



## Disease Resistant Varieties: A Key Approach for Sustainable Production

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Normal plant life disturbance is a result of the disease. A plant disease that reduces the performance to its maximum potential. In the normal state, plant disease can interrupt its vital function. The disease is caused by living thing is Biotic and non-living thing Abiotic can infect society as well as the world. In Indian history, great Bengal famine in 1943 was due to a brown leaf spot of rice and almost perished 3 million Bengalis (Aritra, 2021).

Seeds play important role in good crop production. If seeds are healthy, pure and vigorous, crop yield will boost automatically. Major threat global food security is the changing pattern of pathogen to cause the disease in changing climate, results in huge crop loss all over the world, chemical control of disease using different pesticides leaves the residue in plants and grains, which is hazardous to human being as food.

Seeds with ability to resist the pathogen to cause the disease is the economic and environmentally safe method. So varieties with disease resistant are becoming popular in all cereals, vegetables, and pulses crops. Breeders are focusing on multiple disease resistance now days in same cultivar.

### Effect of disease on health of plant and crop production

A plant disease causes significant loss in crops, the occurrence of the disease each side of the triangle is must be required one side is the environment and the second side is the pathogen and the third side is the host. If one side of the triangle missing then disease will not occur. Many factors are responsible to interrupt plant health but mainly living and non-living factors are responsible for plant health problems (Anonymous, 2023). Disease-infected plant can be susceptible or reduce the ability of competitiveness, resulting the increasing management cost & yield reduction. Diversity is important to learn the plant health intervention and causal factors. For example, the disease that occurs in apple crop scab of apple caused by the fungus *Venturia inaequalis* the favorable environment for this disease is the cool environment, a wet spring when the plant is young and emerging leaves wet for a long period.

### Method to develop disease resistant variety

Crop improvement is the major step to improving food crop production. The management of disease through cultural methods by using a resistant variety is the most important tool. The normal cultivar is affected by many diseases caused by different types of pathogens like bacteria, fungi, viruses, nematodes etc.

Resistant varieties govern mono for polygenes that responsible for disease resistance in plants. These genes synthesize protein or enzyme, which prevent the pathogen to make relationship with plant cell, even in favorable climatic conditions, hence result in healthy plant due to non occurrence of disease. The genes for disease resistance are mainly introgressed from wild species of a crop using back cross breeding or gene pyramiding

methods in the crops, where resistant genes are identified and possible to incorporate into modern cultivars. Basically, resistance work on the principal of gene for gene hypothesis given by HH Flor.

Another approach to develop resistant variety is loss of susceptibility. According to this hypothesis, if the gene responsible for susceptibility in plants is altered using mutation or gene knocking, which results in termination of gene transcription and translation, it is possible to loss the function of susceptible gene. Hence the variety will be resistant to that specific pathogen. Various modern cultivars have been developed and released using these above mentioned techniques in different crops time to time (Table1).

### Role of resistant varieties

The use of resistant variety is an important and effective control method. Resistant varieties can suppress the development of disease. A specific variety is resistant to one or more specific diseases. Genetic resistance is a most appropriate approach to crop protection and facilitates disease resistance to specific crop species (Sharma, 2003). The knowledge is implemented in crop species and enhances the resistance against pathogens. In the area where in the past a major issue of disease, the resistant variety is strongly recommended. Plant resistance gene (R gene) that is used in various resistance breeding programs for a long time (McDowell and Woffeden, 2003).

### List of resistant varieties different crop various

Sr no	Crop	Variety	Resistant trait	Source
1	Rice	Pusa basmati 1886	Blast and bacterial blight resistance	Ministry of Agriculture, GOI, 2021
2	Rice	Pusa basmati 1847	Blast and bacterial blight resistance	
3	Rice	Pusa basmati 1885	Bacterial blight and blast resistance	
4	Rice	DRR dhan 58	Resistant to bacterial blight	
5	Rice	DRR dhan 59	Resistant to bacterial blight	
6	Rice	DRR dhan 60	Resistant to bacterial blight	
7	Wheat	PBW Unnat 343	Resistant to yellow rust	IIWBR, Karnal, 2022
8	Wheat	DBW 372	Resistant to brown and yellow rust	
9	Wheat	DBW 222	Resistant to brown rust and moderately resistant to yellow rust	
10	Wheat	DBW 252	Highly resistant to wheat blast disease	
11	Wheat	DBW 187	Resistant to yellow and brown rust	
12	Wheat	DBW 173	Resistant to yellow and brown rust	
13	Wheat	DBW 168	Black rust and brown rust resistant	
14	Wheat	WB 2	Powdery mildew, brown rust and yellow rust resistant	
15	Wheat	DBW 93	Resistant to black rust	

16	Wheat	DBW 107	Brown rust resistant
17	Wheat	DBW 110	Brown rust resistant
18	Wheat	DBW 88	Resistant to yellow and brown rust
19	Wheat	DBW 90	Adult plant resistance to yellow and brown rust
20	Wheat	DBW 71	Resistant to yellow rust
21	Wheat	DBW 39	Resistance to black rust, brown rust and tolerant to leaf blight
22	Wheat	CBW 38	Resistant to rust
23	Mustard	RCH-1	Erusic acid <2% and glucosinolates <30 ppm
24	Mustard	PDZM 31	Erusic acid <2% and glucosinolates <30 ppm
25	Soybean	NRC 142	Free from antinutritional factor trypsin inhibitor
26	Pigeonpea	IPH 15-3	Wilt and sterility mosaic resistant
27	chickpea	IPCMB 19-3	Fusarium wilt resistant
28	Pearl millet	HHB 67 improved 2	Resistant to downy mildew

Ministry of  
Agriculture, GOI.  
2021

### Benefits of resistant varieties

Disease or insect-resistant varieties reduce the input cost and increase the benefit-cost ratio to maintain soil fertility for a long time. Resistant varieties are less vulnerable to attack by diseases. The major advantages of using resistant variety is high production compared to normal plant and saving crop loss from the disease.

There are several benefits of using resistant varieties in agriculture:

1. Disease and pest control: Resistant varieties have built-in resistance to specific diseases and pests, reducing the need for chemical pesticides and fungicides. This can help lower production costs and minimize the environmental impact of agriculture.
2. Increased yield and productivity: Resistant varieties can withstand attacks from pests and diseases, allowing crops to grow and develop without significant damage. This leads to higher yields and increased productivity in the field.
3. Reduced crop losses: By using resistant varieties, farmers can minimize crop losses caused by diseases and pests. This helps ensure a more stable and reliable food supply, especially in areas with high disease pressure.



**Plate: Practicing Backcross breeding in wheat crop**

4. Decreased reliance on chemical inputs: Resistant varieties can reduce the need for chemical inputs, such as pesticides and fungicides. This can have positive environmental and health impacts by minimizing the use of potentially harmful chemicals.
5. Improved crop quality: Resistant varieties often show improved quality traits, such as enhanced nutritional value, better storability, and increased shelf life. This can lead to higher market value and consumer acceptance of the produce.
6. Long-term sustainability: By using resistant varieties, farmers can promote sustainable agriculture practices by reducing the use of chemical inputs, preserving soil health, and minimizing the risk of crop failure due to diseases and pests.

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