

Identification of new sources of partial resistance to oat crown

Marty Carson

USDA-ARS, Cereal Disease Laboratory, University of Minnesota, St. Paul, MN 55108
mcarson@umn.edu

Control of oat crown rust (*Puccinia coronata* f.sp. *avenae*) has traditionally been achieved with the use of cultivars with race-specific seedling genes (*Pc* genes), but this resistance typically is only effective for 3-5 years once a cultivar becomes widely grown. Over 90 *Pc* genes have been described in *Avena* spp., but corresponding virulence has been found for each of them in the U.S. crown rust population. The high frequency of positive virulence associations, the ability to maintain complex virulences without an apparent cost in fitness, and the corresponding "gene pyramiding" program occurring on buckthorn, the alternate host of *P. coronata*, makes achieving durable resistance by pyramiding race-specific *Pc* genes highly unlikely. Race non-specific, partial resistance (or slow rusting) to crown rust of oat was first reported decades ago, but oat breeders have largely ignored it. One reason partial resistance has not been utilized is the difficulty selecting for it in the presence of *Pc* genes for which corresponding virulence is rare. For example, if virulence to a *Pc* gene or a particular combination of *Pc* genes is at a low frequency in the crown rust population, oat cultivars with those genes will appear to have partial resistance; i.e., low severity but susceptible infection type. Even in the St. Paul buckthorn nursery with its highly diverse crown rust population, oat varieties with known race-specific resistance may appear to have partial resistance. To identify germplasm that has true partial resistance, oat accessions that have exhibited low rust severity in the buckthorn nursery or as reported in the GRIN database were tested in trials where plots of those accessions were inoculated with a crown rust inoculum specifically selected for virulence on seedlings of that accession. When compared with data from the buckthorn nursery, these tests appear to discriminate between true partial resistance and race-specific resistance where corresponding virulence is at a low frequency. Several new potential sources of partial resistance in very diverse genetic backgrounds have been identified this way. Crosses with the more promising accessions have been made for future genetic and mapping studies.