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# Potential for Integration of Chemical and Natural Enemy Suppression of Azalea Lace Bug (Heteroptera: Tingidae)<sup>1</sup>

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## Abstract

Efficacies of nine insecticides were compared for suppression of azalea lace bug (ALB) and effect on natural enemies. Examination of leaf samples collected weekly revealed reduced ALB populations in all treatments while six of the tested products required multiple applications for effective control. Acephate was the most cost effective treatment. Emergence of *Anagrus takeyanus*, an egg parasitoid of ALB, was observed in all treatments and increased during the study period.

**Index Words:** *Anagrus takeyanus*, *Stephanitis pyrioides*, egg parasitoid, natural enemies, chemical control.

**Insecticides used in this study:** Orthene Turf, Tree & Ornamental Spray (Acephate), *O,S*-Dimethyl acetylphosphoramidothiate; Cygon 2E (Dimethoate), *O,O*-dimethyl-*S*(*N*-methylcarbamoylmethyl) phosphorodithoate; NTN 33893 (proposed trade name: Merit, proposed common name: Imidacloprid), 1-[(6-chloro-3-pyridinyl)methyl]-*N*-nitro-2-imidazolidinimine; Turcam 76WP (Bendiocarb), 2,2-dimethyl-1,3-benzodioxol-4-yl methylcarbamate; Tempo (Cyfluthrin), cyano(4-fluoro-3-phenoxyphenyl)methyl 3-(2,2-dichloroethenyl)-2,2-dimethylcyclopropanecarboxylate; Avid 0.15EC (Abamectin), avermectin B<sub>1</sub>; Margosan-O (Azadirachtin); M-Pede Insecticidal Soap; Volck Supreme Spray (Horticultural Oil).

## Significance to the Nursery Industry

The azalea lace bug (ALB) is a serious pest of cultivated azaleas and has only two reported natural enemies. Control of ALB has been primarily through the use of chemical insecticides; however alternative control strategies, including the use of natural enemies, have received increased attention. Effectiveness of nine insecticides for control of ALB were compared in this study. Additionally, the effect of these products on development of a wasp parasitoid of ALB eggs, *Anagrus takeyanus* Gordh, was observed. Multiple applications of several compounds were required to maintain low pest population levels; a single application of acephate provided the most cost effective and long-term suppression of ALB. The level of naturally-occurring parasitism on these treated plants suggests that natural control of ALB by this wasp may complement insecticide use.

## Introduction

The azalea lace bug, *Stephanitis pyrioides* (Scott), is the most serious pest of cultivated azaleas. Adults and nymphs feed on leaf mesophyll through the undersides of azalea leaves causing the symptomatic chlorosis of lace bug damage when viewed from above. Cast skins of nymphs and the tar-like excrement of ALB further discolor the leaves from below. Adult females oviposit along the mid-rib and secondary veins of the leaves, frequently covering the eggs with

dark frass. Seasonal activity of ALB varies with geographic location (1,4).

Recommended control strategies for ALB currently emphasize use of chemical insecticides. Increasing concerns about the effect of these chemicals on the environment has focused attention on alternatives to traditional pest management techniques, including the use of natural enemies (9). The azalea lace bug has only two reported natural enemies: a mirid plant bug, *Stethoconus japonicus* Schumacher (5), and a parasitoid wasp in the family Mymaridae, *Anagrus takeyanus* Gordh (1). This minute wasp deposits its eggs in the eggs of ALB. Wasp larvae emerge within the ALB egg and feed on the contents, thereby killing their hosts. *Anagrus takeyanus* is presumed to have been introduced from Asia along with its host (2) and has been found to be a natural enemy of ALB in Georgia, Alabama, Florida, and North Carolina (unpublished data).

This study was designed to compare several insecticidal sprays for suppression of ALB and to determine the potential of the parasitoid wasp to establish populations on treated plants.

## Materials and Methods

One hundred 'Hershey Red' azaleas were planted eight feet apart in a ten by ten block pattern at the Georgia Station in Griffin, GA in October, 1991. Plants were irrigated every ten days or as needed to prevent wilt symptoms and fertilized after bloom in May, 1992, with Sta-Green slow release azalea, camellia, and rhododendron fertilizer 11N-2.2P-4.2K (11-5-5) at the labelled rate. The azalea plants were infested twice in November, 1991, and three times in April, 1992, with adult ALB collected from local landscape plantings.

