

PROJECT SUMMARY January 2008

TITLE: Which aphids are bringing barley yellow dwarf into Alabama wheat fields?

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Results from our experiments the past few years have been discouraging. We know that *barley yellow dwarf virus* (and the related *cereal yellow dwarf virus*) can cause serious yield losses in wheat in Alabama. But we don't know which aphids are responsible for bringing the viruses into Alabama wheat fields each year. So, in fall 2005, 2006, and 2007 we collected winged aphids from Alabama wheat fields, and tested them to see if they were carrying yellow dwarf virus. Preliminary results from Tallassee in fall 2005 showed that we could find winged aphids in the fall. We did find, however, that the percentage of aphids carrying virus was very low (less than 1%). In fall 2006 and fall 2007, we focused on commercial wheat fields. In 2006, there were very few winged aphids in the fields, and none of the aphids that were collected carried yellow dwarf virus. We repeated the aphid collections in fall 2007. Again, winged aphid populations were low, and we are still waiting for the results of virus testing. We still need to know which aphids are carrying yellow dwarf viruses into the wheat fields, in order to develop more effective management recommendations for aphids and barley yellow dwarf disease. We will probably give this one more try in fall 2008. We are also considering what other methods we can use to collect winged cereal aphids in the fall.

JUSTIFICATION:

Barley yellow dwarf virus (and the related *Cereal yellow dwarf virus*) causes serious yield losses in wheat in Alabama. Previous studies have documented the impact of these viruses in Alabama. They have also shown that early planted wheat is more likely to have virus than later planted wheat, that different strains of the virus are prevalent in different years, and that foliar or seed-applied insecticides can reduce the spread of the disease. Certain weather conditions in the summer may also affect the amount of virus in the fall-planted wheat.

Each autumn, winged aphids fly into wheat fields. Some of these aphids are carrying barley yellow dwarf or cereal yellow dwarf virus from the summer hosts. The aphids feed on the wheat plants, and infect them with the viruses. Later in the season, aphids can spread the virus from these infected plants to other plants in the field.

We don't know which aphids are responsible for bringing the viruses into Alabama wheat fields each year. We need to know this in order to develop more effective management recommendations for aphids and barley yellow dwarf disease. There are several species of aphids that are found in Alabama wheat fields. Right now, we just count all aphids as equal when scouting for aphids. We could actually tolerate more aphids that don't typically carry barley yellow dwarf, and probably can tolerate fewer aphids that often bring in barley yellow dwarf. This is a fundamental weakness in our aphid action threshold.

Progress

2005/2006 Results:

Only 3 of the hundreds of aphids collected in fall 2005 from Tallassee and Headland carried a yellow dwarf virus:

- All infectious aphids came from Tallassee
- One rice root aphid collected on November 11th 2005 was found to be infective with the RPV strain of *Cereal yellow dwarf virus*.
- One bird cherry-oat aphid collected on the same date was found to be infective with the PAV strain of *Barley yellow dwarf virus*. Another aphid transmitted this strain, but as luck would have it, it was one of a few aphids that were lost when the sample was transferred from the field collection vial.

What can we tell from this? Not much. This is the first in what has to be a multiple year study to figure out which aphids are bringing the viruses in. Some years aphids bring in a lot of virus, other years they do not. In fall 2005, the aphids weren't carrying much virus. It will take at least four years of testing before we can make any conclusions.

The collections did give us a better idea of what aphids are landing in the wheat fields. The predominant species in October in Tallassee was the greenbug, *Schizaphis graminum*. In November and December, it was rice root aphid, *Rhopalosiphum rufidiabdominale*. In Headland, the first collection was in November. In November, the most common aphid was rice root aphid. In December, greenbug and rice root aphid were the most common. Bird cherry-oat aphid, *Rhopalosiphum padi* was the next most abundant aphid. Other aphids found were: *Histeroneura setariae*, *Sipha flava*, *Tetraneura nigriabdominalis*, *Aphis craccivora*, and *Eulachnus rileyi*.

Current and future research

Our new graduate student, Mr. Buyung Ratna Hadi, arrived in January 2006. He will identify the aphids, and continue the virus testing. The following studies are part of his Ph.D.research.

- 1) In fall 2006, we started collecting winged aphids from 6 production wheat fields in (3 each in northwest and southwest AL) We are testing them to see if they were carrying barley yellow dwarf virus. Aphids were collected weekly in fall, and will be collected every other week throughout the growing season.
- 2) We will determine how good the two most common aphids (greenbug and rice root aphid) are at transmitting the yellow dwarf viruses.
- 3) We will determine which, if any, summer weeds are serving as local reservoirs of the yellow dwarf virus.