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Systemic Insecticides

to control

Mealybug
Scale
Aphids
Cyclamen mite

on Ornamentals

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THE CONNECTICUT
AGRICULTURAL EXPERIMENT STATION
NEW HAVEN

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Cover photograph: aphids on chrysanthemum. This photograph and all others in this circular are by B. W. McFarland of this Station.

SYSTEMIC INSECTICIDES to Control Mealybug, Scale, Aphids, and Cyclamen Mite on ORNAMENTALS

John C. Schread

Insect pests of ornamental plants have been controlled by insecticides applied either by fumigation or by spraying. The development of chemicals which may be absorbed into the plant and translocated has provided a new way to control some of these pests. Such chemicals are particularly useful to control sucking insects. Furthermore, there is no problem from residues in ornamental plants.

The systemic insecticides may be applied to the foliage and absorbed there. David and Kilby (1) and David (2) have shown that some materials are absorbed by the upper surface of the leaves more freely than by the lower surface. Materials were translocated from old to new foliage, and from new leaves to older leaves below.

Some materials are absorbed freely by the roots and transported to all parts of the plant. Finally, some volatile materials used as soil drenches may kill insects in the vapor phase.

Systemic insecticides have been especially effective in killing sucking insects and mites. Small chewing insects may be killed, but larger insects escape serious injury. Furthermore, parasites and predators may escape insecticides, especially when the application is made on the soil.

The effectiveness of systemic insecticides was well established before the work reported here was undertaken. The purposes of these experiments were (1) to test the effectiveness of the material on serious pests, (2) to established the dosages required, (3) to determine the effects of the chemicals on growth of the plants, and (4) to determine the length of time the insecticides are effective.

Materials and Methods

The experiments reported here were carried on between 1951 and 1956 as follows: Systox, malathion, endrin, Loro, Thimet (0,0-diethyl S-(ethylthiomethyl) phosphorodithioate), and the experimental compounds 12008 (0,0-diethyl S-isopropylmercaptomethyl dithiophosphate) and G-22870 (3 methylpyrazolyl-(5)-dimethylcarbamate).

Treatments were made on greenhouse plants. With the exception of azaleas which were planted directly into benches all other plants were grown in clay or plastic pots. Potted plants were placed individually on a layer of sand in the bottom of glass dishes or in pans. This was done to prevent the spread of the treatments from pot to pot in the benches. Each pot was soaked with water the night before treatment to minimize possible marginal foliage burn.

Figure 1. Nephthytis infested with Mexican mealybug.

Most of the treatments were applied as soil drenches. A hand sprayer was used to make one series of treatment and a power sprayer was employed to apply treatments to azaleas. A few cyclamen plants were dipped and others were allowed to stand in treatments to permit absorption of systemics through the bottom of the pots.

Mealybugs

Control of mealybug on nephthytis

About a half dozen species of nephthytis occur naturally in tropical Africa. Two of these are now grown extensively in greenhouses and as house plants. When allowed to thrive undisturbed they have a vine-like growth. The bright shiny green leaves are arrow-shaped, with long peticles.

Several species of mealybug, notably the Mexican mealybug (*Phenacoccus gossypii* Towns and Ckll.), are often serious pests of nephthytis. They attack the leaves and stems in all stages of development. Uncontrolled outbreaks may result in yellowing, distortion, and stunting of new growth. Older leaves similarly infested lose their rich green color, turn brown, wither, and remain hanging from the plant until removed.

Nephthytis plants growing in 5½- and 6¼-inch clay pots were treated on January 13, 1956 with 21 per cent Systox and 50 per cent Thimet at dilutions of 1:200 and 1:400 to control the Mexican mealybug. Each dilution was used as a soil drench at the rate of 1 ounce per inch of pot diameter, and duplicated.

Counts of infestation made before treatments were applied indicated 62 immature and 11 adult mealybugs on three leaves. All of the adult mealybugs were surrounded by many eggs and well protected by "cotton."

Results of the treatments to control mealybug on nephthytis, taken on February 6, are shown in Table 1. Four leaves from each treatment were examined.