One experimental compound, eight registered products, and a water check were applied to the azaleas in a randomized complete block design with ten replications. Insecticides were applied on June 16, 1992, with a CO<sub>2</sub>-powered

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backpack sprayer attached to a meter jet gun. Rates of formulation per 100 gals. were: Orthene Turf, Tree & Ornamental Spray (Acephate) 5.3 oz. (Chevron Chemical Co.); Cygon 2E (Dimethoate) 33.8 oz. (American Cyanamid); NTN 33893 (Imidacloprid) 1.5 oz. (Miles, Inc.); Turcam 76WP (Bendiocarb) 6 oz. (NOR-AM Chemical Co.); Tempo (Cyfluthrin) 2.33 oz. (Bayer AG); Avid 0.15EC (Abamectin) 8 oz. (Merck & Co., Inc.); Margosan-O (Azadirachtin) 84.4 oz. (Grace-Sierra Horticultural Products Co.); M-Pede Insecticidal Soap, 84.4 oz. (Ecogen Inc.); and Volck Oil (Horticultural Oil) 84.4 oz. (Valent U.S.A. Corp.).

A sample of two leaves per plant was collected prior to application of insecticides on June 16 and samples of two terminals per plant were collected weekly for six weeks post-treatment to evaluate insecticidal control of ALB and follow parasitoid activity. Two additional samples were collected on August 11 and September 18 for a total of eight samples collected over 13 weeks. Leaves were examined under the microscope for the presence of ALB eggs which were categorized as intact, having had an ALB nymph emerge, or parasitized. Evidence of ALB egg parasitism by *A. takeyanus* is a round emergence hole in the operculum. An egg from which an ALB nymph has hatched has the entire operculum removed. The numbers of ALB nymphs and adults on each terminal were recorded.

Additional applications of soap, oil, azadirachtin and abamectin were made on June 29 and July 20 when pest populations on plants treated with these materials were high. Bendiocarb and cyfluthrin were also reapplied on July 20. Materials were reapplied at initial treatment rates.

Total numbers of ALB per sample were compared by analysis of variance followed by a test of least significant difference among treatments (10).

## Results and Discussion

*Effects of treatments on ALB.* Effective suppression of ALB was achieved with all treatments during the 13 week experimental period. Most effective control was achieved in plants treated with one application of acephate and dimethoate, organophosphates, and the experimental product, imidacloprid. The mean number of lace bugs (nymphs and adults) was consistently one or less insect per leaf sample from these plants (Fig. 1). Cyfluthrin provided short-term suppression relative to some of the other products and had significantly more living ALB than the control on two sampling dates.

A price comparison in the Athens, GA, area of the eight registered products in this study indicated that the single application of acephate provided the most cost effective and long-term suppression of ALB (unpublished data). Additional costs include high mammalian toxicity levels and extended residual activity characteristic of some organophosphates and other "hard" pesticides in general (7). Combined with potential risk to human health, these costs have led growers and landscapers to consider use of less hazardous materials, such as soaps and oils.

In north and central Georgia, overwintering ALB eggs hatch around mid-March (1). If chemical control is the suppression tactic of choice, spray applications to the leaf undersides would be best timed before the first generation completes development in late April.

*Effects of treatments on Anagrus takeyanus.* No exit holes characteristic of *A. takeyanus* emergence were found in the initial leaf sample collected prior to insecticide application on June 16. Parasitoid emergence was detected in acephate-treated plants one week later and evidence of ALB egg parasitism by *A. takeyanus* increased in the trial plot as the sampling period progressed, regardless of product applied (Fig. 2). This increased activity paralleled parasitoid phenology on azaleas in landscape plantings in central Georgia (unpublished data). Parasitism varied among treatments on each sampling date, but was higher in treated plants than in the control on all sampling dates except August 11. Initial parasitism rates during the first two weeks of the study averaged 0.51% and increased with each successive leaf sample to a high of 16.2% on September 18. Overall parasitism during the study was 5.1%.

