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# Effects of Cultivar and Insecticide Choice on Oleander Aphid Management and Arthropod Dynamics on *Asclepias* Species[1]

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## Abstract

Performance of oleander aphid (*Aphis nerii* Boyer de Fonscolmbe) and large milkweed bug (*Oncopeltus fasciatus* Dallas) on 21 species of *Asclepias* was evaluated in a two-year field study. Season-long pest and beneficial insect population growth was monitored. Plant quality ratings also were obtained. Relative numbers of Monarch butterfly (*Danaus plexippus* (Linnaeus)) larvae were also recorded. All milkweed species supported growth and development of oleander aphid except *A. vestita*, which failed to establish in this study. The only species that did not become infested with milkweed bugs were *A. syriaca* and *A. sullivantii*. The plant species with the lowest number of aphids, the highest plant quality ratings and the highest number of Monarch larvae (which is desirable as a larval food plant for the butterflies) was gooseplant, *A. physocarpa*. *A. tuberosa* cultivars also ranked high among all species tested.

Five insecticides were tested for efficacy against the Oleander aphid. All insecticide products evaluated: Endeavor (pymetrozine), Orthene (acephate), Merit (imidacloprid), Tempo (cyfluthrin) and Mpede (insecticidal soap) resulted in short-term reductions in aphids in field plots during 1999. Reinfestation occurred within two to three weeks. Parasitoids and predators were also suppressed to varying degrees by materials applied.

**Index words:** oleander aphid, *Aphis nerii*, milkweed bug, *Oncopeltus fasciatus*, Monarch butterfly, *Danaus plexippus*, milkweed, butterfly weed, *Asclepias* spp., parasitoids, predators, host plant resistance.

**Species used in this study:** *Asclepias asperula* (Decne.) — antelope horn; *Asclepias curassavica* L. — bloodflower, 'Silky Gold' and 'Red Butterflies'; *Asclepias emoryi* Tidestr; *Asclepias eriocarpa* Benth. — indian milkweed; *Asclepias erosa* Torrey — desert milkweed; *Asclepias exaltata* L.; *Asclepias fascicularis* Decne — narrowleaf milkweed; *Asclepias fruticosa* L. — swan plant; *Asclepias hirtella* RE Woodson — tall green milkweed; *Asclepias incarnata* L. — swamp milkweed, 'Soul Mate', 'Cinderella', 'Ice Ballet'; *Asclepias oenotheroides*, Cham & Schelecht 'Ice Follies; *Asclepias physocarpa* (E.H. Mey) Schlechter — gooseplant; *Asclepias solanoana* RE Woodson; *Asclepias speciosa* Torr — showy milkweed; *Asclepias* sp. 'Davis, CA', *Asclepias sullivantii* Engelm. — prairie milkweed; *Asclepias syriaca* L. — common milkweed; *Asclepias tuberosa* L. — butterfly weed, 'Gay Butterflies', 'Hello Yellow'; *Asclepias verticillata* L. — whorled milkweed; *Asclepias vestita* Hook & Arn. Per.; *Asclepias viridis* Walt. Fl. Carol — green milkweed.

**Insecticides used in this study:** acephate (Orthene T T & O), O, S dimethyl acetylphosphoramidothioate; cyfluthrin (Tempo 20 WP), cyano (4-fluoro-3-phenoxyphenyl) methyl 3-(2,2 -dichloroethenyl)-2,2-dimethyl-cyclopropanecarboxylate; imidacloprid (Merit 75 WSP), 1-[(6-chloro-3-Pyridinyl) methyl]-*N*-nitro-2-imidazolidinimine; insecticidal soap (Mpede 2%); pymetrozine (Endeavor WDG).

### Significance to the Nursery Industry

*Asclepias* species and cultivars were evaluated for differences in susceptibility to oleander aphid and large milkweed bug. Insecticides were evaluated for their degree of aphid suppression and for non-target effects on natural enemies of the oleander aphid. The only species that did not become infested with milkweed bugs in this two-year study were *A. syriaca* and *A. sullivantii*. Plants with the lowest number of aphids, the highest plant quality ratings and the highest number of Monarch larvae (which is desirable, since this is a larval food plant for the butterflies) were gooseplants, *A. physocarpa*. *A. tuberosa* cultivars also ranked high among all species tested. All products evaluated: Endeavor (pymetrozine), Orthene (acephate), Merit (imidacloprid), Tempo (cyfluthrin) and Mpede (insecticidal soap) effected short-term reductions in aphids in field plots during 1999. Reinfestation occurred within two to three weeks. Parasitoids and predators were also suppressed to varying degrees by materials applied.

