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Biological control of leafy spurge Progress report to GPC-14 Nov. 14, 1986

R. M. HOSFORD, JR., G. D. STATLER, and J. G. JORDAHL

North Dakota State University, Dept. of Plant Pathology, Fargo, ND 58105. Phones (701) 237-7079 & (701) 237-7064

Wilt and root rot

A *Fusarium* species was isolated from the few dead and dying leafy spurge (*Euphorbia esula*) plants found by Dr. Hosford in Washington and Wyoming in June-July 1986. Inoculation of soil around spurge plants in the greenhouse with the *Fusarium* alone has not, to date, resulted in wilt or root rot. In November 1986 a nonsporulating fungus was repeatedly isolated by Mr. Jordahl from brown streaks in roots of wilting leafy spurge plants growing in Sunshine Mix (a soilless mixture of peat moss, perlite and vermiculite from Canada). Spurge plants will be inoculated with this fungus.

Alternaria species

In September 1985 Dr. Hosford observed a disease killing some inflorescences and then the flowering stem of *Euphorbia esula* (leafy spurge) in western North Dakota, central Montana and southern Oregon. The disease was scattered in patches of spurge at one site in North Dakota and one site in Montana and abundant in a solid 100-acre stand of leaf spurge covering a valley in southern Oregon. In May 1986, he and Don Mundal observed a similar disease in eastern North Dakota. *Alternaria* was repeatedly isolated from the advancing edge of stem lesions from all these sites. In 36-65 hour wet periods isolates B1-1 and B1-6 of *Alternaria* from central Montana caused small dark spots to extensive dark lesioning, killing flowers, leaves and stems of leaf spurge biotypes 113, 110 and 108 in greenhouses at Fargo, ND. All 27 conidial inoculated plants developed spotting and/or top dieback. The 25 water inoculated check plants were not spotted. *Alternaria* resembling B1-1 and B1-6 were reisolated from the lesions and not from healthy check plants. On 4-30-86 Dr. Joe Krupinsky sent us two of his stem killing isolates of *Alternaria* from Mandan, North Dakota (4).

In the prairie provinces of Canada *Alternaria* spp. have caused leaf spotting to top dieback in up to 10% of the leafy spurge at some sites (5). *A. tenuissima* f. sp. *euphorbiae* caused leaf spotting and top dieback in North Dakota, but artificial field inoculation at 3 sites in 1984 resulted in only a little infection, probably due to inadequate moisture (4, L. J. Littlefield personal communication).

Uromyces striatus

The rust, *Uromyces striatus* was detected killing leafy spurge near Lidgerwood in southeastern North Dakota in 1982. It spread slowly from plant to plant through 1982-84. In 1985 it spread quickly by aerial spores to scattered plants over 3 acres of spurge. In 1985 its uredispores were found on alfalfa in the fields, then produced in the greenhouse and stored in liquid nitrogen. On May 7, 1986 Dr. Hosford and Dr. Mundal found a rust disease resembling *U. striatus* killing a few plants near Lisbon, ND but not in an adjacent alfalfa field. We have a report of this rust on a few leafy spurge plants south of Carrington, ND. The rust kills the spurge plant. We are looking for another alternate host other than alfalfa or clover (3) from which spurge may be infected.

***Malampsora euphorbiae*, *Uromyces* spp. and *Endophyllum* spp.**

In September 1985 we found a *Malampsora euphorbiae*-like rust on an Oregon State University herbarium specimen of *E. esula* collected in Medford, Oregon in 1964. We did not find the rust in Medford, but M. R. Hubbel, who collected it in 1964, is looking for it for us. *Melampsora* rust spp. occur on *Euphorbia* spp. and are highly specific for their hosts. This combined with their urediospore on *Euphorbia* spp. makes them good candidates for biocontrol of leafy spurge. *Melampsora euphorbiae* was collected at Victoria, B.C. by Dr. Littlefield in August, 1984 and sent to the Plant Disease Research Laboratory (PDRL) at Frederic, Maryland. *Uromyces euphorbiae* was collected by Dr. Littlefield on a collecting trip to Eastern Europe in the spring of 1984, and that rust was also sent to PDRL. Evaluation of these rusts for host range, prior to release to us, is in progress. At Frederic Dr. W. L. Bruckart is studying these and other microorganisms that he, Dr. Littlefield and others have collected (1). Dr. Bruckart reports that in Swiss studies by Dr. G. Defago *et al.* *Uromyces scutellatus* is reducing stands of cypress spurge by 90% (1, 2). He found that *M. euphorbiae* from Eastern Europe caused very limited infection on spurge collections other than those from which it came (1). We plan to look for these fungi on leafy spurge in the United States. Harris *et al.* (3) recommended the "autoecious rusts, such as *Melampsora euphorbiae* (Schub.) Cast., *Uromyces scutellatus* (Pers.) Lev. and *Endophyllum* species, as possible biocontrol agents for control of North American leafy spurge." On Oct. 21, 1986 Dr. Larry Littlefield sent us the uredial/telial stage of an autoecious rust (*Uromyces proeminens* or *U. magorii*?) on *Euphorbia dentata* (?), toothed spurge, in Oklahoma. Dr. Statler is testing this rust for pathogenicity to leafy spurge. On August 19, 1986 Sharon Collman, County Agent for King County, Washington sent us an orange rust severely rusting petty spurge (*Euphorbia peplus*) in King County. On October 7, 1986 Joseph Kropf, County Agent for Cowlitz County, Washington sent us an orange rust severely rusting petty spurge in Cowlitz County. On Nov. 7, 1986 Jack Waud, County Agent for Clallam County, Washington sent us an orange rust and leaf spots on small to medium size spurge plants in Clallam County. Dr. Statler is testing these rusts for pathogenicity to leafy spurge.

Sclerotium rolfsii

Dr. Littlefield obtained *Sclerotium rolfsii* isolates from southern United States. On January 28, 1986 10 ml of 2 two-week-old petri plate cultures of sclerotia and mycelium of *S. rolfsii* in 50 ml of water plus 2 drops of Tween 20 were poured on the base of each of 5 plants of leafy biotype 113. The plants in each of 5 pots were watered daily. By 8-18 days after inoculation the stems of the inoculated plants were killed at the soil surface, but new stems grew from the roots. Five water inoculated check plants were undamaged. This fungus damages many important plants and crops in the southern United States. It is assumed that it will not survive northern winters. If it were to survive, it might become a serious problem. We are studying this fungus only in the greenhouse in the winter.

Conclusions

We should continue studying root rot and wilt diseases for a potential control of leafy spurge and look for more virulent or aggressive isolates of *Alternaria* and autoecious rusts, such as *Melampsora euphorbiae* (Schub.) Cast, *Uromyces scutellatus* (Pers.) Lev., and *Endophyllum* species, on North American leafy spurge. We should also look for any other organisms, fungi, bacteria, viruses, nematodes, etc., that may be damaging leafy spurge.

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