Curriculum Vitae of Professor Anupam Varma

Name	:	Anupam Varma
Date of Birth	:	23.07.1940
Education	:	B.Sc. and M.Sc., Allahabad University, India, 1959 and 1961 Ph.D., London University, U.K., 1967
Affiliation	:	*Advisor, ANASTU*[1] *Programme of Government of India*, and *Emeritus Professor* Advanced Centre for Plant Virology Division of Plant Pathology Indian Agricultural Research Institute New Delhi-110012, India Tel: Office: +91-11-25842134; Residence: +91-11-25072511 Mobile: +91- 9810217141 Email: anupamvarma@acpv.in ; av.acpv@gmail.com

Employment

- National Professor, Indian Council of Agricultural Research Institute, New Delhi, July 2000 to July 2005.
- Dean, Indian Agricultural Research Institute, New Delhi, November, 1995 to July 2000
- Head, Division of Plant Pathology, Indian Agricultural Research Institute, New Delhi, March 1988 to November 1995.
- Professor of Plant Pathology, IARI, New Delhi, July 1986 – February 1988.
- Professor of Virology, March 1984 to July 1986.
- Applied Plant Virologist with the FAO, March 1979 to August 1981 for developing the National Horticultural Research Institute, Ibadan, Nigeria; also worked in 1981 as the Project Manager of the same Project to manage the work of 9 FAO experts and the Nigerian Counterparts.
- Principal Plant Virologist July 1976 to March 1984.
- Senior Plant Virologist, IARI, New Delhi, March 1968 to June 1976.

Experience

Research	:	49 Years
Post-Graduate Teaching	:	41 Years

[1] ANASTU is the acronym of Afghanistan National Agriculture and Technology University, which is being established at Kandahar, Afghanistan with the assistance of the Government of India.

Research

Professor Anupam Varma has made enormous contributions to understanding the ultrastructure of filamentous plant viruses; molecular analysis of plant viruses, particularly Begomo- and Potyviruses, which have emerged as severe constraint in improving agricultural productivity; development of technologies for quick and reliable diagnosis of virus, viroid and mycoplasma diseases commonly referred to as virus and virus-like diseases (VVDs) of crop plants, which have provided the required technical capability to control and minimize the economic losses caused by VVDs in India and Nigeria; introduced electron microscopic techniques to detect not only the known but also the unknown viruses and fastidious prokaryotes; development of meristem culture technique for curing potato clones infected by diverse viruses; development of transgenic plants for resistance to viruses using coat-protein and antisense approaches; development of unique certification for the production of tissue culture raised plants in India. In addition he has been involved in collaboration with colleagues in Australia, France, Spain, the UK and the USA in understanding the evolution of viruses and developing strategies, particularly application of biotechnological approaches for their management.

Made important contributions to fundamental and applied aspect s of Plant Virology, which are widely quoted and acclaimed. Determined the ultrastructure of a large number of flexible viruses and showed their helical symmetry with a pitch of c 33A by optical diffraction. This was very useful in identifying filamentous viruses even when a part of the virus could be seen by electron-microscopy of negatively stained preparations. Also determined the ultrastructure of Rhabdoviruses, badna viruses and carmoviruses. Developed technology for the diagnosis of diseases caused by viruses through the use of R-PAGE-immuno-electronmicroscopy, monoclonal antibodies, c-DNA probes and PCR. The new technologies corrected many misidentification and provided tools for the reliable diagnosis of VVDs caused by even small pathogens like viroids.

Initiated researches on mycoplasmal diseases of plants in India, opening a new dimension for the cure of devastating diseases like sandal spike. Freed several cultivars of potato and horse-radish by meristem culture, and developed effective practices for the integrated management of viral and mycoplasmal diseases of plants. He also initiate development of transgenic plants in India.

The aetiology of devastating diseases like sandal spike, mango malformation, brown bast of rubber and bunchy top of banana has been baffling the plant pathologists for a long time. Prof. Varma demonstrated that sandal spike is caused by a phytoplasma, mango malformation by *Fusarium moniliforme* var. *subglutinans*, brown bast by a viroid and bunch top by a very small multi component DNA virus. These findings were very useful in developing diagnostic procedures and management strategies for these devastating diseases.

