

Pre-existing biochemical defense mechanism in host plants.

Chemical substances produced by the host plants prior to any infection or after the infection is more effective than the physical barriers of defense mechanism. It prevents the pathogens in causing a diseases even if there is no physical barrier in the hosts.

There are various types of biochemical defence mechanism which are as follows:—

(A) Inhibitors released by the host plants in the environment.

Host plants exudate varieties of substances through their aerial parts in the phyllosphere or through their root surfaces in the rhizosphere. These substances may be accumulated on the plant surface or they are diffused into the moisture surrounding the plant. These exuded substances may be amino acids, sugars, glycosides, organic acids, enzymes, alkaloids and inorganic substances. In addition to these substances, certain other substances are also released which have inhibitory action over several pathogens.

Examples:— ① Fungitoxic exudates are released on the leaves of tomato and sugar beet which inhibit the germination of conidia of their pathogens, Botrytis cinerea and Cercospora beticola respectively.

② In the red-scaled onion variety, red pigments of phenolic compounds namely protocatechuic acid and catechol are found. They inhibit the germination of conidia of Colletotrichum circinans, on the scaled leaves. This fungus causes the disease onion smudge.

③ Powdery mildew resistant variety of apple exude waxes on leaf surface which inhibits the germination of conidia of Podosphaera leucotricha, the causal fungus of this mildew disease.

④ Root exudates are also responsible for certain defense mechanism against the fusarial wilts. For example, wilt resistant flax varieties exude a glucoside, which produces hydrocyanide (HCN), which is highly toxic to Fusarium spp.

(B) Inhibitors present in plant cells before infection

Presence of several phenolics and tannins in high concentration in cells of young leaves and fruits lead to inhibition of

growth of pathogens and thereby provide a defense mechanism. However, with the ages of the host tissue, the inhibitor content decreases and the host defense becomes weak.

Examples:- ① The resistant variety of potato against potato scab caused by Streptomyces scabies contains higher concentration of chlorogenic acid, a phenolic, toxic to the pathogen. This phenolic was found more in tissues through which pathogen enters.

② The roots of the resistant varieties of potato against Verticillium wilt also contains chlorogenic acid, which inhibits the infection.

③ Saponins and Tomatine in tomato and Avinacin in oats have antifungal activity, which also act as defense mechanism.

④ Plant cells may also contain hydrolytic enzymes like glucanases and chitinases that may breakdown the cell wall compounds of pathogens.

© Defense through lack of essential factors

Most of the obligate parasites have very limited host and often only a single variety, while facultative & saprophytes have a wide range of hosts. This indicates that facultative saprophytes get all the nutrients they require from wide range of host, while it is not as such in obligate parasites. This suggests that pathogens cannot infect if there is non availability of any specific required factor in the plant which appears to be non-host for that pathogen.

Thus the plant species not producing the required essential factor for growth of pathogen become resistant to that pathogen

Example:- ① Rhizoctonia solani causing seedling diseases of radish and lettuce requires specific substance in susceptible host for the formation of hyphal cushion and penetration tube.

② Erwinia carotovora var. atroseptica causing bacterial soft rot of potato requires high level of reducing sugar in its host to infect. Low level of reducing sugar reduces the severity of the disease.

③ Venturia inaequalis causing apple scab requires a growth factor to become infective. There are certain mutants of this pathogen which cease to be pathogenic in the absence of this factor.