Barley yellow dwarf transmission by *Diuraphis noxia* (Mordvilko) and other Cereal Aphids (Homoptera: Aphididae) in Southwestern Idaho

Susan Halbert and June Connelly

Introduction

More than eight species of aphids regularly infest cereal crops in southwestern Idaho. In addition, many other species which normally infest other Gramineae may occasionally feed on grain. Most of these species have been reported as vectors of barley yellow dwarf virus (BYDV) (Jedlinski, 1981), but only a few are considered to be important vectors. *Diuraphis noxia* (Mordvilko), the recently introduced Russian wheat aphid, has been reported to be a vector of BYDV in South Africa (Von Wechmar, 1984). The objectives of these experiments were to sample natural populations of aphids in southwestern Idaho to determine what percentage of them were viruliferous and to compare infectivity of *D. noxia* with that of other species.

Materials and Methods

Aphids used in the assays were collected in two different ways in each of four years. First, samples were collected directly from grasses and crops taking only one aphid per plant, except in the case of *Anoecia setariae* Gilette & Palmer for which entire colonies were used. Second, aphids were collected in a suction trap at Parma adapted for live collection. Assays were done by caging aphids singly on "California Red" oat or (in the case of *D. noxia*) "Luther" barley indicator plants and allowing them to feed for 48 to 72 hours. Entire colonies of *A. setariae* were placed on exposed roots of the oat seedlings. After transmission access, the plants were sprayed. They were held in the greenhouse for 3-4 weeks and observed for symptom expression. Representative plants were submitted to Dr. Richard Lister's lab at Purdue University for ELISA confirmation in 1987.

In Idaho we maintain standard isolates of BYDV which have transmission properties similar to PAV, RPV, MAV, SGV and RMV. *Diuraphis noxia* colonies were allowed to infest barley plants infected with these isolates. When the colonies were well established, the aphids were transferred to indicator plants (6 plants per isolate; 2 aphids per plant). After several weeks, representative indicator plants were assayed using the normal vectors for each isolate.

Results

Aphids representing nine different species were collected from their host plants and tested for BYDV transmission. Of these *Rhopalosiphum padi* (L.), *Sitobion avenae* (Fabricus), *Rhopalosiphum maidis* (Fitch), *Metopolophium dirhodum* (Walker), *Schizaphis graminum* (Rondani) and *Macrosiphum euphorbiae* (Thomas) all transmitted BYDV at least occasionally. *Diuraphis noxia* (760 tested) may have transmitted BYDV at a very low rate. The single plant infected in 1987 proved to have an SGV-like isolate. *Diuraphis noxia* was never able to transmit this isolate in subsequent experiments. *Anoecia setariae* (124 colonies tested) and *Sipha elegans* del Guercio (31 tested) did not transmit BYDV. *Diuraphis frequens* (Walker), which regularly colonizes wheat, was never abundant enough for a sample to be collected for an assay.

Among those aphids assayed from suction trap collections, *R. padi* was collected in highest numbers and transmitted BYDV most consistently (Table 2). Other common aphids on cereal and corn which transmitted BYDV in these assays included *R. maidis*, *M. dirhodum*, and *M. euphorbiae*. Ten other species of aphids which normally infest other possible hosts of BYDV were also tested. Of these, *Rhopalosiphum insertum* (Walker) transmitted BYDV consistently, and *Ceruraphis eriophori* (Walker) transmitted it once (63 tested).

Approximately 200 isolates were tested with Dr. Lister's MAV, PAV and RPV antisera. Those Idaho isolates which had biological properties similar to RPV, PAV and MAV were readily recognized as such by the respective antisera. Dr. Lister had no antisera which reacted with Idaho RMV-like or SGV-like isolates.

Diuraphis noxia did not transmit any of the Idaho standard isolates of BYDV.

Discussion

At best, *D. noxia* is a very poor vector of BYDV in southwestern Idaho. More than 1,000 field collected *D. noxia* have been tested, and so far, only one indicator plant has had recoverable BYDV. In that case, the virus was consistently transmissible by *S. graminum* but not by *D. noxia*. In comparison with *R. padi*, *S. graminum*, *R. maidis* and *S. avenae*, *D. noxia* is currently not important for epidemiology of BYDV in southwestern Idaho. Neither 1987 nor 1988 was an epidemic year for BYDV. In 1988, populations of cereal aphids other than *D. noxia* were very low. It remains to be seen whether *D. noxia* will become an important vector in a year when BYDV is more abundant.

References cited:

Jedlinski, H. M. C. 1981. Rice root aphid, *Rhopalosiphum rufiabdominalis*, a vector of barley yellow dwarf virus in Illinois, and the disease complex. Plant Disease 65:975-978.

von Wechmar, M. B. 1984. Russian aphid spreads Gramineae viruses. pp. 38-41 in N. C. Walters, ed.: Progress in Russian wheat aphid (*Diuraphis noxia*, Mordw.) research in the Republic of South Africa. R. S. A. Dept. of Agr. Technical Communication #191.