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Survey of Cereal Aphids in Kentucky Wheat Fields: Common Species and Distribution

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ABSTRACT

Species determination and relative abundance of cereal aphids in samples from winter wheat were investigated in major production areas of Kentucky in 1992–1993 and 1993–1994. Cereal aphids were more abundant in 1992–1993 than in 1993–1994. The bird cherry–oat aphid (*Rhopalosiphum padi*) was the most common aphid followed by English grain aphid (*Sitobion avenae*), corn leaf aphid (*R. maidis*), and greenbug aphid (*Schizaphis graminum*), respectively. All species were widely distributed in the Kentucky wheat production area.

INTRODUCTION

Barley yellow dwarf (BYD), a disease resulting from infection by a viral pathogen (BYDV), is the most important viral disease of cereals worldwide (Plumb 1983). The pathogen is resident in a large number of crop and non-crop species of the grass family (Poaceae), e.g., corn (*Zea mays*) and tall fescue (*Festuca arundinacea*) and is vectored within and among these hosts/crops by a complex of aphid species (Homoptera: Aphididae). Fields of small grains infected with this disease often produce significantly reduced yields (Irwin and Thresh 1990). In Kentucky, BYD in wheat may be found at low levels each year; it occasionally reaches epidemic status.

Much literature on BYD and associated hosts and vectors has been published by researchers around the world (Burnett 1989; Irwin and Thresh 1990). In Kentucky, however, little information about BYD in production fields is available. We wish to establish which species of cereal aphids are most common in Kentucky soft red winter wheat (*Triticum aestivum*) 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 to or different from that in surrounding areas.

MATERIALS AND METHODS

Aphid collections were made in fall and spring in each of the 1992–1993 and 1993–1994 growing seasons. Collection sites were selected to represent the distribution of wheat production in Kentucky (KAS 1991). Ten (1992–1993) and five (1993–1994) fields were sampled in each of 15 counties (Ballard, Bourbon, Calloway, Christian, Daviess, Graves, Hardin, Henderson, Hickman, Logan, Shelby, Simpson, Todd, Trigg, and Warren), producing a possible 150 and 75 samples, respectively (Figure 1). During both seasons fall samples were taken in the last 2 weeks of November and the first 2 weeks of December; spring samples were taken in April.

The sample for each field was a composite of cereal aphids collected from foliage of five plants at five locations, randomly spaced along a diagonal line across the field, and were no closer than ca. 15 m from the field edge or one another. Aphid populations were not overly abundant in either year, and no effort was made to differentiate the cereal aphids by location in a field. Aphids were obtained by collecting leaf sections on which they rested into appropriately labeled vials of 70% ETOH and held in the laboratory until examination. Identification was accomplished by microscopic examination and by reference to Pike, Boydston, and Allison (1991) and Stoetzel (1987). Several samples were discarded as unusable due to physical damage to the aphids from improper handling.