### Introduction

*Asclepias* spp. are valuable additions to perennial gardens for their aesthetic attributes and as nectar sources and larval food plants for Monarch butterfly larvae (*Danaus plexippus* (Linnaeus)). However, other specialist insects utilize milkweeds, detracting from the plant's aesthetic appearance and reducing plant vigor, flower production and seed set. *Aphis nerii* Boyer de Fonscolmbe is a bright yellow and black aphid commonly found feeding on milkweed in Georgia. Large milkweed bug, *Oncopeltus fasciatus* Dallas, commonly feeds on developing seed of milkweed. Investigation of the population ecology of *Aphis nerii* on oleander has demonstrated the influence of man in increasing populations of this cosmopolitan pest primarily through pruning and irrigation activities that favor aphid development on oleander, *Nerium oleander* L. (7). Previously, acephate, bendiocarb, chlorpyrifos, dimethoate, fenvalerate, methidathion, methomyl, permethrin, phosalone, and pirimicarb have been shown to provide aphid control for 5 days after one spray application (9). Additional pesticides that might play a role in maintaining plant quality in wildlife and perennial plant

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**Table 1. Oleander aphid and milkweed bug infestations on milkweed species planted in field plots in a nursery site, 1999.**

| | No. aphids[z] | | No. Milkweed bugs[y] |
|---|---|---|---|
| | 7/20 | 8/4 | 7/20 |
| *A. syriaca* | 64.8 | 712.5 | 0.0 |
| *A. curassavica* 'Red Butterfly' | 4.8 | 607.2 | 0.8 |
| *A. sullivantii* | 46.0 | 408.3 | 0.0 |
| *A. curassavica* 'Silky Gold' | 31.5 | 296.2 | 0.7 |
| *A. incarnata* 'Ice Follies' | 61.5 | 283.2 | 0.0 |
| *A. incarnata* 'Cinderella' | 86.0 | 251.7 | 0.5 |
| *A. verticillata* | 52.0 | 238.2 | 0.7 |
| *A. incarnata* 'Soulmate' | 9.5 | 233.5 | 1.0 |
| *A. incarnata* | 136.0 | 229.3 | 0.5 |
| *A. tuberosa* | 55.7 | 196.3 | 4.3 |
| *A. incarnata* 'Ice Ballet' | 0.0 | 185.8 | 0.0 |
| *A. tuberosa* | 9.0 | 164.0 | 4.2 |
| *A. physocarpa* | 28.5 | 157.3 | 0.0 |
| *A. tuberosa* 'Hello Yellow' | 132.8 | 136.5 | 0.2 |
| *A. tuberosa* 'Gay Butterflies' | 20.3 | 116.8 | 1.0 |
| F | 0.85 | 4.29 | 2.85 |
| P | NS | 0.0001 | 0.0008 |
| $LSD_{.05}$ | — | 214.9 | 2.15 |

[z]Number of insects per two terminals.

[y]Number of insects per plant.

gardens or in nursery production were evaluated in the present study.

Host plant resistance has been demonstrated as a valuable integrated pest management strategy in the landscape (5). Insect and disease problems and associated economic and environmental costs in the nursery and landscape can be minimized by selecting relatively pest-resistant species or varieties that are well suited to local growing conditions. Resistance among ornamental and turfgrass species to some key landscape and production pests has been identified (for example 1, 2, 3, 4, 6, 8, 10, 11). Often, however, resistance properties of available plant taxa are not well characterized. Studies were conducted to determine the potential resistance to aphids and milkweed bugs among 21 milkweed species currently commercially available.

## Methods and Materials

*Asclepias* species and cultivars (15 taxa, Tables 1 and 2) were evaluated at two sites during 1999 for differences in susceptibility to aphids, large milkweed bugs, Monarch butterfly larvae, and aphid parasitism by the hymenopteran wasp *Lysiphlebus testaceipis* (Cresson), and were also rated for subsequent plant quality. Plants were started from seed in the greenhouse except for *A. tuberosa* 'Hello Yellow', which were supplied as plugs, and all taxa were transplanted to field plots in the University of Georgia Griffin Campus Research and Education Garden on May 19, 1999 (garden site). Plots were arranged in a randomized complete block design (five replicates of two plants each) of all species and cultivars, fertilized, mulched with pine bark mulch and placed on drip irrigation. At a second nursery site in Spalding Co., GA, plants were transplanted into trade-gallon (3.8 liter) containers, fertilized, and placed on weed barrier cloth in a full sun location in a randomized complete block design with 15 single-pot replications. Plots were examined weekly for occurrence of oleander aphid and large milkweed bug.

