Soaps for home landscape insect control

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Greenhouse thrips adults killed by a soap spray on English laurel. The spray was applied with a hand mister.

The utility of soap sprays for insect control was demonstrated as early as 1842. During the latter half of the 19th and early 20th centuries, whale-oil soaps, and more commonly fish-oil soaps, were an important part of insect control technology. As the more effective synthetic organic insecticides were developed, research on soap as an insecticide was largely discontinued; but soap continued to be used, principally by home gardeners and in other small-scale situations.

Today there is renewed interest in soap sprays, yet directions for use are often vague and confusing, and the literature is unclear as to how effective soaps are. To obtain a more accurate estimate of the potential for soap spray use on ornamental plants, we conducted a series of replicated trials in 1978.

Single application experiments

Table 1 gives the results of three experiments. Each trial included a pesticide known to be effective against the pest, and an untreated check. The soap and detergent solutions used were Ivory Liquid dishwashing detergent, Acco Highway Plant Spray soap (containing by volume 38.5 percent coconut oil soap, 1.1 percent lanolin, and 0.3 percent EDTA), Shaklee's Basic H, Fels Naptha laundry bar soap, and Tide detergent. The pests and plants sprayed were: a mixed aphid population consisting of *Myzus persicae, Aphis citricola,* and *A. fabae* on tobira; acacia psyllid, *Psylla uncatoides,* on Sydney golden wattle, *Acacia longifolia;* and citrus red mite, *Panonychus citri,* on Mexican orange, *Choisya ternata.*

Plots consisted of infested single-stem terminals. Treatments were applied as coarse sprays until runoff with polyethelene plant misters. Soap sprays are known primarily for their ability to physically dislodge insects from plants when applied at high pressures. In addition, other researchers have suggested that insects might be asphyxiated by soap sprays. By applying the solutions at low pressures, we were able to prevent dislodging test insects.

The aphid population crashed several days after treatment, but in the other trials counts were made at both one and seven days after treatment. The soap and detergent solutions achieved a substantial reduction of the three insects tested. Some of the solutions provided a level of control similar to that of the pesticide standard. In general, the more concentrated solutions provided more satisfactory control than those less concentrated.

Some soaps and detergents tested are not reported here. Over-all, the soaps were not more effective than the detergents. Solutions derived from dry formulations performed well, but they were not as easy to use as liquid soaps and detergents. Bar soaps required chipping and boiling to make a solution, and some jelled when left to cool overnight. In addition, high concentration rates such as 225 gms/gal sometimes caused the spray nozzle to clog or resulted in phytotoxicity or unsightly deposits on leaves. These problems were minimized by using lower concentrations (45 or 56 gms/gal) with good control in most cases. Since dry soaps vary in the amount of filler substances they contain, the optimum control range depended somewhat on the product used.

Another problem was encountered when solutions were prepared from bar shaving soap. Though it was fairly effective, excessive lather clogged spray nozzles and made it difficult to apply.

Solutions derived from liquid formulations were much easier to prepare and store than those of other forms. Of the liquids, Ivory Liquid dishwashing detergent provided the most consistent control, especially when used at 1 to 2 percent. Preliminary trials not included here suggest that many other liquid dishwashing detergents may be as effective as Ivory.

Spray damage

More concentrated solutions provided more effective control but increased the potential for plant damage. Table 3 gives the effects of five fairly concentrated solutions, sprayed on eight plant species representing a wide range of leaf structures and surfaces, and inspected two weeks later. Leaf burning, along the margins or in patches, was the most common phytotoxicity symptom. Some solutions left unsightly white residues on certain plants.

This trial indicates that solutions vary in their phytotoxicity. No pattern emerged; detergents did not consistently respond differently from soaps, and solutions derived

TABLE 1. Effects of Soap and Detergent Sprays on Certain Insects

Pest and Site	Material and Concentration	Mean No. Insects After: 1 day	7 days
Aphids on *Pittosporum tobira*	Diazinon, EC, label rate	0.0	
	Ivory, 0.4%	14.5	
	Ivory, 1.5%	2.5	
	Acco, 0.4%	43.8	
	Acco, 1.5%	24.0	
	Basic H, 0.4%	22.0	
	Basic H, 1.5%	14.5	
	Fels Naptha, 56 gms/gal	27.5	
	Fels Naptha, 225 gms/gal	2.5	
	Tide, 56 gms/gal	9.8	
	Tide, 225 gms/gal	0.8	
	Untreated	130.8	
Acacia psyllid on *Acacia longifolia*	Diazinon, EC, label rate	0.3	1.8
	Ivory, 1.5%	3.8	25.0
	Ivory, 3.0%	11.0	27.7
	Acco, 1.5%	13.2	43.8
	Acco, 3.0%	7.2	15.0
	Basic H, 1.5%	6.7	23.5
	Basic H, 3.0%	12.5	52.8
	Fels Naptha, 56 gms/gal	2.4	24.2
	Tide, 56 gms/gal	6.5	25.2
	Untreated	41.0	48.8
Citrus red mite on *Choisya ternata*	Dicofol, EC, label rate	13.0	0.8
	Ivory, 1%	6.8	4.5
	Acco, 1%	13.8	5.0
	Basic H, 1%	8.8	7.8
	Fels Naptha, 45 gms/gal	12.5	12.0
	Tide, 45 gms/gal	7.3	3.0
	Untreated	37.5	29.5