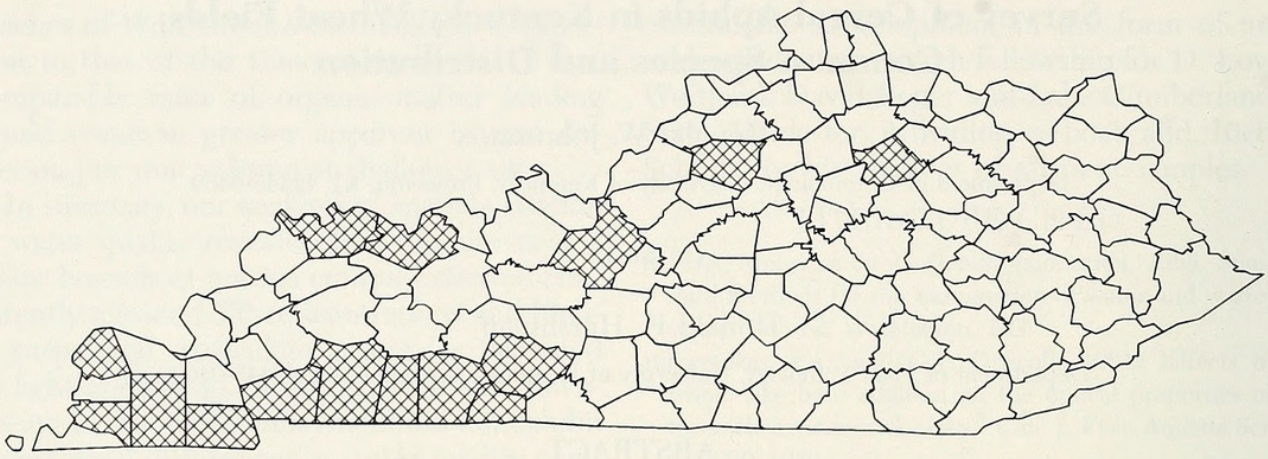

Figure 1. Kentucky counties containing fields of soft red winter wheat sampled for cereal aphids in 1992–1993 and 1993–1994.

RESULTS

Cereal aphids were more abundant in 1992–1993 than in 1993–1994. Of the 150 fields visited in 1992–1993, the fall collection yielded 109 samples of which 104 were usable; of these, three contained mixed species. In spring, 109 samples were collected, and 100 were usable; of these, four contained mixed species. In 1993–1994, of the 75 fields visited, the fall collection produced only 17 samples yielding 16 usable, with one containing mixed species. The spring yielded 50 samples of which 49 were usable, with three containing mixed species.

Four species of cereal aphids common in wheat production were found: *Rhopalosiphum padi* (L.), bird cherry–oat aphid; *R. maidis* (Fitch), corn leaf aphid; *Schizaphis graminum* (Rondani), greenbug aphid; and *Sitobion avenae* (Fab.), English grain aphid. All these species are able to serve as vectors for BYDV. Additionally, BYDV isolates associated with these aphids have been confirmed from Kentucky soft red winter wheat fields (unpublished data).

The bird cherry–oat aphid (BCOA) was the most commonly encountered species. It was collected in all four survey periods and was present in the greatest numbers of samples in three of the four collections. The English grain aphid (EGA) was the second most common aphid. It was collected in all four collection periods and dominated the samples in spring 1994. The corn leaf aphid (CLA) and greenbug aphid (GB) were found in much fewer numbers (Table 1).

These cereal aphids are ubiquitous in Kentucky soft red winter wheat. When all samples are considered, BCOA was collected from every county surveyed; EGA was collected in all but four (Graves, Hardin, Hickman, and Simpson) of the 15 surveyed counties. The three GB samples were collected from Daviess and Graves counties; the two CLA samples, from Ballard and Logan counties.

Table 1. Numbers of samples containing various species of common cereal aphids, collected during a survey of soft red winter wheat fields in Kentucky in fall and spring 1992–1993 and 1993–1994.

	1992–1993		1993–1994	
	Fall	Spring	Fall	Spring
Total samples	145	141	74	74
Samples with aphids	104	100	16	49
Bird cherry–oat aphid	99	85	16	3
Corn leaf aphid	1	0	0	0
English grain aphid	4	17	1	49
Greenbug aphid	3	0	0	0

DISCUSSION

The species collected and their wide distribution in Kentucky soft red winter wheat were expected. Gildow (1987), in his summary of regional BYD research, pointed out that this same series of aphid species is commonly encountered in Illinois, Indiana, Missouri, and many other states in the United States. However, when working with a pathosystem as complex as BYD, unsubstantiated assumptions can quickly lead to erroneous results. For this reason and to allow for the use of research in

nearby states it is important to know that these species are present.

The commonness of BCOA is also to be expected. However, the differences among 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 fall and to decrease with the onset of cold weather; EGA is generally encountered late in spring after wheat begins to produce inflorescences (personal observation). Our samples were generally collected later in fall and earlier in spring than one would expect to encounter large numbers of CLA and EGA, respectively. A similar shift in species composition was reported in Virginia (McPherson and Brann 1983). The large increase in EGA samples in spring 1994 is probably due to the early occurrence of spring weather that year. Additional research concerning the timing of shifts of aphid species in Kentucky wheat is certainly warranted.

ACKNOWLEDGMENTS

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