IDENTIFICATION AND CONTROL OF FOLIAR PESTS OF AMERICAN JOINTVETCH

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ABSTRACT

American jointvetch, Aeschynomene americana L., a component of grass-legume pastures in Florida, is subject to attack by the noctuid defoliators Selenis monotropa Grote, the velvetbean caterpillar, Anticarsia gemmatalis Hübner, the tobacco budworm, Heliothis viricola (F.), and the gelechiid leafborer, Evippa sp. Some biological control is provided by the spiders Misumenops celer (Hentz) and M. bellulus (Banks), the parasitic wasp Euplectrus comstockii Howard, and the entomophagous fungus Nomuraea rileyi (Farlow) Samson.

Five insecticides were evaluated for pest control. Diflubenzuron permitted the fewest caterpillars and least leaffeeding. Less effective were chlorpyrifos, triflumuron, Upjohn U-47319 (Methyl N [[[[di(thoxyphosphinothioyl)isopropylamino]chloro)methylamino]carbonyloxyl]ethanimidathioate), and trichlorfon.

Reduction in leaffeeding can improve seed production by as much as 300%.

RESUMEN

Tamarindillo, Aeschynomene americana L., un componente de los potreros de gramíneas y leguminosas en Florida, está atacado por los lepidópteros siguientes: Selenis monotropa Grote, Anticarsia gemmatalis Hübner, Heliothis viricola (F.), y Evippa sp. Las arañas, Misumenops celer (Hentz) y M. bellulus (Banks), la avispita parasitica Euplectrus comstockii Howard, y el hongo entomófago, Nomuraea rileyi (Farlow) Samson algas controlan estos lepidópteros.

Cinco insecticidas fueron evaluados contra estas plagas. El uso de diflubenzuron resultó en el mínimo de larvas noctuidas y de hojas atacadas. Chlorpyrifos, triflumuron, Upjohn U-47319, y trichlorfon fueron menos efectivos.

La reducción de atadura de hojas puede aumentar el rendimiento de semillas hasta 300%.

There are ca. 4800 ha of permanent mixed pasture for cattle grazing in Florida in which American jointvetch, Aeschynomene americana L., comprises the legume component. Genung and Allen (1962) report that a caterpillar Selenis monotropa Grote subjects jointvetch to severe defoliation. Meeting the large demand for jointvetch seed might be achieved more economically if seed production was increased by prevention of insect damage.

Identification and management of arthropods in an American jointvetch planting at Fort Pierce, FL, were undertaken during the 1978 and 1979 growing season. Our purpose was to determine if insect damage is of economic significance in seed production of American jointvetch.
MATERIALS AND METHODS

1978 Field Experiment. In June, commercial American jointvetch was seeded in rows, spaced 2.4 m apart, at the Agricultural Research Center, Fort Pierce. Treatments were applied on 3 m row plots separated by 1.5 m buffers in the row and single adjacent untreated rows. A randomized complete block design with 7 replications was used.

Single rates of diflubenzuron with Ortho X-77 spreader and of chlorpyrifos were applied with a knapsack sprayer weekly and biweekly (Table 1). Spraying was started on Sept. 22 when plants were ca. 1 m high and leaves exhibited some foliar feeding and binding of leaf pinnae. Diflubenzuron was applied at the manufacturer's rate of 14.2 g AI per 378.5 1 and chlorpyrifos at 113.4 g AI per 378.5 1, the lower of 2 rates that Goodyer and Rand (1976) found gave excellent control of pasture caterpillars in Australia.

1979 Field Experiment. Natural reseeding of jointvetch plants on the same area that was used in 1978 provided a dense, even stand of plants. The experimental area consisted of 35 plots. Each plot was made by cutting 1 m wide alleys and cross alleys through the area. A randomized complete block design consisting of 7 treatments, replicated 5 times, was used.

Ten terminal stems/plot were selected and tagged to evaluate treatments for control of a gelechiid leafbinder, Evioppe sp. Every 2 weeks, while damage assessments were being made, all bound leaflets distal to the tag were removed so that subsequent damage could be easily detected.

