

PLANT PATHOLOGY AT A GLANCE

(Encyclopedia of Plant Pathology)

For students of General Botany, Microbiology, Mycology, Plant Bacteriology, Plant Virology, Plant Nematology and Plant Pathology

Dr. D.P. Tripathi Ph. D.

Ex Professor

Department of Plant Pathology,
C. S. Azad University of Agriculture & Technology,
Kanpur-208 002 (U.P.)

Published by:

Scientific Publishers (India)
5 A, New Pali Road, P.O. Box 91
Jodhpur 342 001 (India)

E-mail: info@scientificpub.com
Website: www.scientificpub.com

Branch Office
Scientific Publishers (India)
4806/24, Ansari Road, Daryaganj
New Delhi - 110 002 (India)

Print : 2013

All rights reserved. No part of this publication or the information contained herein may be reproduced, adapted, abridged, translated, stored in a retrieval system, computer system, photographic or other systems or transmitted in any form or by any means, electronic, mechanical, by photocopying, recording or otherwise, without written prior permission from the author and the publishers.

Disclaimer: Whereas every effort has been made to avoid errors and omissions, this publication is being sold on the understanding that neither the author nor the publishers nor the printers would be liable in any manner to any person either for an error or for an omission in this publication, or for any action to be taken on the basis of this work. Any inadvertent discrepancy noted may be brought to the attention of the publishers, for rectifying it in future editions, if published.

ISBN: 978-81-7233-520-5

© Tripathi, D.P., 2008

Typeset by Rajesh Ojha
Printed in India

Preface

The book entitled 'Plant Pathology at a Glance' is intended chiefly for graduate and post graduate students of General botany, Agriculture, and Microbiology in general and of Plant Pathology in particular. It required a great deal of experience through working with different aspects of the subject, aptitude to understand them and acquaintance with the vast amount of literature before a book of this caliber was attempted. There has been a long felt need by the students and teachers for a comprehensive book on Plant Pathology in such a question and answer form like this. Specifically, this book has been designed as a guide for students and for aspirants preparing for different competitive examinations. The book is scholarly and detailed account of Plant Pathology has been included in an easy to read style. The organization of extensive collection of enormous information and dedicated efforts are the testimony for the author's appreciable and judicious venture in bringing out this valuable book. Divided in fifteen chapters, this book adequately covers the syllabi of all Universities.

I am thankful to Prof. (Dr.) V.K. Suri, Honorable Vice Chancellor and to Dr. A.N. Tewari, Dean (Agriculture) along with to different members of the Department of Plant Pathology, C.S. Azad University of Agriculture and Technology, Kanpur (U.P.) for their help in different ways.

Help rendered by Mrs. Kalpanarani and Sri Sandeep Rajani in preparation of the manuscript for this book is duly acknowledged.

At last but not least, I thank to M/s Scientific Publishers (India), Jodhpur for publishing the book in such a form well in

time. In the end, I express my humbleness in accepting the unintentional mistakes and omissions found in the text, if any. I would greatly appreciate receiving suggestions regarding improvement of the book. I am sure this book will find due place among students and teachers alike through out the country.

Dept. of Plant Pathology,
C.S. Azad University of
Agriculture & Technology,
Kanpur (U.P.)
November, 7, 2007

D.P. Tripathi
E-mail: dptripathi1945@rediffmail.com

Contents

Preface

iii

Chapter 1. Introduction and history

1-55

Introduction, importance, sub-divisions, some common terminology, plant pathogens, causes of plant diseases, classification of diseases, disease epidemiology, disease symptomatology, pathogenicity and pathogenesis, plant disease clinic and requirements for plant disease clinic.

Chapter 2. Mycology as a sub-discipline

56-125

Introduction and history, culture collection, fungi and their morphology, classification of fungi, rhizomorphs and mycorrhiza, lichenology, variations in fungi, physiology of fungi, nutritional requirements in fungi, enzymes and their importance, growth and growth factors, mushroom and their cultivation, mycotoxins and their types, reproduction in fungi, mycological laboratory organization and mycological laboratory techniques.

Chapter 3. Fungal diseases of crops

126-240

Cereal diseases - diseases of wheat, barley, paddy, sorghum and other cereals; diseases of pulse crops- chick pea, cowpea, soybean, lentil, pigeon pea, black gram and pea; diseases of oil seeds – groundnut, linseed, mustard, rapeseed, sunflower, safflower and sesame; Industrial crop diseases- sugar beet, sugarcane, potato, cassava, cotton and jute; diseases of vegetables- cole crops, cauliflower, cabbage, turnip and other crucifers, radish, cucurbits, water melon, elephant foot yam, beans, lablab beans, lima beans, colocassia, egg plant, tomato, beet, spinach, onion, okra, garlic; diseases of fruits - Almond, apple, citrus, banana, cashew nut, grape, guava, jack fruit, mango, loquat, Jamun, water melon, musk melon, papaya, pine apple, plum, pomegranate, peach, cherry and walnut; diseases of arecanut, cocoa, coconut, coffee, tea and rubber; diseases of spices- ginger, coriander, turmeric and chilli.