The other major contributions relate to viruses transmitted through seeds, which are of considerable economic importance and ecological relevance particularly in grain legumes like urdbean, cowpea, pea, etc., even when present in small amounts (less than 100 ng/seed). Developed serological and electron microscopical techniques for the detection of viruses like blackgram mottle, cowpea aphid-borne mosaic, cowpea (vein) banding, cowpea chlorotic spot, pea

seed-borne mosaic and others in seeds of different grain legumes, and R-PAGE method for detecting viroids in seeds of plants like Coleus. These technologies are very useful for the seed industry in producing virus-free certified seeds, which is a major concern for the industry. Similarly ELISA based technology has been developed to detect cassava mosaic virus infection even in apparently healthy plants which are used for propagation. This is of special relevance as cassava is being introduced even in non-traditional areas as an industrial crop for which this technology will prove to be very useful to screen and supply healthy planting material. Methods have also been developed to cure the virus-infected seeds of cowpea by heat and chemotherapy.

Most damaging plant diseases in India are caused by whitefly transmitted viruses which result in an annual loss of about Rs. 10 billion. For long, identity of these viruses was not known. Using monoclonal antibodies and c-DNA probes Prof. Varma demonstrated that these diseases are caused by a new group of viruses now known as begomoviruses. The begomoviruses have two circular genomic DNA commonly referred as DNA-A and DNA-B. DNA-A is highly conserved in various begomoviruses, therefore its c-DNA probe detects all begomoviruses, whereas DNA-B probes are specific. Both DNA-A and B of begomoviruses like bhindi yellow vein, tobacco leafcurl, cotton leaf curl, tomato leaf curl, cowpea golden mosaic, mungbean yellow mosaic and Luffa leaf distortion have been cloned and specific probes prepared, for not only identifying different begomoviruses and their strains but also their coat protein and other genes. The genomes of several begomoviruses have been sequenced to further identify functional genes. The begomoviruses are not easily sap transmissible. To overcome this difficulty techniques for agro-infection using cloned DNAs was developed. These contributions are a great help in developing appropriate management practices and screening for resistance in plants to specific strains of the viruses.

Next to begomoviruses, potyviruses are of economic importance. For their management, coat-protein gene of potato virus Y has been cloned, sequenced and introduced into plants for dev eloping resistance. PVY causes severe disease in tobacco. Sixteen transgenic lines of tobacco containing CP gene of PVY in different orientations have been produced. Of these, five transgenic lines posses a high degree of stable resistance to PVY. The coat protein gene of another important potyviruses known as papaya ringspot virus has also been cloned and used for developing virus resistant transgenic plants. Under his leadership technologies have been developed for transgenic resistance to diverse viruses affecting important crops like banana, citrus, cucumber, pepper, potato, tomato and papaya.

In addition to virus research he is also interested in finding solutions to environmental issues like the food contamination by aflatoxins and air pollution by crop burning.

Human Resource Development

- Teaching Plant Virology to M.Sc. and Ph.D. students at the IARI, New Delhi since 1968.
- Guided researches of over 20 Ph.D. students and a large number of Post-doc

- Trained a large number of personnel of IARI, other Institutes and Universities in plant virological techniques. Trained personnel at the national Horticultural Research Institute, Ibadan, Nigeria during 1979-81. Organized several training courses in Plant Virology.

- Coordinating teaching of MSc courses to ANASTU students in Agronomy, Animal Husbandry, Horticulture and Plant Protection at the IARI, New Delhi and ANASTU, Kandahar, Afghanistan since 2014. Forty students have already graduated, 20 more will graduate in 2020 and 37 are under attending various courses.

Research and Education Management

- Managed research, teaching and extension work of the Department, having more than 50 Scientists, as Head, Division of Plant Pathology, Indian Agricultural Research Institute for over seven years.
- Developed a Centre of Advanced Studies in Plant Pathology
- Managing teaching programmes in 21 Disciplines related to agricultural sciences, with a faculty of over 500 Scientists.
- Introduced innovative programmes for improving post graduate teaching.
- Modernized the IARI Library, and initiated its digitization.
- Developed Information network by connecting all the Divisions of IARI by optical fibre cable for LAN for and easy access to CD-ROMs available in the library; developed radio-link for fast internet access.