Plants were evaluated for naturally occurring aphid infestations during 1999 by clipping two 20 cm (8 in) terminals per plant on July 20 and August 4 at the nursery site and on July 23, August 13 and September 8 at the garden site. Terminals were placed in 120 ml (4 oz) plastic cups containing 70% ethanol as a preservative and returned to the laboratory where number of aphids were counted using a stereomicroscope. Number of milkweed bugs was assessed visually as total number of bugs per plant on each date.

Parasitism, Monarch density and plant quality ratings were taken during September. Plant quality ratings at the garden site only were taken on September 8, 1999, using a 10 point scale (0 = dead, 10 = optimum appearance) by two independent observers. Parasitism was evaluated as the number of aphid 'mummies', the brown, leathery remains of aphids that have been parasitized by the wasp *Lysiphlebus testaceipis*, per two terminals on September 8.

During 2000, 21 species (Table 3) were evaluated for aphid density and plant quality. All plants were started from seed in the greenhouse and transplanted to the research garden (previously described) on June 8, 2000. Plots were arranged in a randomized complete block design with three replications and two plants per replication. Aphid density was evaluated, as previously described, on July 12. Plant quality ratings at the garden site during 2000 also were taken on July 12 using a 10 point scale (0 = dead, 10 = optimum appearance) by two independent observers.

Product evaluations for aphid suppression and non-target effects were conducted in replicated plots in a randomized complete block design using four replications during 1999. *Asclepias incarnata* 'Ice Ballet' that were established in landscape plots for two years were treated with one of five insecticides during Trial 1 or four insecticides during Trial 2, and aphid numbers were compared with untreated controls. In Trial 1, applications were made using a SOLO backpack sprayer to runoff on August 3 and repeated on August 10. At 3, 7, 10, and 21 days post-application, dating from the first application, two terminals, clipped at the third fully expanded leaf node, were placed in (120 ml) (4 oz) containers of 70% ethanol and returned to the laboratory where the number of



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**Table 2. Numbers of oleander aphids, milkweed bugs, monarch larvae and aphid parasitoids on *Asclepias* species at a garden site in 1999. Plant quality also was rated on 9/8/99.**

| | 7/26 | | 8/13 | 9/8 | | | |
|---|---|---|---|---|---|---|---|
| | Aphids[z] | Milkweed[y] bugs | Aphids | Aphids | Plant[x] quality | Monarch[y] larvae | Aphid[z] 'mummies' |
| *A. curassavica* 'Red Butterfly' | 1.7 | 12.8 | 99.8 | 100.2 | 2.8 | 1.4 | 1.6 |
| *A. incarnata* 'Cinderella' | 0.0 | 0.0 | 134.3 | 71.2 | 2.0 | 1.2 | 1.2 |
| *A. syriaca* | 2.0 | 0.0 | 101.5 | 71.0 | 1.2 | 0.8 | 2.0 |
| *A. curassavica* 'Silky Gold' | 121.2 | 10.3 | 177.8 | 61.0 | 2.4 | 1.2 | 4.2 |
| *A. incarnata* 'Soulmate' | 0.2 | 0.3 | 234.0 | 49.2 | 2.8 | 1.6 | 2.2 |
| *A. tuberosa* 'Hello Yellow' | 1.2 | 0.0 | 240.8 | 48.2 | 2.5 | 0.4 | 0.3 |
| *A.physocarpa* | 3.6 | 3.5 | 60.8 | 35.0 | 5.8 | 8.0 | 0.2 |
| *A. incarnata* 'Ice Ballet' | 0.6 | 0.4 | 207.4 | 33.2 | 3.2 | 2.0 | 0.6 |
| *A. tuberosa* 'Gay Butterflies' | 1.3 | 0.5 | 116.7 | 33.0 | 4.1 | 1.0 | 0.0 |
| *A. incarnata* 'Ice Follies' | 10.8 | 2.9 | 213.3 | 31.8 | 2.8 | 2.3 | 0.7 |
| *A. incarnata* | 0.1 | 0.1 | 305.2 | 18.8 | 2.7 | 1.6 | 0.0 |
| *A. tuberosa* | 0.4 | 3.4 | 345.0 | 17.3 | 2.1 | 0.4 | 0.3 |
| *A. tuberosa* | 0.0 | 0.0 | 220.0 | 16.0 | 1.7 | 0.0 | 0.0 |
| *A. sulivantii* | 12.2 | 0.0 | 217.5 | 7.5 | 2.6 | 0.4 | 0.0 |
| *A. verticillata* | 7.6 | 0.1 | 96.3 | — | 0.8 | 0.0 | 0.0 |
| F | 0.94 | 3.84 | 1.32 | 2.49 | 6.04 | 7.16 | 1.43 |
| P | NS | 0.0001 | NS | 0.046 | 0.0001 | 0.0001 | NS |
| $LSD_{.05}$ | — | 6.3 | — | 51.2 | 1.4 | 2.0 | — |

