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Which Pest Control Method Is Best for Basil?

Sweet basil, familiar to many cooks as an aromatic spice, is a plant cultivated in warm climates all over the world. Although basil grows well in the United States, much of what we use is imported (six to eight million pounds per year) as persistent insect pests reduce the yield and quality of commercially-grown sweet basil.

Finding a suitable means of pest control for basil is thus a goal of significant commercial interest. There are four general approaches widely used to control herbivorous insect pests:

1. Hand removal. This is a very labor intensive process whereby a farmer runs his/her hands through the leaves of the plants to dislodge any insects. While the procedure often works well for small plots of basil, it is too inefficient and expensive for large-scale cultivation.

2. Horticultural oil. Horticultural oils are highly refined petroleum products that are mixed with water and sprayed on plants. These oils are safe for humans because they are not poisonous. They kill insects by covering the outside of the insect body with a thin film that plugs its spiracles (pores through which the insect breathes). The oil-covered insect literally suffocates. However, the oil may damage the plant as well. Plants also have pores through which the plant “breathes,” called stomata. Carbon dioxide, oxygen and water enter or leave the plant through these pores on the undersides of the leaves. Like spiracles, the stomata can become plugged with oils, interfering with normal plant functions.

3. Chemical pesticides. A common chemical pesticide used on basil plants is pyrethrum. Pyrethrum is an organic powder made from Chrysanthemum flowers. The powder is mixed with water and sprayed on plants. It acts by paralyzing the insects on contact, and has low toxicity to mammals. Pyrethrum is not a stable compound and breaks down very quickly, helping to reduce its impact on the environment. However, this rapid breakdown of pyrethrum necessitates the frequent reapplication of the insecticide for adequate crop protection.

4. Bioinsecticide. A bioinsecticide is a biological agent that reduces or eliminates insect pests. *Bacillus thuringiensis* is a bacterium that has been sprayed or dusted on crops for half a century. When *B. thuringiensis* is applied to plants, insects (particularly butterfly and moth larvae) ingest the bacteria as they eat the plant. A toxin is released from the in-

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gested bacteria that kills the larvae. *B. thuringiensis* is not toxic to humans, or to many beneficial insects like ladybugs that eat other insects. The gene for the bacterial toxin of *B. thuringiensis* has been spliced into the genomes of crop plants such as corn and soybeans, making these crops toxic to insect pests. The larvae eat the plants and die. The toxin does not affect humans: Activation of the toxin requires a very high pH (9.5 or higher) which is the environment of the gut of susceptible insects, but not of the human digestive system.

Although many pest control methods are available to ward off insect attacks of basil, which method is the best to use? James Bidlack of the University of Central Oklahoma and then graduate student Paul Olson set out to test the effectiveness of the various pest control methods on basil crop yield. The researchers went on to examine the effects of these control methods on the basil plant’s natural defenses. While there are biochemical ways to check this, a simpler approach is to measure trichome density. Trichomes are cell structures, some pointed like thorns, that offer the plant protection either by secreting chemicals that deter insects, or by impaling larval predators. In some plants, there is a positive correlation between trichome number and resistance to predators.