Disease of Native Grasses. Paul M. Gray[1], John D. Matula[1], Josephine Taylor[1], Jim A. Stevens[2], and R. Alan Shadow[2]. [1]Department of Biology, Stephen F. Austin State University, and [2]USDA-NRCS, East Texas Plant Materials Center, Nacogdoches, TX.

Perennial native grasses are hosts to a number of plant pathogens which can impact forage quality, yield, seed production, and longevity. Some of the most important diseases of native grasses are caused by fungi. Big bluestem (*Andropogon gerardii*) is most severely impacted by two smut diseases (kernel smut caused by *Sphacelotheca occidentalis* and culm smut caused by *Sorosporium provinciale*), ergot (*Claviceps purpurea*), leaf rust (*Puccinia andropogonis*) and leaf spot (*Phyllosticta andropogonivora* and *Ascochyte brachypodii*) (Owsley, 2000). *P. andropogonivora* (Krupinsky and Tober, 1990) as well as four rust species (Farr *et al*., 1989) are pathogenic on little bluestem (*Schizachyrium scoparium*). Indiangrass (*Sorghastrum nutans*) is host to the leaf spot pathogen *Colletotrichum caudatum* (Zeiders 1987) and the rust fungus *Puccinia virgata*. The most severe fungal diseases on switchgrass (*Panicum virgatum*) include rust caused by *Puccinia emaculata* and smut caused by *Tilletia maclagani* (Nyoka *et al*., 2007). The increased interest in native grasses as sources of biomass for biofuel production has led to the discovery of new fungal pathogens on these hosts (Crouch *et al*., 2009; Krupinsky *et al*., 2004).

Naturally occurring genetic variation is an important source of disease resistance in native grasses (Gustafson *et al*., 2003). An ongoing collaboration between researchers at the East Texas Plant Materials Center (ETPMC) and the SFASU Department of Biology has been established to identify resistance to the rust *P. virgata* in indiangrass, as well as to investigate the mechanisms by which this resistance is conveyed. Matula (2003) compared disease development under field conditions in five varieties and was

able to separate highly resistant from highly susceptible genotypes. He also used microscopy to monitor pathogen development, and found that fungal infection and growth were inhibited in resistant plants. The ETPMC recently screened a collection of indiangrass from the Native Prairie Association of Texas, identifying 23 individuals exhibiting little to no rust infection (Shadow 2008). These plants are currently undergoing multi-year field evaluation for yield and disease severity in order to select the best material to incorporate into a breeding program to develop a rust resistant plant for release in East Texas. The morphology of resistant and susceptible indiangrass genotypes are being compared in order to identify features conveying the resistance, which can subsequently be used as selection criteria in the breeding program (Gray and Taylor 2010). Stomatal and trichome distribution, subsidiary cell spacing, and intercostal cell lengths have been analyzed to date, with results indicating that more topographically uniform indiangrass leaf surfaces are less likely to be infected by rust.

There are a number of avenues for further research surrounding native grass diseases. Little is known, for example, about pathogen variability or mechanisms of overwintering in perennial bunch grasses. Conservation and restoration efforts, as well as forage and biomass production, will significantly benefit as diseases of native grasses are more thoroughly understood.

References

Crouch, J.A., Beirn, L.A., Cortese, L.M., Bonos, S.A. and Clarke, B.B. 2009. Anthracnose disease of switchgrass caused by the novel fungal species *Colletotrichum navitas*. Mycol. Res. 113:1411-1421.

Farr, D. F., Bills, G. F., Chamuris, G. P. and Rossman, A. Y. 1989. Fungi on plants and plant products in the United States. APS Press, St. Paul, MN.

Gray, P. M. and Taylor, J. 2010. Investigation of morphological differences leading to rust resistance in indiangrass. Tex. J. Micros. 41(1):10 (abstract).

Gustafson, D.M., Boe, A. and Jin, Y. 2003. Genetic variation for *Puccinia emaculata*

infection in switchgrass. Crop. Sci.43:755-759.
Krupinsky, J.M., Berdahl, J. D., Schoch, C.L. and Rossman, A.Y. 2004. A new leaf spot disease on switchgrass (*Panicum virgatum*) caused by *Bipolaris oryzae*. Canadian Journal of Plant Pathology 26:371-378.
Krupinsky, J.M. and Tober, D.A. 1990. Leaf spot disease of little bluestem, big bluestem, and sand bluestem caused by *Phyllosticta andropogonivora*. Plant Dis. 74:442-445.
Matula, J. D. 2003. An investigation of rust resistance in five indiangrass (*Sorghastrum nutans* L. Nash) varieties. M.S. Thesis, Stephen F. Austin State University, Nacogdoches, TX.
Nyoka, B., Jeranyama, P., Owens, V. and Boe, A. 2007. Management guide for biomass feedstock production from switchgrass in the Northern Great Plains. North Central Sun Grant Center, South Dakota State University, Brookings, SD. http://agbiopubs.sdstate.edu/articles/SGINC2-07.pdf.
Owsley, C.M. 2000. Review of big bluestem. USDA-NRCS, Jimmy Carter Plant Materials Center, Americus, GA. ID# 2291; http://plant-materials.nrcs.usda.gov/pubs/gapmcarbigblue.pdf.
Shadow, R. A. 2008. Rust resistant indiangrass. ETPMC, Nacogdoches, TX. ID# 8053; http://www.plant-materials.nrcs.usda.gov/pubs/etpmcab8053.pdf.
Zeiders, K.E. 1987. Leaf spot of indiangrass caused by *Colletotrichum caudatum*. Plant Dis. 71:348-350.