[z]Number of insects per two terminals.

[y]Number of insects per plant.

[x]Plant quality rating of 0–10, where 0 = dead and 10 = optimum appearance.

aphids and beneficial insects per two terminals were recorded. In Trial 2, plants were treated only once, on August 10. Samples were collected as described above at 3, 7, and 14 days post-treatment. Effects on selected beneficials were also observed.

All data were subjected to analysis of variance. Following a significant ANOVA, mean separation was accomplished using Fisher's protected least significant difference test ($P < 0.05$). Parasites and predators were also analyzed as a percentage of the aphid population. Data were transformed using an arcsine square root transformation prior to analysis.

## Results and Discussion

During 1999, all plant selections became infested with aphids. Average number of aphids per two terminal samples varied from 0 to >700 depending upon date, location and plant taxa. Under field conditions at the nursery site, *A. syriaca*

**Table 3. Oleander aphid infestation and plant quality of cultivated milkweed in field plots at a garden site, 2000.**

| | No. aphids per terminal | | Plant quality rating (0–10) |
|---|---|---|---|
| *A. latifolia* | 178.25 | *A. vestita* | 0.55 |
| *A. syriaca* | 116.75 | *A. erosa* | 1.55 |
| *A. sp.* 'Davis CA' | 91.75 | *A. exalta* | 2.00 |
| *A. eriocarpa* | 78.75 | *A. asperula* | 2.67 |
| *A. exalta* | 74.50 | *A. viridis* | 2.89 |
| *A. fruticosa* | 73.50 | *A. sullivantii* | 3.22 |
| *A. oenotherioides* | 64.50 | *A. hirtella* | 3.89 |
| *A. sullivantii* | 61.75 | *A. eriocarpa* | 3.89 |
| *A. viridis* | 57.25 | *A. verticillata* | 5.00 |
| *A. physocarpa* | 50.5 | *A. emoryi* | 5.00 |
| *A. speciosa* | 50.0 | *A. speciosa* | 5.22 |
| *A. incarnata* | 49.0 | *A. fascicularis* | 5.22 |
| *A. hirtella* | 43.5 | *A. syriaca* | 5.67 |
| *A. verticillata* | 42.25 | *A. latifolia* | 6.00 |
| *A. curassavica* | 33.0 | *A. sp.* 'Davis CA' | 6.22 |
| *A. asperula* | 26.5 | *A. oenotherioides* | 6.44 |
| *A. fascicularis* | 20.0 | *A. incarnata* | 6.56 |
| *A. erosa* | 15.25 | *A. curassavica* | 6.67 |
| *A. emoryi* | 15.0 | *A. tuberosa* | 6.89 |
| *A. tuberosa* | 10.0 | *A. physocarpa* | 7.33 |
| *A. vestita* | 0.0 | *A. fruticosa* | 7.67 |
| F | 5.19 | F | 19.15 |
| P | 0.0001 | P | 0.0001 |
| $LSD_{.05}$ | 48.33 | $LSD_{.05}$ | 1.30 |



