

# MATERIAL FACT SHEET KAOLIN CLAY

**MATERIAL NAME:** Kaolin clay

**MATERIAL TYPE:** Mineral particle film

**U.S. EPATOXICITY CATEGORY:** Category III, “Caution”

**USDA-NOP:** considered nonsynthetic, allowed. Pests may be controlled through mechanical and physical methods including nonsynthetic controls such as repellants. Diseases may be controlled through application of biological, botanical or nonsynthetic mineral inputs (NOP 2000).

**ACTIVE INGREDIENT DESCRIPTION:** Kaolin is a naturally occurring clay resulting from weathering of aluminous minerals such as feldspar with kaolinite as its principal constituent (ATTRA 2004). Kaolin is a common mineral, considered “generally regarded as safe” (GRAS) by the U.S. Food and Drug Administration. It is used as an anti-caking agent in processed foods and an additive to cosmetics, toiletries and health products. It is also used as an “inert” carrier in some pesticides, and enhances the performance of some microbial products (Rasad and Rangeshwaran 2000).

Kaolin is ground and processed further to reach a uniform particle size for application as a plant protectant. Applied in suspension in water, kaolin produces a dry white film layer of interlocking microscopic particles on the surface of leaves, stems and fruit after evaporation of the water.

**HOW DOES IT WORK:** This material has several modes of activity (Stanley 1998). Kaolin acts as a physical barrier preventing insects from reaching vulnerable plant tissue. It acts as a repellent by creating an unsuitable surface for feeding or egg-laying. The uniform white film may also disrupt the insect’s host finding capability by masking the color of the plant tissue. Furthermore, particles of kaolin act as an irritant to the insect. After landing on a treated surface, particles of kaolin break off and attach to the insect’s body triggering an excessive grooming response that distracts the pest.

Kaolin formulations have also been shown to suppress diseases in greenhouse and field studies (Haggag 2002, Puterka et al. 2000, Glenn et al. 1999), and to kill insects in stored grain (Mostafa and Al Moajel 1991). Labeled products for these purposes are not currently available in the US.

The use of Surround® (a trade name for kaolin clay) can increase overall fruit yields in regions with high light and temperature levels (Puterka et al. 2000). In these situations, it can act as an anti-transpirant, reducing stress on the plant.

Surround® has caused both yield increases and decreases in vegetable trials (Maletta et al. unpublished). In eggplant, it reduced marketable yields and plant growth, while in potato it increased yields of 'Superior' but not 'Norland' variety, even though it had no effect on potato leafhopper levels.

**FORMULATION AND APPLICATION GUIDELINES:** Kaolin clay is available as a wettable powder to be mixed with water. Application can be made with most commercially available spray equipment but large amounts of water are required. To prevent caking, it is suggested that the material be added while mechanical agitation is running, or to first completely mix the needed amount in a small amount of water before filling up the tank to the recommended volume. It may be tank mixed with soaps, and most pesticides, but not copper, sulfur, or Bordeaux mixtures. Precipitation, curdling, uneven film formation or changes in viscosity are signs of incompatibility (Engelhard 2001).

Periodic shaking is recommended for a backpack sprayer or use of an automatic agitation mechanism for larger equipment in order to keep the material suspended in water. Efficacy is only successfully achieved with thorough coverage. Care should be taken to cover the entire surface of the crop.

Hydraulic sprayers at full dilution apply a better covering than mist blowers using concentrated sprays.

**REENTRY INTERVAL (REI) AND PRE-HARVEST INTERVAL (PHI):** 4 hour REI. May be applied up to the day of harvest.

**AVAILABILITY AND SOURCES:** Available from several mail-order suppliers; also regional agricultural chemical suppliers in fruit regions.

**OMRI LISTED PRODUCTS:**

Surround WP®, Engelhard Corporation

**NON-OMRI LISTED:**

Surround CF®, Engelhard Corporation

**CONCERNS:** The white film, while non-toxic, may reduce marketability if not removed. It can be wiped or brushed and washed off after harvest. To avoid this, applications can be discontinued earlier to allow for natural weathering of the material. Care should be taken to protect workers from the dust generated during mixing and application.

**EFFECT ON THE ENVIRONMENT:** Not currently assessed. Soil effects are likely to be similar to natural kaolin clay in the soil. Since Surround® is applied at high concentrations, beneficial insects that come

into contact with the direct spray would likely be affected, but less so once the material dries on the plant.

**EFFECT ON HUMAN HEALTH:** Inhalation of dust can cause lung damage. Use a respirator when handling. Its LD50 is above 5000 mg/kg (Engelhard Corp 2003).

**TYPES OF PESTS IT CONTROLS:**

Surround has been shown effective against several orchard pests, including apple maggot, white apple leafhopper, and pear psylla (Heacox 1999). It generally gives at least fair control of plum curculio and several species of fruit pest caterpillars (codling moth, oriental fruit moth, tufted apple bud moth, lesser appleworm). However, university trials also show that heavy use is harmful to beneficial species, and can lead to a flare up of European red mites or San Jose scale.

