BREEDING FOR BIOTIC STRESS

Biotic stress: Adverse conditions for crop growth and production caused by biological factors such as diseases, insects and parasitic weeds.

Types of biotic stress:-

i) **Vertical resistance:-**Resistance of a host to the particular race of pathogen; also called as major gene resistance, oligogenic resistance, qualitative resistance.

ii) Horizontal resistance: - Resistance of a host to all the prevalent races of a pathogen; also called as minor gene resistance, polygenic resistance, nonspecific resistance, general resistance.

Mechanism of Disease resistance:-

- **Disease escape:-**The ability of susceptible host plants to avoid attack of disease due to environmental conditions factors, early varieties, charge in the date of planting, change in the site of planting; balanced application of NPK etc is called disease escape.
- **Disease endurance or tolerance:**-The ability of the plants to tolerate the invasion of the pathogen without showing much damage. This endurance is brought about by the influence of external characters. Generally, tolerance is difficult to measure since it is confounded with partial resistance and disease escape.
- **Immune reaction:**-When the host does not show the symptoms of disease it is known as immune reaction. Immunity may result from prevention of the pathogen to reach the appropriate parts of the host e.g. exclusion of spores of ovary infecting fungi by closed flowering habit of wheat and barley.
- **Hypersensitivity:-**Immediately after the infection several host cells surrounding the point of infection are so sensitive that they will die. This leads to the death of the pathogen because the rust mycelium cannot grow through the dead cells. This super sensitivity (hypersensitivity) behaves as a resistant response for all practical purposes. Phytoalexins are specific polyphenolic or terpenoid chemicals and are produced by the host in response to the infection by a pathogen.

Sources of Disease Resistance:

- A known variety:-Disease reactions of most of the cultivated varieties are documented and a breeder may find the resistance he needs in a cultivated variety.
- **Germplasm collection:**-When resistance to a new disease or a new pathotype of a disease is not known in a cultivated variety germplasm collection should be screened.
- **Related species:-**Often the resistance to a disease may be found in related species and transferred through interspecific hybridization. Eg. Resistance to stem, leaf & stripe rusts of wheat.
- **Mutation:**-Resistance to diseases may be obtained through mutation arising spontaneously or induced through mutagenic treatments. Eg, Resistance to Victoria blight in oats was induced by irradiation with x-rays or thermal neutrons / also produced spontaneously, Resistance to stripe rust in wheat, Resistance to brown rust in oats, Resistance to mildew in barley.

Methods of Breeding for Disease Resistance:-

- Plant Introduction:-Process plants introduced from their native plac to another place for crop improvement. Eg; Early varieties of groundnut introduced from USA have been resistant to leaf spot (Tikka). Kalyanasona and Sonalika wheat varieties originated from segregating material introduced from CIMMYT, Mexico, were rust resistant. African bajra introductions have been used in developing downy mildew resistant cms lines.
- Selection:-Kufri Red potato is selection from Darjeeling Red round, Pusa Sawani behind (yellow mosaic) selection from a collection obtained from Bihar, MCU I was selection from CO4 for black arm resistance in cotton.
- **Pedigree method**;- In wheat Kalyana Sona, Sonalaka, Malvika 12, Malvika 37, Malavika 206, Malavika 234, Laxmi in Cotton (Gadag 1 x CO2) for leaf blight resistance are agronomically highly desirable variety. If the resistant parent is a wholly unadapted variety, backcross method is a logical choice
- **Budding and Grafting:**-The disease resistance in vegetatively propogated material is transferred by adopting either by budding or grafting. By grafting or budding the resistant material, the resistance can be transferred.

• **Mutation Breeding:**-When adequate resistance is not available in the germplasm. Mutation breeding is resorted to induce resistance. This is also us ed to break the linkages between desirable resistant genes and other desirable genes.

Varieties resistant to different diseases crop variety:-

Rice:- Blast Co25, Co26, **Wheat:-** all three rusts NP 809, Yellow rust NP 785, NM86,**Sugarcane :** Red rot Co 419, Co 421, Co 527,**Cotton :-** Wilt Vijay, Kalyan, Suyog, **Tikka leafspot:-**Ah 45.

Mechanism of Insect- Pest resistance:

- Non-preference:- Various features of host plant which make the host undesirable or unattractive to insects for food, shelter or reproduction, a mechanism of insect resistance; also called non-acceptance or antixenosis.
- Antibiosis:- Adverse effects of the host on feeding, development and reproduction of insect pest.
- **Tolerance:** Ability of a host to reproduce well despite the establishment of a pathogen in the host tissues or the ability of a variety to produce more yield than susceptible variety at the same level of insect attack.
- Avoidance:- Escape of a variety from insect attack either due to earliness or its cultivation in the season when insect population is very low.