While natural enemies are often susceptible to the chemical sprays targeted at pests, several instances of tolerance have been reported (3,6,8). Within the protective covering of the ALB egg, the developing wasp probably escapes exposure to insecticidal sprays. The season-long increase in *A. takeyanus* emergence suggests that adult females were able to emerge and oviposit on treated plants and/or that females arriving from outside the trial plot were able to successfully oviposit on treated plants. Our finding that *A. takeyanus* parasitism was not affected by any of the compounds suggests that this natural enemy may effectively complement chemical control strategies for ALB suppression.

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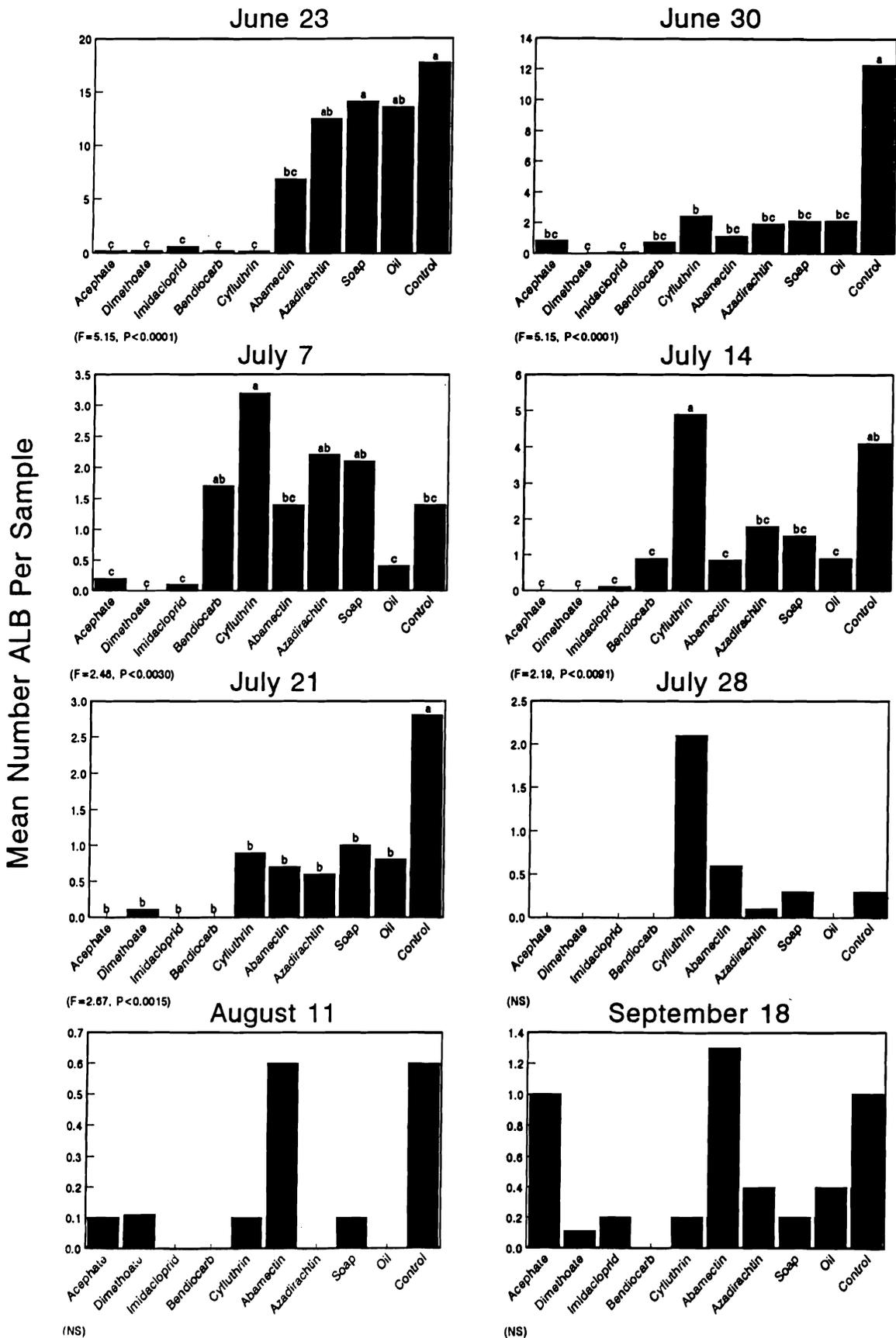


Fig. 1. Effect of nine insecticidal treatments on ALB over thirteen weeks: June 23–September 18, 1992. (Y-axes range in scale from 0-20 mean number of ALB per sample on June 23 to 0–0.7 on August 11.)

