

CEREAL APHIDS TRANSMIT BEAN COMMON MOSAIC VIRUS

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Because bean common mosaic virus (BCMV) is a nonpersistently transmitted virus, aphid species which do not colonize beans should be considered as potential vectors of the virus. Cereal aphids average about 54% of total Idaho suction trap collections over the past 8 years. Russian wheat aphid [*Diuraphis noxia* (Kurdjumov)] made up about 22% of the aphids collected since 1987 when it was first detected in Idaho. Because cereal aphids comprise such a large proportion of our aphid samples, we suspected that they may be important vectors of BCMV. The objective of this research was to determine BCMV transmission efficiency of key Idaho cereal aphids, including Russian wheat aphid.

Materials and Methods:

Our isolate of BCMV was obtained from the field in order to ensure optimum aphid transmissibility. It was a serotype A. Characterization by differential bean varieties revealed reactions characteristic of the strain designated NL-8.

Infections were assessed by symptoms and by ELISA. The ELISA was done in Prosser, WA, using a monoclonal antibody specific to BCMV Serotype A. All indicator plants were Sutter Pink beans.

We tested BCMV transmission in three different ways. First, we did standard timed 15-60 second probes, using 100 aphids per species. Green peach aphids [*Myzus persicae* (Sulzer)] were used as a control. We tested Russian wheat aphids, bird cherry oat aphids [*Rhopalosiphum padi* (L.)], greenbugs [*Schizaphis graminum* (Rondani)], English grain aphids [*Sitobion avenae* (Fabricius)] and rose grass aphids [*Metopolophium dirhodum* (Walker)]. The assays were divided into lots of 20 so several species, along with the green peach aphid controls, could be tested in one day. Aphids were starved prior to use.

In order to further test the possibility of transmission of Russian wheat aphid, we did bulk assays using at least 100 aphids per test plant (10 plants). Aphids were allowed to feed on infected tissue for 5 minutes, the optimum time for bulk assays. For comparison, we also did these assays using green peach aphids (4 plants) and rose grass aphids (8 plants).

In California, Russian wheat aphid was shown to transmit beet mosaic virus, but only when alate aphids were released in an arena (Summers et al., 1990). We repeated their methods as closely as possible, using a bean plant infected with BCMV as the virus source. The experiment was done with Russian wheat aphids and green peach aphids. For each species, 25 aphids were released into each of three arenas containing an infected plant and six healthy indicator seedlings. After two days, we sprayed the indicators with insecticide.

Results:

Results of the timed probes showed that all species except Russian wheat aphid transmitted BCMV (Table 1).

Table 1. BCMV transmission efficiency of major Idaho cereal aphids.

Species	percent transmission
Russian wheat aphid	0.0
Rose grass aphid	3.0
Bird cherry oat aphid	9.3
English grain aphid	5.0
Greenbug	21.9
Green peach aphid	50.0

In the mass transmission experiments, both green peach aphids and rose grass aphids transmitted BCMV to all the indicator plants. Russian wheat aphid never transmitted the virus.

In the arena experiment, green peach aphids transmitted BCMV to 14 out of 18 plants, whereas Russian wheat aphids never transmitted the virus.

Discussion:

Even though green peach aphids are among the most efficient vectors of BCMV, they are probably not the major vectors in bean producing areas of Idaho. Using aphids collected before August 1 (the time period in which BCMV infection causes economic losses), major cereal aphids made up 71% of the total aphid catch at Kimberly. By contrast, green peach aphids were only 0.1% of the total. Thus, even though they do not transmit BCMV as efficiently as green peach aphids, cereal aphids contribute more vector pressure because of their numbers.

Russian wheat aphid appears to be a non vector of BCMV. There is nothing in the theory of non persistent virus transmission that explains a non vector that probes normally, which Russian wheat aphids do. More research is needed to determine why Russian wheat aphid does not transmit the virus.

Literature Cited:

Summers, C.G., A.S. Newton, Jr., M. Kirk and S.R. Temple. 1990. Transmission of been yellows and beet mosaic viruses by noncolonizing aphid vectors. *Journal of Economic Entomology* 83:2448-2451.