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**Table 4. Evaluation of insecticide products for oleander aphid control on milkweed and non-target effects on natural enemies at 3, 7, 10, and 21 days after the first application. Each insecticide was applied twice one week apart (Trial 1, 1999).**

| Compound | Formulation | Rate per 100 gal | Mean number per two terminals | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Aphids | Parasites | Lady beetles | Syrphid larvae | Syrphid pupae | Lacewings |
| **3-day post** | | | | | | | | |
| Endeavor | 50 WG | 2.5 oz | 9.0b[z] | 1.8b | 0.5a | 0.0a | 2.5a | 0.0 |
| Endeavor | 50 WG | 5.0 oz | 10.0b | 0.8b | 0.8a | 1.3a | 0.8bc | 0.0 |
| Orthene | 75 S | 1/3 lb | 8.8b | 0.8b | 0.0a | 0.0a | 0.8bc | 0.0 |
| Merit | 75 WP | 3.5 T | 3.5b | 1.3b | 0.0a | 0.0a | 1.8abc | 0.0 |
| Tempo | 20 WP | 1.9 oz | 0.3b | 0.3b | 0.3a | 0.0a | 0.5c | 0.0 |
| UTC | — | — | 335.8a | 5.8a | 1.0a | 1.0a | 2.3ab | 0.0 |
| **7-day post** | | | | | | | | |
| Endeavor | 50 WG | 2.5 oz | 49.0b | 0.0a | 0.0a | 0.0 | 0.8ab | 0.0 |
| Endeavor | 50 WG | 5.0 oz | 17.8b | 0.3a | 0.0a | 0.0 | 1.5a | 0.0 |
| Orthene | 75 S | 1/3 lb | 47.3b | 0.5a | 0.0a | 0.0 | 0.8ab | 0.0 |
| Merit | 75 WP | 3.5 T | 8.3b | 0.0a | 0.0a | 0.0 | 0.3b | 0.0 |
| Tempo | 20 WP | 1.9 oz | 2.0b | 0.0a | 0.0a | 0.0 | 0.0b | 0.0 |
| UTC | — | — | 852.0a | 2.3a | 1.0a | 0.0 | 1.5a | 0.0 |
| **10-day post** | | | | | | | | |
| Endeavor | 50 WG | 2.5 oz | 3.3b | 4.8a | 0.0b | 0.0b | 0.8bc | 0.5b |
| Endeavor | 50 WG | 5.0 oz | 1.5b | 0.8a | 0.0b | 0.0b | 1.5b | 2.0ab |
| Orthene | 75 S | 1/3 lb | 0.0b | 0.0a | 0.0b | 0.0b | 0.3c | 0.0b |
| Merit | 75 WP | 3.5 T | 2.0b | 0.0a | 0.0b | 0.0b | 0.3c | 0.0b |
| Tempo | 20 WP | 1.9 oz | 0.0b | 0.0a | 0.0b | 0.0b | 0.3c | 1.0ab |
| UTC | — | — | 791.0a | 3.0a | 0.5a | 1.75a | 2.8a | 3.5a |
| **21-day post** | | | | | | | | |
| Endeavor | 50 WG | 2.5 oz | 230.2bc | 0.0b | 0.3a | 1.0a | 0.3b | 0.0a |
| Endeavor | 50 WG | 5.0 oz | 276.0b | 0.3b | 0.0a | 0.3a | 0.5a | 0.0a |
| Orthene | 75 S | 1/3 lb | 295.5b | 0.5b | 0.0a | 0.3a | 0.0b | 0.0a |
| Merit | 75 WP | 3.5 T | 22.5d | 0.0b | 0.0a | 0.5a | 0.0b | 0.3a |
| Tempo | 20 WP | 1.9 oz | 87.0cd | 1.3ab | 0.0a | 0.0a | 0.0b | 0.0a |
| UTC | — | — | 440.5a | 3.5a | 1.0a | 0.0a | 2.0a | 0.0a |

[z]Means followed by the same letter within a column are not significantly different LSD ($\alpha = 0.05$).