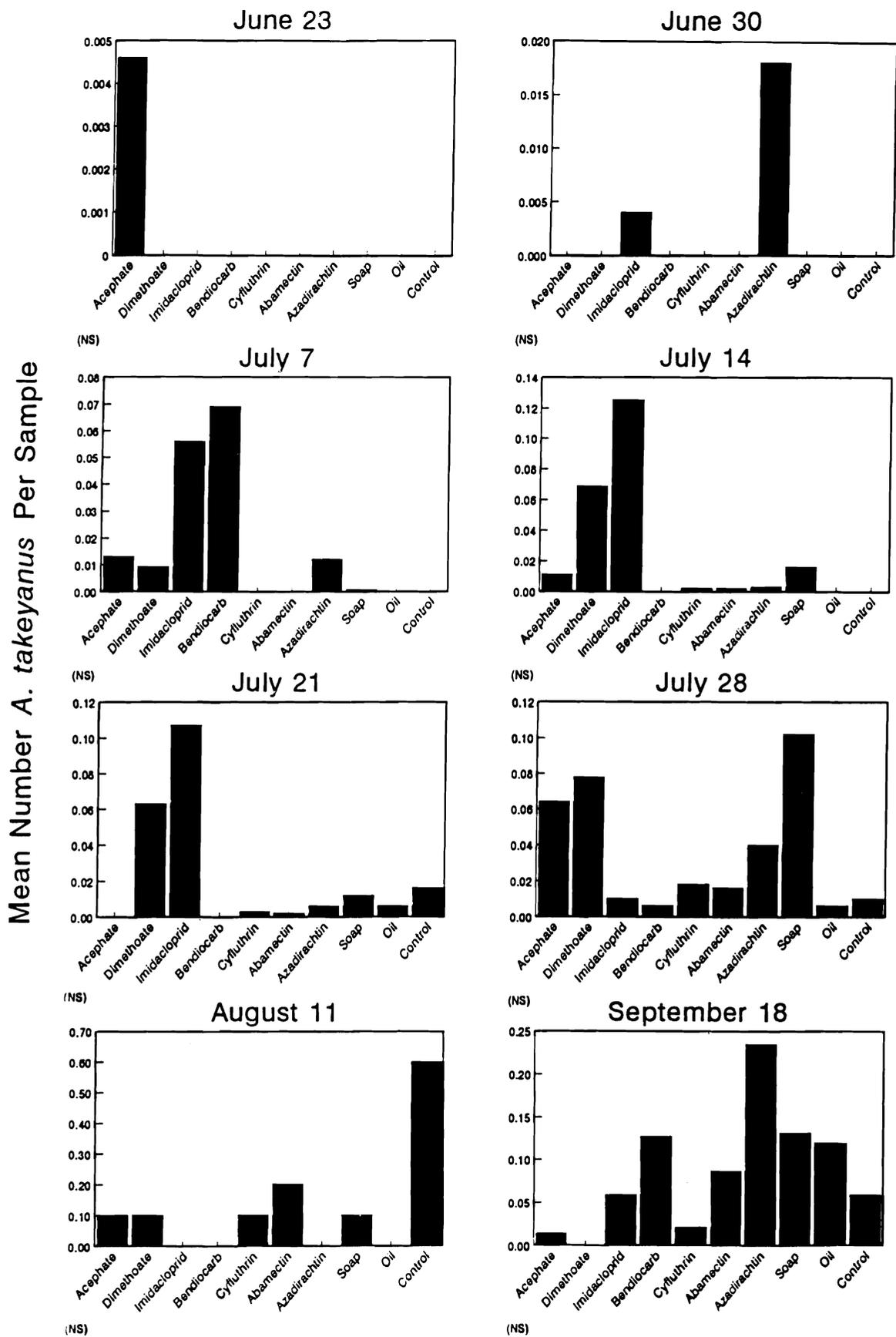


Fig 2. Emergence of *A. takeyanus*, an egg parasitoid of ALB, on insecticide-treated azaleas over thirteen weeks: June 23– September 18, 1992. (Y-axes range in scale from 0–0.005 mean number of parasitoids per sample on June 23 to 0–0.25 on September 18.)