

# **Modern Plant Pathology**

**H. C. DUBE**

**Agrobios Publications**

# MODERN PLANT PATHOLOGY

THIRD EDITION

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**H. C. DUBE**

*Former Professor and Head*

*Department of Life Sciences*

*Maharaja Krishnakumarsinhji Bhavnagar University*

*Bhavnagar (Gujarat)*

*hcdharish@yahoo.co.in*



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Phone: 0291-2643993, 3092884, Fax: 2642319

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Cover page figure shows structure and mode of action of x A 21 resistant gene products, in genetically modified rice plants against bacterial blight of rice.

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# PREFACE

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## *Friends*

I have pleasure in offering the new edition with great zeal. I feel happy to remember that this book was first published in 1976 as *A Text book of Modern Plant Pathology* (Bilgrami & Dube) by VIKAS, New Delhi. Now it is 38 years 'young'! It was "Modern" in 1976 and it is so in 2014. This has been the endeavour of the author to live this 'hallmark'.

JG Horsfall once said, "Plant pathology has been kind to me. It took me all over the world...." Permit me a little temerity to say, I too feel the same, but with a difference. It enabled me to enjoy reading so many branches of Life Sciences, which, otherwise, would not have been possible. There has never been a dull moment. Watching the incessant biochemical "tug of war" between the pathogens and the host (?) is thrilling! The penchant of the author for history is justifiable. If you want to make history, read history. And, didn't Louis Pasteur say, "History of science is science itself"? The epic events described in first chapter on History of Plant Pathology, indicate how basic science has been a point of pride in our science. This is evident by the influx of molecular biologists, biochemists, computer experts, and by the routine use of most modern techniques for detection of pathogens and for prying deep to locate the biochemical lesions in the host. The use of molecular cloning and its spin-off technologies have contributed much in understanding "How things work". It helps in controlling and managing the disease. Transgenic plants have been made that provide resistance against insect pests, viruses, fungi, bacteria and herbicides. It is essential to be abreast in related areas to understand plant pathology as it is now.

I remember, always, with gratitude my mentor (late) Prof. KS Bilgrami under whose tutelage I have grown. I fondly remember Prof. HP Srivastava, Prof. K Natarajan and Prof. RN Swamy who are no more to guide but I continue getting their inspiration in more subtle way. I have enjoyed gleaning the vast literature and provide an up-to-date, modern understanding of plant pathology to the students. Every mother produces a Christ, and to me it is beautiful book, though imperfect. Later authors will write better books and students will be benefited. Good luck.

**H. C. DUBE**



*Dedicated to*



**Dr. H.P. Srivastava**  
Professor of Botany &  
JNV University  
Jodhpur (Rajasthan)



**Dr. K. Natarajan**  
Prof. of Mycology  
CAS in Botany  
University of Madras (Chennai)

Their demise has left me  
forlorn, sober and sad



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# 1

## HISTORY OF PLANT PATHOLOGY

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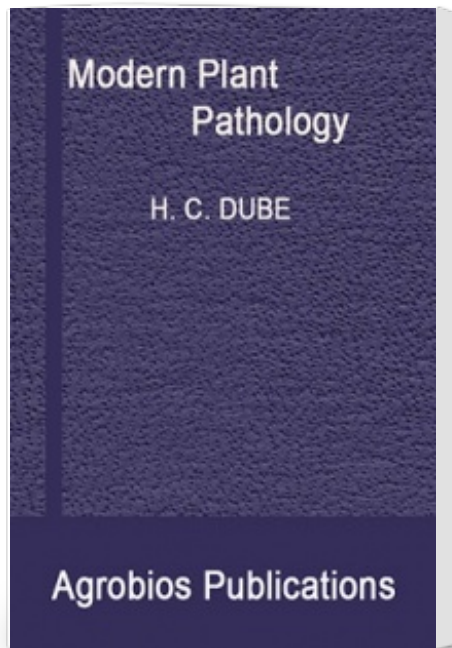
*History of science is science itself.*

*Pasteur*

Fossil records of parasitic fungi date back to Devonian period (395-345 million years ago), which suggests that plant diseases originated along with plants, much before man came on earth. When man started growing food, he also unwittingly started culturing the parasites. The outbreaks of plant diseases, then, must have started much before recorded history. Mention of plant diseases are found in ancient Greek and Indian citations. First authentic records of plant diseases are found in the writings of **Theophrastus** (380-287 B.C.), "The father of botany". While describing trees, cereals and pulses, he also described their diseases. He recorded the harmful effects of wind, weather and location. He and other Greek philosophers of that time believed that diseases originated spontaneously from the plants or from the environment. This erroneous belief delayed our understanding of parasitism and disease for two thousand years. Plant pathology benefited considerably from the intellectual climate of the European renaissance of 14<sup>th</sup> century.

The invention of microscope in the 17<sup>th</sup> century gave vision to the hitherto unknown world of microorganisms. **Leeuwenhoek** discovered bacteria in 1617. An Italian botanist **Micheli**, in 1729, made an extensive study of fungi and their reproductive structures. He discovered the role of spores and experimentally proved that fungi originated from their spores. This was the first experimental proof that fungi were autonomous organisms which produced seed-like bodies and were not capricious creatures of the spontaneous generation. This was a big step forward and gave the first blow to the concept of spontaneous generation. Micheli was much ahead of his time and his thinking had little impact on the prevailing beliefs. This was predominantly the age of describing plants and naming them. **Linnaeus** (1753) gave the binomial system of nomenclature, but his contributions to fungi were insignificant. He too believed in the spontaneous origin of disease. His students, **Persoon** and **Fries** applied the binomial system of nomenclature to fungi and gave firm footing to the taxonomy of fungi. But their belief in spontaneous generation was firm. "*These fungi*", stated Fries (1821-1832), "*depend on*

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