Pyrethrins, Pyrethrum, & Pyrethroids

There are several terms used to describe many of the insecticides on the market today, and these terms are easily confused with one another:

- pyrethrin(s)
- pyrethrum
- pyrethroid(s)

There are six pyrethrins (each one is a pyrethrin):

1. cinerin I
2. cinerin II
3. jasmolin I
4. jasmolin II
5. pyrethrin I
6. pyrethrin II

These pyrethrins are naturally occurring insecticides derived from the flowers of *Chrysanthemum cinerariaefolium*. Due to their relatively low mammalian toxicity, these pesticides have acquired a large market share of the insecticides, especially since their more toxic predecessors, namely the organophosphates, gradually are being phased out of use.

**Pyrethrum** is simply a mixture of pyrethrins.

**Pyrethroids**, on the other hand, are synthetic variations of pyrethrins (each variation is a pyrethroid). These are sometimes referred to as *synthetic pyrethroids*, although this is a redundant term, because a pyrethroid is synthetic by definition.

The following excerpt is from the *Farm Chemicals Handbook 2000* by Meister Publishing Company:

**Pyrethrins:**

**PROPERTIES:** A botanical insecticide whose active principles are pyrethrins I and II (esters of pyrethrolone and chrysanthemic acid and pyrethroic acid), cinerins I and II (esters of cinerolone and chrysanthemic and pyrethroic acids), and jasmolin I and II (jasmoline and chrysanthemic and pyrethroic acids), collectively known as the “pyrethrins.” The plant *Chrysanthemum cinerariaefolium*, and the flowers are the source of the principles. The flowers and extracts are principally imported from Kenya, Rwanda, Tanzania, and Ecuador. Pyrethrum dried flowers contain 0.9-1.3% pyrethrins. The crude extract or oleoresin contains 50-60% pyrethrins and most refined grade (pale) about 50% (20% in U.S.) pyrethrins by dewaxing and decoloring. Formerly the dried flowers were known as Dalmatian insect flowers; the powdered flowers as “insect powder.”

**ACTION:** Contact insecticide.

**USE:** Because of their safety, pyrethrum extracts are used extensively in stock sprays, aerosols, industrial sanitation sprays, and to protect stored food in warehouses, etc. These
Pyrethrins may be extracted in kerosene, alcohol, acetone, or ethylene dichloride for formulation in dust, sprays, etc. They are incompatible with lime and ordinary soaps because acids and alkalies speed up the processes of hydrolysis. Pyrethrins have proved to be stable for long periods in water-base aerosols where modern emulsifiers give neutral water systems. Pyrethrins are oxidized on exposure to the air and stored flowers may lose 20% of their activity in a year. Impregnated and stabilized dusts are less susceptible to oxidation than dusts made from ground flowers. Oxidation is not a problem in stabilized oil concentrates. Oxidation can be inhibited with materials such as hydroquinone, pyrogallol, isopropyl cresol, tannic acid, and other antioxidants.

**FORMULATIONS:** Concentrate in oil and water, usually containing synergists (such as piperonyl butoxide); in impregnated and stabilized dust concentrates; and in dilute dusts made from ground flowers. In recent years a low-color, 20% pyrethrin extract in oil has become the “standard” item of the industry, although less concentrated solutions in oil are still available.

Pyrethrins offer a highly effective, organic alternative to synthetic insecticides, but they have two primary drawbacks: (1) they are short-lived in the environment; and (2) they are easily detoxified by many insect pests.

While short-lived chemicals may be environmentally friendly, they also result in the need for frequent re-application in order to provide effective control of insect pests. This trait, along with the fact that many insect pests can detoxify pyrethrins faster than pyrethrins can neutralize the pests, has resulted in many pyrethrin-containing products being formulated with *synergists*. Synergists don’t have any pesticidal properties in and of themselves (although they are regulated as pesticides), but they act to slow the degradation of pyrethrins in the environment and/or in target organisms, thereby increasing the efficacy of the pyrethrins with which they are formulated. Piperonyl butoxide (PBO) is an example of a synergist that is commonly mixed with pyrethrins. It should be noted that, while pyrethrins are organic, the synergists with which they are often mixed typically are not considered organic.

Pyrethroids have overcome the primary drawbacks of pyrethrins listed above. Consequently, dozens of pyrethroids exist today, and it seems likely that more will continue to be developed. Modern pyrethroids even manage to provide fair residual insect control under certain conditions. While pyrethroids are considered to be broad spectrum insecticides with relatively low mammalian toxicity, the exact pests controlled and toxicity of these products vary from one to the next, so **read the label carefully!**