20 Slenderflower Thistle (Winged Slender or Seaside Thistle)

A. Gassmann[1] and L.-T. Kok[2]

[1]CABI Bioscience Centre Switzerland, Delémont, Switzerland;
[2]Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, USA

PEST STATUS OF WEED

Nature of Damage

Like many other *Carduus* species, slenderflower thistle, *Carduus tenuiflorus* Curtis, is associated with pastures, disturbed areas, and vacant lots. Invasion is favored by annual burning of pastures. The thistle protects forage from grazing and is a competitive weed in improved pastures.

Geographical Distribution

Slenderflower thistle occurs in Pennsylvania, New Jersey, and Texas but the most serious infestations occur in California, Oregon, and Washington (USDA, NRCS, 1999). The closely related species, Italian thistle, *Carduus pycnocephalus* L., is known from New York, Alabama, and South Carolina in the eastern United States.

BACKGROUND INFORMATION ON PEST PLANT

Taxonomy

Carduus tenuiflorus is very similar to *C. pycnocephalus*, and the two species are sometimes treated together. Flowering stems are single or multiple from the base, branched, strongly ribbed, and slightly woolly. Spiny wings are continuous on stems to the base of the flower heads, but are discontinuous on *C. pycnocephalus.* The flower heads of *C. tenuiflorus* occur in clusters of five to 20, whereas those of *C. pycnocephalus* are in smaller clusters. The slender flower heads are less than 2 cm long, and lack stalks. Rosette and stem leaves are deeply lobed with numerous spines along the margin.

Biology

Carduus tenuiflorus is a winter annual, sometimes a biennial. Plants can grow from 0.3 to 2.0 m tall. It prefers soils of moderate to high fertility, in areas with moderate rainfalls.

Analysis of Related Native Plants in the Eastern United States

See this section in the chapter on musk thistle.

HISTORY OF BIOLOGICAL CONTROL EFFORTS IN THE EASTERN UNITED STATES

As pointed out by Dunn (1978), the oldest document relating to biological control of *Carduus* thistle was a USDA note from 1956 regarding the abundance of *C. pycnocephalus* and *C. tenuiflorus* in California. The program against this species began in 1959, with the establishment of the USDA overseas laboratory in Rome, Italy. Thistle insect surveys by USDA staff in Italy initially focused on *C. pycnocephalus* but later were extended to *C. tenuiflorus* and *Carduus nutans* L. During the surveys on the latter two species, it was found that musk thistle supported a larger complex of insects than the other *Carduus* species, and work was subsequently concentrated on musk thistle. Slenderflower thistle also was included in the survey of European thistles carried out by the Commonwealth Institute of Biological Control (now CABI Bioscience) in the 1960s and funded by the Canada Department of Agriculture (Zwölfer, 1965). Major surveys for natural enemies of *C. pycnocephalus* were conducted also by Goeden (1974) in central and southern Italy, and in Greece during 1971 and 72.

Area of Origin of Weed

The native range of slenderflower thistle is western and southern Europe and the Mediterranean area, extending northward to Scandinavia.

Areas Surveyed for Natural Enemies

Areas surveyed included southern England, France, Austria, Germany, Italy, the northern part of former Yugoslavia, and Greece (Zwölfer, 1965; Goeden, 1974; Dunn, 1978).

Natural Enemies Found

Most of the *C. tenuiflorus* and *C. pycnocephalus* populations sampled by Zwölfer (1965) were in western and southern France, respectively. Altogether, some 15 oligophagous insect species were recorded on *C. tenuiflorus* and *C. pycnocephalus* in Europe (see Table 1 in the chapter on musk thistle). Although concern about the invasiveness of slenderflower thistles was the reason for the initiation of the *Carduus* biological control program in North America, attention soon was redirected to musk thistle. No biological control agent was specifically targeted for slenderflower thistle. Populations of the seed-feeding weevil *R. conicus* (from *C. pycnocephalus* in Italy) and the root-crown fly *C. corydon* have been released against *C. tenuiflorus* and *C. pycnocephalus* in the United States. The host range and biology of the two species are described in the chapter on musk thistle.

Host Range Tests and Results

See the chapter on musk thistle.

Releases Made (from Julien and Griffiths, 1999)

Rhinocyllus conicus. Releases of this seed-feeding weevil originating from Italy were made on *C. tenuiflorus* in 1973 in California and Oregon only. Releases have been made on *C. pycnocephalus* as well.

