

## AGALINIS PURPUREA: A PARASITIC WEED ON SYCAMORE, SWEETGUM, AND LOBLOLLY PINE

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Until 1969 the root parasitic behavior by chlorophyll containing members of the figwort family (Scrophulariaceae) was considered to be little more than a biological curiosity. At that time (Mann et al., (1)) reported senna seymeria (*Seymeria cassioides* (Walt.) Blake) as a serious pathogen of slash pine (*Pinus elliotii* Engelm.) in northwestern Florida. Experience with senna seymeria led to a study of other root parasites as potential pathogens of commercial tree species in the South (Musselman and Mann, (2)). Despite extensive field studies throughout the South, no root parasite other than senna seymeria was ever found in large numbers in commercial plantings. This paper reports the occurrence of extensive parasitism by purple gerardia (*Agalinis purpurea* (L.) Penn.) in a 3-year planting of sycamore (*Platanus occidentalis* L.), sweetgum (*Liquidambar styraciflua* L.) and loblolly pine (*Pinus taeda* L.) near Roduco, N.C.

The plantations, adjacent to each other, are on a Coxville-Myatt-Rains soil association, which has slow internal drainage. Topography is flat, so surface drainage is poor. As a result, soils are waterlogged much of the year. One-year-old nursery stock was planted on burned, clearcut areas in the winter of 1975. The sites were mound disked (bedded)

the previous summer to provide better aeration in root zones. The hardwoods were disked once or twice a year to reduce herbaceous vegetation that competes with planted seedlings.

Purple gerardia is an annual, with opposite leaves and spreading branches (fig. 1A). The size of individual plants is exceptionally variable depending on the availability of host roots and on host type. Vigorous plants will attain a height of about 3 m at maturity.

Large, attractive purple (occasionally white) flowers are produced in the late summer and fall. The fruit is a capsule (fig. 1B) containing numerous honeycombed seeds. Each capsule contains between 125 and 150 seeds. A large plant is capable of producing about 32,000 seeds. The seeds are apparently distributed by the wind, although we observed numerous seeds floating on water in the shallow depressions left by mounding, indicating a possible role for water in seed dispersal. We were able to obtain a very high germination percentage (ca. 95 percent) after cold storage at 3° C for 21 days. Thus, the parasite is well adapted for rapid spreading.

Like senna seymeria and all other parasitic figworts, purple gerardia forms specialized roots, termed haustoria, which penetrate

Purple gerardia parasitized 3-year-old planted sycamore, sweetgum, and loblolly pine in northeastern North Carolina. Despite heavy infestations, no growth loss was evident, but damage can logically be expected in the second year.

the roots of host plants (figs. 1C-E). Each haustorium is an invasion and partial disruption of host xylem. Interestingly, haustoria remain alive on the host plant long after the rest of the parasite is dead. Decaying haustoria no doubt allow for the initiation of micro-organisms. Haustoria were abundant on all three tree species. The roots producing the haustoria often coil about the host root and produce rows of parasitic connections (fig. 1C). Smaller roots were often dead in the region of high haustoria frequency. Despite this damage, no deleterious effect on the hosts was apparent.

Ecologically, purple gerardia favors full sun and open disturbed habitats. It is not host-specific in nature, but is never abundant in areas without woody plants. At the Roduco site, purple gerardia was most abundant at the margin of disked mounds, but was occasionally found in the furrows. Increased shading as the trees mature will gradually reduce the density of the parasite.