Table 1 shows that one Systox or Thimet soil treatment was effective

Figure 2. Nephthytis leaf badly curled by Mexican mealybug.

in destroying mealybugs on nephthytis. Counts of dead mealybugs include both immatures and adults. All live mealybugs were about one-half grown and protected by "cotton."

Some marginal foliage burn occurred on the oldest leaves on the lower parts of the plants. This was most noticeable on those treated with the stronger dilutions. All new leaves developing at the apex of the stems seemed normal in color and formation.

Table 1. Results on February 6 of Systox and Thimet treatments applied January 13 to control mealybug on nephthytis

Material and dilution	Number of mealybugs Dead	Alive
Systox 1:200	61	2
Systox 1:400	217	3
Thimet 1:200	310	0
Thimet 1:400	259	3

Control of mealybug on lemon tree

A small 5-foot lemon tree growing in a wooden tub 2 feet in diameter was used to control mealybug (*Pseudococcus citri* (Risso)). The tree was made up of four main divisions, each with several smaller branches. Mealybug infestation was heavy; the foliage was covered with quantities of sticky honeydew in which a black sooty mold was growing, resulting in unsightly appearance. Mealybug counts were not made before treatment. The young, however, were in various stages of development and were for the most part moving about freely over the surface of the leaves and on the branches. Some of the eggs had not hatched and were protected by a waxy secretion.

The tree was sprayed on December 12, 1952 with 50 per cent malathion emulsion at dilutions of 1:100, 1:200, and 1:400 using one division of the tree per treatment. The fourth main division was left untreated. No additional spreading or sticking agent was added to the insecticide. A 3-gallon hand pressure sprayer was used to make the treatments. All of the plant, excepting the division under treatment was protected by heavy burlap as each dilution of malathion was applied. Results of the experiment are given in Table 2.

The results of the malathion treatments as indicated in Table 2 show that good control of mealybug had been obtained. Mature mealybugs not completely covered by waxy secretion and those located in crotches between twigs or branches were most easily killed. In the latter instance the insecticide ran down the stems and settled in the crotches. By January 7, 1953, all eggs had collapsed and no live mealybugs could be found.

Table 2. Results on December 18 of malathion treatments applied December 12 to control mealybug on lemon tree

Dilution	Number of young mealybugs Dead	Alive	Number of female mealybugs Dead	Alive
1:100	186	0	28	3
1:200	180	0	15	2
1:400	163	0	10	2
Untreated	7	177	0	17

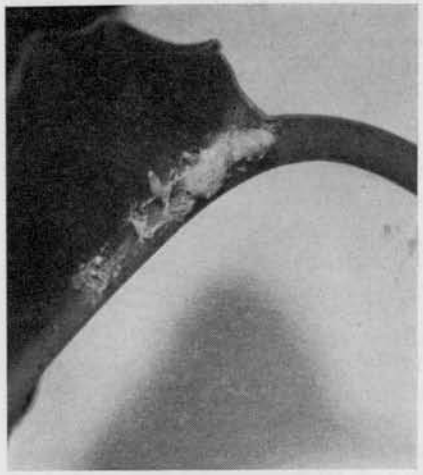

Figure 3. Mealybug infestation on Chinese evergreen leaf.

Control of mealybug on Chinese evergreen

Chinese evergreen plants are extremely susceptible to attack by the Mexican mealybug (*Phenacoccus gossypii* Towns & Ckll.). Leaves and stems of infested plants lose some or all of their green color and become yellowish in appearance.

Because the insects hide in large numbers between the petioles and sheaths where many eggs are laid it is difficult to kill them with sprays or fumigation. Furthermore, colonies situated on either side of the thick midrib on the underside of the leaves are not easily destroyed by contact sprays. Consequently badly infested plants may die or become unsightly.