Institution Building

- Established research lab and green-houses, which were specially designed for the tropics, and also helped in the overall establishment of the National Horticultural Research Institute (NIHORT), Ibadan, Nigeria as an expert of the Food and Agriculture Organization of the United Nations (March 1979 – August 1981).
- Established Advanced Centre for Plant Virology at the Indian Agricultural Research Institute (IARI), New Delhi, which is a leading centre for plant virology research in the Indian Sub-continent, the ICAR/UNDP/FAO support in 1988.
- Developed a Centre of Advanced Studies in Plant Pathology at the IARI (1995).
- Establishment of National Certification System of Tissue Culture Plants (NCS-TCP) for freedom from viruses and genetic fidelity in 2008, and monitoring the programme since inception as Chair of the Project Monitoring and Evaluation Committee.

Association with Academic Organisations

Prof. Varma is actively engaged in activities related to promotion of science for societal development and motivation of young scientists for pursuing research through participation in the programmes of the science societies, academies and trusts, which have played important role in strengthening of scientific research and education in India and other countries of the region. He continues to play the creative role in enlarging the canvas of academic activities of the following institutions.

- ***Indian Phytopathological Society***
    - Fellow (1976)
    - Secretary (1983-1988)
    - Chief Editor (1992-1994)
    - President (1998-99)

- ***Indian Virological Society***
    - Fellow (1985).
    - Vice-President (1990-92).
    - President (2017-1919)

- ***Indian National Science Academy*** (INSA)
    - Fellow (1987)
    - Vice-President (2005-07)
    - Member, Inter-Academy Panel (IAP), a network of over 100 science academies to address policy issues (2005-07).
    - Chair, National Committee of International Union of Microbiological Societies (2008-10).

- ***National Academy of Sciences, India*** (NASI)
    - Fellow (1987).
    - President, Biological Sciences Section, National Academy of Sciences, India, 1993.

- ***National Academy of Agricultural Sciences*** (NAAS)
    - Founder Fellow
    - Founder Secretary (1990-98)
    - Vice-President (2015-17)

- ***Indian Science Congress***
    - President, Agricultural Sciences (1988-89).

- **Trust for Advancement of Agricultural Sciences**
    - Founder, Vice-Chairman (2001-2008)

- **International Society of Plant Pathology** (Minnesota, USA).
    - Secretary General (1993-98).
    - Vice-President (1998-2003).
    - Vice-President, International Congress of Plant Pathology, Edinburgh, 1998.

- ***International Council of Scientific Union*** (ICSU; Paris, France)
    - Member, International Committee for Taxonomy of Viruses (1978-1982)
    - First Chair, ICSU Reginal Committee for Asia and the Pacific (ICSU-RCAP; 2006-2008); established ICSU-RCAP Office in Kuala Lumpur, Malaysia and developed

its programmes for improving the societal impact of scientific development in Asia and the Pacific.

- **World Society of Virology**
  - Founder Member

Support to the publication of scientific journals

- Editor, International Journal of Tropical Plant Disease (1983 -2006)
- Editor, Journal of Phytopathology, Germany (1989-2005)
- Chief Editor of Indian Phytopathology (1992 – 1994)
- Founder Editor-in Chief of NAAS/Springer Journal '*Ágricultural Research*' (since 2012)
- Editorial Board Member of a large number of journals.
- Chairman, Journal Rating Committee, NAAS (2019 -2021)

Awards and Honours

In recognition of his contributions to science Prof. Varma has been honoured with election to the Fellowship and leadership positions of eminent Academies and Societies listed above, and several prestigious awards like the World Food Day Award of the FAO and IAAS, 1985; VASVIK Award for Science and Technology (1989); Om Prakash Bhasin Award for Science and Technology (1992); James Wallace Award of the International Organization of Citrus Virologists, USA, 1999; Millenium Plaque of Honour Award of the Indian Science Congress Association (2005); PNASF Gold Medal Award, 2009; Professor K.S. Bhargava Lifetime Achievement Award of IVS (2007); INSA Shanti Swarup Bhatnagar Medal, 2010; A.P. Misra Lifetime Achievement Award of IPS (2011); NASI Dr. B.P. Pal Memorial Award 2013; and a large number of prestigious lecture awards.

