Nutrition Society of India, Food Chemistry Division, National Institute of Nutrition (NIN), Jamiaosmania, Hyderabad, 500007 |
|        |                        | 13.00-14.00     | Lunch Break  |   |
|        |                        | 14.00-16.30 (P) | Crossing and selfing techniques and maintenance of CMS and SI lines in Brassica vegetable crops              | Dr. Shrawan Singh and Dr. B. B. Sharma, Scientists, Dr. P. Muthukumar, Div. of Vegetable Science, IARI  |
| Day-6  | 18. 2.2018             | Sunday          |  |   |
| Day-7  | 19.02.2018 (Monday)    | 9.00 -10.45 (L) | Nutrition security in India - the way forward  | T. Longvah, Scientist 'G' & Director Incharge, NIN, Hyderabad   |
|        |                        | 11.45 -11.00    | Tea Break  |   |
|        |                        | 11.00-13.00(L)  | Tomato Genomics: Present status and future prospects in improving productivity and nutritional traits        | Dr. N. K. Singh, National Professor & Project Director, NRCPB ,New Delhi  |
|        |                        | 13.00-14.00     | Lunch Break  |   |
|        |                        | 14.00-16.30 (P) | Hands on experience for pesticide residue analysis in vegetable crops  | Dr. K. K. Sharma, Network Coordinator ( AINP on Pesticide Residues), Dr. (Ms.) Vandana Tripathy Sr. Scientist, Div. of Agricultural Chemicals, IARI   |
| Day-8  | 20.02.2018 (Tuesday)   | 10.00-13.00 (P) | Visit at NBPGR bank and interaction with scientists dealing with conservation of vegetable genetic resources | Dr. Chitra Pandey, NBPGR, New Delhi and Dr. Shrawan Singh, Scientist, Division of Vegetable Science, IARI, New Delhi  |
|        |                        | 13.00-14.00     | Lunch Break  |   |
|        |                        | 14.00-16.30 (P) | Extraction and HPLC analysis of pigments (anthocyanin and lycopene) from vegetable samples                   | Dr. Supradip Saha, Sr. Scientist, Div. of Agric. Chemicals & Dr. Angel, Scientist, Div. Vegetable Science   |
| Day-9  | 21.02.2018 (Wednesday) | 10.00-11.15 (L) | DNA finger printing for vegetable crop improvement   | Dr. Ambika B. Gaikwad, Principal Scientist, NBPGR, New Delhi  |
|        |                        | 11.15-11.30     | Tea Break  |   |
|        |                        | 11.30-13.00 (L) | Recent advancements in molecular markers and their use in plant breeding                                     | Dr. A. K. Singh, Head, Division of Genetics, IARI   |
|        |                        | 13.00-14.00     | Lunch Break  |   |
|        |                        | 14.00-15.30 (L) | Peptide signaling transduction in Solanaceous vegetables (followed by lab visit)                             | Dr. R. C. Bhattacharya Professor & Principal Scientist, NRCPB, New Delhi  |
|        |                        | 15.30-16.30     | Participation in Mushroom day in Division of Vegetable Science, IARI   | -   |
| Day-10 | 22.02.2018 (Thursday)  | 10.00-12.00 (P) | Hands on practice for estimation of antioxidants and food colorants in vegetable crops using                 | Drs. Sabina Islam, Shrawan Singh and Y. Angel Lyngdoh, Division of Vegetable Science,   |

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|        |                        |                   | spectrophotometer  | IARI.   |
|        |                        | 11.15-11.30       | Tea Break  |   |
|        |                        | 11.30-13.00(L)    | Recent advancement in potato breeding for nutritional traits   | Dr. S.K. Chakrabarti, Director, CPRI, Shimla  |
|        |                        | 13.00-14.00       | Lunch Break  |   |
|        |                        | 14.00-16.00 (P)   | Hands on practice for estimation of antioxidants and food colorants in vegetable crops using spectrophotometer | Drs. Sabina Islam, Shrawan Singh and Y. Angel Lyngdoh, Division of Vegetable Science, IARI.                   |
|        |                        | 16.00 – 17.15 (L) | Recent advances in tomato breeding   | Dr.A.T.Sadashiva, Head, Division of Vegetable Crops, ICAR-IIHR, Bengaluru                                     |
| Day-11 | 23. 02.2018 (Friday)   | 11.00 – 12.00 (L) | Varieties and Hybrids by Rashi HyVeg Seeds Pvt. Ltd.   | Dr. A. Dayal Product Director, Rashi Seeds Pvt, Ltd., Manesar   |
|        |                        | 11.15-11.30       | Tea Break  |   |
