MATERIAL FACT SHEET
PESTICIDAL SOAP

MATERIAL NAME: Pesticidal Soap

MATERIAL TYPE: synthetic

U.S. EPA TOXICITY CATEGORY: IV,
"Caution." Potassium and ammonium salts of fatty acids are exempt from tolerance levels on raw agricultural commodities (EPA 1992).

USDA - NOP STATUS: Allowed for use as insecticide, miticide, algicide, and moss killer. Ammonium soaps are permitted as animal repellants provided there is no contact with edible portion of crop or with soil. Soap is not currently permitted for use as a fungicide or herbicide. (NOP 2000). The USDA-NOP regulation does not describe the type of soaps permitted, though the initial review was for potassium salts of fatty acids. Soaps classed by EPA as List 4 inerts (inerts of minimal concern) may be used as inert ingredients and adjuvants.

MATERIAL DESCRIPTION: Pesticidal soaps are potassium or ammonium salts of fatty acids. Pesticidal soaps are selected to be relatively non-phytotoxic, unless specifically formulated as herbicides. For information on neem-based soaps, please see the neem products chapter of this manual.

HOW IT WORKS: Insecticidal soap products work by smothering soft bodied pests and disrupting their cuticle layer. In order to be effective, it is necessary to thoroughly coat the pest. After the soap dries on the plant surface, insects and mites will not pick up a lethal dose. Soaps have little efficacy against insect eggs (Lawson and Weires 1991, Liu et al. 1996). Some insecticidal soaps are also labeled for powdery mildew suppression. It is not clear how soaps work to suppress plant diseases. Ammonium salts of fatty acids are used as a mammal repellant. They slowly release an ammonia smell that may deter deer and rabbits.

Soaps also function as wetting agents or surfactants, reducing the surface tension of water. Using them can allow spray materials to penetrate into small crevices and cover plant surfaces better with less "beading up".

TYPES OF PESTS IT CONTROLS: Insecticidal soap products are effective against some aphid, mealybug, whitefly, mite, and other soft-bodied species. Soaps can also be formulated as herbicides, killing weeds as

well as moss and algae. Insecticidal soap products can suppress powdery mildew in some crops. Ammonium soaps show some repellency against deer and rabbits. Be sure to check product labels to choose the right soap product, and see above for USDA/NOP status.

RELATED PRODUCTS: Recently, pesticidal research has been done on sugar esters that are produced by reacting fatty acids with sugars. These kinds of sucrose esters are found naturally in plants and were originally isolated form the hairs present on tobacco leaves (EPA 2002). They are relatively nontoxic to mammals and have some efficacy as insecticides (Puterka et al. 2003), but are considered synthetic and are not approved for organic production. Other related products include those composed of plant oils and organic acids which may also be effective against pests Products of this type may be marketed as "plant washes" to avoid pesticide labeling requirements. See appendix F for discussion of pesticide products exempt from EPA registration.

APPLICATION GUIDELINES:

Insecticidal soaps are widely available for use against soft bodied insects such as aphids. Some are also labeled against powdery mildew, though this use is not approved under the NOP. Currently, no commercial herbicidal or mammal-repellant soap products are approved for organic production.

In order for soaps to be effective, hardness of water must be neutralized. Adding an approved acid to hard water will accomplish this. Soap products are most effective when they dry slowly, so spraying in the evening or at night is best (Imai et al. 1995).

Phytotoxicity can be a concern with soap products. The M-Pede® label lists cucumbers and several species of ornamental plants that are sensitive. For grapes, the label warns that soap applications within 3 days of a sulfur spray can increase the likeliness of injury. Fruit crops may be damaged if heavy spray volume allows soap to accumulate at the base of the fruit. When in doubt, spray a portion of one plant a day in advance to test for phytotoxicity.

Protective eyewear is required when applying ammonium soap products.

OMRI LISTED PRODUCTS:

M-Pede® (Dow Agrosciences/Mycogen)
Safer® Brand Fruit & Vegetable Insect Killer II (Woodstream Corporation)
Safer® Brand Houseplant Insect Killing Soap Concentrate II (Woodstream Corporation)
Safer® Brand Houseplant Insect Killing Soap II (Woodstream Corporation)
Safer® Brand Insect Killing Soap Concentrate II (Woodstream Corporation)
Safer® Brand Moss & Algae Killer & Surface Cleaner Ready to Spray II (Woodstream Corporation)

Safer® Brand Moss & Algae Killer & Surface Cleaner Ready to Use II (Woodstream Corporation)
Safer® Brand Rose & Flower Insect Killer II (Woodstream Corporation)

As adjuvants:
Green Valley Natural Plant Wash (WTB Technology)
Green Valley Ultra Guard Plant Wash (WTB Technology)

NON OMRI -LISTED PRODUCTS:

Concern Insect Killing Soap Concentrate
Concern Insect Killing Soap Ready To Use
Hinder Deer and Rabbit Repellant
Ho2 Moss Killer
Organica Neem Oil Insecticidal Soap Concentrate
Safer™ Sharpshooter V Ready To Use
Safer Sharpshooter Weed & Grass Killer Concentrate

Reentry interval (REI) and pre-harvest interval (PHI) REI 12 hours, PHI 0 (M-Pede®)

EFFECTS ON THE ENVIRONMENT:

Soap products rapidly degrade and wash off of leaf surfaces. The half-life of fatty acids is estimated to be less than one day (EPA 1992). Because of this, as well as soap's presumed low mammalian toxicity and long history of use, agricultural use of soap is thought to have minimal negative environmental impact. If spilled into water, potassium soaps are highly toxic to invertebrates (EPA 1992).