International work experience:

Prof. Varma has the experience of working at the Rothamsted Experimental Station, UK (1964-67), to work on characterisation of viruses, production of virus-free plants by meristem culture; Visiting Fellow, Australian National University, Canberra (1977) to characterise tobamoviruses; National Horticultural Research Institute at Ibadan, Nigeria (1979-1981) to develop trained human resource for research in plant virology; Scottish Crop Research Institute, Dundee, UK (1986) to work on molecular characterization of geminiviruses; INRA, Bordeaux, France (1992 and1994) to work on etiology of greening disease of citrus. Also visited laboratories for short periods in Bangladesh, Canada, Egypt, France, Germany, Iran, Italy, Japan, Kenya, Malaysia, the Netherlands, Thailand, Singapore, South Africa and USA.

List of Professor Varma's Publications

Professor Varma has published more than 200 papers in refereed Journals and invited articles in reference books, policy and human resource development related publications, and has edited seven books which have become important source books of plant pathology and virology.

1. Tandon, R.N. and Varma, A. (1962). Physiological studies on *Colletotrichum gloeosporioides* causing leaf spot disease of *Punus persica*. *Phyton*. **19**:49-57.

2. Tandon, R.N. and Varma, A. (1963). Pathological studies of *Colletotrichum gloeosporioides* causing leaf spot disease of *Punus persica* Stokes. Proc. Nat. Acad. Sci., India. **33**:411-417.

3. Tandon, R.N. and Varma, A. (1964). Some new storage diseases of fruits and vegetables. *Current. Sci*. **33**: 625-627.

4. Gibbs, A.J., Varma, A. and Woods, R.D. (1966). Viruses occurring in white clover (*Trifolium repens*) from permanent pastures in Britain. *Ann. appl. Biol.* **58**: 231-240.

5. Kassanis, B. and Varma, A. (1967). The production of virus-free clones of some British potato varieties. *Ann. appl. Biol.* **59**: 447-450.

6. Varma, A. (1967) Studies on Red Clover Mosaic Virus. Ph.D. Thesis, University of London, UK.

7. Hickman, J.A. and Varma, A. (1968). Viruses in Horse-radish. *Plant Path.* **17**: 26-30.

8. Varma, A., Gibbs, A.J., Woods, R.D., and Finch, J.T. (1968). Some observations on the structure of the filamentous particles of several plant viruses. *J. gen Virol.* **2**: 107-114.

9. Varma, A., Chenulu, V.V. Raychaudhuri, S.P., Prakash, N., and Roa, P.S. (1969). Mycoplasma like bodies in tissues infected with sandal spike and brinjal little leaf. *Indian Phytopath.* **22**: 289-291.

10. Varma, A., Raychaudhuri, S.P., Lele,V.C., Asha Ram (1969). Towards the understanding of the problem of mango malformation. *Acta Horticulturae* **24**:237.

11. Yadav, T.D. and Varma, A. (1969). Evaluation of insecticides against mango budmite *Aceria mangiferae* Sayed. *Indian J. Ent.* **31**: 244-246.

12. Singh, S., Sachchidananda, J., Prakash, N., and Varma, A. (1970). Primula mottle virus. *Indian Phytopath.* **23**: 148-150.

13. Varma, A. (1970). Red clover vein mosaic virus. Description of plant viruses. C.M.I., England. C.M.I./A.A.B. Descriptions of Plant Viruses No. 22.

14. Varma, A., Gibbs, A.J., Woods, R.D. (1970). A comparative study of red clover vein mosaic virus and some other plant viruses. *J. gen. Virol.* **8**: 21-32.

