INSECT RESISTANCE OF SWITCHGRASS

P.F. Dowd

Crop Bioprotection Research, National Center for Agricultural Utilization Research, ARS-USDA, 1815 N. University Street, Peoria, IL 61604, USA

Production of ethanol from biomass materials such as native grasses or corn stover has the potential to be lower cost and have less impact on food and feed supplies compared to ethanol production from corn starch. However, biomass materials are more resistant to fermentation than corn starch. One strategy being considered to increase fermentability is to develop biomass crops with reduced lignin content. However, previously published studies have shown that corn lines with reduced lignin content used for silage can be more heavily damaged by insects and disease than standard hybrids. Transgenic studies with several plant species, including those performed in our laboratory, have indicated lignin is an insect and disease resistance factor.

Historical observations of native populations of switchgrass have indicated very little insect damage. However, publications investigating specific commercial switchgrass lines have demonstrated insects can be a problem, especially during establishment. Our laboratory studies have indicated newly hatched fall armyworms, a recognized pest of switchgrass, were able to survive well when caged with commercial biomass lines. Field collected native switchgrass plants that were fed to newly hatched fall armyworm larvae had greatly varying degrees of damage. Some plants were damaged as much as the commercial lines tested, while others killed most of the larvae within 2 days. Our examination of the publicly available switchgrass ESTs (expression sequence tags) using conserved sequences of three insect resistance genes found a considerable diversity of resistance gene/allele sequences.

Our data collected so far suggests that there are multiple sources of insect resistance in switchgrass. These sources of resistance, once identified, could be moved into biomass lines suitable for fermentation to ethanol, either through breeding or genetic engineering, in order to promote sustainable production.

Contact: Pat F. Dowd, Crop Bioprotection Research, NCAUR-ARS-USDA, 1815 N. University St., Peoria, IL 61604, USA. Tel: 309-681-6242. E-mail: Patrick.Dowd@ars.usda.gov.