|        |                        | 12.00-13.00(L)    | Vegetable Seed Industry in India   | Dr. Arvind Kapur, MD, Rashi HyVeg Seeds Pvt. Ltd  |
|        |                        | 13.00-14.00       | Lunch Break  |   |
|        |                        | 14.00-15.00 (P)   | Visit to Seed Processing Plant of Rashi HyVeg Seeds Pvt. Ltd   | Dr. Arvind Kapur, MD, Rashi HyVeg Seeds Pvt. Ltd  |
| Day-12 | 24. 02.2018 (Saturday) | 10.00-11.00 (L)   | Genomics approaches for improvement of health compounds in vegetable crops ( <b>Lecture 1</b> )                | Dr. Shelly Praveen, Head, Division of Biochemistry  |
|        |                        | 11.15-11.30       | Tea Break  |   |
|        |                        | 11.00-12.00 (L)   | Genomics approaches for improvement of health compounds in vegetable crops ( <b>Lecture 2</b> )                | Dr. Shelly Praveen, Head, Division of Biochemistry  |
|        |                        | 12.00 – 13.00 (L) | Advances in breeding for improvement of productivity and quality in melons                                     | Dr. Harshwardhan Choudhary, Principal Scientist, Division of Vegetable Science, IARI                          |
|        |                        | 13.00-14.00       | Lunch Break  |   |
|        |                        | 14.00-15.15 (P)   | Crossing and selfing techniques in chilli, onion and garden pea  | Dr. Arpita Srivastava, Dr. Sabina Islam, and Dr. B. B. Sharma, Division of Vegetable Science, IARI, New Delhi |
|        |                        | 15.15-16.30 (P)   | Selfing and hybridization techniques in brinjal and tomato   | Dr.Partha Saha, Scientist (SS) and Dr. P. Muthukumar, Scientist, Div. of Vegetable Science, IARI              |
| Day-13 | 25. 02.2018 (Sunday)   |                   |  |   |
| Day-14 | 26. 02.2018 (Monday)   | 10.00-11.15 (L)   | Advancements and strategies for quality breeding in fruits crops   | Dr. Sanjay K. Singh, Head, Division of Fruits & Horticultural Technology, IARI, New Delhi                     |
|        |                        | 11.15-11.30       | Tea Break  |   |
|        |                        | 11.30-13.00 (L)   | Genetic engineering of glucosinolate biosynthesis pathways in Brassicas  | Dr. Naveen Chandra Bisht, NIPGR, New Delhi  |
|        |                        | 13.00-14.00       | Lunch Break  |   |
|        |                        | 14.00-15.15 (L)   | Extraction methods of nutraceuticals and bioactive compounds from vegetables                                   | Dr. Suresh Walia Emeritus Scientist, Division of Agricultural Chemicals, IARI, New Delhi                      |
|        |                        | 15.15-16.30 (P)   | Computational techniques (software running) and statistical analysis of  | Dr. Asif Iqbal, Scientist (sr. Scale), IASRI, New Delhi and   |

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|        |                            |                 | compositional data   | Mr. Jogendra Singh, Scientist, Division of Vegetable Science, IARI, New Delhi   |
| Day-15 | 27.02.208<br>(Tuesday)     | 9.30-10.30 (L)  | Advances in breeding for improvement of productivity and quality in okra and leafy vegetables                      | Dr. R.K. Yadav, Principal Scientist<br>Division of Vegetable Science, IARI  |
|        |                            | 10.30-11.30 (L) | Protected cultivation and efficient water use practices for higher productivity of quality vegetables              | Dr. Neelam Patel,<br>Incharge & Principal Scientist,<br>Centre for Protected Cultivation<br>Technology,<br>IARI, New Delhi-110012                       |
|        |                            | 11.30-11.45     | Tea Break  |   |
|        |                            | 11.45-13.00 (L) | TILLING: application in improving quality traits in crop plants  | Dr. C. Bhardwaj, Principal Scientist, Division of Genetics, IARI, New Delhi   |
|        |                            | 13.00-14.00     | Lunch Break  |   |
|        |                            | 14.00-15.00     | Carotenoids: nature's gift for plants and humans   | Dr. Anil Dahuja, Principal Scientist, Div. of Biochemistry, IARI  |
|        |                            | 15.00-16.30 (P) | Sample preparation and HPLC analysis of beta-carotene content in vegetable samples at Division of Biochemistry     | Dr. Anil Dahuja, Principal Scientist, Div. of Biochemistry, IARI, Dr. Shrawan Singh, Scientist & Ms. Nitupachouri, SRF, Div. of Vegetable Science, IARI |
