= Urnula craterium =

Urnula craterium is a species of cup fungus in the family Sarcosomataceae . It is parasitic on oak and various other hardwood species ; it is also saprobic , as the fruit bodies develop on dead wood after it has fallen to the ground . Appearing in early spring , its distinctive goblet @-@ shaped and dark @-@ colored fruit bodies have earned it the common names devil 's urn and the gray urn . The distribution of U. craterium includes eastern North America , Europe , and Asia . It produces bioactive compounds that can inhibit the growth of other fungi . The asexual (imperfect) , or conidial stage of U. craterium is a plant pathogen known as Conoplea globosa , which causes a canker disease of oak and several other hardwood tree species .

= = History and taxonomy = =

Urnula craterium was first described in 1822 by American botanist Lewis David de Schweinitz as Peziza craterium , based on a specimen found in North Carolina . The species first appeared in the scientific literature under its current name when Elias Magnus Fries described the new genus Urnula in 1849 , and set Peziza craterium as the type species . In 1896 , German mycologist Heinrich Rehm removed the species from Urnula ? transferring it to the genus Geopyxis ? and replaced the type species with Urnula terrestris , a peripherally related species . This restructuring resulted in a taxomically untenable situation in which the genus Urnula consisted of a single species with ambiguous resemblance to the original species (described by Fries) upon which the genus was based . According to Elsie Kupfer , who had written Rehm to clarify the rationale for his decision :

Urnula craterium was placed with its related species under Geopyxis , because Geopyxis was established by Persoon before Urnula by Fries ; and that in order to retain the genus Urnula , under which Saccardo had placed Podophacidium terrestre of Niessl , he (Rehm) restricted the genus to this latter fungus .

As Kupfer explains , Rehm did not justify why he believed Urnula craterium should be allied to Geopyxis , or why Podophacidium terrestre should be considered an Urnula . Kupfer 's macro- and microscopic analysis of tissues from these and related genera clearly showed the inconsistency in Rehm 's taxonomical choices , and that Urnula craterium represented an entirely different genus not related to Geopyxis ; Fries 's naming was restored .

The genus name means " little urn " ; the specific epithet is derived from the Latin cratera , referring to a type of bowl used in antiquity to mix wine with water . It is commonly known as the devil 's urn and the gray urn .

= = Description = =

The fruit bodies begin from dense , black mycelium on the surface of oak branches in contact with the ground . Starting out as rolls of cylindrical tissue 1 or more centimeters long and 3 ? 4 mm wide , they expand slowly over the winter , and grow rapidly in the spring when the weather becomes warmer .

The goblet @-@ shaped fruit body (technically an ascocarp) is 3 ? 4 cm (1 @.@ 2 ? 1 @.@ 6 in) in diameter and 4 ? 6 cm (1 @.@ 6 ? 2 @.@ 4 in) deep ; initially it is closed , but opens as it matures , leaving a ragged or smooth inrolled margin around a round opening . The flesh of the ascocarp walls is tough and initially gelatinous , later becoming leathery . The exterior of the ascocarp is brownish black to black , with a velvety surface , while the interior spore @-@ bearing surface , the hymenium , is brownish black in color , usually somewhat paler than the outside . The outer surface may be partially covered with small flakelike patches of tissue . When viewed with a magnifying glass , the " hairs " (fungal hyphae) making up the outer velvety surface are variable in length , and are thick @-@ walled , blunt , and appear to wind from side to side (flexuous) . The ascocarp is connected to a stalk that is typically 3 ? 4 cm (1 @.@ 2 ? 1 @.@ 6 in) long by 0 @.@ 4 ? 0 @.@ 8 cm (0 @.@ 2 ? 0 @.@ 3 in) thick , with black mycelia at its base .