Cheilosia corydon. This thistle rosette fly from Italy was released in 1990 in Maryland and New Jersey, as well as in Montana and Oregon. The fly also has been released on *C. pycnocephalus* in Oregon.

BIOLOGY AND ECOLOGY OF KEY NATURAL ENEMIES

See the chapter on musk thistle.

EVALUATION OF PROJECT OUTCOMES

Establishment and Spread of Agents (from Rees *et al*., 1996; Julien and Griffiths, 1999)

Rhinocyllus conicus. This weevil (Fig. 1) has become established and contributed to the control of slenderflower thistle in Oregon, especially in unburned areas.

Cheilosia corydon. Establishment of this fly has not been confirmed.

Puccinia carduorum. This rust (Fig. 2) has been accidentally introduced in North America. It is recorded on *C. tenuiflorus* in California and Oregon. *Puccinia carduorum* is native to the Mediterranean area but also is reported from Bulgaria and Romania. The fungus was imported from Turkey by the USDA for host range tests at the Foreign Diseases–Weed Research Laboratory in Frederick, Maryland (Politis and Bruckart, 1986). It also was tested and released for musk thistle control in 1992 (Baudoin *et al.*, 1993).

Figure 1. *Rhinocyllus conicus* adult and eggs on thistle head. (Photograph by L.-T. Kok.)

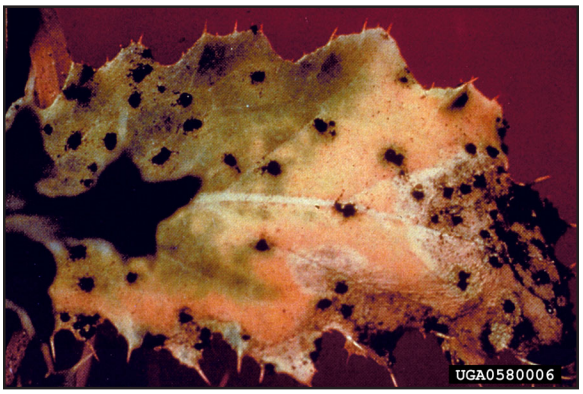

Figure 2. *Puccinia carduorum* infested thistle leaf. (Photograph by L.-T. Kok.)

(For details, see the chapter on musk thistle). The disease appears first as tiny yellow specks. In several days, rust pustules containing thousands of spores become visible (Figs. 3, 4).

Figure 3. Close up of *Puccinia carduorum* infection. (Photograph by L.-T. Kok.)

Figure 4. Urediniospores and teliospores of *Puccinia carduorum*. (Photograph by L.-T. Kok.)

REFERENCES

Baudoin, A. B. A. M., R. G. Abad, L.-T. Kok, and W. L. Bruckart. 1993. Field evaluation of *Puccinia carduorum* for biological control of musk thistle. *Biological Control* 3: 53-60.

Dunn, P. H. 1978. History of the biological control of musk thistle in North America and studies with the flea beetle *Psylliodes chalcomera*, pp. 1-6. *In* Frick, K. E. (ed.). *Biological Control of Thistles in the Genus Carduus in the United States*. U.S. Department of Agriculture, Stoneville, Mississippi, USA.

Goeden, R. D. 1974. Comparative survey of the phytophagous insect fauna of Italian thistle (*Carduus pycnocephalus*) in southern California and southern Europe relative to biological weed control. *Environmental Entomology* 3: 464-474.

Julien, M. H. and M. W. Griffiths (eds.). 1999. *Biological Control of Weeds. A World Catalogue of Agents and their Target Weeds,* 4th ed. Commonwealth Agricultural Bureaux International, Wallingford, United Kingdom.

Politis, D. J. and W. L. Bruckart. 1986. Infection of musk thistle by *Puccinia carduorum* influenced by conditions of dew and plant age. *Plant Disease* 70: 288-290.

Rees, N. E., P. C. Quimby, Jr., G. L. Piper, E. M. Coombs, C. E. Turner, N. R. Spencer, and L. V. Knutson. 1996. *Biological Control of Weeds in the West.* Western Society of Weed Science, Bozeman, Montana, USA.

USDA, NRCS. 1999. U.S. Department of Agriculture, Natural Resources Conservation Service) PLANTS Database. http://plants.usda.gov, (accessed April, 2001).

Zwölfer, H. 1965. *A list of phytophagous insects attacking wild Cynareae species in Europe.* Progress Report 15. Commonwealth Institute of Biological Control, Silwood Park, Ascot, United Kingdom.