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Table of Contents

Crops

Binodoxys communis Field Cage Releases for Control of Soybean Aphid in Wisconsin.....	129
Managing Drought Stressed Pastures	130
2007 Winter Wheat Variety Results	131
Winter Wheat Variety Selection and Seed Quality	131

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Binodoxys communis Field Cage Releases for Control of Soybean Aphid in Wisconsin

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On Friday, August 10th 2007, releases of the soybean aphid parasitoid *Binodoxys communis* were made in field cages in southern Wisconsin. Sites of the releases were on the UW Arlington Agricultural Research Station (Columbia Co.) and on a private farm near Deerfield (Dane Co.).

Binodoxys communis is a tiny parasitic wasp, one of the most important groups of natural enemies of aphids. There are nearly always parasitic wasps in the native range of an aphid species. In many cases when exotic pest species invade a new area, their natural enemies are left behind in their native habitat. Such was the case when soybean aphid invaded Wisconsin in 2000. Midwest researchers have traveled to Asia, native home of the soybean aphid, and have identified several natural enemies that have the potential for biological control without themselves causing problems. *Binodoxys* is one such natural enemy of soybean aphid and has been approved by for field release by the US Department of Agriculture as well as six Midwest states. These releases represent a milestone towards our long-term goal of introducing parasitoids that survive and reproduce in the Midwest and hold down aphid numbers from year-to-year with no further inputs.

Binodoxys communis is barely visible to the naked eye – smaller than a pinhead. The free-living adult wasp parasitizes the aphid by first laying an egg in it. When the egg hatches, the tiny larva begins to feed on the aphid until it is fully grown. Parasitized aphids often become inflated as the parasite reaches full size. The next generation wasp will emerge from the host aphid, and when it flies away, just the inflated shell of the host aphid remains; this is referred to as a "mummy". Each adult female wasp lays eggs in many aphids.



Healthy soybean aphid (Photo: UW Madison Entomology Dept)



Soybean aphid "mummy". This aphid was parasitized, and killed, by the parasitic wasp *Binodoxys communis*.

(Photo: Dan Mahr, UW Madison Entomology Dept)

At the release sites, a quonset hut-shaped field cage approximately 6 x 3 feet consisting of saran screen was placed over a row of soybean plants. Access to the cage was

provided by a zipper that ran lengthwise along the top of the cage. Other aphid natural enemies (such as lady beetles and minute pirate bugs) were removed from the plants prior to placing the cage over them. The reason for doing this was to allow *Binodoxys* free access to aphids with interference or competition from other predators.

We then placed potted soybean plants containing soybean aphids and *Binodoxys* mummies from our laboratory colony into the cage, with the pot buried in the soil. Adult parasitoids were introduced directly through the zippered opening in the cage. We intend to leave the cages on for 10 to 14 days, which will be sufficient for the parasitoid to complete a generation, after which the cages will be removed to allow the parasitoids to disperse freely.

At the **Arlington** site, the release was made in a soybean field near the experiment station headquarters. This field was planted late (mid June) and was in the R2 stage of development. Soybean aphid numbers were 100-150 per plant, most of which were the “summer/white” morph. Approximately 85 mummies and 15 adults were released in the cage.

At **Deerfield**, the release was made into a field that was in the R4/R5 stage of development. Soybean aphid numbers were 150-200 per plant, most of which were the “summer/white” morph. Approximately 100 mummies were released in the cage.

Binodoxys were provided to our project by Dr. George Heimpel of the University of Minnesota, who collected the parasitoid in its native habitat and has conducted much research on the biology and safety of this natural enemy. Dr. Heimpel has made releases in Minnesota and has provided *Binodoxys* to collaborating researchers in IL, IN, IA, and SD for release this summer. We will determine the parasitoid's efficacy and spread, and it's survival over the winter into 2008.

This project is supported, in part, by the North Central Soybean Research Program.

Managing Drought Stressed Pastures

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Severe drought has affected pasture growth throughout much of Wisconsin and Minnesota. While little can be done to increase forage pasture growth in the short run, careful management now can minimize long term stand damage and help maintain forage yields when rains do come. This article will discuss ways in which the impact of drought on pastures can be minimized.

Grazing Management

When drought comes and pasture forage is in short supply it is tempting to continue to graze until all the forage is gone. While this will provide a few more grazing days in the short term, it will delay regrowth and decrease forage yields when rains do come. Leaving green, living leaf area will provide for photosynthesis and more rapid regrowth than if the plants

are completely defoliated. Where possible leave an appropriate stubble height to allow for carbohydrate storage and regrowth. For short grasses like bluegrass and ryegrass this is two inches. For taller grasses such as orchardgrass, bromegrass, timothy and tall fescue the proper residual height is 4”. Of course, if all plant material is brown and dead, grazing this material will not harm the plants.

Another temptation is to remove cattle from pastures, and then put them back for a day or two each time there is a small amount of regrowth. Again, while this allows for some grazing in the short run it has detrimental affects if the long run. Continually removing regrowth removes root carbohydrates and will reduce the plants ability to regrow when rains resume. Long term pasture yields will be reduced. A better strategy is to allow plants to regrow to appropriate heights before grazing. This allows replenishment of root reserves and will mean healthy plants and higher pasture yields. The appropriate regrowth height is 6 inches for bluegrass and ryegrass and ten inches for orchardgrass, bromegrass, timothy and tall fescue.

