

Pests in Organic Systems and Promising Solutions

Av Singh, Ph.D.

Organic farming emphasizes creating healthy soils using compost and green manures, crop rotations (including underseeding and intercropping), and having crop production integrated with a livestock enterprise. These management practices also act as a first-line of defence against pests. Pests, simply defined, are insects, weeds, or diseases that may affect the yield or quality of a crop.

Typically, a pest management strategy also involves cultural practices such as cultivation, flaming, and handpicking (including vacuuming). These methods are generally very time-consuming and may be labour or machinery intensive. Alternately, organic producers may use physical barriers to deter pests. Examples of natural barriers would include living or killed mulches and repellent crops (i.e., companion planting) while a synthetic barrier may refer to the use of sticky traps, row covers, and netting. Row covers work well in horticultural crops, but may interfere with pollination and may increase damage from pests that emerge from under row covers. Row covers are also impractical for field crops. As a last resort, the organic farmer can rely on non-synthetic *pesticides*. Now, the terms organic and pesticide seem contradictory, however organic certifying bodies do permit some pesticides. These are typically “natural” products as opposed to synthetic chemical substances that are prohibited in organic farming. This article will provide a brief introduction to many generic substances used by organic farmers and will list some potential products that are seeking regulation. The article will avoid brand names but many can be found on the Organic Materials Review Institute list (www.omri.org).

Botanical Insecticides

Rotenone – a plant derived broad-spectrum insecticide that was once used extensively as an alternative to chemical pesticides. Safer alternatives exist and are recommended by many certifying bodies, however rotenone is still often used for external parasites in livestock.

Pyrethrum – are the dried flower heads of *Chrysanthemum* species and act as nerve poisons to many sucking and chewing insects like aphids, leafhoppers, spider mites, and Colorado potato beetle (CPB).

Neem – is a broad-spectrum repellent, growth regulator, and insecticide that may have a systemic effect on the plant, making it unpalatable for insects. It has been shown to be effective against CPB, corn earworms, cucumber beetles, flea beetles, aphids, leafminers, thrips, and whiteflies.

Fungicides

Baking soda – has demonstrated adequate control for powdery mildew in ornamental flowers and some berry crops.

Bordeaux mix – a combination of copper sulphate and hydrated lime, this powder (or spray) acts as a fungicide with insecticidal and insect repellent properties and can offer control of anthracnose, bacterial wilt, rust, powdery mildew, and fire blight.

Sulphur products (including lime-sulphur) – act as fungicide against anthracnose, brown rot, leaf spot, mildew, and scab and is effective in killing mites.

Compost tea – foliar sprays of tea made from mature compost act as natural fungicides preventing late blight or powdery mildew infections, by introducing beneficial microorganisms to plants.

Copper products – Many copper products (e.g., copper sulphate or bluestone) have herbicidal and fungicidal properties. Many organic certifying bodies are regulating the overuse of copper products.

Hydrogen peroxide – is a broad-spectrum fungicide and bactericide with potential use on several edible crops.

Biological Control

Beneficial animals & insects – chickens, snakes, lacewings, ladybugs, midges, predatory mites, trichogramma wasps, and many parasitic bacteria represent the diversity of species available for control of detrimental pests.

Bacillus thuringiensis (Bt) – more than 35 different varieties of this bacterium have been used in organic agriculture to control larval insect pests. Resistance to Bt has been reported in diamondback moths. Organic producers must also be weary that Bt can be produced via genetic engineering and these sources are prohibited.

Beauveria bassiana – is a common soilborne fungus that attacks both immature and adult insects including CPB, grasshoppers, aphids, European corn borer, chinch bug, codling moth, and several others.

Spinosad – a product produced by a soil-dwelling bacterium that has favourable control on flea beetle and spanworms in fruit crops and CPB control in potatoes

Viral sprays – Nuclear polyhedrosis virus (NPV) and granulosis virus (GV) have been commercially used to control armyworms, gypsy moths, and potato tuberworms.

Oils, Sprays, & Powders

Garlic oil – acts as a nonselective insecticide having antibiotic and antifungal properties, as well. Garlic oil, often mixed with mineral oil, has best control when used early in cucurbits, but has limited impact on CPB.

Canola oil – effective aphid and mite control could be achieved by canola oil sprayed on crops ranging from alfalfa to zucchini, but now organic producers must ensure that canola oil is free from GE contamination.

Essential oils – Cinnamon oil has been used to control mites on edible products such as grapes, strawberry, and sweet potatoes, while other oils such as tea tree, citrus, cedar, eucalyptus, citronella, geranium, clove, lavender are often used for pest control with livestock.

Kaolin clay – an edible mineral (common in toothpaste and Kaopectate) forms a non-toxic particle film that places a barrier between the pest and the host. It offers good control of leafrollers, leafhoppers, as well as stink bugs, mites, codling moth, and apple maggot.

Acetic acid (vinegar) – a nonselective contact herbicide can be effective at weed control as a spot spray or via wick application.

Insecticidal soap – Safer soap, Shaklee's Basic H, or even common household soaps control soft-bodied insects like aphids and whiteflies, and will also kill earwigs, fleas, mites, thrips, and ticks.

Corn gluten meal – inhibits root formation of many weeds such as dandelion, curled dock, plantain, lamb's-quarters, foxtail, crabgrass, and pigweed and is used as a pre-emergent herbicide with no effect (other than 10% N) on species with well developed root systems.

Diatomaceous earth – is a nonselective insecticidal dust that causes pests to die of dehydration.

Dormant and summer oils – many petroleum-based oils are used to manage overwintering insects such as aphids and spider mites (heavier - dormant oils), while oils sprayed on actively growing plants (lighter-summer oils) are used to suffocate mites, aphids, mealybugs, thrips.

Pheromones

Attractants – pheromones used to attract beneficial insects

Mating disruptors – female sex pheromones used to confuse male insects have successfully reduced codling moth populations in organic apple orchards.

This is not an exhaustive list, but merely serves as an introduction to potential alternatives to synthetic chemical pesticides. A crucial caution remains: ***prior to using any product, organic producers must check with their certifying bodies to ensure that it is indeed an accepted material.*** Many of the items listed above have not been registered under the Pest Management Regulatory Agency (PMRA), despite being approved by OMRI, and therefore are not available for commercial production. Currently, across Canada PMRA has been proactively working with provincial integrated pest management specialists, producer organizations and others to determine which pesticide products producers are most interested in getting registered. Many of the products recommended for testing are those already approved by the United States Environmental Protection Agency, are currently listed on OMRI, and are being used by organic farmers in the US.

In Eastern Canada, the Atlantic Canadian Organic Regional Network (ACORN) in collaboration with provincial organic specialists in the Maritimes have been working on generating an approved input list, product description, and supplier to aid organic producers in determining what to use and where to find it. Currently, much of this information is not readily available, but most certifying bodies do maintain an accepted and prohibitive materials list and many organic agricultural supply retailers will have product information for those products registered with PMRA.

Av Singh, Ph.D., is the Extension Coordinator at the Organic Agriculture Centre of Canada and is available for comments or questions by phone at 902.893.6275 or via email at asingh@nsac.ns.ca.