(common milkweed) was the most heavily infested species by August (Table 1). Milkweed bugs were most numerous on *A. tuberosa* (butterfly weed) at that site. At the garden site, aphids also infested all containerized plant selections by August. Containerized *A. curassavica* 'Red Butterfly' (bloodflower) was still heavily infested in September. *A. physocarpa* (gooseplant) supported comparatively fewer aphids among dates, received the highest plant quality rating, and supported the largest number of Monarch larvae (Table 2). The only species that did not become infested with milkweed bugs were *A. syriaca* and *A. sullivantii*. Although low levels of aphid parasitism were observed at this field site, no significant differences among taxa were determined (Table 2). Numerous other natural enemies were attracted to the aphids on these plants including lady beetles (Coleoptera Coccinellidae), green lacewings and syrphid flies. Plant quality ratings among the *Asclepias* species tested for aphid tolerance during 1999 resulted in the following ranking from highest to lowest quality: *A. physocarpa* > *A. tuberosa* 'Gay Butterflies', *A.incarnata* 'Ice Ballet' > *A. incarnata* 'Soul Mate', *A. curassavica* 'Red Butterfly', *A. incarnata* sp. > *A. incarnata* 'Ice Follies', *A. tuberosa* 'Hello Yellow', *A. curassavica* 'Silky Gold', *A. tuberosa* sp., *A. incarnata* 'Cinderella' > *A. sullivantii* > *A. syriaca* > *A. verticillata*.

During 2000, all 21 species were again infested with aphids except *A. vestita*, which failed to grow properly in our field plots and received the lowest plant quality rating (Table 3). *Asclepias syriaca* and *A. latifolia* were the most heavily infested. *Asclepias physocarpa* and the very similar in appearance *A. fruticosa* (Swan Plant) received the highest plant quality ratings. Milkweed bugs were too few to count and parasitism also was negligible (data not presented). Aphid populations and plant quality were apparently both greatly reduced by the drought conditions that existed during 2000 even though plants were supplied with drip irrigation. Therefore, only July assessments of pest infestation were obtained during 2000.

All pesticide products evaluated resulted in short-term reductions in aphids in field plots at the garden site during 1999. In Trial 1, both rates of Endeavor, Orthene, Merit and Tempo all suppressed aphid populations substantially within 3 days after application (Table 4). Populations began to rebound after 21 days. Aphids in treated plots were still lower than those in untreated plots even after 21 days. Reductions in aphid populations in the plots treated with Merit or Tempo were lower than those treated with Orthene or Endeavor after 21 days under heavy pest pressure in those plots. In Trial 2, substantial reductions in aphid numbers resulted after a single appli-



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**Table 5. Evaluation of insecticide products for oleander aphid control on milkweed at 3, 7, and 14 days after treatment (Trial 2, 1999).**

| Compound | Formulation | Rate per 100 gal | Aphids Mean number per 2 terminals |
|---|---|---|---|
| | | **3-day post** | |
| Endeavor | 50 WG | 2.5 oz | 0.6b[z] |
| Endeavor | 50 WG | 5.0 oz | 0.6b |
| Orthene | 75 S | 1/3 lb | 0b |
| M Pede | | 2 gal | 1.3b |
| UTC | — | — | 122.3a |
| | | **7-day post** | |
| Endeavor | 50 WG | 2.5 oz | 3.3b |
| Endeavor | 50 WG | 5.0 oz | 4.9b |
| Orthene | 75 S | 1/3 lb | 0.7b |
| M Pede | | 2 gal | 1.1b |
| UTC | — | — | 113.1a |
| | | **14-day post** | |
| Endeavor | 50 WG | 2.5 oz | 13.5b |
| Endeavor | 50 WG | 5.0 oz | 19.3b |
| Orthene | 75 S | 1/3 lb | 3.1b |
| M Pede | | 2 gal | 33.1b |
| UTC | — | — | 96.2a |

[z]Means followed by the same letter within a column are not significantly different LSD ($\alpha = 0.05$).

cation of Endeavor at either rate, Orthene or insecticidal soap (Table 5). Aphids began to rebound at 14 days post application. Overall, plant quality declined dramatically as a result of heavy aphid pressure. Parasitoids and predators also were suppressed to varying degrees by materials applied (Table 4). Beneficial insects tended to be most numerous in untreated control plots in Trial 1, although syrphid pupae and aphid mummies were numerous in plots treated with Endeavor. However, when predators and parasites were expressed as a percentage of total aphids per plot, no significant differences among treatments were observed ($P > 0.05$).

Our data indicate that the butterfly weeds, *A. tuberosa*, particularly 'Gay Butterflies' and gooseplant, *A. physocarpa*, maintained good plant quality under conditions of heavy aphid pressure. When milkweeds are being grown as larval food plants for Monarch butterflies, short-term aphid suppression with insecticidal soap is an option that may be least suppressive to butterfly larvae.

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