Six Chinese evergreen plants 12 to 14 inches high with 7 to 10 leaves each, growing in 3¼-inch clay pots, were treated on January 7, 1955 with 30 per cent Systox, 50 per cent experimental compounds 12008 and Thimet at dilutions of 1:800 and 1:1600. The treatments were applied as soil drenches using 3¼ ounces of solution per pot. Because of the restricted number of plants available for the tests, the treatments could not be repeated.

Figure 4. Chinese evergreen with mealybug infestation.

Pre-treatment counts indicated 23 and 73 mature mealybugs and egg masses respectively on two plants. Most of the colonies were at the base of the petioles nearest the stem of the plants or between the petioles and the sheaths. A few occurred on the underside of the leaves.

Results of the treatments were taken on January 20. With the exception of 25 dead immature mealybugs on the plant treated with compound 12008 at 1:800 dilution, no mortality had developed among the colonies on the remainder of the treated plants. Consequently the plants were retreated on January 25. Data taken on February 11 relative to the effectiveness of two treatments is given in Table 3. Many normal healthy eggs were found with each live female mealybug.

An examination of Table 3 indicates good control of mealybug on Chinese evergreen with two soil treatments. The only appreciable survival was where Thimet had been used at the lowest dilution. None of the systemics resulted in noticeable injury to the plants. A rather general yellow-green color developed in most of the foliage because of exposure to continuous sunlight.

Scale Insects

The soft brown scale (*Coccus hesperidum*) occurs on a wide range of greenhouse plants including palms, ferns, rose, camellia, and ivy. The insect is soft, greenish-brown or yellowish-green, with a ridged pattern across the back. It is oval in outline, somewhat flattened and about one-eighth of an inch long. Badly infested leaves and stems may be bumpy in appearance. Honeydew is secreted by the insects. It serves as a medium for the growth of sooty mold, hence the unsightly blackish discoloration so common to foliage infested by the scales.

Control of scale on nephthytis

Nephthytis plants growing in 3½-inch clay pots were treated on November 20, 1955 with 32 per cent Systox emulsion at dilutions of 1:200, 1:400, and 1:800. The Systox dilutions were applied to the soil of each pot at the rate of 3½ ounces per pot. Treatments were repeated on one series on January 6 (Table 4).

The results indicate one soil treatment with Systox did not give good control of soft scale. Two treatments were superior to one, but caused serious injury to plants.

Table 3. Results on February 11 of systemic treatments applied January 7 and 25 to control mealybug on Chinese evergreen

Material and dilution	Immature mealybugs Dead	Immature mealybugs Alive	Adult mealybugs Dead	Adult mealybugs Alive	Eggs
Systox 1:800	350+	0	11	0	All hatched
Systox 1:1600	100+	0	5	0	All hatched
12008 1:800	200+	0	7	0	All hatched
12008 1:1600	150+	0	4	1	All hatched
Thimet 1:800	175+	0	5	0	All hatched
Thimet 1:1600	200+	75+	1	6	All hatched
Untreated		100+	3	51	500+

Table 4. Results on January 1 of one Systox treatment and on March 18 of two Systox treatments to control scale on nephthytis

Dilution	One treatment Nov. 20 Scale count Jan. 1 Dead	Alive	Two treatments Nov. 20 & Jan. 6 Scale count Mar. 18 Alive
1:200	....	....	Plant Dead
1:400	2	10	0
1:800	2	8	9
Untreated	0	9	189

When a second series of treatments was made the strongest dilution killed the plant completely. The two lesser dilutions did not destroy the plants but resulted in the loss of many leaves. Dead scales shrivelled and fell from the plants or were knocked off by everyday watering. All new growth produced after treatment showed no signs of chlorosis and was completely free from scale infestation.

Control of euonymus scale

The following experiment was carried on under greenhouse conditions. In these tests the plants had been rooted for 6 months or longer and had been transplanted into 4-inch clay pots where they were well established. They ranged in height from 4½ to 12 inches. All were of the variegated shrub variety. Counts on 10 leaves taken from the plants before treatment indicated 210 immature scales in a range of 3 to 98 per leaf.

Treatments were made on March 19 using 30 per cent Systox, 50 per cent compound 12008, and Thimet emulsions at dilutions of 1:800 and 1:1600. Each plant received 4 ounces of soil drench. Control data taken on April 21 is given in Table 5.

