Gulf and Caribbean Research

Volume 3 | Issue 1

January 1970

# Observations on *Claviceps purpurea* on *Spartina alterniflora* in the Coastal Marshes of Mississippi

Lionel N. Eleuterius
*Gulf Coast Research Laboratory*



## Recommended Citation

Eleuterius, L. N. 1970. Observations on *Claviceps purpurea* on *Spartina alterniflora* in the Coastal Marshes of Mississippi. Gulf Research Reports 3 (1): 105-109.
Retrieved from https://aquila.usm.edu/gcr/vol3/iss1/2
DOI: https://doi.org/10.18785/grr.0301.02

# Observations on *Claviceps purpurea* on *Spartina alterniflora* in the Coastal Marshes of Mississippi [1]

by

Lionel N. Eleuterius
Gulf Coast Research Laboratory
Ocean Springs, Mississippi

Seventy-five years ago the first report of the occurrence of *Claviceps purpurea* (Fr.) Tul. on *Spartina alterniflora* Loisel in Mississippi was made by Tracy and Earle (1895). Collections were taken at Ocean Springs, Mississippi on Christmas Day in 1892. These specimens are in the herbarium of the Department of Plant Pathology at Mississippi State University. Tracy and Earle presented no data on the infection rate nor does collection data indicate widespread infection. Parris (1959) published a revised host index of Mississippi plant diseases in which he listed *C. purpurea* based on the collections by Tracy and Earle. No further reports have been made of the parasite in this area of the Gulf Coast.

The fungus, *C. purpurea*, commonly known as ergot, was observed, collected and studied on *S. alterniflora* (smooth cord grass, oyster grass) in the tidal marshes of Mississippi during the late summer and fall of 1968. Collections taken by the author have been deposited at Mississippi State University, the United States Department of Agriculture, Agriculture Research Service at Beltsville, Maryland, and the herbarium of the Gulf Coast Research Laboratory.

In the present study list-count quadrats were used to obtain data on the intensity of infection. A one-half by two meter rectangular frame was placed out at random in three *S. alterniflora* habitats in Mississippi; these habitats were located on the east beach of Ocean Springs, Davis

[1] This study was conducted in cooperation with the Department of Interior, Bureau of Commercial Fisheries, under Public Law 88-309, Project 2-25-R.

Bayou and at Graveline Bayou. Three quadrat samples were made per habitat. All mature culms present were producing seed. Counts of infected and uninfected panicles were made. *C. purpurea* was present on 96.5% of the mature *S. alterniflora* culms (Figure 1). The panicles occurring in the quadrats were clipped and placed in envelopes and labeled. Sclerotia were observed growing from the seed embryos. Counts of the infected and uninfected seeds per panicle were obtained. Seventy-one percent of the seed produced on infected panicles bore sclerotia. The number of seeds per panicle ranged from 147 to 561 and averaged 274 seeds. The length of the sclerotia at maturity ranged from 9 to 33 mm and averaged 14.5 mm. The diameter of the sclerotia ranged from .5 mm to 1 mm and averaged .86 mm (Figure 2). Conidia accompanied early sclerotia development (Engler 1896). These conidia were characteristically mixed in a thick sweet, nectar-like secretion. It has been reported that, attracted by this nectar, insects visiting the infected ovaries distribute the conidia to uninfected flowers, spreading the fungus in this way (Alexopoulos 1964). The conidia have been maintained in culture for future work (Lewis 1959). Seeds were considered infected if visible signs of infection such as sclerotia were present. Based on this data, it is estimated that the fungus reduced the total potential production of viable seed by 68.5% during 1968. Unseen infection or damage to the seed embryo was not investigated. Therefore, the viable seeds reduction was probably even greater. Whether the heavy infection is a common seasonal occurence is not known. However, if the heavy infection is common then the reproductive ability of *S. alterniflora* is greatly affected by reducing the number of viable seeds produced each year. The number of seeds produced per square meter was 8496. Therefore 34,375,016 seeds which weigh approximately 16.7 lbs. are produced per acre. The loss of 68.5% or more of this production may have considerable impact on estuarine fish and wildlife resources. Schelshe and Odum (1961) pointed out that the estuaries and specifically tidal marshes are among the most productive natural ecosystems in the world. The primary production of *S. alterniflora* was determined to be 2,000 gr. of dry organic matter /m$^2$ or 10 tons of dry organic matter per acre per year. Any factor which affects the plant population of *S. alterniflora* would greatly affect the estuarine system and ultimately the economically important food organisms of man.