Soap products have little effect on beneficial species unless they are soft-bodied and directly covered with the spray. Some predator mite species and ladybeetle larvae (Liu et al. 1996) are adversely affected.

EFFECTS ON HUMAN HEALTH:

Potassium salts of fatty acids are generally recognized as safe (GRAS) by the US FDA (EPA 1992). Acute toxicity to rats LD 50 > 5000 mg/kg for M-Pede® formulated with ethyl alcohol. Insecticidal soaps are presumed to be rapidly broken down in the environment and metabolized when ingested in small amounts. They are thought to have little if any long-term health effect. Ammonium soaps can cause permanent eye damage (EPA 1992). Soap salts have caused reproductive and mutagenic effects when fed to test animals at high doses (EPA 1992), but are not reported to be carcinogenic in NTP or IARC databases (Mycogen 1998).

EFFICACY

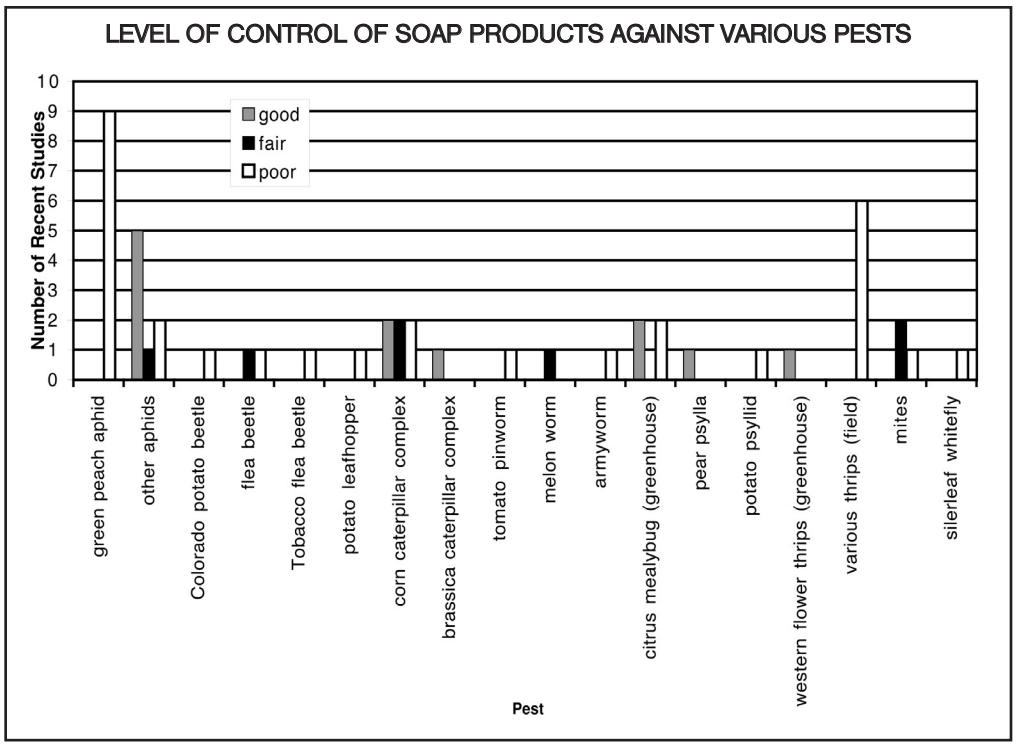
Insecticidal soaps are generally considered to be effective against aphids, mites, whiteflies, mealybugs, and psyllids and some other soft bodied insects. Recent university-based trials mostly support these uses, though efficacy was variable against aphids and poor against whiteflies and thrips. In particular, soaps were ineffective against green peach aphid.

Surprisingly, there have also been variably positive results against caterpillar pests.

A summary of recent university field trials of soap products on fruit and vegetable crops commonly grown in the Northeast was compiled for this fact sheet. These university-based trials typically test products with untreated buffer rows and other conditions that create unusually severe pest pressure.

In the table below, "good control" means statistically significant reductions in pest numbers or damage of 75% or more, compared to an untreated control. "Fair control" includes those with significant reductions of 50-74%, and any non-significant reductions of over 50%. The "poor control" group includes any results with less than 50% reduction.

On fully-sprayed fields in which a good program of cultural controls has also been implemented the level of pest control obtainable is likely to be higher than shown.



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