DISEASE AND INSECT RESISTANCE IN PLANTS



Dhan Pal Singh & Arti Singh

Contents

Pre	face	vii				
1.	The	Value of Disease and Insect Resistance1				
2.	Con	cepts in Disease Resistance7				
	2.1	Variability in Plant Pathogens				
		2.1.1 Variability in Fungal Pathogens				
		2.1.2 Variability in Bacteria				
		2.1.3 Variability in Viruses				
	2.2	Identification of Physiological Races				
	2.3	Genetic Nature of Physiological Specialization				
	2.4	The Importance of Parasitic Variability to the Plant Breeder				
	2.5	Resistance in the Host				
		2.5.1 Mechanisms of Resistance				
		2.5.2 Types of Resistance				
	2.6	Structural Defense Mechanisms				
		2.6.1 Preformed Defense Structures				
		2.6.2 Defense Structures Formed in Response to				
		Infection by the Pathogen				
	2.7	Biochemical Defense Mechanisms				
		2.7.1 Pre-Existing or Pre-formed Biochemical Defense				
		2.7.2 Induced Biochemical Defense				
3.	Concepts in Insect-Pest Resistance					
	3.1	Degree of Resistance				
	3.2	Functional Resistance				
	3.3	Types of Genetic Resistance				
	3.4	Effect of Different Types of Resistance on Pest Population				
	3.5	The Combination of Factors				
	3.6	The Biotypes of Insect Pests				
	3.7	Genetics of Virulence				
	3.8	Genetics of Resistance				

x /	' Dise	ase and Insect Resistance in Plants			
	3.9 3.10	Location of Gene(s) on Chromosomes Problems Associated with Breeding for Resistance to Insects			
4.	Genetics of Host-Parasite Interaction				
	4.1	Genetics of Resistance			
	4.2	Inheritance of Induced Resistance			
	4.3	Location of Resistance Gene(s) on the Chromosomes			
	4.4	Genetics of Pathogenicity			
	4.5	Host-Parasite Specificity			
	4.6	Gene-for-Gene Concept			
	4.7	A Second Gene-for-Gene Hypothesis			
	4.8	The Gene-for-Gene and the Protein-for-Protein Hypothesis			
	4.9	Biochemical Basis of the Gene-for-Gene Hypothesis			
	4.10	How Does the Gene-for-Gene Relationship Come into the Picture?			
	4.11	Genetic Limitations to Models of Specific Interactions of the			
		Host and its Parasite			
		Gene-for-Gene Basis in HR			
	4.13	Additive Effects, Genetic Background, Gene Dosage,			
	4 1 4	Dominance Reversal, Heterotic Effect and Environmental Effects			
		The Vertifolia Effect			
		Host-Specific Phytotoxins and Pathogenesis			
:		Population Genetics of Gene-for-Gene Interactions			
		Fitness Models of Gene-for-Gene Interactions			
		Vertical and Horizontal Resistance in Relation to Loss of Fitness			
	4.19	Epidemiology of Vertical and Horizontal Resistance			
5.		rces of Resistance and Methods of			
		ing for Resistance 183			
	5.1	Sources of Resistance			
	5.2	Screening for Resistance to Diseases			
		5.2.1 Fungal Diseases			
		5.2.2 Bacterial Diseases			
		5.2.3 Tests for Resistance Using Toxins			
	5.3	Virus Diseases			
	5.4	Sequential Inoculations for Multiple Disease Resistance			
		5.4.1 Assessment of Disease Resistance			
	5.5	Methods of Testing for Resistance to Pests			
	5.6	Assessment of Insect-Pest Resistance			
6.	Breeding for Resistance to Diseases and Insects				
	6.1	Methods of Breeding for Resistance			
		6.1.1 Cross-Pollinated Crops			
		6.1.2 Self Pollinated Crops			
		6.1.3 Vegetatively Propagated Crops			

	6.2	Manag	gement of Disease and Insect Resistance				
		6.2.1	Management of Vertical Resistance Gene(s)				
		6.2.2	Mechanism of Action of Multilines				
		6.2.3	Multiple Resistance				
	6.3	Management of Tolerance					
	6.4	Management of Horizontal Resistance					
7.	Pro	ductio	on of Disease-Resistant Plants by				
	Und	onvei	ntional Breeding	275			
	7.1	The C	Cell and Tissue Culture Approach				
		7.1.1	Basic Techniques in Plant Cell Culture				
	7.2	Prospects for the Future					
	7.3	Genetic Marker-based Approach or Molecular Approach					
		7.3.1	Isozyme Markers				
		7.3.2	DNA Markers				
		7.3.3	Role of Molecular Markers-assisted Selection				
	7.4	Trans	genic Plants for Biotic Stress Resistance				
8.	Stability and Vulnerability of Resistance						
	8.1		lity of Specific Resistance				
	8.2	The I	Proposed Solution				
Re	ferenc	es		323			
			1				
511	mect .	таех		020			