Pests in the home garden

Many of the home remedies used to control garden pests may have merit but have not been scientifically tested. UC urban entomologists evaluated some of them under controlled conditions, with mixed results.

Soaps as insecticides

Carlton S. Koehler
Leslie W. Barclay
Thomas M. Kretchun

Frequently applied, they control some soft-bodied pests.

Popular gardening literature in recent years has been replete with advice on pest control by nontraditional means. The variety of home remedies described by their originator, or given testimonial support by users, is nearly endless. That some of the described practices may have merit cannot be summarily dismissed, yet very few of them have been subjected to field evaluation under controlled conditions.

An earlier report in *California Agriculture* (June 1979) described experiments with several soaps and their efficacy in control of soft-bodied pest arthropods, such as aphids, psyllids, and mites, on ornamentals. Since that time a new soap product, Safer Agro-Chem's Insecticidal Soap, has been registered in California as an insecticide and is available in small containers for home garden pest control. Its registration allows use on ornamentals as well as on selected home garden fruits and vegetables. This report describes trials comparing this product with other substances for control of several common arthropod pests of home vegetable gardens.

Carlton S. Koehler is Entomologist, and Leslie W. Barclay is Staff Research Associate, Cooperative Extension, University of California, Berkeley. Thomas M. Kretchun is Superintendent, UC Deciduous Fruit Field Station, San Jose. *The cooperation of Joseph Hile, Pest Management Intern, in the studies on soaps and companion plants, and of Walter Vodden, Blake Gardens, in the study on snails, and the assistance of the Elvenia J. Slosson Endowment Fund in the three studies are gratefully acknowledged.*

Procedure

Raised bed plantings of bush beans, zucchini squash, and cabbage were established at the Deciduous Fruit Field Station, San Jose. Plots of a single plant each were arranged in randomized complete block designs and treated with various materials as sprays or dusts using hand equipment. Counts of pest arthropods, visual rating of pest damage, and/or weight of the crop were recorded once or several times after treatment. Data were processed by analysis of variance and Duncan's new multiple range test.

Results

Against the greenhouse whitefly, *Trialeurodes vaporariorum* (Westwood), on beans, no significant differences were evident among any of the treatments, including the untreated control, on August 21, probably because of low insect numbers (table 1). On August 27, after two applications of test materials and increased whitefly populations, significant differences were found between Ivory Detergent and the untreated control. No differences were evident among Safer and Acco soaps, Ivory Detergent, and malathion on the latter date.

Also on beans, and against the twospotted spider mite, *Tetranychus urticae* Koch, significant differences were found between dicofol and malathion on August 21, and between dicofol and malathion, and dicofol and the untreated control, on August 27. No significant differences were evident among any of the soap and detergent treatments directed against the twospotted spider mite, or between any of those products and the control.

For control of the potato aphid, *Macrosiphum euphorbiae* (Thomas), on squash, the insecticide diazinon was found superior to each of the soap and detergent products, none of which differed significantly from the untreated control on any sampling date (table 2).

Counts of larvae of the cabbage looper, *Trichoplusia ni* (Hübner), and the imported cabbageworm, *Pieris rapae* (L.), on cabbage indicated that only *Bacillus thuringiensis* consistently and significantly reduced their numbers as compared with the untreated control

TABLE 1. Evaluation of several soap products and conventional pesticides against greenhouse whitefly and twospotted spider mite on bush beans, 1981

Treatment*	Formulation (ml)/ gal. water†	Avg. no. whitefly nymphs/leaf‡§		Avg. no. motile mites/leaf§	
		Aug. 21	Aug. 27	Aug. 21	Aug. 27
Safer Insecticidal Soap (50.5% Conc.)	88.8	12 a	18 ab	40 ab	99 ab
Acco Highway Spray (38.5% Conc.)	9.5	6 a	8 ab	44 ab	75 ab
Ivory Liquid Detergent	19.0	9 a	3 a	50 ab	47 ab
Malathion (50% Emul. Conc.)	14.8	9 a	55 ab	104 b	142 b
Dicofol (18.5% Emul. Conc.)	5.0	—	—	8 a	20 a
Untreated	—	8 a	153 b	28 ab	111 b

* Applied Aug. 14; repeated Aug. 21 after leaf samples taken for arthropod counts. Six replicates of all treatments.
† "Label" rates, except for Ivory Detergent, whose rate was established by prior experience.
‡ Dicofol was not evaluated for whitefly control because it is a miticide.
§ Means in each column followed by the same letter are not significantly different at the 5% level.