An examination of Table 5 indicates good control of euonymus scale had been obtained on euonymus through the use of Systox. Compound 12008 and Thimet were not as efficient as Systox during the first 4 weeks after treatment. Examinations of adult scales showed eggs were hatching and that many of the young scales were still alive. This was more noticeable on the plants treated with 12008 and Thimet. Fewer live young scales were present under the parent scales on the Systox-treated plants.

With the exception of the plants treated with compound 12008 at 1:1600 (in which no injury occurred) a minimum of marginal foliage burn was seen on some of the leaves at the base of the other plants.

On June 21, 3 months after treatment, all of the treated plants were re-examined (Table 6). Ten leaves from untreated plants and all of the leaves on the treated ones were examined.

Table 5. Results on April 21 of systemic treatments made 30 days earlier to control euonymus scale

Material and dilution	Scale count Dead	Alive	Per cent kill
Systox 1:800	111	1	99+
Systox 1:1600	124	0	100
12008 1:800	160	61	72.3
12008 1:1600	275	68	80
Thimet 1:800	124	40	75.6
Thimet 1:1600	195	91	68.1
Untreated	8	88	

Table 6. Results on June 21 of systemic treatments made 90 days earlier to control euonymus scale

Material and dilution	Scale count Dead	Alive	Per cent kill
Systox 1:800	11	0	100
Systox 1:1600	51	1	99
12008 1:800	139	17	89
12008 1:1600	121	36	77
Thimet 1:800	141	0	100
Thimet 1:1600	172	77	69
Untreated	0	391	

One treatment of 12008 and Thimet at the strongest dilution resulted in considerably better control of scales at the end of 3 months than after 1 month, Tables 5 and 6. Systox "held its own" at both dilutions throughout the entire 3 months. Furthermore new leaves on all of the treated plants showed no noticeable evidence of insecticide injury when the experiment was discontinued at the end of 3 months.

Aphids

Control of aphids on chrysanthemum

Chrysanthemum plants are susceptible to attack by several insect pests of which aphids may be the most prevalent. The following experiment was undertaken to determine the value of two new insecticides for aphid control.

The two species of aphids infesting the plants used in the investigation were identified by James B. Kring of this Station as the leaf-cure plum aphid (*Aphis helichrys* Kaltenbach), which was green in color, and the chrysanthemum aphid (*Macrosiphum sanborn* Gillette), a reddish or mahogany colored species.

Figure 5. Aphid-free chrysanthemum at left, aphid-infested plant at right.

Sixteen chrysanthemum plants including several color varieties were used in the tests. Six of the plants were 20 to 24 inches high and had three to five branches each. The remaining ten plants were 6 to 12 inches high with two to four branches each. All were growing in 6-inch clay pots. Aphid counts made before treatments were applied indicated an average of 101.7 individuals on 10 1¼-inch leaves.

The first experimental treatments were made on January 7, 1955, using four of the tallest plants for the purpose. Thimet 50 per cent and G-22870 25 per cent emulsions were used in dosage series of 1:800 and 1:1600. Each plant received 6 ounces of solution as a soil drench. The treatments were not repeated.

Results of the treatments taken on January 8 showed that most of the aphids had dropped from the plants treated with Thimet and were dead or dying. None, however, had dropped from, nor were there any dead aphids on, the plants treated with compound G-22870. Two days later the rest of the living aphids had fallen from the plants treated with Thimet. Furthermore, it was seen that all of the aphids had dropped from the plants treated with G-22870 and were dead or dying.

Since the plants treated with both materials were kept side by side in a greenhouse bench it was thought that perhaps Thimet vapors also destroyed the aphids on the G-22870-treated plants. Consequently on January 13, G-22870 was applied to additional pots at the rate of 1:800 and 1:1600 and repeated three times. Two plants were held as checks. The treated plants were kept in a greenhouse separated from those treated on January 7. The check plants were put in a third greenhouse remote from both the January 7 and January 13 treatments.

