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# Plants & Science

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## ***What are defenses in plants and how do they help or hinder the plant?***

### ***What do plant defenses entail?***

Plants, like all organisms, can evolve over time. How and when a plant evolves depends on the surrounding environment. Those fit to survive in that environment possess the biological make-up to live, and those not fit dwindle away along with their unfit genes. This is known as natural selection, a concept introduced by Charles Darwin. Afterwards, when the plants in that area mate, the fit genes will be more prominent. Mutations in plants also bring about evolution. Plants have the means to protect themselves from outside factors that may harm them. These mechanisms come in two different forms, constitutive and induced responses. Constitutive responses are always present in the plant, while induced are only produced as a reaction. The ways in which pathogens and other organisms have attacked plants has evolved over the years, but so has the plants way in which it fights off these intruders. All plants deal with intruders in different ways, and some in similar ways. Most ways benefit the plant, but not all do. For example, when a

pathogen enters a plant, it may have it fight it off while also hurting itself. You see this when brown spots show up on the leaf of a plant, called necrotic lesions.

### ***Dealing with herbivore.***

Insects are one of the main organisms that plants have to deal with on a daily basis. The defense mechanism they use is in the constitutive category, because what fights them off is always there. The trichomes (which are small hair like structure on the plant) as well as the actual toughness of the leaf helps make it harder for the invading insect to feed on the plant. This was shown to be true in an experiment done by Dr. Mark Fishbein. He is a part of the Department of Plant Biology, Ecology, and Evolution Program at Oklahoma State University, and does research focused on how evolution operates within populations. He also does research over the evolution of defenses against herbivore. He believes that the results found can go on to start up the conversation about how plant environments, herbivore communities, and the actual

environment tie in with some defense strategies found in plants.

### ***Induced Responses with Insects***

We all know that insects and animals eat on plants for nutrition. Some plants have the ability to create a chemical that flows throughout the plant in the areas where it senses the attack. The main hormone produced is called jasmonic acid. This hormone acts as a signaler to the plant that an insect is feeding on it. It signals for the plant to produce a chemical that doesn't taste too good for the animal to now consume.

### ***Plant Defenses-Milkweeds***

Dr. Fishbein focused on milkweed plants for his experiment over the topic of herbivory on plants, along with the mechanisms the plant used to keep them at bay. It was shown that latex excreted from the plant and trichomes played a huge role in getting rid of insects. It's given that plants have different levels of how they are made physically. For example some plants have thicker tissue than the next, or longer trichomes than the next, and so on. Focusing on a specific species for the experiment eliminated all of these factors that might have skewed the data negatively. The first purpose of the experiment was to measure the plants traits (explained above) for the milkweed plant. Do milkweeds successfully ward off caterpillars when they have thicker trichomes, or is there no correlation? Is the success based on how much latex is produced? Leaf toughness? These are the questions that went into the process of this experiment. After the experiment was

carried out, it was found from the regression models what to make from what was done.

There was little to no significance in caterpillars death and the varying sizes of trichomes. As far as the correlation between latex production and caterpillar death, it can be more complicated. From the experiment there was no negative effect of latex on the insect, but this can be from other factors. It's common knowledge that latex does in fact kill off the insect, but this doesn't show that. Fishbein explains that other plant defenses could be the reason that plants with a higher production of latex didn't have to even use the latex mechanism.

### ***What does this mean?***

The fact that plants are able to protect themselves with these mechanisms makes the problem of them not being able to move around a smaller problem. Over time, they developed ways to protect themselves from outside forces that may not plan to destroy them, but ends up being the outcome. The ways in which a plant carried out these tactics seems to not matter as much as the actual act happening.

## *References*

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