The fungus was observed to occur on *S. alterniflora* over a range of approximately 120 miles along the Gulf Coast which included the

Figure 1. Figure 2.

Figure 1. *Claviceps purpurea* parasitizing seeds in the panicles of *Spartina alterniflora*. Arrow (←) indicates an infected panicle.

Figure 2. Close up view of the sclerotia of *C[illegible] purpurea* extending from the seeds of *Spartina alterniflora*. Arrow (←) indicates one sclerotium.

Mississippi, Alabama and 30 miles of the Louisiana Coast. *S. alterniflora* was not observed in the Pensacola, Florida area, including Pensacola Bay. Observations in the Louisiana marshes were made only as far as the Rigolets and Lake Borgne area. *C. purpurea* was found at all points of observation where *S. alterniflora* was present. However, the rate or intensity of infection varied. The intensity of infection was not measured by quadrat in Alabama or Louisiana, but the general effect and intensity of infection were easily observable. The infection was not as intense in Alabama or Louisiana as in Mississippi.

The range of *S. alterniflora* and its pattern of distribution along the Gulf Coast is not presently known. The absence of *S. alterniflora at* Pensacola indicates a disjunct distribution.

*C. purpurea* has been reported on two other plant species in Mississippi, salt grass, *Distichilis spicata* and *Tripsacum dactyloides* (Parris 1959). Unidentified species of *Claviceps* have been reported to occur on *Anthaenantia rufa, Panicum virgatum, Andropogon sp.,* and *Paspalum sp.,* all of which are upland species. *P. virgatum* is present in low salinity marshes. None of these species have been observed with *C. purpurea* infection in Mississippi.

In established stands, *S. alterniflora* is capable of vegetative reproduction by growth of rhizomes and expands to occupy adjacent suitable environment. The ability to establish natural new stands in suitable environment would depend on viable seed or the transfer of rhizomes eroded from established areas. I have observed that uninfected *S. alterniflora* seed do germinate and that seedlings grow vigorously whenever seeds are buried in a suitable drift line area on the beaches and in the marshes of Mississippi.

Rapidly increasing industrial development along the Mississippi Gulf Coast and the resulting dredging and filling operations threaten to reduce estuarine production of fish and wildlife resources. Spoil areas in open water usually erode to or near surface levels and remain barren. Winnowing leaves a relatively high energy sand area that is not productive. The importance of rapid establishment of *S. alterniflora* on some spoil areas has been pointed out by Chapman (1967). Experiments were carried out with transplanted rhizomes. Preliminary studies at the Gulf Coast Research Laboratory indicate that seeding may be more efficient and economical. Consequently, the recurrence and spread of heavy *C. purpurea* infections may have serious effects on the estuarine environment.

## LITERATURE CITED


Alexopoulos, Constantine J. 1964. Introductory Mycology. pp. 322-325. John Wiley and Sons, New York.

Chapman, Charles R. 1967. Habitat Rehabilitation. Report of the Bureau of Commercial Fisheries Biological Laboratory. Galveston, Texas. United States Department of the Interior. Circular 295, pp. 20-22.

Engler, A. and K. Prantl. 1896. Die Naturlichen Planzenfamilien. Tiel 1. Abt. 1,513 pp. 293 Figs. Wilhelm Engelmann, Leipzig.

Lewis R. M. 1959. Production, storage, and germination of Conidia of *Claviceps purpurea.* Acta Bontanica Acd. Sci. Hung. 5:71-77.

Parris, G. K. 1959. A revised host index of Mississippi Plant Diseases. Botany Department, Mississippi State University, Miscellaneous Publication Number 1, pp. 82

Schelshe, Clair L. and Odum, Eugene P. 1961. Mechanisms maintaining high productivity in Georgia estuaries. Proceedings Gulf and Caribbean Fisheries Institute, 62:75-80.

Tracy, S. M. and F. S. Earle. 1895. Mississippi Fungi, Mississippi Agricultural and Mechanical College Experiment Station Bulletin, 34:80-122.