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## **Reaction of different biotypes of leafy spurge and other plant species to *Alternaria tenuissima* f. sp. *euphorbiae***

S. M. YANG, D. R. JOHNSON, W. M. DOWLER, and J. M. KRUPINSKY

Research Plant Pathologist, Research Biologist, and Research Leader, USDA-ARS, Frederick, MD 21701; and Plant Physiologist, USDA-ARS, Mandan, ND 58554.

The noxious weed leafy spurge (*Euphorbiae esula*) continues to pose a serious problem in rangelands and pastures throughout several western states. Satisfactory chemical control has not been established, and use of insects for biological control is still developing stage. The use of fungi for biocontrol offers another possible control mechanism which could be used alone or in combination with herbicides, plant growth regulators, and insects. We report some results from studies with a fungus, *Alternaria tenuissima* f. sp. *euphorbiae* (ATE), which has been shown by Krupinsky and Lorenz (2) to be pathogenic on leafy spurge.

### **Materials and methods**

Conidia of ATE were produced on surface sterilized, detached leaves of leafy spurge on sterile moistened filter paper in petri dishes at 20°C (12 hour light). Conidia were obtained by flooding the leaves with sterile distilled water containing 0.1% polyoxethylene sorbitan monolaurate and gently rubbing the surface with a spatula. The conidial suspension was filtered through two layers of cheesecloth and adjusted to contain about 10<sup>6</sup> spores per ml. Inoculum was sprayed on to plants until runoff. The inoculated plants were incubated in dew chambers at desired temperatures ranging from 12-25°C and for 12 to 24 hours. Severity of disease was recorded six days after inoculation.

### **Temperature and dew period**

The optimum temperature for infection at a 12 hour dew period occurred between 15-20°C (59-68°F) with some infection occurring from 12-25°C. Increasing the dew period to 24 hours resulted in heavier infection. This effect was more pronounced on plants other than leafy spurge (see section on Host Range).

**Table 1. Reaction of leafy spurge collections to *Alternaria tenuissima* f. sp. *euphorbiae*. After inoculation plants were held for 12 hours in a dew chamber at 20°C.**

Slightly infected <sup>a</sup>	Moderately infected <sup>a</sup>	Severely infected <sup>a</sup>	No infection
#11 (North Dakota)	MI-13 (Michigan)	IC (Italy)	BC-25 (Br. Col.)
#50 (North Dakota)	#12 (North Dakota)	TU1 (Turkey)	ID-5 (Idaho)
1A (Iowa)		MT-6 (Montana)	#10 (No. Dakota)
NJ-1 (New Jersey)		YU-1 (Yugoslavia)	CIT-1, (Italy) <sup>b</sup>

<sup>a</sup> Slightly infected: Brown spots on leaves at lower and middle parts of stems, or edge of leaves becomes straw colored; Moderately infected: Leaves at lower and middle part of stems were severely discolored, or tips of young shoots died; Severely infected: More than 80% of leaves discolored, or plants died.

<sup>b</sup> Cypress spurge

## Biotypes of leafy spurge

Several biotypes of leafy spurge have been collected during the past few years. Examples of the reaction of several of these collections to inoculation with ATE is presented in Table 1. These results indicate the variability present in leafy spurge, and underscores the need for rapid, accurate methods of biotype identification.

## Host range

The fungus used in this study infected plants other than leafy spurge as shown in Table 2. It should be noted that these results were obtained under ideal conditions for the fungus (48 hours in the dew chamber at 20°C). It will be important to compare infection rates and severities under field conditions to determine the relative safety of using ATE for biocontrol of leafy spurge on a large scale.

**Table 2. Reaction of different plant species to *Alternaria tenuissima* f. sp. *euphorbiae*. After inoculation plants were held for 48 hours in dew chamber at 20°C.**

Plant	Reaction
Corn	Straw-colored spots on leaves
Roma bean	Straw-colored spots on leaves
Wheat	No infection
Cucumber	Straw-colored spots on leaves of some plants
Red clover	Edge of leaves straw-colored
Lettuce	Straw-colored spots on leaves
Hot pepper	No infection
Soy bean	Straw-colored and brown necrotic spots on leaves
Safflower (Gila)	Leaf blight on some first and second leaves
Okra	Leaf spots on cotyledons
Artichoke	Necrotic spots on leaves of some plants
Cantaloupe	No infection
Zinnia	Tip burn on lower four leaves of some plants
Velvet leaf	No infection
Marigold	Infected plants died
Leafy spurge	Infected leaves turned straw-colored, plants died

Additional studies confirmed that plants other than leafy spurge may be less susceptible to infection under conditions less than ideal for the fungus (Table 3). The fungus could be isolated from infected plants, but more than 12 hours dew was required to reinfect the same host. When combined inoculum from these plants was used to inoculate YU-1 leafy spurge, plants were severely infected when held in the dew chamber for 12 or 24 hours.

**Table 3. Results of inoculating *Alternaria tenuissima* f. sp. *euphorbiae* isolated from infected plants to the same host.**

Host	To Same plant species	
	12 hour <sup>a</sup>	24 hour <sup>a</sup>
Corn	No infection	Moderate-severe infection
Safflower	No infection	Slightly infected
Artichoke	No infection	(Not tested)
Zinnia	(Not tested)	Slightly infected

<sup>a</sup>Number of hours incubated at 20°C after inoculation.

## Conclusions

Results obtained from this study and by other scientists (1) indicate ATE has potential as a mycoherbicide for biological control of leafy spurge. However, limited field trials (2) have not been encouraging, and there are many things we need to know about this organism before considering large scale field trials. We need to know 1) how to increase the effectiveness of ATE on leafy spurge, 2) how to overcome the biotype problem, 3) plant parts affected by ATE, particularly damage caused to the root system, 4) potential spread of the fungus, 5) overwintering ability, and 6) the potential for damage to non-target crops under field conditions. Limited field trials might be considered under specified conditions without having answers to all the questions raised above.

The most likely role for ATE may be as an additional tool for use in a management approach, such as integrated pest management. Such an approach might include use of herbicides/plant growth regulators, introduced insects, introduced fungal pathogens, and grazing management. It appears that it is not too early to begin planning preliminary cooperative studies to determine how well ATE might play its part in this scheme.

## References

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2. Krupinsky, J. M., and Lorenz, R. J. 1983. An *Alternaria* sp. on leafy spurge (*Euphorbia esula*). *Weed Science* 31:86-88.