Results of the January 13 treatments taken on January 17 showed that G-22870 had destroyed the aphids on the treated plants. There were 239 live and 7 parasitized aphids on five 1¾-inch leaves taken from the untreated ones. From these results it would seem that the systemic action of G-22870 and not the fumigant action of Thimet was responsible for aphid kill. This is borne out by the fact that the aphids were alive 2 days after treatment and did not show the effects of the treatments until later.

An examination of the treated plants on February 11 showed slight marginal foliage burn on leaves present when G-22870 was used at 1:800 on January 13. No noticeable injury could be seen on the plants treated at 1:1600 nor in any of the plants treated with Thimet at both dilutions. It could also be seen at this time that the new leaves on the plant treated with G-22870 at 1:800 were uninjured. All plants treated with both systemics were free from aphid reinfestation. This continued up to and including the time that the treated plants were discarded on May 12. Concurrently a total of 819 live aphids and no dead ones were counted on five leaves taken from the untreated plants.

Control of aphids on geranium

Of the many varieties of geranium grown by the thousands in greenhouses during the winter months only a few become infested with aphids. The species most commonly responsible for infestation is the foxglove aphid (*Myzus solani* (Kaltenbach)), identified by James B. Kring. This species also infests foxglove, pansies, devils-paintbrush, potatoes, and various species of anthemis. The leaves of seriously infested plants are badly crippled and stunted by the pest. Yellowish discoloration develops and the growth is greatly impaired.

Figure 6. Geranium plant at center is free from aphids, others show effects of aphid infestation.

An experiment in controlling geranium aphid was started on February 9 using 12 plants comprising several varieties. The plants were 4 to 6 inches high and were growing in 4-inch clay pots. Counts before treatment indicated a total of 46 aphids on four small leaves.

Experimental systemic 12008 and Thimet 50 per cent emulsions were used at dilutions of 1:1600 and 1:3200. Plants received soil drenches at the rate of 4 ounces of dilution per pot. Each treatment was replicated twice. The plants were not kept in dishes of sand but they were separated so that the treatments could not spread from pot to pot.

Results of the experiment taken 24 hours after treatments were made showed that the insecticidal vapors arising from the systemics had caused all of the aphids to drop from the plants and were dead or dying.

Examinations 2 weeks later showed that all of the plants treated with Thimet at 1:1600 had been injured to some extent, especially on the lower leaves. Compound 12008 caused less yellowing of the foliage at the 1:1600 dilution. The 1:3200 dilutions of both materials appeared not to harm the plants.

After examination all of the geranium plants were returned to the benches where many others were growing. Despite the presence of aphids on plants in the near vicinity, the treated ones did not become reinfested during the following months.

Cyclamen Mite

The cyclamen mite (*Tarsonemus pallidus* Banks) is a pest of greenhouse plants such as cyclamen, kalanchoe, snapdragon, chrysanthemum, geranium, velvet-plant, African violet, and most varieties of

greenhouse ivy. In addition it is sometimes injurious to a few garden plants, namely: Dahlia, perennial delphinium, gerberias, strawberry, and geums.

The adult cyclamen mite is more or less caramel color. The young are whitish. They may not be seen easily by the unaided eye. Movement from plant to plant is encouraged when foliage intermingles. Spread is also accomplished artificially by handling plants and through the movement of soil, pots, tools, and other equipment. Some distribution out-of-doors may be expected by rain, wind, and insects.

Mites attack new and tender growth of infested plants. Flowers and leaf buds are most seriously affected. Both are distorted and blackened. Mature flowers are crippled, small in size, and distorted. The petals are streaked with black and unsightly. Injured leaves are usually small in size, curled, twisted, and off-color. Large leaves are not attacked as a rule. When they appear damaged the injury was initiated when they were small and before they began unfolding.

Treatment with hot water has been useful in controlling cyclamen mite on cyclamen (3). Cyanogas and aerosol bombs have been used with varying degrees of success in controlling the pest on a variety of plants in greenhouses. In the following experiments, systemics and other materials were used experimentally for control of the species.

