Reduced Risk Crop Protection Chemicals: Mode of Action

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**Bacillus amyloliquefaciens**
Derived from a bacterium that is active in the soil root zone and grows on the outer cells of plant roots. It physically blocks pathogens from entering the root system.
Example: Double Nickle (o), Triathlon BA (o)

**Bacillus subtilis/ pumilus**
Derived from a soil bacterium that is antagonistic to fungal and disease pathogens by means of nutrient competition, site exclusion, colonization, attachment of the bacteria to the fungal pathogen, etc.
Example: Serenade Max (o), Sonata (o)

**Bacillus thuringiensis (Bt)**
Derived from a bacterium which is selectively toxic to many moth and larvae. When ingested, Bt produces an endotoxin in the insect’s gut which is toxic to the insect. Common subspecies include, *Bacillus thuringiensis subsp. kurstaki, aizawai, israelensis*.
Examples: Dipel (o), Crymax, XenTari (o)

**Beauveria bassiana**
Spores of the Beauveria bassiana come into contact with the body of an insect host, germinate, enter the body, and grow inside, eventually killing the insect. The fungus multiplies and destroys the internal structures of the host under high humidity environments
Examples: BotaniGard, Mycotrol (o)

**Copper products**
Controls blights, mildew, anthracnose, but commonly associated with bacteria control
Example: Basic Copper 53 (o), Nucop 50DF (o), Champ WG (o)

**Diatomaceous earth:**
Naturally occurring substance comprised of the fossilized remains of diatoms. Insects such as roaches, ants, silverfish, fleas, etc. come in contact with this powder and die from desiccation.

**EM / Compost Teas:**
Effective microorganisms and nutritional supplements that enhance and promote existing soil organisms
Examples: Bokashi, Agripower, EM
**Horticultural Oils:**
Cover, wet, and suffocate, over wintering eggs, nymphs and adults. Effective on scale insects.
Examples: Volck oil, JMS Stylet-oil (o), Biocover, Pure Spray Green (o)

**Hydrogen Dioxide**
Oxidizes rapidly on contact.
Examples: Oxidate (o)

**Insecticidal Soaps:**
Potassium Salts of Fatty Acids typically disrupt membranes of soft body pests leading to rapid death by evaporation.
Example: Mpede (o)

**Iron Phosphate**
Compound made up of iron, phosphate and oxygen. When consumed, it acts like a stomach poison for slugs and snails and stops them from feeding.
Example: Sluggo Maxx (o), Sluggo Snail and Slug Bait (o), Ferroxx AQ.

**Kaolin Clay:**
Common food additive approved by the FDA. It primarily serves as a protective barrier, distracts pest from the host plant and deters pest movement and damaging behavior.
Examples: Surround WP (o)

**Neem Oil/ Azadirachtin: (IGR)** **many labels say it is toxic to fish**
Disrupts insects' hormonal balance so they die before they molt, suppresses some insects' desire to feed, and it also repels. It has fungicidal properties as well.
Examples: Trilogy (o), Neemix 4.5 (o), Debug Turbo (o), Molt-X (o)

**Natural / Essential Oils:**
Pepper, citrus, clove, mint, oils. Caution as oils can burn. Herbicide properties.
Examples: Ecotec (o)

**Phosphorous Acid**
Different from P fertilizers, phosphorus acid has fungicidal properties that are especially effective against Oomycete pathogens, such as *Phytophthora, Phythium,* and Downy mildews. Systemic properties.
Examples: Aliette, Fungi-Phite, Fosphite

**Potassium Bicarbonate**
Used as a contact fungicide mainly for powdery mildew in organic farming systems.
Examples: Armicarb (o), Kaligreen (o), Milstop (o)

**Pyrethrin:**
Derived from the blossoms of the pyrethrum flower, a chrysanthemum (contact). Breaks down in the environment quickly.
Example: Pyganic (o)

**Reynoutria sachalinensis**
Bio fungicide used to enhance plant health and trigger the plant’s natural defenses to control fungal and bacterial diseases. Delays onset of disease through multiple modes of actions. Plant based extract with systemic properties.
Example: Regalia (o)

**Spinosad**
Derived from a bacterium in the soil. Kills by contact and ingestion. (Nerve and stomach poison)
Examples: Entrust (o), Radiant, GF-120 NF (o)

**Steinernema carpocapsae**
Entomopathogenic nematodes are used as a biological control of insect pests.
Entomopathogenic nematodes only infect insects. Entomopathogenic nematodes live inside the body of their host and are most effective on soil dwelling insect pest.
Example: Nematac

**Streptomyces lydicus WYEC 108**
Beneficial bacterium that colonizes on the surface of the roots and leaves. It attacks many soil borne and foliar diseases via different modes of action.
Example: Actinovate (o)

**Sulfur**
Inhibits the attack of healthy plants by fungus disease by creating an environment that is not conducive to disease growth. Also effective on selected mites.
Examples: Sulfur, DF (o), Kumulus DF (o)

NOTE: (o) Refers to products approved for organic production by the Organic Material Review Institute (OMRI).

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