TABLE 2. Evaluation of soaps and a conventional insecticide against potato aphid on squash, 1981

Treatment*	Formulation (ml)/ gal. water†	Avg. no. aphids (× 10)/leaf‡		
		Sept. 10	Sept. 18	Sept. 29
Safer Insecticidal Soap (50.5% Conc.)	88.8	23 b	47 b	78 b
Acco Highway Spray (38.5% Conc.)	9.5	24 b	71 b	62 b
Ivory Liquid Detergent	19.0	25 b	76 b	85 b
Diazinon (25% Emul. Conc.)	9.8	0 a	12 a	18 a
Untreated	—	38 b	39 ab	66 b

* Applied Sept. 9; repeated Sept. 18 after samples taken for aphid counts. Six replications of all treatments.
† Label rates, except for Ivory Detergent, whose rate was established by prior experience.
‡ Means in each column followed by the same letter are not significantly different at the 5% level.

(table 3). Sprays of Safer soap applied weekly six times, however, significantly reduced worm numbers and their injury to foliage, as determined after the final application (table 4). Safer soap significantly depressed the harvest weight of heads of treated cabbage.

Discussion

Soaps and detergents have some value for the control of soft-bodied arthropods in the home vegetable garden, as indicated by their performance against whiteflies on beans and worms on cabbage. They did not, however, perform as well as the conventional pesticides dicofol, for control of the twospotted spider mite on beans, diazinon against the potato aphid on squash, or *Bacillus thuringiensis* for control of worms on cabbage. Any superiority of Safer or Acco soaps over Ivory Liquid Detergent was not demonstrated in these experiments.

Earlier work showed that soaps must be applied at rather frequent intervals for maximum efficacy. Two applications one week apart, as used here, apparently are insufficient, as suggested by results of that schedule against spider mites on beans, aphids on squash, and worms on cabbage. That soap may cause injury to some crop plants when used frequently is indicated by the 23 percent reduction in the harvest weight of cabbage treated six times with the Safer product.

Neither diatomaceous earth nor a spray preparation made of strained, macerated worms was found to have value for control of worms on cabbage, at least under the conditions described here. ■

The insecticide diazinon was superior to soaps and detergents against aphids on squash (above). Sprays of Safer soap applied weekly significantly reduced cabbageworm numbers and damage but also depressed harvest weight of treated cabbage.

TABLE 3. Comparison of materials for control of mixed population of cabbage looper and imported cabbageworm on cabbage, 1981

Treatment*	Amount substance (ml)/pt. water	Avg. no. living worms/plant†‡		
		Oct. 19	Oct. 22	Oct. 27
Safer Insecticidal Soap (50.5% Conc.)	11.1	6 b	3 b	4 b
Macerated worms, strained	§	3 ab	4 b	5 b
Diatomaceous earth	**	5 b	2 ab	4 b
Bacillus thuringiensis (0.8% Conc.)	1.9††	2 a	1 a	1 a
Untreated	—	6 b	4 b	7 b

* Applied Oct. 13; repeated Oct. 22 after worm count. Four replications of all treatments.
† Worms not removed when plants were sampled.
‡ Means in each column followed by the same letter are not significantly different at the 5% level.
§ Prepared by macerating 20 loopers (2.4 g) and 15 cabbageworms (0.9 g) in 10 ml water. Finished strained mixture was 16 ml; 1.9 ml of finished mixture in 1 pt. water applied Oct. 13; doubled to 3.8 ml finished mixture in 1 pt. water on Oct. 22.
** Applied as a dust.
†† Containing 4 billion IU per quart.

Catnip surrounding cabbage plant repelled cabbageworms somewhat, but beneficial effects were offset by competition of companion plants for moisture and nutrients.

TABLE 4. Effect on cabbage of 6 weekly applications of soap, 1982

Treatment*	Avg. no. larvae and pupae/plant†	Avg. injury rating† ‡	Avg. weight (g)/head†
Safer Insecticidal Soap (50.5% Conc.)	4.7 a	1.9 a	2,055 b
Untreated	15.0 b	3.8 b	2,671 a

* Label rate (88.8 ml 50.5% product per gal. water) applied to point of complete coverage on Sept. 29, Oct. 6, 13, 20, 27, and Nov. 3. Nine replications of treatments.
† Mixed population of cabbage looper, imported cabbageworm, and unidentified Noctuidae. Evaluated Nov. 11. Means in each column followed by the same letter are not significantly different at the 5% level.
‡ Rating of 1 to 5: 1 = no, or trace of, worm feeding; 5 = severe feeding injury.

In the 1982 planting, nasturtium, marigold, catnip, summer savory, and basil were used as companions to cabbage plants.

Baits are effective against the brown garden snail, but some home gardeners prefer not to use them for various reasons.

Ridges of barrier materials on plastic sheets formed snail test arenas. An elevated board in the center of each arena provided cover for snails.