TABLE 2. Effects of Soap Sprays on Greenhouse Thrips

Treatment	Application date(s)	Average Numbers of Thrips/10 Leaves on: 9/18	10/3	10/25
Orthene, EC, label rate	9/12/78	0.6	0	0
Acco Highway Plant Spray, 1%	9/12, 9/13, 9/27, 10/4	8.3	0.1	0.1
Water	9/12, 9/18, 9/27, 10/4	5.7	6.7	6.4
Acco Highway Plant Spray, 1%	9/12	5.2	3.2	6.2
Untreated		8.3	8.3	7.2

TABLE 3. Phytotoxicity of Soap and Detergent Sprays on Certain Plants

Treatment	Wandering jew	Coast redwood	Redwood sorrel	Camellia	Kahili ginger	Glossy abelia	Echium	Fortnight lily
Acco, 2%	-	-	+, 0	-	-	-	-	-
Basic H, 2%	+	-	+	-	-	+	+	+
Ivory, 2%	+	-	-	-	-	-	+	-
Fels Naptha, 90 gms/gal	+	-	-	-	-	0	0	-
Tide, 90 gms/gal	+	+	+	-	+	+, 0	0	0

+ = Leaf burning and/or distortion
0 = Spotty soap residues on leaves
- = No adverse effect to plant

from dry formulations were not consistently different from those derived from liquid. The dry formulations, however, left more unsightly deposits.

It is difficult to generalize as to the plant type susceptible to spray injury. One factor may be leaf pubescence, which causes more solution to be retained. *Echium,* a plant with densely pubescent leaves, was usually either burned or left with unsightly soap deposits. Other plants that often were burned included wandering jew and redwood sorrel, *Oxalis oregana.* These plants have fairly succulent foliage. Camellia was not adversely affected by any of the solutions used, probably because of its heavily waxed, nonpubescent leaf surfaces.

The phytotoxicity of these sprays, and the possibility that rinsing plants with water several hours after spraying may reduce it should be studied further. Moreover, it has not yet been determined whether there is a harmful buildup of soap and detergent materials in the soil when repeated applications are made over a long period.

Multiple application experiments

Soap and detergent sprays lack residual activity—a potential problem wherever the insect population is mobile. In an effort to prolong the control achieved, an experiment was done with four repeated applications at weekly intervals (table 2). Acco Highway Plant Spray soap (Acme Chemical Company) was chosen because it is registered with the U.S. Environmental Protection Agency as an insect control agent. Treatments were applied with a hand pump compression sprayer to 5-square-feet sections of hedge. The experiment was directed against greenhouse thrips, *Heliothrips haemorrhoidalis,* a common species which feeds on fully expanded leaf surfaces. Two replicates were placed on English laurel, *Prunus laurocerasus,* and two on viburnum, *Viburnum propinquum.*

Each time the soap spray was applied a further reduction in insect numbers occurred. Control was still excellent three weeks after the last application. Toward the end of the experiment, thrips migration within the experimental area had diminished, and numbers remained low in the Acco repeated spray and Orthene plots.

Home landscape insect control

In 1974, D. E. Pinnock, University of California, reported successful suppression of aphids with 0.01 to 0.1 percent soap solutions applied at 200 to 250 lb/in^2, a pressure not obtainable with home garden equipment. The experiments reported here indicate that favorable levels of control can be achieved with soaps and detergents applied at the low pressures of hand pump compression sprayers, hose-end sprayers, and even plant misters, when a low dilution rate is used.

In a total of eight experiments conducted during 1978, the soap and detergent sprays produced high mortality of all arthropods tested except spittlebugs. The mites, aphids, psyllids, and thrips used in these experiments are all soft-bodied, sucking arthropods, the kind known to be particularly susceptible to soap sprays. Soap sprays had also been advocated, before the advent of synthetic organic insecticides, for control of whiteflies and scale insects.

The effects of soap and detergent sprays on beneficial insects have not been adequately studied. Observations indicate that many insects—including adult snake flies and convergent ladybird beetles—die when contacted with the sprays. However, it is thought that these sprays are less damaging to natural enemy populations than are most synthetic organic insecticides. In the home landscape, where 100 percent insect control is seldom necessary, soap and detergent sprays could be used to keep pest insects at nondamaging levels while potentially making better use of natural enemies.

The experiments conducted demonstrate that soap and detergent sprays can be used to effectively reduce certain insect populations on ornamental plants. Because these sprays do not have the residual properties of synthetic organic insecticides, and do not provide the same consistently high level of control, repeat applications of thoroughly applied sprays are indicated. In addition, phytotoxicity may reduce their applicability on certain plants.

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