February 2016

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plant disease
Published by The American Phytopathological Society

January 1998, Volume 82, Number 1, Page 128

http://dx.doi.org/10.1094/PDIS.1998.82.1.128B

Disease Notes

First Report of *Pythium ultimum, P. irregulare, Rhizoctonia solani* AG4, and *Fusarium proliferatum* from Arrowleaf Clover (*Trifolium vesiculosum*): A Disease Complex

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Poor stand establishment, failure to recover after grazing, and premature plant death have reduced the utilization of arrowleaf clover (*Trifolium vesiculosum* Savi) as a forage crop in the southeastern United States in recent years. Clover plants collected from poor stands in east Texas pastures during the 1995 to 1996 and 1996 to 1997 seasons first exhibited root disease symptoms as young seedlings in the fall. Symptoms consisted of one or more of the following: tan discoloration of lateral roots and taproot; root pruning; and small, tan, sunken lesions on the taproot and crown. Many *Rhizobium* nodules were brown and dead. Toward spring, symptoms increased in severity. Root lesions became larger and darker, and internal crown discoloration was observed. Disease incidence reached 100% in both growing seasons. Premature death of plants also was observed, especially in pastures where plants had been grazed. Most of the fungi isolated from diseased roots were *Pythium*, multi- and binucleate *Rhizoctonia*, and *Fusarium* spp. Many plants were infected with two or three pathogens simultaneously. Two *Rhizoctonia* isolates (AR96-17 and -26) were identified as *R. solani* anastomosis group 4 (AG4; D. R. Sumner, University of Georgia). AR96-8 was identified as *Fusarium proliferatum* (T. Matsushima)

Nirenberg (Fusarium Research Center, Penn State University; deposited as isolate M-8382). Three *Pythium* isolates (AR96-7, -11 and -39) were identified as *P. irregulare* Buisman, based on oogonial and sporangial characteristics. Eight other *Pythium* isolates were not identified. *Pythium* isolate AR97-1, found in 1997, was identified as *P. ultimum* Trow. Greenhouse studies to confirm pathogenicity of these isolates were conducted by sowing cv. Yuchi arrowleaf clover seed into artificially infested soilless medium. In pathogenicity tests for *P. ultimum*, seedling emergence for controls was 69% after 8 days, but no seedlings emerged from *P. ultimum*-infested media. Several seeds showed imbibition and emerging radicles but were symptomatic. The pathogen was reisolated from necrotic radicles. After 19 weeks, survival and root disease symptoms were recorded for plants infected by the other isolates. Pathogens were reisolated from diseased plants. Disease symptoms were similar to those observed on plants collected in the field, and differed among pathogens. The *Pythium* isolates and *P. irregulare* caused tan discoloration and pruning of the entire root system, sometimes leaving only stubs along the taproot. Survival of clover plants infected by *Pythium* spp. and *P. irregulare* isolates averaged 79 and 83%, respectively. *R. solani* AG4 isolates caused internal crown discoloration, root lesions, and severe root rot, and plant survival was only 31%. *F. proliferatum* caused hyperelongation of the hypocotyl and stem, mild chlorosis, tan discoloration of roots, and 94% plant survival. Survival was 86% for control plants. *P. ultimum, P. irregulare, R. solani* AG4, and *F. proliferatum* are part of a larger disease complex occurring on arrowleaf clover in east Texas that also includes bean yellow mosaic virus (1) and possibly other root and crown rot diseases. This report is the first to identify some of the components of this disease complex impacting arrowleaf clover in Texas, and to demonstrate pathogenicity of each fungal pathogen individually. There are no arrowleaf clover cultivars currently known to have resistance to any of these pathogens.

Reference: (1) I. J. Pemberton et al. Phytopathology 81:1001, 1991.