Resistance terminology and pest code acronyms

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Resistance terminology

Below you will find the definitions of the terms describing the reaction of plants to pests[1] for the vegetable seed industry (based upon an ISF approved version, May 2017).

Introduction

The relationship between a plant and a pest or pathogen is very complex. The terms that describe the reaction of a plant variety to a pest or pathogen are determined by tests with known and characterized biotypes, pathotypes, races or strains of the pest or pathogen in question.

In practice however, the ability of a pest or pathogen to cause disease in or damage to a plant depends on environmental conditions, the properties of the organism itself and the capacity of the plant to defend itself. Plant varieties within a species can differ in their ability to defend themselves. Under different conditions, such as age of the plant, pest or pathogen pressure and degree of virulence or adverse environmental conditions, the interaction between the same plant variety and pest or pathogen may have different outcomes.

Pests and pathogens are known to develop and form new biotypes, pathotypes, races or strains that can cause disease in or damage to plants that remain unaffected by the original form of the pest or pathogen.

Definitions

Susceptibility is the inability of a plant variety to restrict the growth and/or development of a specific pest or pathogen.

Tolerance: the ability of a plant variety to endure abiotic stress without serious consequences for growth, appearance and yield. Vegetable companies will continue to use tolerance for abiotic stress.

Resistance is the ability of a plant variety to restrict the growth and development of a specified pest or pathogen and/or the damage they cause when compared to susceptible plant varieties under similar environmental conditions and pest or pathogen pressure. Resistant varieties may exhibit some disease symptoms or damage under heavy pest or pathogen pressure.

Two levels of resistance are defined:

[1] FAO defines a pest as: Any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products. Pathogens (microorganisms such as bacteria, viruses and fungi that cause a disease) are, therefore, included in the term “pest”. http://www.fao.org/3/w3587e/w3587e01.htm

- High resistance (HR): plant varieties that highly restrict the growth and development of the specified pest or pathogen under normal pest or pathogen pressure when compared to susceptible varieties. These plant varieties may, however, exhibit some symptoms or damage under heavy pest or pathogen pressure.
- Intermediate resistance (IR): plant varieties that restrict the growth and development of the specified pest or pathogen, but may exhibit a greater range of symptoms or damage compared to highly resistant varieties. Intermediate resistant plant varieties will still show less severe symptoms or damage than susceptible plant varieties when grown under similar environmental conditions and/or pest or pathogen pressure.

Immunity: is when a plant is not subject to attack or infection by a specified pest or pathogen.

Coding

Resistances in varieties of our crops will be coded (please, see our coding list for explanation), unless indicated otherwise.
To separate pest organisms, species codes and strain codes, the following separators will be used:

- In case a variety is resistant to more than one pathogen, the individual resistance codes will be separated by the symbol "/ " (solidus).
- Species codes will be separated from the strain code(s) by the symbol ":" (colon).
- Strain codes will be separated by the symbol "," (comma).
- In case that there are more than two strain codes in a logical order, the notation will be abbreviated in a from-to mode by the symbol "-" (hyphen-minus).

Varieties claiming the same level of resistance against a specific pest or pathogen may exhibit a different resistance response due to a different genetic makeup of a variety.
It is to be noted that if a resistance is claimed in a plant variety it is limited to the specified biotypes, pathotypes, races or strains of the pest or pathogen.

If no biotypes, pathotypes, races or strains are specified in the resistance claim for the variety, it is because no generally accepted classification of the cited pest by biotype, pathotype, race or strain exists. In this case resistance is only claimed against certain not further specified isolates of that pathogen. New biotypes, pathotypes, races or strains that may emerge are not covered by the original resistance claim.

Codes (Acronyms) per species

Beans -Phaseolus vulgaris L.

Code	Scientific name	English name	Races/Strains
BCMV	Bean Common Mosaic Virus	Bean Common Mosaic Virus	
Cl	Colletotrichum lindemuthuanum	Anthracnose (race Lambda)	Lambda
Psp	Pseudomonas syringae pv. Phaseolicola (race 6)	Halo blight	6
Ua	Uromyces appendiculatus (many prevalent races)	Rust (many prevalent races)	

Beetroot - Beta vulgaris L.

Code	Scientific name	English name	Races/Strains
Cb	Cercospora beticola	Leaf spot	
Pfb	Peronospora farinosa f. sp.betae	Downey mildew	

Broccoli - Brassica oleracea L. convar. botrytis

Code	Scientific name	English name	Races/Strains

Cabbage - Brassica oleracea L.

Code	Scientific name	English name	Races/Strains
Foc	Fusarium oxysporum f. sp. conglutinans	Cabbage yellows wilt	
Xcc	Xanthomonas campestris	Black rot	

Carrot - Daucus carota L

Code	Scientific name	English name	Races/Strains
Ad	Alternaria dauci	Leaf blight	

Cauliflower - Brassica oleracea L. var. botrytis L.

Code	Scientific name	English name	Races/Strains

Cucumber - Cucumis sativus L.