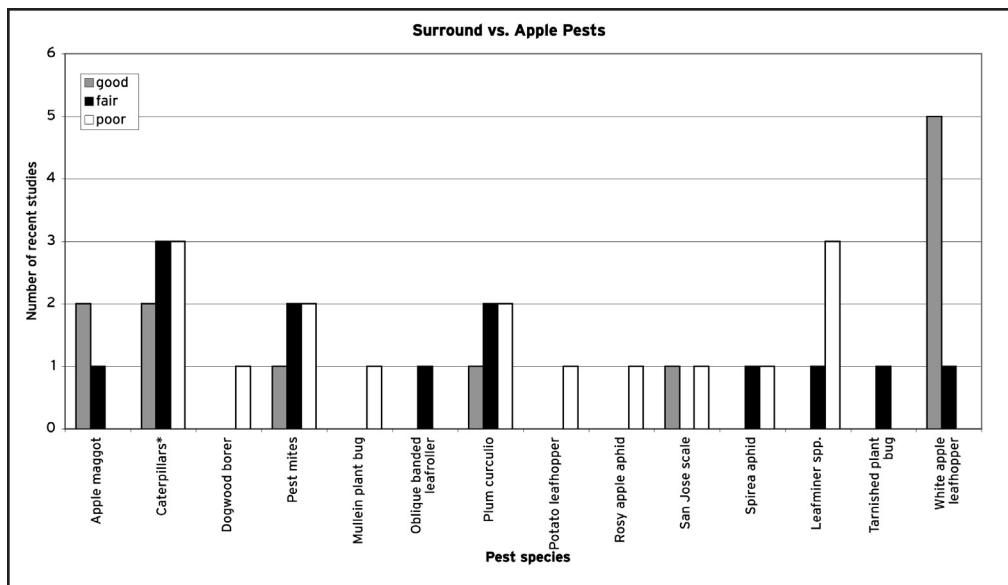
Surround has shown potential against pepper weevil, cabbage aphid, and onion thrips on vegetables in field trials, though more research is needed. It has been effective in the lab against flea beetles, but less so in the field. It has shown some repellancy against the silverleaf whitefly in the lab (Liang and Liu 2002). Surround has shown inconsistent results against the striped cucumber beetle in field trials; however, it was applied on a weekly basis in these trials. Some growers have reported better results against the cucumber beetle when Surround is used twice weekly when plants are small and more susceptible to damage from this pest.

An experimental kaolin product has also given good control of grape and cucurbit powdery mildew and brown rot in peaches in controlled trials. This product is not currently available commercially.

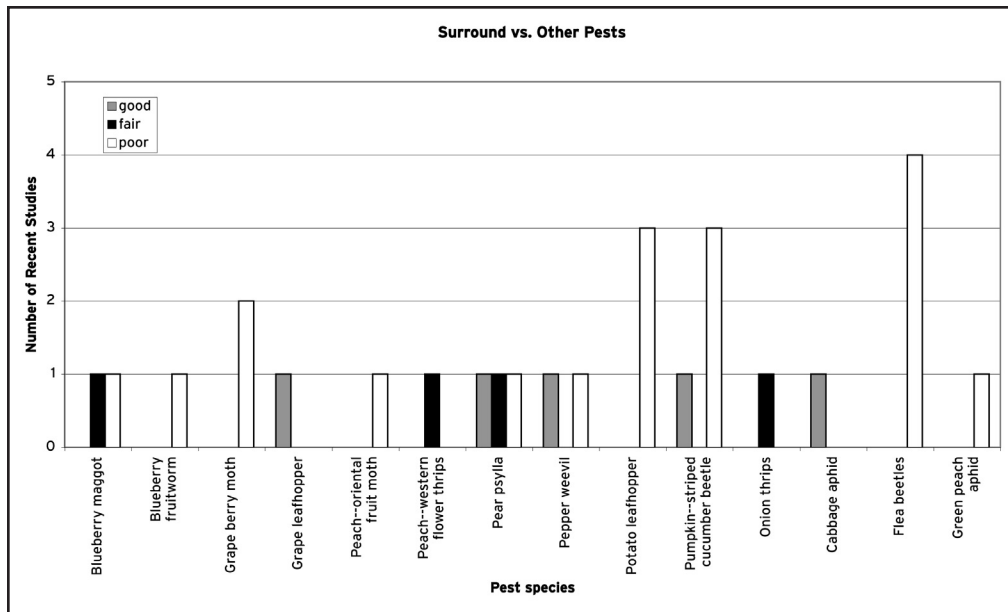
A summary of recent university field trials of Surround® on fruit and vegetable crops commonly grown in the Northeast is compiled in the table below. Note that university-based trials typically test products with untreated buffer rows and other conditions that may create unusually severe pest pressure.

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.

The level of pest control obtainable on completely treated fields in which a good program of cultural controls has also been implemented is likely to be higher than shown below. This is especially true for a product like Surround®, which acts as a repellent or host disguise.



\* Codling moth, oriental fruit moth, tufted apple bud moth, lesser appleworm



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