

## Disease resistance breeding in Cucurbitaceous crop

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### INTRODUCTION

Most of these vegetables are subjected to infestation by many diseases leading to heavy loss. Among the various diseases the most devastating is downy mildew, powdery mildew and mosaics. The cucurbitaceous vegetables comprise of cucumber, gourds, melons, squashes and pumpkins are important vegetable crops of India.

The chemical method of management of these diseases is costly besides their hazardous residual effect on the consumers. Therefore, it is imperative to concentrate on the development of varieties with high level of resistance. To develop variety resistant to diseases, the knowledge on sources of resistant and their genetics is must.

### IMPORTANT DISEASES OF CUCURBITS

#### 1. FUNGAL DISEASES

- |                        |  |
|------------------------|--|
| • Anthracnose          | <i>Colletotrichum orbiculare</i>             |
| • Cercospora leaf spot | <i>Cercospora citrullina</i>                 |
| • Damping-off          | <i>Fusarium spp</i>                          |
| • Downy mildew         | <i>Pseudoperonospora cubensis</i>            |
| • Fusarium wilt        | <i>Fusarium oxysporum f. sp. cucumerinum</i> |
| • Powdery mildew       | <i>Sphaerotheca fuliginea</i>                |

#### 2. BACTERIAL DISEASES

- |                       |  |
|-----------------------|--|
| • Angular leaf spot   | <i>Pseudomonas syringae pv. lachrymans</i>   |
| • Bacterial leaf spot | <i>Xanthomonas campestris pv. cucurbitae</i> |
| • Bacterial wilt      | <i>Erwinia tracheiphila</i>                  |

#### 3. VIRUS DISEASES

- |                           |  |
|---------------------------|--|
| • Cucumber green mottle   | Cucumber green mottle mosaic virus (CGMMV) |
| • Cucumber mosaic         | Cucumber mosaic virus (CMV)                |
| • Cucumber vein yellowing | Cucumber vein yellowing virus (CVYV)       |
| • Melon necrotic spot     | Melon necrotic spot virus (MNSV)           |
| • Squash leaf curl        | Squash leaf curl virus (SqLCV)             |
| • Watermelon mosaic       | Watermelon mosaic virus (WMV)              |
| • Zucchini yellows        | Zucchini yellows mosaic virus (ZYMV)       |

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**Table 1. Percent yield loss by different diseases in cucurbits**

Crops	Disease	Yield loss (%)
Muskmelon, watermelon, Cucumber	Powdery mildew	12-75
Muskmelon, watermelon, cucumber and squashes	Downy mildew	79.06
Muskmelon, watermelon, cucumber and gourds	Anthraco nose	89.5
Muskmelon, watermelon, Cucumber	Fusarium wilt	80
Muskmelon, watermelon, cucumber and squashes	Cucumber mosaic	96
Muskmelon	WMV	70
Watermelon	WBNV	71
Indian melon	CABYV	40

## MECHANISM OF DISEASE RESISTANCE

**Morphological feature:** Various morphological characters such as few, small sunken and hairy stomata with lesser opening duration, and lesser opening duration of flower have been found associated with disease resistance in different crop plants.

**Hypersensitivity:** Hypersensitivity of the host cells leading to the cell death or necrosis around the point of infection and consequent staining of the obligate parasite. This delays staff of an epidemic and contributes to a defense mechanism against specific race of a pathogen.

**Biochemical features:** Toxic and potentially therapeutic compounds in cucurbits

include, Oxygenated tetra cyclic triterpinoids such as cucurbitacins, saponins, glycosides alkaloids, amino acids and Xanthophylls.

## GENETICS OF DISEASE RESISTANCE

Genetic resistance refers to those heritable features of a host plant that suppress or retard development of a pathogen. In other words, resistance is the ability of some genotypes to give higher yields of good quality than other varieties at the same initial level of disease infestation under similar environmental conditions.

## VERTICAL RESISTANCE

It displays discontinuous variation among genotypes and classification of genotypes into resistance and susceptible classes. Transfer of oligogenic resistance from

one host genotype to another is simple. It is usually short lived or less durable. The resistance can easily breakdown when new races of a pathogen formed It provides protection only for one race of a pathogen. It has high heritability and can be easily identified in the breeding programme. Vertical resistance applies to host pathogen gene for gene hypothesis.

### HORIZONTAL RESISTANCE

Classification of genotypes into different distinct classes is not possible. It has low heritability and here identification of resistant types is difficult.

Protection against several races of a pathogen. The resistance it exhibits continuous variation among genotypes and therefore, cannot be easily overcome by new races of a pathogen due to polygenic control.

### METHODS OF BREEDING FOR DISEASES RESISTANCE

#### 1. SELECTION-

Muskmelon- Arka Rajahans

Cucumber - Phule Shubangi

#### 2. INTRODUCTION-

Watermelon-Charleston Grey

Cucumber-Poinsettia

#### 3. HYBRIDIZATION-

Watermelon- Arka Manik

<b>ACHIEVEMENTS-</b>		
<b>Crops</b>	<b>Resistance line/ varieties</b>	<b>References</b>
<b>I. Watermelon</b>		
Fusarium wilt, anthracnose	Dixielle	Crall and Elmstrom(1979)
Powdery mildew ,downy mildew and anthracnose	Arka Manik	Bassett (1986)
Fusarium wilt and Anthracnose	Charleston Grey	Norton et al.,(1993)
Anthracnose and gummy stem blight	AU Sweet Scarlet, Chalee, Au-Producer	Norton <i>et al.</i> , 1986Au-Product
Fusarium wilt	Calhoun Gray, Summit	
<b>2. Muskmelon</b>		
Powdery mildew, Downey mildew	Hara Madhu, Punjab Sunehari	Tamburaj and Singh (2001)
Powdery mildew Downy mildew, Mosaic	Mr-12, Pusa Sharabati Cinco	Tamburaj and Singh (2001) Thomas and Webb, 1982
Downey mildew and Viral complex	Punjab hybrid, Mr-12	Dhiman et al., (1994)
<b>3. Cucumber</b>		
Powdery mildew, Downey mildew		Tamburaj and Singh (2001)
Anthracnose, Angular leaf spot and Downey mildew	Palmetto, Ashley, Chinese long stone, M17'	Singh (2001), Claude and Raymon, 1982,
Powdery mildew	Polaris, Ambra, Yamaki	Singh (2001)
Mosaic	Market More	Kaloo (1994)
Anthracnose	Hybrid 517, South Carolina	

## ACHIEVEMENTS-

### 4. Bitter gourd

Downey mildew	RHR	Tamburaj and Singh (2001)
Summer squash		
Powdery mildew	Punjab Chappan	Powdery mildew

## Conclusion

There is greater scope for development of diseases resistance with high yielding varieties by using various sources of resistance reported for various diseases. Because of evolution of new races of pathogens, the breakdown of diseases resistance. Therefore, breeding for diseases resistance is a continuous process. It is emphasized to develop varieties with multiple diseases resistance to solve the production constraints in cucurbitaceous vegetable crops.