Control of cyclamen mite on velvet-plant

The velvet-plant (*Gynura aurantiaca,* DC.) is a handsome greenhouse plant from Java. It grows rapidly and under ideal conditions may attain a height of 2 to 3 feet at maturity. Both the stems and the large, soft oval-shaped leaves are densely clothed with violet or purple hairs. The flowers are inconspicuous. It makes an excellent

Figure 7. A mite-infested velvet-plant on the right, normal plant on the left.

Table 7. Results on March 9 of one systemic treatment and on April 4 of two systemic treatments to control cyclamen mite on velvet-plant

Material and dilution	One treatment Jan. 24		Two treatments Jan. 24 & Mar. 14	
	Leaves examined 3/9 *Number*	Live mites *Number*	Leaves examined 4/4 *Number*	Live mites *Number*
Systox 1:800	17	149	14	5
Systox 1:1600	17	32	12	7
12008 1:800	5	0	8	0
12008 1:1600	19	9	10	2
Thimet 1:800	9	45	9	0
Thimet 1:1600	15	54	12	0
Untreated	5	110	12	24

house plant. The new growth of mite-infested plants may be checked and completely distorted. When infestation continues uncontrolled plants will become unsightly and may die.

Pretreatment counts made on 12 ¾-inch leaves taken at random from the tops of infested plants indicated an average of 7 mites in a range of 1 to 24 per leaf. Plants growing in 4-inch clay pots were treated on January 24, 1955 with 30 per cent Systox, 50 per cent compound 12008, and 50 per cent Thimet at dosages of 1:800 and 1:1600.

Each pot received 4 ounces of solution as a soil drench. All treatments were repeated three times. The number of leaves (average length ¾-inch) examined for control data varied because of the difference in the size of the plants.

Because of poor control obtained with one treatment as indicated on March 9, a second series of treatments were made on March 14.

Two treatments of systemics were more effective than one in controlling cyclamen mite on velvet-plant (Table 7). Experimental compound 12008 and Thimet were noticeably superior to Systox. Re-

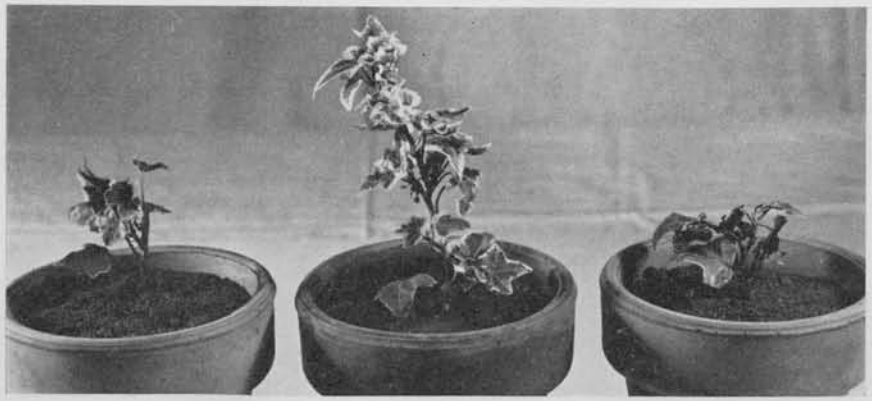

Figure 8. Normal plant of variegated ivy at center, others are mite-infested.

peated applications of the systemics produced no noticeable foliage injury to treated plants.

Control of cyclamen mite on ivy

Scale insects (4) and mites are the principal enemies of the many varieties of ivy. Scales are especially destructive when the plants are growing indoors. Cyclamen mite and greenhouse red spider occur quite often when preventive or corrective measures are not employed. The cyclamen mite may check the growth of infested plants completely. The leaves are deformed and stunted. In addition a blackish discoloration adds to the unsightliness of the plants.

