

THE OCCURRENCE OF A HYPOGEOUS ASCOMYCETE IN THE NORTHERN CHIHUAHUAN DESERT¹

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Sporocarps of the hypogeous ascomycete *Carbomyces emergens* Gilky were collected in the northern Chihuahuan Desert, at the entrance to the Jornada Experimental Range, 25 km NNE of Las Cruces, New Mexico on March 13, 1985. The site consisted of coppiced dunes vegetated with *Atriplex canescens* (Pursh) Nutt., *Prosopis glandulosa* Torr., and several spring flowering annuals, *Lepidium lasiocarpum* Nutt., and *Lesquerella gordonii* (Gray) Wats. The interdune spaces were generally devoid of vegetation. The ascocarps were discovered 2–5 cm below the soil surface in and around recent rodent digs located in the interdune areas. Dried specimens were subsequently discovered on the soil surface (April 10, 1985) in the ecotone between the *Larrea tridentata* (DC.) Cov. and the *Bouteloua eriopoda* (Torr.) Torr. vegetation zones of the Jornada Long Term Ecological Research site, located on the New Mexico State University college ranch, 15 km north of the original collection area.

Ascocarps (FIG. 1) were subglobose, ovoid to irregular (0.5–2.1 × 0.8–2.0 cm diam), cream to honey yellow in color, and produced singularly and in clusters. Glebal mass was white when immature becoming yellowish brown with the maturation of the fertile pockets of asci. Flesh of mature specimens turning yellow when cut, otherwise remaining white at maturity. Dried specimens found on the soil surface were as described by Trappe (1979).

The genus *Carbomyces*, which consists of 3 species (Trappe, 1979), is known only from the deserts of southwestern United States. *Carbomyces emergens* was originally described from material collected at Carlsbad, New Mexico (Gilkey, 1954). In her description, Gilkey (1954) stated that ascocarps occurred epigeously or hy-

pogously in sandy soil under shrubs in New Mexico and California. In his monograph of the hypogeous ascomycetes, Trappe (1979) indicated, however, that there was only indirect evidence that *Carbomyces* developed hypogously. The collection reported here is the first documented account of *Carbomyces* developing below ground and the apparent mycophagy of the fruitbodies by rodents.

The ingestion of hypogeous sporocarps by rodents is a well known occurrence (Maser *et al.*, 1978; States, 1983). States (1984) indicated that the prevalence of hypogeous fungi in the arid coniferous forests of the southwestern United States was due in part to the widespread consumption of their sporocarps by squirrels and other rodents. Although there is no direct evidence, considering the time of year and location where the ascocarps of *C. emergens* were collected, *Spermophilus spilsoma*, the spotted ground squirrel (Wood, 1969), could be responsible for digging up the fruitbodies.

Since the original collection of *C. emergens* was a fortuitous event, the length of the fruiting period is unknown. Attempts to collect the ascocarps in succeeding weeks from rodent digs were unsuccessful, suggesting that late March may be the end of the fruiting period in this region. It is likely that ascocarps may be produced in the northern Chihuahuan Desert during late winter (January–March) since soil moisture levels are high during this period.

Hypogeous ascomycetes are generally presumed to form ectomycorrhizal associations with perennial hosts (Miller, 1982). Awamah *et al.* (1979) reported, however, that four species of desert truffles from Kuwait (*Terfezia bouldieri*, *T. clovergi*, *Tirmania nivea*, and *T. pinoyi*) formed a specific type of mycorrhizae with two annual species of *Helianthemum*. Although there is no direct evidence that *Carbomyces* forms my-

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FIG. 1. Ascocarps of *Carbomyces emergens*. Scale bar = 1.0 cm.

corrhizae, studies of the ecology of hypogeous ascomycetes from deserts in north Africa and west Asia (Alsheikh and Trappe, 1983a, b) suggest that *C. emergens* is probably symbiotic.

Specimens have been deposited in the herbarium of Oregon State University.

Key Words: *Carbomyces*, hypogeous ascomycete, Chihuahuan Desert.

LITERATURE CITED

- Alsheikh, A. M., and J. M. Trappe. 1983a. Taxonomy of *Phaeangium lefebvrei*, a desert truffle eaten by birds. *Canad. J. Bot.* **61**: 1919–1925.
- , and ———. 1983b. Desert truffles: the genus *Tirmania*. *Trans. Brit. Mycol. Soc.* **81**: 83–90.
- Awameh, M. S., A. M. Alsheikh, and S. Al-Ghawas. 1979. Mycorrhizal synthesis between *Helianthemum ledifolium* and *H. salicifolium* and four species of the genera *Terfezia* and *Tirmania* using ascocarps and mycelial cultures obtained from ascospore germination. *Fourth North American Conference on Mycorrhizae*, Abstract no. 23. Colorado State University, Fort Collins, Colorado.
- Gilkey, H. M. 1954. Tuberales. *North Amer. Flora Series* **2**(1): 1–36.
- Maser, C., J. M. Trappe, and R. A. Nussbaum. 1978. Fungal–small mammal interrelationships with emphasis on Oregon coniferous forest. *Ecology* **59**: 799–809.
- Miller, O. K. 1982. Taxonomy of ecto- and ectendomycorrhizal fungi. Pp. 91–102. *In: Methods and principles of mycorrhizal research*. Ed., N. C. Schenck. The Amer. Phytopathol. Soc., St. Paul, Minnesota.
- States, J. S. 1983. New records of hypogeous ascomycetes in Arizona. *Mycotaxon* **16**: 396–402.
- . 1984. New records of false truffles in pine forests of Arizona. *Mycotaxon* **19**: 351–367.
- Trappe, J. M. 1979. The orders, families, and genera of hypogeous ascomycotina (truffles and their relatives). *Mycotaxon* **9**: 297–340.
- Wood, J. E. 1969. Rodent populations and their impact on desert rangelands. *New Mexico State Univ. Agric. Expt. Stat. Bull.* **555**. 17 p.