15. Varma, A., and Yadav, T.D. (1970). Efficacy of systemic insecticidal granules against mango bud mite, *Aceria mangifera* Sayed. (Eriophydae, Acarina). *Indian J. Ent.* **32**: 211-214.

16. Ghosh, S.K., Raychaudhuri, S.P., Varma, A. and Nariani, T.K. (1971). Isolation and culture of mycoplasma associated with citrus greening disease. *Curr. Sci.* **40**: 229-300.

17. Ram, A., Raychaudhuri, S.P., and Varma, A. (1971). Fungistatic activity of some systemic and non-systemic pesticidal chemicals. *Indian Phytopath.* **24**: 325-311.

18. Raychaudhuri, S.P. and Varma, A. (1971). Some recent advances in plant virus research in some India. J. Indian Bot. Soc. Golden Jubilee Volume **50A**: 34-40.

19. Varma, A., Raychaudhuri, S.P., Lele, V.C., Asha Ram (1971). Preliminary investigation on epidemiology and control of mango malformation. Proc. Indian Nat. Sci. Acad. **37B**: 291-300.

20. Raychaudhuri, S.P., Chenulu, V.V., Ghosh, S.K., Varma, A., Rao., P.S., Srimathi, R.A. and Nag, K.C. (1972). Chemical control of spike disease of sandal. *Curr. Sci.* **41**: 72-73.

21. Sharma, S.R. and Varma, A. (1972). Effect of systemic insecticides on virus infection in cowpea. *Indian J. Ent.* **34**: 361-364.

22. Singh, S., Varma, A. and Chenulu, V.V. (1972). Pigweed mosaic virus. *Phytopath. Z.* **75**: 82-85.

23. Plavsic, B., Maramorosch, K., Raychaudhuri, S.P., Chenulu, V.V., Varma, A. and Ghosh, S.K. (1973). Electron microscopy of graft transmitted sandal spike. F.A.O. Plant Prot. Bull. **21**: 25-26.

24. Ghosh, S.K., Varma, A., Raychaudhuri, S.P., and Sang, A. (1974). Histopathological studies of witches broom affected *Mirabilis jalapa* L. using light and fluorescent microscopy. *Indian J. Experimental Biology* **12**:586-587.

25. Varma, A., Lele, V.C., Raychaudhuri, S.P., Asha Ram, and Asha Sang (1974). Mango malformation - a fungal disease. *Phytopath. Z.* **79**: 254-257.

26. Varma, A., Lele, V.C. and Goswami, B.K. (1974). Mango malformation. *In* Current Trends in Plant Path. Eds. S.P. Raychaudhuri and J.P. Verma, Lucknow University, Botany Department, pp.196-204.

27. Varma, A., Sang, A., Ghosh, S.K., Raychaudhuri, S.P., Chenulu, V.V. and Prakash, N. (1974). Probable mycoplasmal etiology of Broombush witches broom. *Curr. Sci.* **43**: 349-350.

28. Ghosh, S.K., Raychaudhuri, S.P., Chenulu, V.V. and Varma, A. (1975). Isolation, cultivation and characterisation of mycoplasma like organism from plants. Proc. Indian Nat. Sci. Acad. **41**: 362-366.

29. Ghosh, S.K., Raychaudhuri, S.P., Sang, A. and Varma, A. (1975). Witch's broom malady of *Mirabilis jalapa* linn. *Science and Culture* **41**: 334-335.

30. Kassanis, B. and Varma, A. (1975). Sunnhemp mosaic virus, CMI/AAB Descriptions of Plant Viruses No. 153.

31. Lele, V.C., Raychaudhuri, S.P. and Varma, A. (1975). Maladies of Mango Fruits: A review of their causes and cure. *Prog. Hort.* **7**: 39-45.

32. Rao, P.S., Srimath, R.A., Nag, K.C., Raychaudhuri, S.P., Ghosh, S.K., Chenulu, V.V. and Varma, A. (1975). Response of spike disease of sandal to mixed treatment with antibiotics and fungicides. Proc. Indian Nat. Sci. Acad. **41**: 340-342.

