Identification, monitoring, & management of Asiatic garden beetle in field crops

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The Asiatic garden beetle (AGB), is an annual white grub species (i.e. a single generation per year) that was introduced to the United States in 1921 and has since spread to 24 states and 2 Canadian provinces. AGB adults feed on over 100 plant species including turf, ornamentals, weeds, and (more recently) field crops like corn and soybean.

Asiatic garden beetle ID
- On face: Distinctive white bulb. (no other species has this feature)
- Behavior: aggressive and 'bitey'
- Other: damage to corn, alfalfa, potato in N. Indiana & Ohio, S. Michigan

Note the characteristic white bulb on face of AGB grub

Seasonal distribution of life stages in field crops (based on sampling in MI & OH)
- 2nd (bottom) and 3rd (top) instar grubs shown next to a dime. These stages hibernate through the winter and infest crops the following spring
- Pupae and barrel-shaped, chestnut-brown adults (paperclip for size). 3rd instar grubs stop feeding and pupate in late-May to June.

In summer, eggs are laid in clusters under food plants, often in sandy areas in fields. Tiny 1st instar grubs hatch and feed on roots.

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AGB grubs and adults are found in the highest numbers in very (>80%) sandy soil, particularly on sandy knolls. For example, in an infested field in Ohio, nearly 4 times as many grubs were found in sandy compared to loamy areas. AGB damage often follows a similar pattern. The picture to the right is an overhead view of an AGB-infested field in SE Michigan, showing ‘hot spots’ of stand loss.

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• Adult populations generally peak in the first two weeks of July, and egg laying begins soon after.

• AGB adults and grubs are found in soybean, corn, potato, alfalfa, and wheat, regardless of previous crop. Adults may simply be attracted to cool moist areas under a dense plant canopy for egg-laying, regardless of crop type.

• There is currently no traps designed for AGB, but there are a few indirect ways to assess numbers. Adult beetles are attracted to lights and will flock towards them on warm summer evenings. Surrounding vegetation under lights will often show feeding damage. Both adults and grubs can be scouted by pulling up preferred weed species in fields and on field margins.

Signs and Symptoms of AGB Infestation

Left to right: Feeding by 2nd and 3rd instar grubs in the spring (A) can result in extensive root loss (B) which causes plants to stunt (C) and remain “stuck” in early growth stages, turn yellow and/or purple (D), wilt from reduced water uptake, and ultimately die. Heavy infestations can cause extensive plant stand reduction (E) and necessitate replanting when losses are too great.

« Nocturnal adults feed on the foliage and flowers (from the edges towards the center) of over 100 species of plants; unlike Japanese beetle, they consume entire leaves including veins. AGB adults cause no apparent harm to field crops, but do feed on many weed species including (F) palmer amaranth, (G) giant ragweed, and (H) marestail, as well as ornamental plants and turf. Regardless, it is the adults that are reproducing and dispersing.
**Impact of Tillage**

Damaging AGB infestations have been found in both no-till and conventionally tilled fields, although no-till fields may be at greater risk for egg-laying if crop residue keeps the soil moist and cool.

Tillage may provide some reduction in AGB by directly injuring grubs, reducing protective residue, or bringing AGB to the surface where they are exposed to the elements and predators. The graph to the right shows an apparent reduction in the number of grubs in the tilled half of an Ohio field. However, tillage does not reduce populations to ‘0’.

**Planting date**

Fields with a history of AGB infestation should be planted last, to reduce the time of crop exposure to grub feeding (grubs stop feeding after pupation). This recommendation is based on our knowledge of AGB biology and observations from several crop consultants.

**Timely weed control**

- In season: Weed control in wheat stubble after harvest and in fields left fallow from the spring should reduce attractiveness for egg laying by AGB females, and reduce food for newly hatched grubs.
- Fall: weed control after harvest would remove hosts for AGB grubs in the current year and in the following spring.
**Insecticides and AGB**

The biggest gap in AGB management is in the use of insecticides. To date, there are no replicated studies that document actual reduction in grub numbers with the use of seed treatments or soil insecticides. The information below is based on conversations with and impression of growers and consultants, and our knowledge of the efficacy of insecticides to control other grub species.

### Neonicotinoid seed treatments

<table>
<thead>
<tr>
<th>Rate</th>
<th>Description</th>
<th>Evidence</th>
<th>Advantages</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>250</td>
<td>No impact</td>
<td></td>
<td>Corn fields heavily damaged by AGB all had at least a 250 rate of insecticidal seed treatment.</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>Limited protection under low AGB populations</td>
<td></td>
<td>Anecdotal observations from producers and consultants</td>
<td>most corn hybrids can be sourced with a 500 rate of insecticide; easy to handle &amp; plant; use with any equipment</td>
</tr>
<tr>
<td>1250</td>
<td>Good protection but not bullet-proof under high AGB populations</td>
<td></td>
<td>Anecdotal observations from producers and consultants</td>
<td>Will also provide some corn rootworm larval control; easy to handle &amp; plant; use with any equipment</td>
</tr>
</tbody>
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### Insecticides applied at planting: protection under moderate AGB pressure

**Liquid bifenthrin in-furrow or a granular soil insecticide**

- **Advantages**: prescription, IPM-based solution compared to seed treatments, because the system can be shut off/on to treat only hotspots in field.
- **Note**: A 2ee recommendation is in place for Bifenture LFC and Capture LFR on AGB at a rate of 8.5 oz/acre. The 2ee is for use only in Indiana, Michigan, Ohio, & Pennsylvania.
- **Limitations**: many growers no longer have insecticide boxes on their planter - otherwise, must upgrade to a liquid system; correct calibration can be a pain.

**Another limitation**: Where insecticides have been used against AGB, reductions in beetle emergence and increases in yield are hard to document:

**Evidence**: Given that multiple, weekly sprays in potato fields failed to reduce AGB grub damage to tubers, it is unlikely that a single spray in soybean would protect next year’s corn. Even if it were effective, this spray would be difficult to time.

**Insecticides sprayed to kill egg-laying beetles**: Not recommended

**Evidence**: In a replicated, field-length strip trial in NW Ohio, under “very high’ AGB pressure, there was no yield difference in treated & untreated plots. (trial done by A. Michel & E. Richer, OSU)

Despite a full rate of Lorsban 15G at planting, numerous beetles emerged from this field in SW Michigan.