Animal Management

These recommendations mean that animals will likely need to be removed from pastures and fed stored feed for some time. For those without adequate facilities for this there are three options. One is to establish a sacrifice paddock where feeding will take place. This limits the damage this practice causes to a discreet area. Forage growth from this area will be minimal this year but will likely recover with minimal inputs next year. A second option is to rotate the pastures where feeding takes place. Leave the feed bunk or wagon in a paddock for only a day or two then move to another. This limits the amount of plant damage in any one paddock. A third option is to feed animals in alley ways and lanes. In all cases make sure animals have adequate access to water.

Increasing Available Forage

There are still options available to increase late summer/fall pasture forage availability. Applications of 50 units of nitrogen have shown to increase late summer forage production by around 1000 lbs of dry matter per acre. Of course, realizing the benefits of nitrogen is dependant on rainfall. Nitrogen sources such as ammonium nitrate and ammonium sulfate will reduce volatilization losses from dry pastures after application. Volatility losses from urea, while greater than other sources are still only about 20% and so urea is also an option.

Forage brassicas are another option to increase fall forage production. Brassicas such as turnips and rape can be seeded in August for fall grazing. These crops provide high quality pasture and can be grazed multiple times beginning within 60 days of seeding. As with nitrogen applications, the success of these crops will depend on late summer rains.

Grazing standing corn is another option for those short of pasture forage due to drought. Corn provides good quality forage and, for some fields where grain yields are low due to poor rainfall, grazing may be the most economical harvest method. Corn should be strip grazed using highly visible electric fence such a polytape.

Planning for dry weather.

Unfortunately dry weather happens nearly every year to some extent, some years more than others. Planning ahead for dry weather can help minimize the impact. Below are a few ideas to consider in the future

Rotational grazing

For those practicing continuous grazing, dividing pastures into smaller (5-10 acre) paddocks and moving animals frequently from paddock to paddock is the single best way to increase pasture yields. Employing rotational grazing and a good fertility program can easily double the available forage in a pasture, which would provide more grazing days and help reduce the impact of dry weather.

Nitrogen management

Applications of 50 units in early May and again in early August have shown to increase pasture dry matter yields by up to 2000 lbs/acre. Mid summer applications have not proven as effective. It is important to limit nitrogen application rates as applying too much at one time will result in leaching and volatility losses. Nitrogen applications in early May will provide additional pasture which can be mechanically harvested and fed during dry weather later in summer. August applications provide for increased late summer/early fall pasture yields.

Warm season annual grasses.

There are a number of warm-season annual grasses which can provide forage during dry weather. These include sorghum-sudan hybrids and several types of millets. These forages are typically planted in early June and provide forage within sixty days. Forage yields are in the 2 – 3 ton/acre range and provide multiple grazings. These species do better in hot, dry weather than our cool-season species and so are a good choice for managing drought.

2007 Winter Wheat Variety Results

Mark Martinka, Shawn Conley, and John Gaska

Winter wheat yields were good in Wisconsin this year, with almost no winter injury observed. The hard frost in the first week of April did slow spring growth. Moisture stress during the growing season adversely affected yield and added to field variation. Growers in some areas of the state with more adequate rainfall have reported whole field yields nearing 100 bu/acre with good test weights and very limited lodging.

The 2007 performance trials included public varieties, experimental, and commercial entries. Trials were conducted at Arlington, Janesville, Racine, and Chilton. All varieties were treated with a fungicide seed treatment. Two year means are included for all entries tested in 2006 and 2007. Results of this test are available at <http://soybean.uwex.edu/> or linked directly to the [Winter Wheat Variety Trial Results Page](#).

We also thank the WI Crop Improvement Association for sponsoring the entry of released and experimental public lines into our trials.

Winter Wheat Variety Selection and Seed Quality

Shawn Conley, John Gaska, Craig Grau

Near record wheat and straw prices coupled with moderate to severe drought conditions has led to an increase in wheat seed demand for the 2007-08 growing season. As with any crop, variety selection is the most important factor to consider in maximizing winter wheat yield and profitability. When choosing a soft red winter wheat variety several factors must be considered. These include winter survival, insect and disease resistance characteristics, heading date, lodging, test weight, and most importantly, yield. Since no variety is ideal for every location it is important to understand the crop environment and pest complex that affects your specific region in order to maximize yield.

Yield is based on the genetic potential and environmental conditions in which the crop is grown. Therefore, by diversify the genetic pool that is planted, a grower will hedge against crop failure. Yield data and yield stability characteristics can be attained from the [UW Winter Wheat Variety trial results](#). Select those varieties that perform well not only in your area but across experimental sites and years. This will increase the likelihood that given next years environment (which you cannot control) the variety you selected will perform well.

