

contents

PART 1 GENERAL ASPECTS

1.		
<i>introduction</i>		3
The concept of disease in plants		4
Classification of plant diseases		7
History of plant pathology		7
Importance of plant diseases		13
Diagnosis of plant diseases		22
Identification of a previously unknown disease—Koch's postulates		26
2.		
<i>parasitism and disease development</i>		28
Parasitism and pathogenicity		28
Host range of pathogens		30
Stages in the development of disease		31
3.		
<i>how pathogens attack plants</i>		48
Mechanical forces exerted by pathogens on host tissues		49
Chemical weapons of pathogens		50
Growth regulators in plant disease		58
4.		
<i>pathogen effects on plant physiological functions</i>		64
Effect of pathogens on photosynthesis		64

Effect of pathogens on translocation of water and nutrients in the host plant	65
Effect of pathogens on host plant respiration	68
5.	
<i>how plants defend themselves against pathogens</i>	72
Structural defense	72
Biochemical defense	79
6.	
<i>genetics and plant disease</i>	86
Introduction	86
Mechanisms of variability	86
Stages of variation in pathogens	90
Types of plant resistance to pathogens	91
Genetics of virulence in pathogens and of resistance in host plants	92
Breeding of resistant varieties	95
7.	
<i>effect of environment on development of infectious plant diseases</i>	104
Effect of temperature	105
Effect of moisture	106
Effect of wind	108
Effect of light	109
Effect of soil pH	109
Effect of host-plant nutrition	110
The role of environmental factors in plant disease epidemics	111
Weather and forecasting of plant disease epidemics	112
8.	
<i>control of plant diseases</i>	115
Regulatory methods	116
Cultural methods	117
Biological methods	120
Physical methods	123
Chemical control	126
 PART 2	
<i>SPECIFIC PLANT DISEASES</i>	
9.	
<i>environmental factors that cause plant diseases</i>	147
Introduction	147
Temperature	150
Moisture	155

Inadequate oxygen	158
Light	158
Air pollution	159
Nutritional deficiencies in plants	161
Soil minerals toxic to plants	165
Herbicide injury	168
Other improper agricultural practices	171
 10.	
<i>plant diseases caused by fungi</i>	172
Introduction	172
Characteristics of plant-pathogenic fungi	172
Classification of plant-pathogenic fungi	177
Isolation of fungi (and bacteria)	183
Life cycles of fungi	188
Control of fungus diseases of plants	189
Diseases caused by the lower fungi	191
<i>Diseases caused by Myxomycetes</i>	191
the true slime molds, 191; clubroot of crucifers, 196	
<i>Diseases caused by Phycomycetes</i>	200
black wart of potato, 202; Pythium seed rot, damping off, and root rot, 207; Phytophthora diseases, 213; the downy mildews, 226; Rhizopus soft rot of fruits and vegetables, 234	
<i>Diseases caused by Ascomycetes and Imperfect Fungi</i>	237
sooty molds, 244; leaf curl diseases caused by Taphrina, 247; the powdery mildews, 250; foliar diseases, 255; stem and twig cankers, 278; anthracnose diseases, 289; fruit and general diseases, 303; vascular wilts, 324; root and stem rots, 342; postharvest diseases of plant products, 358	
<i>Diseases caused by Basidiomycetes</i>	372
the rusts, 372; the smuts, 396; root and stem rots, 410; wood rots and decays, 423	
<i>Mycorrhiza and plant growth</i>	431
 11.	
<i>plant diseases caused by bacteria</i>	435
Introduction	435
Characteristics of plant-pathogenic bacteria	436
Bacterial spots and blights	446
Bacterial vascular wilts	464
Bacterial soft rots	477
Bacterial galls	483
Bacterial cankers	489
Bacterial scabs	498
Root nodules of legumes	501
Plant diseases caused by rickettsialike bacteria	504
Pierce's disease of grape and alfalfa dwarf, 507	

12.		
<i>plant diseases caused by mycoplasmalike organisms</i>		511
Introduction		511
Properties of mycoplasmas		513
Other organisms that resemble mycoplasmas: L-forms of bacteria		520
Examples of plant diseases caused by mycoplasmalike organisms		521
	aster yellows, 521; lethal yellowing of coconut palms, 524; elm phloem necrosis, 526; peach X-disease, 527; pear decline, 528; citrus stubborn disease, 530; corn stunt disease, 532	
13.		
<i>plant diseases caused by parasitic higher plants</i>		537
Introduction		537
	odder, 538; witchweed, 540; broomrapes, 543; dwarfmistletoes, 544, true or leafy mistletoes, 547	
14.		
<i>plant diseases caused by viruses</i>		549
Introduction		549
Characteristics of plant viruses		550
The biological function of viral components—coding		556
Virus infection and virus synthesis		557
Translocation and distribution of viruses in plants		560
Symptoms caused by plant viruses		561
Physiology of virus-infected plants		564
Transmission of plant viruses		566
Purification of plant viruses		574
Serology of plant viruses		575
Nomenclature and classification of plant viruses		576
Identification of plant viruses		577
Economic importance of plant viruses		578
Control of plant viruses		580
	tobacco mosaic, 581; cucumber mosaic, 585; bean common mosaic and bean yellow mosaic diseases, 588; curly top of sugar beets, 590; barley yellow dwarf, 593; necrotic ring spot of stone fruits, 596; tristeza disease of citrus, 600	
Plant diseases caused by viroids		603
	potato spindle tuber, 606; citrus exocortis, 608; chrysanthemum stunt, 610	
15.		
<i>plant diseases caused by nematodes</i>		612
Introduction		612
Characteristics of plant-pathogenic nematodes		612
Isolation of nematodes		617
Symptoms caused by nematodes		619
How nematodes affect plants		619