Single rates of diflubenzuron and triflumuron were applied with a knapsack sprayer biweekly and monthly (Table 2). Trichlorfon and Upjohn U-47319 (methyl N-[[[diethoxyphosphinothiol]-isopropylamino(thiol)methylamino[carbonyl]oxy] ethanimidothioate) were applied biweekly. One liter of finished spray was applied to each plot. The monthly diflubenzuron treatment regime was started on Aug. 22. The 1st application of the remaining treatments commenced on Sept. 21 when most plants were ca. 1 m tall, 10% had initiated flowering, and leafbinding was general throughout the plots.

In both years, population levels of destructive and beneficial arthropods were monitored biweekly by direct examination of each 3 m row plot for a 5-min period.

The terminal 30.5 cm of tagged stems were cut at harvest and pods were removed and counted in the laboratory. Cleaned seed was weighed to provide yield data. All test data were subjected to analysis of variance and Duncan's multiple range test.

RESULTS AND DISCUSSION

1978 Field Experiment. The most prevalent pest encountered was a caterpillar Selenia monotropa. This may be the same 'yellow and black worm' that E. M. Hodges reported producing serious damage to jointvetch in late summer at Ona, FL (Bee Beef Cattle Field Day, IFAS, ARC, Ona, FL 1968). The velvetbean caterpillar, Anticarsia gemmatalis Hübner, and the tobacco budworm, Heliothis virescens (F.), were present but less numerous.

The spiders Misumenops celer (Hentz) and M. bellulus (Banks) were seen feeding on captured larvae of S. monotropa. Both the penultimate instar
and adult of *M. celer* preyed on young *S. monotropa* caterpillars in the laboratory.

The sac spiders *Chiracanthium inclusum* (Hentz) and *Clubiona* sp. inhabited webbed chambers constructed at the growing tip of plants by doubling the tip back and binding it to the stem. Although considered beneficial, no remnants of prey were found in the chambers.

An external hymenopteran parasite, *Euplectrus comstockii* Howard, was observed on *S. monotropa* prey. Immatures were attached as a group to the dorsum of the thorax of active caterpillars and pupated beneath the empty carcass within an open network of stiff fibers formed prior to pupation. The carcass served as the 'roof' of the communal pupal chamber.

Binding of leaf pinnae was general in distribution throughout the planting by mid-September. A microlepidopteran, *Evippe* sp. (Gelechiidae), was responsible for the leafbinding. Gelechiids were reported by Singh et al. (1978) as pests of mungbeans and soybeans. Presence of natural enemies of *Evippe* sp. was not determined nor chemical control evaluated in 1978.

The cowpea aphid, *Aphis craccivora* Koch, was occasionally encountered during October on tender foliage or tender shoots but was never abundant or generally distributed in the planting. Weekly diflubenzuron applications provided the best crop protection (Table 1), better than both weekly and biweekly chlorpyrifos applications. Diflubenzuron applied biweekly was superior to chlorpyrifos applied biweekly.

The severe defoliation reported by Genung and Allen (1962) as well as stem boring inflicted on *A. indica* L. by *S. monotropa* (Genung and Green, 1965) failed to occur on *A. americana*. Apparently the robust stem of *A. indica* provided an ample pupal chamber whereas the thinner stem of *A. americana* could not accommodate the mature caterpillar and it pupated elsewhere.

**1979 Field Experiment.**  *Selens monotropa* was again the most prevalent defoliator encountered in 1979. The velvetbean caterpillar population suffered an epizootic of *Nomuraea rileyi* (Farlow) Samson prior to September 20 in the aftermath of a hurricane that left standing water in the planting.

