

HEIN, GARY L.^{1*}, ROSANA SERIKAWA², JOHN E. FOSTER², and JOHN THOMAS¹,¹ Panhandle Research and Extension Center and ² Department of Entomology, University of Nebraska-Lincoln, 4502 Ave. I, Scottsbluff, NE 69361. **Variability in varietal response for resistance to sugar beet root aphid and potential implications.**

ABSTRACT

The sugar beet root aphid is a common pest seen throughout a number of sugar beet growing areas in North America. Varietal resistance is the primary tool to manage root aphid populations; however, not all growing areas have highly resistant adapted varieties. Because of the importance of resistant varieties in managing this destructive insect, it is critical to understand the mechanisms of resistance involved and how insect populations respond to widespread deployment of these improved varieties. Our objectives were to monitor the response of root aphid populations to resistant varieties in a region where widespread deployment of resistant varieties has occurred, establish potential mechanisms of varietal resistance and begin to determine the genetic variability of root aphid populations in North America.

Annual root aphid greenhouse screens were performed on several varieties ranging from susceptible to resistant with Beta 6863 used each year (2002-2006) as a susceptible check and Monohikari used as a highly resistant check. Each trial consisted of testing single plants in a pot and testing from 12-32 different plants for a variety. Each year aphid colonies are reestablished after the summer from field collected aphids; therefore, each year's tests were done using independently collected aphids.

Data from the variety testing in the greenhouse indicate that the primary mechanism of resistance to the aphid has been the reduction in reproductive ability of aphids to survive on resistant plants. However, in the last three years we have seen increased survival of aphid populations on the highly resistant variety (Monohikari). These results suggest the possibility that the aphids are beginning to overcome the resistance found in beets; therefore, we may be seeing development of biotypes. However, through several attempts in the greenhouse, we have not been able to establish colonies that survive for extended periods on resistant varieties. In addition, we have not been able to observe aphids surviving well on resistant varieties in the field.

If biotypes are developing we will need to develop the ability to identify these biotypes. The best method for this is to be able to identify them genetically. In addition, a better understanding of the genetic variability of aphid populations will allow us to better predict the potential for biotype development. In order to establish some baseline to compare aphid populations across regions, aphids from several growing regions in North America (NE, CO, WY, MT, ID, MI, Alberta) were collected and analyzed for genetic variability using AFLP techniques. Through our preliminary analysis we have determined that all aphid populations tested from the Rocky Mt. growing areas were genetically more related. In contrast, the aphids collected from Michigan were genetically distinct from all the other collections. Overall, a great deal of variability was found in the populations as about 75% of all the genetic variability occurred within populations and only 25% was seen between populations. In addition, the variability in the samples indicated that for many populations sexual reproduction appears to be likely. While this is not surprising in the Rocky Mt. areas that are close to primary hosts, this was an unexpected result for the Michigan populations. The presence of genetic recombination

resulting from sexual reproduction makes the development of biotypes more likely. The results of these studies are inconclusive as to the presence of biotypes but continued evaluation of the potential development of biotypes is critical. In addition, the potential for biotypes creates a critical need for a dramatically expanded understanding of the genetic variability of root aphid populations in all growing areas of North America.

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