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Appendix 8: Host plant specificity testing

Introduction

APHIS incorporates rigorous ‘safety testing’ procedures into the process of classical biological control. You should feel free to assure any landowners or cooperators with whom you interact that the leafy spurge biocontrol agents described in this manual will not attack any economically important plants or native plants outside of the genus *Euphorbia*.

TAG evaluation

Any foreign biocontrol agent being considered for importation and release against leafy spurge must first be evaluated by a multi-agency Technical Advisory Group (TAG). The TAG considers whether the organism in question is a potential threat to U.S. crop, ornamental, and native plants, and then recommends whether or not the agent should be introduced. USDA-APHIS, acting on a positive decision by TAG, then issues permits for the importation and release of the biocontrol agent.

Most of the evidence considered by TAG consists of ‘screening’ or host-specificity experiments with the biocontrol agent in question. The International Institute of Biological Control (IIBC) in Switzerland or the USDA-ARS laboratory in Montpellier, France, tests for host-specificity of biocontrol insects. For some insects, USDA-ARS or university laboratories in this country may conduct additional tests under quarantine conditions. Entomologists test a variety of plant species, including leafy spurge and related species, plants reportedly eaten by insects related to the species being examined, and a range of crop and ornamental plants. The entomologists try to include a number of native species related to leafy spurge. Tests assess the ‘ability’ of plant species to support: (1) adult insect feeding, if relevant; (2) egg deposition by the adult female insect; and (3) survival and development of the larval insect (i.e. completion of the insect’s life cycle). The last factor is probably the most important in determining the likelihood of a biocontrol agent feeding on a plant species under field conditions.

Taxonomy of *Euphorbia*

Botanists have not fully resolved the taxonomy of the genus *Euphorbia*, but there are more than 100 native *Euphorbia* species in the United States and at least 13 that have been introduced. There are at least six subgenera within the genus *Euphorbia*, four of which have representatives in North America. The weed in question, leafy spurge (*Euphorbia esula*), is a Eurasian native that belongs to the subgenus *Esula*; there are at least 20 native *Euphorbia* in this subgenus. The annual *Euphorbia spathulata* (= *E. spatulata*) and the perennial *E. robusta* belong to the subgenus *Esula*, while *Euphorbia glyptosperma*, *E. missurica*, *E. serpens*, and *E. serpylliflora* are all annual plants belonging to the subgenus *Chamaesyce*.

Aphthona cyparissiae

Aphthona cyparissiae was approved for U.S. release in 1986. European screening tests concluded that this species of flea beetle feeds exclusively on hosts in the subgenus *Esula*. Entomologists tested five species of North American *Euphorbia*, though none was in the subgenus *Esula*.

Aphthona czwalinae

Aphthona czwalinae was approved for initial release in the United States in 1987. Screening tests in Europe apparently confirmed that this species feeds only on hosts in the subgenus *Esula*. No feeding was reported on four North American spurge species tested, though none was in the subgenus *Esula*.

Aphthona flava

Aphthona flava was also approved for U.S. release in 1986. Host-specificity tests show that this insect feeds only on spurges in the subgenus *Esula*. Of the U.S. subgenus *Esula* spurges tested, *A. flava* was able to complete its life cycle on four, including *Euphorbia robusta* and *E. spatulata*. Under field conditions, however, *E. spatulata* would probably not be a suitable host, since *A. flava* requires the year-round availability of host roots. Interestingly, *A. flava* did not complete development on *Euphorbia purpurea* and *E. telephiodes*, two native species in the subgenus *Esula* under review for protected status. Thus, *A. flava* has a host range that is restricted beyond the sub-generic level.

Aphthona lacertosa

Aphthona lacertosa received approval for U.S. release in 1993. This beetle is also restricted to hosts in the subgenus *Esula*. The five North American *Euphorbia* species tested were not suitable hosts, though none was in that subgenus *Esula*.

Aphthona nigriscutis

Aphthona nigriscutis was approved for U.S. release in 1989. European screening tests show that this species feeds only on *Euphorbia* species in the subgenus *Esula*. Of four tested North American species, none was in the subgenus *Esula*.

Oberea erythrocephala

Oberea erythrocephala, a root- and stem-boring beetle, received approval for U.S. release in 1979. European host-specificity tests included only three North American spurge (none in the subgenus *Esula*). Again, only *Euphorbia* species in the subgenus *Esula* appear to be suitable hosts. Since this insect probably requires 2 years to complete development in the northern United States, only perennial plants would be appropriate hosts.

Spurgia esulae

Spurgia esulae, the leafy spurge bud gall midge, was approved for U.S. release in 1985. Again, this insect selects host-plants restricted at least to the subgenus *Esula*. In U.S. testing, *S. esulae* completed its life cycle on four native subgenus *Esula* plants, including *Euphorbia robusta* and *E. spatulata*. The gall midge did not feed on the ‘threatened’ *E. purpurea* and *E. telephiodes*.

Summary

Leafy spurge biocontrol agents appear to be restricted to host plants in the genus *Euphorbia*, subgenus *Esula*. Native spurges in the subgenus *Chamaesyce* (e.g. *E. glyptosperma*, *E. missurica*, *E. serpens*, and *E. serpyllifolia*) and other subgenera probably are not suitable hosts and are at little or no risk of attack. The Bozeman Biological Control Facility has received no reports of introduced leafy spurge biocontrol agents feeding on nontarget, native *Euphorbia* species. Certainly, you can be confident that approved leafy spurge biocontrol agents represent no threat to economic or native plants outside the genus *Euphorbia*.