In the following experiment 30 per cent Systox, 50 per cent Thimet and 50 per cent experimental compound 12008 were used as soil drenches at the rate of 1:800 and 1:1600. Each of the treated plants growing in 4-inch clay and plastic pots received 4 ounces of systemic solution on January 25, 1955. The treatments were replicated five times. There were 10 plants in the checks. The ivy plants were of the variegated and evergreen varieties.

Mite counts made before treatments were applied indicated a total of 162 individuals on 25 leaves varying from $\frac{1}{16}$ to $\frac{1}{2}$ of an inch in length. The leaves were taken at random from the apex of the plants. Since many live mites were found on the plants one month after treatment, they were retreated on February 25. The results of both treatments are given in Table 8. Counts were made from 30 leaves taken at random from each treatment (five plants for each treatment).

Two treatments of Thimet and compound 12008 resulted in more complete control of cyclamen mite on ivy than one (Table 8). One treatment of Systox appeared to be about as effective as two. None of the systemics caused any noticeable injury to ivy plants.

Control of cyclamen mite on kalanchoe

Kalanchoe is a succulent herb with fleshy leaves and scarlet or purple flowers. It is grown commercially as a winter plant for household use.

Its principal enemy is the cyclamen mite which attacks the flowers, preventing them from opening. Badly infested flower stalks and flower buds are stunted and

Table 8. Results on February 24 of one systemic treatment and on March 25 of two systemic treatments to control cyclamen mite on ivy

Material and dilution	One treatment Jan. 25 Leaves examined Feb. 24 Number of live mites	Two treatments Jan. 25 & Feb. 25 Leaves examined Mar. 25 Number of live mites
Systox 1:800	2	8
Systox 1:1600	45	25
Thimet 1:800	10	0
Thimet 1:1600	23	0
12008 1:800	7	0
12008 1:1600	9	3
Untreated	216	68

Table 9. Results on December 22 of systemic treatments applied December 8 to control cyclamen mite on kalanchoe

Material and dilution	Number of mites Dead	Alive	Per cent kill
Systox 1:400	15	27	35
Systox 1:800	20	34	37
Thimet 1:400	34	6	85
Thimet 1:800	44	12	78
Untreated	3	60	

streaked with a blackish discoloration. Counts of mites before treatment indicated an average of 5.4, with a range from 1 to 11 on a bud.

Plants growing in 5¼-inch clay pans (3 plants in a pan) were treated on December 8, 1955 with 23 per cent Systox and 50 per cent Thimet emulsions at dilutions of 1:400 and 1:800 and repeated once. Each pan received 5 ounces of soil drench.

Twelve to thirty flower buds were examined for results on December 22 (Table 9).

The strongest soil dilution of Thimet gave good control of cyclamen mite on kalanchoe (Table 9). A lower dose was almost as effective. Systox gave poor results. No phytotoxicity could be seen with any of the treatments.

Control of cyclamen mite on cyclamen

Cyclamen plants may become infested with mites in the seedling stage. When infestation is allowed to continue uncontrolled, leaves and flower buds are stunted and deformed with blackish discoloration. The number of flowers produced by infested plants may be considerably below normal. Moreover, many of the flower petals become twisted and streaked.

Mite-infested cyclamen plants in bloom, growing in 5½-inch pots, were treated on October 14, 1955 with 30 per cent Systox and 50 per cent Thimet emulsions at the rate of 1:1600. Each of four pots re-

Figure 9. Mite-damaged kalanchoe on the right, normal plant on the left.

Table 10. Results on November 15 of systemic treatments as a soil drench applied October 14 to control cyclamen mite on cyclamen

Material and dilution	Area of pot treated	No. of mites Nov. 15 Dead	Alive	Per cent kill
Systox 1:1600	Top	15	108	12.1
Systox 1:1600	Bottom	14	145	8.8
Thimet 1:1600	Top	24	18	57.1
Thimet 1:1600	Bottom	19	59	24.3
Untreated		16	291	5.2

ceived 6 ounces of dilution as a soil drench applied to the top of the soil. An equal number of pots were allowed to stand in the dilutions for 5 hours to allow the materials to be absorbed through the bottom of the pots. Results of the treatments appear in Table 10. For each treatment, five leaves were examined.