Code	Scientific name	English name	Races/Strains
Cca	Corynespora cassiicola	Corynespora blight and target spot	
Ccu	Cladosporium cucumerinum	Scab and gummosis	
CMV	Cucumber Mosaic Virus	Cucumber mosaic	
CVYV	Cucumber Vein Yellowing Virus	Cucumber mosaic	
Co	Colletorichum orbiculare	Anthracnose	1, 2, 3
MMV	Melon Mosaic Virus race 1	Melon mosaic	1
Psl	Pseudomonas syringae pv. Lachrymans	Angular Leaf Spot	
Pcu	Pseudoperonospora cubensis	Downey mildew	
Px	Podosphaera xanthii (ex. Sphaerotheca fuliginea)	Powdery mildew	
ZYMV	Zucchini Yellow Mosaic Virus	Zucchini yellows	

Eggplant - Solanum melongena L.

Code	Scientific name	English name	Races/Strains

Lettuce - Lactuca sativa L.

Code	Scientific name	English name	Races/Strains
Bl	Bremia Lactucae	Downey mildew	1 - 32
LMV	Lettuce Mosaic Virus	Lettuce mosaic	1
Nr	Nasonovia ribisnigri	Lettuce leaf aphid	0
Pb	Pemphigus bursarius	Lettuce root aphid	
TBSV	Tomato Bushy Stunt Virus	Lettuce die back	

Melon - Cucumis melo L.

Code	Scientific name	English name	Races/Strains
Ag	Aphis gossyppi	Cotton aphid	i
Fom	Fusarium oxysporum f. sp. Melonis	Fusarium wilt	0, 1, 2, 1.2
Gc	Golovinomyces cichoracearum (ex. Erysiphe cichoracearum)	Powdery mildew	1
MNSV	Melon Necrotic Spot Virus	Melon necrotic spot	
Px	Podoshaera xanthii (ex. Sphaerotheca fuliginea)	Powdery mildew	1, 2,3, 5, 3.5

Okra - Abelmoschus esculentus L.

Code	Scientific name	English name	Races/Strains

Onion - Allium cepa L.

Code	Scientific name	English name	Races/Strains
Pd	Peronospora destructor	Downey mildew	
St (ex Pt)	Setophoma terrtestris (ex Pyrenochaeta terrestris)	Pink root rot	
Ap	Alternaria porri	Purple blotch	

Pepper - Capsicum annuum L.

Code	Scientific name	English name	Races/Strains
PeMoV	Pepper Mottle Virus	Pepper mottle	
PVY	Potato Y Virus	Potato Y	0, 1, 1.2
TEV	Tobacco Etch Virus	Tobacco etch	
Tm	Tobamovirus group (pepper mild mottle virus, Tobacco mild green mosaic virus, Tobacco mosaic virus, Tomato mosaic virus)		0, 1, 1.2, 1.2.3
TSWV	Tomato Spotted Wilt Virus	Tomato spotted wilt	0
Xcv	Xanthomonas campestris pv. Vesicatoria	Bacterial spot	1, 2, 3, 4, 5

Squash - Curcubita pepo L.

Code	Scientific name	English name	Races/Strains
Px	Podosphaeria xanthii (ex. Sphaerotheca fuliginea)	Powdery mildew	
PRSV	Papaya Ringspot Virus	Papaya ringspot	
WMV	Watermelon Mosaic Virus	Watermelon mosaic	
ZYMV	Zucchini Yellow Mosaic Virus	Zucchini yellows	

Tomato - Solanum lycopersicum L.

Code	Scientific name	English name	Races/Strains
Fol	Fusarium oxysporum f. sp. Lycopersici	Fusarium wilt	
For	Fusarium oxysporum f. sp. Radicis-lycopersici	Fusarium crown and root rot	
Lt	Leveillula taurica	Powdery mildew	
Ma	Meloidogyne arenaria	Root-knot / Nematodes	
Mi	Meloidogyne incognita	Root-knot / Nematodes	
Mj	Meloidogyne javanica	Root-knot / Nematodes	
On	Oidium neolycopersici	Powdery mildew	
Pf	Passalora fulva (ex. Fulvia fulva)	Leaf mold	A, B, C, D, E
Pi	Phytophthora infestans	Late blight	
Pst	Pseudomonas syringae pv. Tomato	Bacterial spot	
Rs	Ralstonia solanacearum	Bacterial wilt	
ToANV	Tomato Apex Necrosis Virus	Tomato Apex Necrosis	
ToMV	Tomato Mosaic Virus	Tomato Mosaic	0, 1, 2
TSWV	Tomato Spotted Wilt Virus	Tomato spotted wilt	
TYLCV	Tomato Yellow Leaf Curl Virus	Tomato yellow leaf curl	
Va	Verticillium albo-atrum	Verticillium wilt	
Vd	Vericillium dahliae	Verticillium wilt	

Watermelon - Citrullus lanatus L.

Code	Scientific name	English name	Races/Strains
Co	Colletotrichum orbiculare	Anthracnose	
Fon	Fusarium oxysporum f. sp. Niveum	Fusarium wilt	