- Chapter 4. Plant bacteriology as a sub-discipline** **241-390**
- Definition and history, prokaryotes and their kinds, plant bacteriology, pioneers in the field of bacteriology, economic importance, morphology and structure, bacteriophages and their classification, growth and physiology, common terminology, cultivation of bacteria, infection and pathogenicity, bacteria and enzymes, synchronous and continuous cultures, prokaryotic metabolism, bacterial genetics, mutation in bacteria, auxotrophs and prototrophs, analysis of structure of DNA, plasmids and their importance, recombinant DNA technology, bacteriological laboratory techniques, plant pathogenic bacteria.
- Chapter 5. Bacterial diseases of crops** **391-423**
- Diseases of cereals – wheat, barley, maize, oat, rice and sorghum; diseases of pulses - cowpea, pea, pigeon pea and soybean; diseases of oil seed crops - castor, sunflower, safflower and sesamum; industrial crop diseases - sugarcane, betel vine, cotton, tobacco, jute and poppy; plantation diseases - coffee and tea; diseases of grasses-sudan grass, lucern, Indian clover and alfalfa; diseases of tuber crops; diseases of fruit crops; diseases of vegetables.
- Chapter 6. Plant virology as a sub-discipline** **424-450**
- Definition and history, characterization of viruses, morphology and structure, economic importance, classification, viroids and their classification, isolation and purification, physical properties, pathogenicity test in viruses, detection of viruses, different methods of transmission, symptomatology, inclusion bodies and phytotoxaemia, common terminology, serology and serological reactions.
- Chapter 7. Viral diseases of crops** **451-474**
- Virus diseases of vegetables - tomato, egg plant, cabbage, radish, turnip and lily, cucumber, melon, water melon, bean, broad bean, pea, cow pea, carrot, celery, parsnip, lettuce and spinach; industrial crop diseases- Virus diseases of sugarcane, sunflower, soybean, sugar beet, potato, tobacco, hop, peanut; diseases of fruit crops.
- Chapter 8. Phyto-nematology as a sub-discipline** **475-517**
- Introduction and history, progress in the science of nematology, characteristics of nematodes, nature and distribution, kinds of nematodes, economic importance, morphology and life cycle, pathogenicity, classification and grouping, characteristics of different orders and families, detection of plant parasitic nematodes

Chapter 9. Nematode diseases of crops	518-527
Diseases of cereal crops, diseases of vegetables & spices, diseases of ornamentals, medicinal and narcotics, diseases of industrial crops and diseases of fruits and plantation crops.	
Chapter 10. Abiotic Plant Pathogens	528-537
Physiological diseases, different causes of abiotic discusses, environmental constraints, important symptoms due to nutritional in balances, symptoms of nutritional toxicities.	
Chapter 11. Abiotic Plant Diseases	538-551
Keys to diseases and symptoms of nutritional imbalances, Nutrients deficiency diseases in different crops.	
Chapter 12. Phanerogamic plant parasites	552-560
Seed plant parasites, some examples, parts of the hosts attacked by such parasites, different kinds of seed plant parasites, Stem parasites, semi-stem parasite, holo stem parasite, Root semi root parasite and holo-root parasite, disease cycle of dodder, pathogenic behaviour of Giant mistletoe, important characteristics of Giant mistletoe, pathogenic effects of Giant mistletoe, Broomrape as holo root parasite, general characteristics of Broomrape, management of Broomrape, Witch weed (<i>Striga</i> species), general characteristics of Witch weed, management of witch weed (<i>Striga</i> species), dwarf mistletoes, disease cycle of dwarf mistletoe and management of dwarf mistletoes.	
Chapter 13. Seed pathology	561-567
Role of seed in plant pathology, association of pathogens with seeds, scientists who reviewed method of detection of seed borne pathogens, objectives of detection of seed borne microorganisms, information desirable for seed health testing, common methods of detection of seed borne microorganisms, important characteristics recorded during examination of dry seeds, examination after softening and soaking of seeds, examination of seed washings, incubation method of seed testing, blotter method of seed testing, Agar plate method of seed testing, rolled paper towel method of seed health testing, 2. 4-D method of seed health testing, some other methods of seed health testing, different kinds of seed borne pathogens, destruction of seed borne pathogens, use systemic fungicide, use insecticides that are compatible with the Thiram, protectant fungicides and seed certification?	

Chapter 14. Management of crop diseases**568-585**

Conditions for management of plant diseases, basic categories for disease management, prophylaxis, prophylactic measures, curative measures, important curative measures, important precautions for avoidance of pathogens, important curative measures, exclusion of inoculum, eradication of pathogen, protective measures, cultural control measures, different methods of obtaining resistance in hosts, classification of fungicides, different kinds of fungicides, important characteristics of good fungicides, different methods of application of fungi-toxicants/fungicides, biological control, biotechnology for disease resistance, tissue culture techniques, principles behind tissue culture and recombinant DNA technology.

Chapter 15. Glossary of terms**586-613****Some Important Publications****614-615**