Test weight is also an important factor to consider when selecting a variety. The minimum test weight to be considered a U.S. #2 Soft Red Winter Wheat is 58 pounds per bushel. Wheat with a test weight lower than 58 pounds will be discounted. Both environment and pests may greatly affect test weight, therefore, selecting a variety that has a high test weight potential in your region is critical to maximize economic gain.

Select a variety that has the specific insect and disease resistance characteristics that fit your regional needs. By selecting the appropriate resistant varieties, crop yield loss may be either reduced or avoided without the need of pesticides. Careful management of resistant cultivars, though crop and variety rotation is required to ensure that these characteristics are not lost.

Crop height and lodging potential are also important varietal characteristics that may be affected based on cropping system. If the wheat crop is intended for grain only, it may be important to select a variety that is short in stature and has a low potential for lodging. This may decrease yield loss due to crop spoilage and harvest loss as well as increase harvest rate. However, if the wheat crop is to be used as silage or to be harvested as both grain and straw then selecting a taller variety may be warranted.

Seed Quality

The next step in maximizing crop yield is planting high quality seed. [Plant certified](#) or private (professionally prepared) seed that is true to variety, clean, and has a high germination percentage (>90%). Seed size is also an important factor in determining seed quality. Select varieties that have large dense kernels and a thousand kernel weight (TKW) greater than 30 grams. A TKW of 30 g is ~15,100 seeds/lb. Wheat seed with TKW values greater than 30 grams tend to have increased fall tiller number and increase seedling vigor. This is especially important to consider with late planted wheat.

If saved seed is to be planted due to a lack of seed availability in 2007 it is critical to clean the seed. Seed cleaning will remove weed seed, chaff, as well as small and broken seed thus increasing seed quality. It is also important to perform a germination test. If the germination percentage is below 90%, increase the seeding rate accordingly; however do not plant seed with a germination test below 80%. If it is known beforehand that seed is to be saved, scout and choose seed from fields where diseases and weeds were minimal.

The next step is to perform a germination test. Germination tests can either be completed at home or by sending a sample to the [Wisconsin Improvement Association](#). A home test can be performed by counting out 100 seeds and placing them in a damp paper towel. Place the paper towel into a plastic bag to conserve moisture and store in a warm location out of direct sunlight. After five days count the number of germinated seeds that have both an intact root and shoot. This will give the grower an estimate of % germination. It is important to choose random seeds throughout the entire seed lot and conduct at least 5 - 100 seed counts. The [Wisconsin Improvement Association](#) also performs a germination test. The test requires 1.25 pounds of seed and costs \$10.00. If germination is below 85% it is important to increase the seeding rate to compensate; however, I would caution growers from seeding any wheat with a germination test below 80%.

The next step is to assess whether to apply a seed treatment. A number of fungicides are labeled for use as seed treatments on winter wheat. These seed treatment fungicides protect germinating seed and young seedlings from seedborne and soilborne pathogens. Seed treatment fungicides will not improve germination of seed that has been injured by environmental factors and will not resurrect dead seed. A correct assessment of the cause of poor seed quality or poor germination rates is the first step in deciding if a seed treatment fungicide is necessary. Research from the 2006-2007 growing season indicated a significant yield response from several fungicide seed treatments in wheat (Table 1).

Table 1. Seed Treatment Effect on Soft Red Winter Wheat Grain Yield at the Arlington Research Station (WI) in the 2006-2007 Growing Season.

Seed Treatment	Grain Yield (bu per acre)
Untreated	80.3
ApronXL	88.3
Charter + ApronXL	91.1
EXP #1	89.4
EXP #2	81.7
Charter PB	93.0
Dividend Extreme	89.7
Dividend Extreme D	96.9
Raxil Thiram	89.1
Raxil MD	89.0
EXP #3	83.2
EXP #4	81.0
EXP #5	78.6

A low incidence of Fusarium head blight was observed in Wisconsin in 2007. Thus, the need for a fungicide seed treatment may be lessened for this year. However, fungicide seed treatments can improve stand density and translate into higher yields in 2008. Kernels from heads with Fusarium head blight (scab) may be shriveled or shrunken and lightweight. Some kernels may have a pink to red discoloration. Others may be bleached or white in color.

This year some reports of black point have been confirmed in northern Illinois and eastern WI. Black point or kernel smudge may be caused by a number of different fungi including species of *Alternaria*, *Fusarium*, and *Helminthosporium*. Affected kernels appear black-pointed. The embryo end of the seed is discolored with a darkened pericarp and may be shriveled. The fungi, which cause black point and scab of wheat seed, may survive in or on the seed, affecting germination and contributing to seedling blight problems if seed is planted.

Loose smut is another factor to consider when using saved wheat. Loose smut replaces the grain in the head with masses of black powdery spores. These spores can be windblown to heads developing on nearby plants. The fungus that causes loose smut survives in the embryo of infected wheat seed. If infected seed is used for planting, the developing plants will have smutted heads. Planting good quality, disease-free seed is an effective means of preventing problems from these seedborne pathogens. If seed with black point or scab must be used for planting, a seed treatment fungicide should be considered. If seed from fields with loose smut must be used for planting, it is important to use a seed treatment containing a systemic fungicide labeled for control of loose smut.