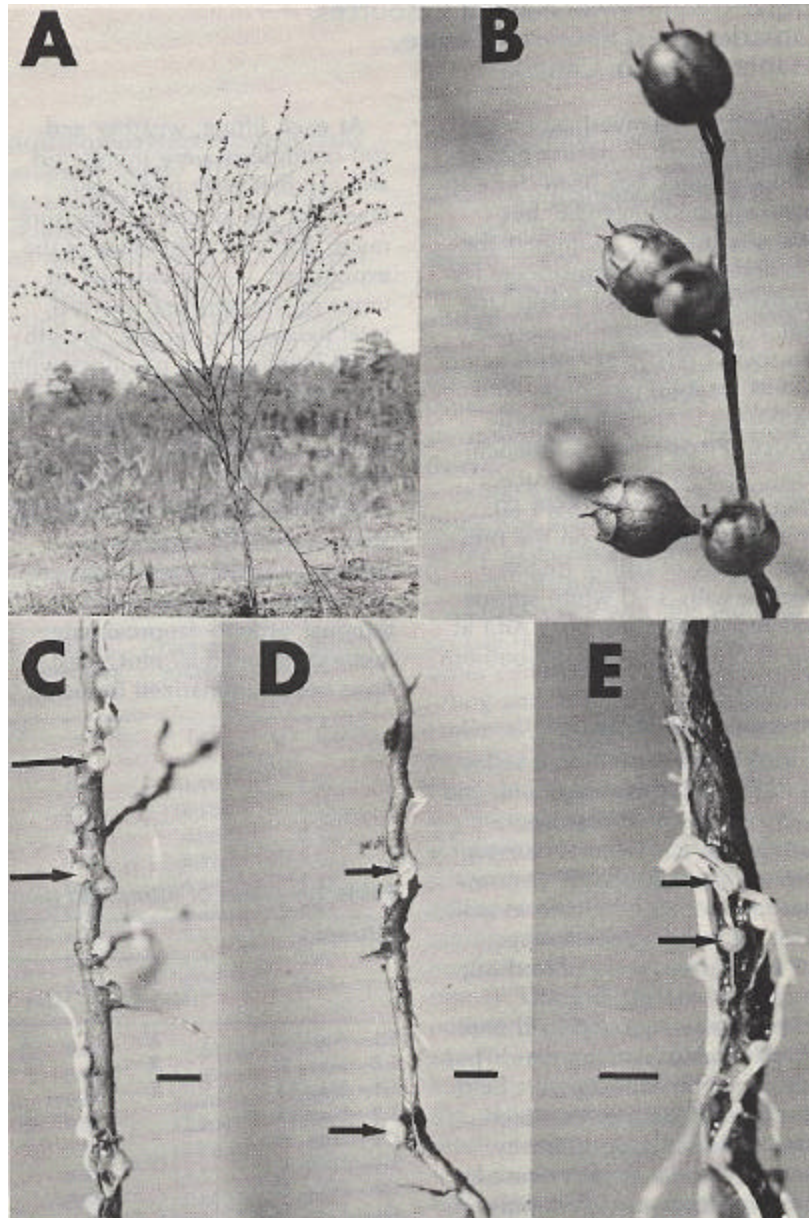
Purple gerardia is widespread throughout the South, growing on a wide variety of soils and sites (2). Since it is most prevalent on cleared, disturbed sites, forest managers should be aware of its parasitic behavior. So more intensive management practices, such as cultivation and fertilization, are employed for conifers

and hardwoods, the risk of parasite invasion becomes greater.

While no host damage was visible in the plantations reported here, it should not be concluded that purple gerardia is not a serious pest. First-year damage, regardless of the size of the population, is seldom evident. Most of the hosts' yearly growth is completed by the time parasites are large enough to have any effect. Growth loss and chlorosis occur primarily in the second year, especially when there are numerous parasites. In the plantations reported here, purple gerardia first became numerous in 1977.

#### Literature Cited

1. Mann, W. F., Jr., H. E. Grelen, and B. C. Williamson.  
1969. *Seymeria cassioides*, a parasitic weed on slash pine. *For. Sci.* 15: 318-319.
2. Musselman, L. J., and W. F. Mann, Jr.  
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**Figure 1.**—(A) Mature plant of *A. purpurea*, 1 M tall. (B) Closeup of seed capsules just beginning to open. (C) Haustoria on sycamore root. (D) Haustoria on sweetgum root. (E) Haustoria on loblolly pine root.