

## A survey of cereal aphids which may vector Barley yellow dwarf virus in Kentucky wheat fields: Common species and distribution.

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### **Introduction**

Barley yellow dwarf (BYD) is a disease resulting from infection by a viral pathogen, and is the most important viral disease of cereals worldwide. The pathogen is resident in a large number of crop and non-crop grass species and is vectored within and among these hosts/crops by a complex of aphid species. Fields of small grains infected with this disease often produce significantly reduced yields. In Kentucky, BYD in wheat may be observed at low levels each year and occasionally reaches epidemic status.

A great deal of literature concerning Barley yellow dwarf virus (BYDV) and, associated hosts and vectors has been published by researchers around the world. However, very little information specific to Kentucky about BYD in production fields is available. In 1992 in response to concerns and support from the Kentucky Small Grain Growers Association a series of investigations into the nature of BYD in Kentucky was begun. In this article the authors wish to establish which species of aphids are most common in Kentucky soft red winter wheat fields, and if the species vary from fall to spring and across the wheat growing region. Specifically we wish to see if the situation in Kentucky is substantially similar or different from surrounding areas.

### **Materials and Methods**

Collections were made during the fall and spring in each of the 1992-1993 and 1993-1994 growing seasons. Collection locations were selected to represent the distribution of wheat production in Kentucky. Ten (1992-1993) and five (1993-1994) fields were sampled in each of fifteen counties (Hickman, Ballard, Graves, Calloway, Trigg, Christian, Todd, Logan, Warren, Simpson, Daviess, Henderson, Hardin, Shelby, and Bourbon) producing a possible 150 and 75 samples respectively. The number of samples was reduced in second year due to time constraints. During both wheat seasons fall samples were taken during the last two weeks of November and first two weeks in December while spring samples were taken in April.

The sample for each field was a composite of aphids collected from the foliage of five plants at five locations in the field. Locations were randomly spaced along a diagonal across the field and were no closer than approximately 45ft from the field edge or one another. No effort was made to differentiate the aphids by location within a field. Aphids were collected into appropriately labeled vials of 70% Ethyl-alcohol and held in the laboratory until examination. Because of the difficulty in identification, winged aphids were preferentially collected. Identification was accomplished by microscopic examination.

### **Results**

Aphid populations were not overly abundant in either year, but were greater in 1992-1993

than in the 1993-1994 season. In 1992-1993 of the 150 fields visited, the fall collection yielded 109 samples containing aphids of which 104 were usable, of these 3 contained mixed species. In spring 109 samples contained aphids with 100 usable; of these 4 contained mixed species. In 1993-1994 of the 75 fields examined, the fall collection produced only 17 samples containing aphids yielding 16 usable, 1 containing mixed species, while the spring yielded 50 samples containing aphids of which 49 were usable with 3 containing mixed species.

Four species of aphid: bird cherry-oat aphid, corn leaf aphid, green bug, and English grain aphid, all common to wheat production were found. It is important to note that all four of these aphid species are able to vector BYDV.

The bird cherry-oat aphid (BCOA) was the predominant species collected. BCOA was found during all four collection periods and comprised the greatest numbers of samples in 3 of the 4 periods. The English grain aphid (EGA) was the second most common aphid collected. It was also found during all four collection periods and dominated the samples in the spring - 1994 sample period. Both corn leaf aphid (CLA) and greenbug (GB) were found in much fewer numbers.(Table 1.)

Distribution of these cereal aphids in Kentucky soft red winter wheat appears to be statewide. When all samples are considered, BCOA was collected from every county surveyed, while EGA was collected in all but four (Graves, Hardin, Hickman and Simpson) of the fifteen survey counties. The three GB samples were collected in Daviess and Graves County, while the 2 CLA samples were obtained from Ballard and Logan County.

### **Discussion**

The species collected and their statewide distribution in Kentucky soft red winter wheat is very much what we expected. A summary of regional BYD research points out that these same aphid species are commonly encountered in IN, IL, and MO, as well as many other states in the US. Additionally, these findings fit well with our general knowledge of BYDV strains present in Kentucky (unpublished data, Hershman and Johnson, article in preparation).

The predominance of BCOA is also to be expected. However, the difference between BCOA, EGA and CLA may be due at least in part to the timing of sample collection. CLA might be expected to occur in wheat early in the fall season and to decrease with the onset of cold weather while EGA is generally encountered late in the spring after wheat begins to produce heads (personal observation). These samples were generally collected later in the fall and earlier in the spring than one would expect to encounter large numbers of CLA and EGA respectively. A similar shift in species composition was reported in Virginia. The large increase in EGA samples in the spring 1994 season is very likely due to an early spring weather which occurred that year. Certainly additional research concerning the timing of species shifting in Kentucky wheat is warranted.

### **Conclusion**

The aphid species collected, their distributions and their association with known BYDV strains present in Kentucky are comparable to surrounding states and in general to many wheat production areas. These results were expected. However, when working with a

pathogen-vector-host system as complex as BYD, unsubstantiated assumptions can quickly lead to erroneous results. Knowing the correct vectors will allow us to utilize a large body of research already in existence.

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**Table 1. Number (percentage) of samples containing various species of aphids collected from winter wheat during the fall and spring of two production seasons.**

<b>No. of Samples</b>	<b>1992-93</b>	<b>1993-94</b>
Fall	104	16
Spring	100	49
<b>Bird Cherry-Oat Aphid</b>		
Fall	99 (95)	16 (100)
Spring	85 (85)	3 (6)
<b>Corn Leaf Aphid</b>		
Fall	1 (1)	0 (0)
Spring	0 (0)	0 (0)
<b>English Grain Aphid</b>		
Fall	4 (4)	1 (6)
Spring	17 (17)	49 (100)
<b>Greenbug Aphid</b>		
Fall	3 (3)	0 (0)
Spring	0 (0)	0 (0)