Thimet used as a soil drench applied to the top of the pots gave the best control of mite. Results of the Systox treatments made at the top or bottom of the pots were not good.

In another experiment 15 cyclamen plants were dipped in a 1:800 dilution of 80 per cent Loro and 15 per cent endrin. The results of these tests are given in Table 11. Mite counts were made both on 5 flower buds and 10 leaves, because the flower buds were much tighter in growth than the small leaves. Consequently a difference in control might be expected.

Control of cyclamen mite by dipping was reasonably good in the small leaves but poor in the flower buds (Table 11). Neither dipping nor soil treatments injured the plants.

Summary

Systox and Thimet used once as soil drenches controlled mealybug on nephthytis. Two soil treatments with these systemics or compound 12008 gave good control of the insect on Chinese evergreen.

Malathion spray controlled mealybug on lemon tree.

Figure 10. Effect of cyclamen mite infestation on cyclamen, normal plant at left.

Table 11. Results on November 21 of systemic treatments by dipping applied November 7 to control cyclamen mite on cyclamen

Material and dilution	No. of mites on leaves Dead	Alive	Per cent kill on leaves	No. of mites on flowers Dead	Alive	Per cent kill on flowers
Loro 1:800	114	58	66.2	26	97	21.2
Endrin 1:800	44	19	69.8	11	26	29.7
Untreated	8	145	.....	....	....	.....

Systox soil treatments controlled scale on nephthytis. Repeated applications injured plants. Thimet and compound 12008 in addition to Systox gave good control of euonymus scale. The first two materials were slower in action and less effective at reduced concentrations.

Thimet and compound G-22870 used as soil drenches gave complete control of aphids on chrysanthemum. Compound 12008 and Thimet produced similar results when used as soil treatments to control aphids on geranium. The strongest dilution of the three systemics caused slight marginal foliage burn to treated plants.

Two soil treatments of Systox, Thimet, and compound 12008 controlled cyclamen mites on velvetplant and ivy. Systox was the least effective of the three systemics.

Thimet was more effective than Systox in controlling cyclamen mite on kalanchoe and cyclamen.

Endrin and Loro used as dips gave reasonably good control of cyclamen mite in the leaves of cyclamen plants but poor control in the flower buds. The treatments did not injure the dipped plants.

Control with systemic insecticides

Systox 20 per cent may be diluted at the rate of 1 pint in 100 gallons of water or 1 teaspoon per gallon and applied to potted plants as a soil drench at the rate of 1 ounce of dilution to each inch of pot diameter (5 ounces for a 5-inch pot). Two treatments at about 14-day intervals may be necessary for best results. Caution should be exercised, however, in repeating treatments, for accumulated toxicity may be hazardous to some plants.

Malathion 50 per cent emulsion used as a spray at the rate of 3 to 4 pints in 100 gallons of water or 3 to 4 teaspoons per gallon should give good control of mealybugs and scales. Wettable powder may be substituted for the emulsion at the rate of 6 to 8 pounds in 100 gallons of water or 4 to 5 tablespoons per gallon. Because young scales and mealybugs hatch for some time, several treatments at about 2-week intervals may be necessary to make good control a certainty.

Endrin emulsion may be used at about 4-week intervals at a dilution of 1 to 2 pints in 100 gallons of water or 1 to 2 teaspoons per gallon as an aid in preventing cyclamen mite infestation.

Literature Cited

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3. Johnson, J. Peter, 1943. The effect of hot water treatment for Cyclamen mite on Cyclamen. Jour. Econ. Ent. 36 (2) :286-289.
4. Schread, J. C., 1954. Scale insects and their control. The Conn. Agr. Expt. Sta. Bull. 578:1-23.

This publication is one in a continuing series on research conducted at this Station to control insect pests on ornamentals. Titles of other publications in this series to date are given below.

B 578 Scale Insects and Their Control

B 588 Aphids and Scale Insects on Ornamentals

B 591 Mite Pests of Ornamentals and Their Control

C 199 Dogwood Borer