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**Table 1. Effectiveness of 2 Spray Programs Against Caterpillar Pests of American Jointvetch in Florida.**

<table>
<thead>
<tr>
<th>Materials</th>
<th>Amount per 378.5 liters</th>
<th>Treatment regime</th>
<th>Caterpillars per plot on Oct. 12</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Sep. 22 29</td>
<td>Oct. 6 13 19</td>
</tr>
<tr>
<td>Diflubenzuron 25W + Ortho X-77</td>
<td>56.7 g</td>
<td>x x x x x x</td>
<td>0.14 c³</td>
</tr>
<tr>
<td></td>
<td>188.3 ml</td>
<td>x x x x x x</td>
<td>1.0 bc</td>
</tr>
<tr>
<td>Chlorpyrifos 4E</td>
<td>236.6 ml</td>
<td>x x x x x x</td>
<td>3.9 ab</td>
</tr>
<tr>
<td></td>
<td>236.6 ml</td>
<td>x x x x x x</td>
<td>6.6 a</td>
</tr>
<tr>
<td>Untreated</td>
<td></td>
<td>x x x x x x</td>
<td>3.9 ab</td>
</tr>
</tbody>
</table>

³Mean separation within columns by Duncan's multiple range test, 5% level.
<table>
<thead>
<tr>
<th>Materials</th>
<th>Amount per 378.5 liters</th>
<th>Treatment regime</th>
<th>% Bound leaves&quot;</th>
<th>Avg yield 30.5 cm cf stem&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sept 14</td>
<td>October 9 18 30</td>
</tr>
<tr>
<td>Diflubenzuron 25W</td>
<td>56.7 g</td>
<td>x x x x</td>
<td>1.2</td>
<td>1.0b 6.8d 13.4b 40a</td>
</tr>
<tr>
<td>+ Ortho X-77</td>
<td>188.3 ml</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U-47319 2 EC</td>
<td>946.0 ml</td>
<td>x x x x</td>
<td>5.0b 6.1d 7.3b</td>
<td>38a 5.20ab</td>
</tr>
<tr>
<td>Triflumuron 25W</td>
<td>56.7 g</td>
<td>x x x x</td>
<td>25.6b 22.0c 15.5b</td>
<td>37a 5.20ab</td>
</tr>
<tr>
<td>Trichlorfon 80 SP</td>
<td>454.0 g</td>
<td>x x x x</td>
<td>10.0b 17.4cd 9.3b</td>
<td>38a 4.24bc</td>
</tr>
<tr>
<td>Untreated</td>
<td>--</td>
<td></td>
<td>13.2b 29.0c 29.9b</td>
<td>36a 3.36c</td>
</tr>
</tbody>
</table>

"Mean separation within columns by Duncan's multiple range test, 5% level.
from September 4 to 17. The tobacco budworm was only occasionally seen.
The leafhopper *Ehippe* sp. was not affected by the epizootic and flourished
without apparent natural control until the experiment was terminated at
harvest during the 1st week of November. Peak emergence of adult *Ehippe*
sp. occurred on October 18 and November 3.

All chemicals and application regimes except trichlorfon significantly
reduced incidence of leafhopping below that of the natural population on all
survey dates (Table 2). Although the ability of trichlorfon to control *Ehippe*
sp. deteriorated with time, its failure did not result in significantly lower
pod yield but did reduce seed production, though not significantly more than
triflumuron. The importance of applying protective sprays early is apparent
(Table 2).

The complete control of pests attacking flower buds and, later, pods has
been considered essential for successful legume production, whereas plants
can tolerate some defoliation prior to flowering without loss of yield. The
presence of a 25% leafhopping level prior to flower initiation on September
14 (Table 2), and its continued high incidence, had a marked influence on
both pod formation and seed yields in the absence of defoliation. Leafhopping
may be as detrimental as defoliation.

Seed production was increased ca. 350% with the use of diflubenzuron.
Such an increase could be of economic significance for growers and seed
dealers who are interested in obtaining maximum yields.

Until insect resistant cultivars are discovered (Kretschmer and Bullock,
1979) or developed, insecticides will be necessary to prevent leafhopping and
assure optimum seed production.

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