| Day-16 | 28. 02.2018<br>(Wednesday) | 9.00-11.00 (P)  | Selfing and crossing techniques in Lettuce, Okra and garden pea  | Dr. Angel, Dr. R. K. Yadav and Dr. Shridhar   |
|        |                            | 11.00-13.00     | Breeding strategies for improvement of productivity and quality in tomato  | Dr. Zakir Hussain, Principal Scientist, Division of Vegetable Science, IARI   |
|        |                            | 13.00-14.00     | Lunch Break  |   |
|        |                            | 14.00-15.00 (L) | Transcriptome analysis and its utility in breeding vegetables for quality traits                                   | Dr. Kishor Gaikwad, Principal Scientist, NRCPB, New Delhi   |
|        |                            | 15.00-16.30 (P) | An acquaintance with Bio-informatics tools and Transformation laboratories of NRC on Plant Biotechnology           | Dr. Kishor Gaikwad Principal Scientist, NRCPB and Dr. Suman Lata, Division of Vegetable Science, IARI   |
| Day-17 | 01. 03.2018<br>(Thursday)  | 9.00-11.00      | Crossing and selfing techniques and maintenance of gynocercious lines in cucurbits                                 | Dr. J. K. Ranjan, Senior Scientist and Dr. Gograj Singh, Scientist  |
|        |                            | 11.00-12.00 (L) | Breeding strategies for higher productivity and bioactive compounds in vegetable crops                             | Dr. P. Kalia, Emeritus Scientist & Former Head, Division of Vegetable Science, IARI   |
|        |                            | 12.00-13.00 (L) | Breeding Strategies of cucumber for productivity, quality, pigments, bioactive compounds and protected cultivation | Dr. A. D. Munshi, Principal Scientist, Div. of Vegetable Science, IARI  |
|        |                            | 13.00-14.00     | Lunch Break  |   |
|        |                            | 2.00-3.00       | Role of nutritious foods in Women and child health   | Dr. R. S. Tonk, Professor RML Hospital, New Delhi   |
|        |                            | 3.00-4.00       | Role of nutritious foods in Women and child health   | Dr. Tanvi Arora, MD, RML Hospital, New Delhi  |

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| Day-18 | 02. 03.2018 (Friday): Holi (Public Holiday) |                   |   |   |
| Day-19 | 03.03-2018 (Saturday)                       | 10.00 -11.15 (L)  | Advance strategies for Seed production of vegetable varieties rich in nutrients and nutraceuticals              | Dr. B. S. Tomar, Head, Division of Vegetable Science, IARI  |
|        |   | 11.15- 11.30      | Tea break   |   |
|        |   | 11.30-13.00 (P)   | Hands on practice on sample preparation and dietary minerals analysis using Atomic Absorption Spectrophotometer | Dr. M. C. Meena, Sr. Scientist, Division of Soil Science and Agric. Chemistry & Dr. Shrawan Singh, Division of Vegetable Science, IARI, New Delhi |
|        |   | 13.00-14.00 (L)   | Lunch Break   |   |
|        |   | 14.00-16.30 (P)   | Hands on practice for determination of minerals and nutraceuticals in Vegetable crops (at NBPGR, New Delhi)     | Dr. Rakesh Bhardwaj, Principal Scientist<br>Dr. Y. Angel Lyngdoh, Scientist   |
| Day-20 | 04. 03.2018 (Sunday)                        |                   |   |   |
| Day-21 | 05.03.2018 (Monday)                         | 9.30.00-10.15 (L) | Hands on practice on gene expression analysis using RT-PCR  | Dr. Manisha Mangal, Principal Scientist, & Dr. Sumanlata, Scientist, Division of Vegetable Science, IARI  |
|        |   | 10.15-11.00 (P)   | Hands on practice on QTL mapping  | Dr. Yashpal, Scientist, Division of Genetics, IARI, New Delhi   |
|        |   | 11.00-11.15       | Tea break   |   |
|        |   | 11.15-12.00 (L)   | Advances in breeding for improvement of productivity and quality in peas and beans                              | Dr. Shri Dhar, Principal Scientist, Division of Vegetable Science, IARI   |
|        |   | 12.00-13.00 (P)   | Advance strategies for higher productivity and quality in carrot  | Dr A.K. Sureja, Principal Scientist, Division of Vegetable Science, IARI  |
|        |   | 13.00-14.00       | Lunch break   |   |
|        |   | 14.00 - 15.00 (P) | Feedback from the participants  | Dr. T. K. Behera and Dr. Shrawan Singh Division of Vegetable Science, IARI.   |
|        |   | 15.00-16.30       | Valedictory Function  |   |

(TusarKanti Behera)  
Course Director