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Perspective

Mechanism of plant defense responses

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ABOUT THE STUDY

Plants have an intact, impermeable barrier made of bark and a waxy cuticle that serves as their first line of protection. Both safeguard plants against herbivores. Hard shells, thorns (modified branches), and spines are some massive defense mechanisms against herbivores (modified leaves). They deter animals by harming them physically or by triggering allergic reactions and rashes. Some types of acacia trees have mutualistic connections with ant colonies; in return for the ants protecting the tree's leaves, they provide them with shelter in its hollow thorns. Numerous species, including bacteria, fungus, protists, insects, and vertebrates, rely on plants as a rich source of nutrients. Plants have evolved a remarkable array of structural, chemical, and protein-based defences designed to identify invading invaders and stop them before they can cause significant damage, probably lacks an immune system equivalent to that of animals. In addition to providing a variety of essential non-food items like wood, dyes, textiles, medications, lubricants, soaps, rubber, plastics, inks, and industrial chemicals, plants are the source of almost all of the food that humans consume. In order to safeguard our food supply and create plant species that are incredibly disease-resistant, it is crucial to understand how plants protect themselves from pathogens and herbivores. Mechanical damage may undermine a plant's external barriers, opening the door for disease invasion. The plant must change to a different set of survival mechanisms, such as toxins and enzymes, if the initial line of protection is compromised. Compounds known as secondary metabolites are not produced by photosynthesis directly and are not necessary for respiration or the development and growth of plants. Many metabolites are hazardous to animals and may even be lethal if they ingest them. Alkaloids are certain metabolites that deter carnivores with unpleasant flavors or odours (like the volatile oils of mint and sage) (like the bitterness of quinine). Other alkaloids have an adverse effect on herbivores by either generating excessive stimulation (caffeine is one example) or the opioid-induced lethargy. Some substances only become hazardous after being consumed; for example, the cassava root's glycol cyanide only releases cyanide when it is consumed by an herbivore. Foxgloves produce a number of poisonous substances, including cardiac and steroidal glycosides. The degree to which defensive characteristics will offer long-lasting pesticides is a crucial factor. Since plant susceptibility features frequently prevent herbivores from grazing, they are probably going to put a lot of pressure on the herbivore to evolve ways to get around plant resistance. Plant tolerance traits, on the other hand, are frequently thought to have little impact on herbivore fitness and are thus unlikely to induce selection on the herbivore. Challenging this presumption by arguing that, under some conditions, tolerance traits might affect herbivore performance. However, few researches have looked into this possibility, particularly in the context of crop protection. In any case, tolerance traits will be more stable and have a higher likelihood of producing persistent pest control than resistance traits, which are likely to exert a heavier selection pressure due to their more significant influences on pests' efficiency. An essential component of safeguarding plants from herbivore attack is the defensive reaction in plants that attracts natural enemies of herbivores. As a result of the combined impact of mechanical stress and inflammatory cytokines from the attacking herbivore, indirect defenses may be constitutive or induced. The secretion of Extra Floral Nectar (EFN) and the production of volatiles facilitate interactions between plants and their natural predators or parasitic organisms, which actively lower the population of herbivorous animals that feed on them. The study of induced indirect responses at the genetic, biochemical, physiological, and ecological levels has recently grown at a rapid pace.

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