33. Raychaudhuri, M. and Varma, A. (1975). Virus vector relationship of marrow mosaic virus with *Myzus persicae* (Sulz.). *Indian J. Ent.* **37**: 247-250.

34. Sang, A. and Varma, A. (1975). Marigold mosaic virus. *Phytopath. Z.* **84**: 10-17.

35. Sharma, S.R. and Varma, A. (1975). Cure of seed transmitted cowpea banding mosaic virus. *Phytopath. Z.* **83**: 144-151.

36. Sharma, S.R. and Varma, A. (1975). Natural incidence of cowpea viruses and their effect on yield of cowpea. *Indian Phytopath.* **28**: 330-334

37. Sharma, S.R. and Varma, A. (1975). Three sap transmissible viruses from cowpea in India. *Indian Phytopath.* **28**: 192-198.

38. Varma, A., Raychaudhuri, S.P. Chenulu, V.V., Singh, S., Ghosh, S.K. and Prakash, N. (1975). Yellows type of diseases in India: egg-plant little leaf. Proc. Indian Nat. Sci. Acad. **41(B)**: 355-361.

39. Das, T.K., Verma, J.P., Singh, R.P. and Varma, A. (1976). Ultra-structure of bacteriophage of *Xanthomonas malvacearum* the causal organism of bacterial blight of cotton. *Acata Phytopathologica* **11**: 231-233.

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55. Varma, A., Chenulu, V.V., Ahlawat, Y.S. and Singh, S. (1982). Detection of mollicutes infecting plants. Proc. All India Symposium on Mycoplasma Diseases 10th Sept. 82. AIIMS, New Delhi, pp.110-115.

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58. Sharma, S.R. and Varma, A. (1982). Control of yellow mosaic of mungbean through insecticides and oils. *J. Entomol. Research* **6**: 130-136.

59. Sharma, S.R. and Varma, A. (1982). Control of virus diseases by oil sprays. *Zbl. Mikrobiol.* **137**: 329-347.

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61. Raychaudhuri, M. and Varma, A. (1983). Effect of oils on infectivity and transmission of marrow mosaic virus. *J. Entomol. Res.* **7**: 107-111.

62. Sharma, S.R. and Varma, A. (1983). Effect of cowpea banding mosaic virus infection on nodulation and nitrogen fixation by cowpea. *Zbl. Microbiol.* **138**: 57-62.

63. Sharma, S.R. and Varma, A. (1983). Effect of heat therapy of infected seeds and application of granular insecticides on field spread of cowpea banding mosaic and seed yield of cowpea. *Turk. J. Phytopath.* **12**: 103-111.

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65. Varma, A. (1983). Mango malformation. *In* Exotic Plant Quarantine Pests and Procedures for Introduction of Plant Materials. Ed. K.G. Singh, ASEAN PLANTI, Malaysia, 173-188.

66. Varma, A. (1983). Control of plant virus vectors - an integral part of pest management. *In* Principles of Insect Pest Management. Ed. R.A. Agarwal, G.P. Gupta and Prem Kishore, Entomology, IARI, New Delhi, pp.48-93.

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71. Rao, A.L.N. and Varma, A. (1984). Transmission studies with cucumber green mottle mosaic virus. *Phytopath. Z.* **109**: 325-331.

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74. Varma, A. (1984). Virus diseases of fruit and vegetables crops in Nigeria. FAO Technical Report AG/DP/NIR/72/007, Rome, p.101.

75. Chowdhry, P.N. and Varma, A. (1986). *Cylindrocarpon mangiferum* sp. nov. a new fungus isolated from mango (*Mangifera indica*) affected with vegetative malformation. *Curr. Sci.* **55**: 1077-1078.

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77. Sharma, S.R. and Varma, A. (1986). Transmission of cowpea banding mosaic and cowpea chlorotic spot viruses through the seeds of cowpea. *Seed Sci. & Tech.* **14**: 217-226.

78. Sharma, S.R. and Varma, A. (1986). Effect of some chemicals on infectivity and transmission of cowpea banding mosaic virus. *Revista de Biologia* **13**: 75-80.

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