= = = Microscopic features = = =

The spores are ellipsoid or sausage @-@ shaped (allantoid) , smooth , and thin @-@ walled . They are non @-@ amyloid (not taking up iodine stain) , and hyaline (translucent) , with dimensions of 22 ? 37 by 10 ? 15 µm . The spore @-@ bearing cells , the asci are eight @-@ spored , cylindrical , and measure 600 by 15 ? 17 µm . They are operculate , analogous to having a flip @-@ top lid mechanism to release the spores . Interspersed among the asci are thin , filamentous , branched paraphyses that extend beyond the tops of the asci .

Viewed with a microscope , the wall of the apothecium is made of three tissue layers of roughly equal thickness . The first layer of tissue is black , leathery and compact , and covered with a fine layer of brownish @-@ black hairs (a tomentum) ; the second layer consists of loosely interlaced brown hyphae suspended in a gelatinous matrix . The third layer is the fertile , spore @-@ bearing surface , the brownish @-@ black hymenium .

= = = Imperfect state = = =

The life cycle of Urnula craterium allows for both an imperfect (making asexual spores , or conidia) or perfect (making sexual spores) form ; as has often happened in fungal taxonomy , the imperfect form was given a different name , because the relationship between the perfect and imperfect forms of the same species was not then known . The imperfect stage of Urnula craterium is the plant pathogenic species Conoplea globosa , known to cause a canker disease (Strumella canker) of oak and several other hardwoods .

= = = Edibility = = =

This species is often listed in field guides as inedible , or not recommended for consumption due to its tough texture . Michael Kuo , in his 2007 book on edible mushrooms , lists the taste as " mediocre " , and comments " the devil 's urn is not as bad as I thought it was going to be . It 's not good , mind you , but it would be possible to eat it with a forced smile if your Aunt Wanda served it to you . "

= = = Similar species = = =

The cup fungus Plectania melastoma is also black , but it is smaller and the cup not as deep .

= = Spore development = =

The spores of U. craterium have a rapid and high percentage of germination . Germination requires only 1 @.@ 5 hours , a relatively short time compared to another inoperculate species in the same family , Sarcoscypha coccinea , which requires 48 hours . Furthermore , germination is possible under a wide temperature range , from 5 ° C (41 ° F) to 35 ° C (95 ° F) , and wide soil pH range ; the quality and quantity of light does not affect germination , although prolonged exposure to light does reduce germination efficiency .

= = Ecology , habitat and distribution = =

Urnula craterium grows singly or clustered together , usually attached to sticks and branches (especially oak) that are partially buried in the ground . The teleomorph state is saprobic , and decomposes hardwood ; the anamorph state is parasitic , and causes a canker of various hardwoods , including oaks , hickories , basswood and beech . The is often found in deciduous forests , although it is sometimes inconspicuous due to its dark color , and because it may be partially covered with leaf litter . One of the first fleshy fungi to appear from March to May , U. craterium has been dubbed a " harbinger of spring " , and is sometimes encountered under melting

snow .

The distribution of U. craterium includes eastern North America , Europe (including the Czech Republic , Finland , Spain ,) Japan , and China . It is red @-@ listed as critically endangered in the Czech Republic .

= = Bioactive compounds = =

Urnula craterium , when grown in liquid culture , produces bioactive chemicals that inhibit the growth of other fungi that are pathogenic to aspen ; specifically , these chemical are antagonistic to aspen blue @-@ stain fungi Ophiostoma crassivaginatum and O. piliferum , as well as the wood @-@ decay fungus Phellinus tremulae . Chemicals produced by U. craterium include pestalotin , 5 @,@ 6 @-@ dehydropestalotin , 4 @-@ methoxy @-@ 3 @,@ 5 @-@ dimethyl @-@ pyran @-@ 2 @-@ one , and (4S) -3,4 @-@ dihydro @-@ 4 @,@ 8 @-@ dihydroxy @-@ 1 (2H) -napthalenone . However , none of these isolated compounds inhibits the aspen pathogens in vitro , suggesting the true nature of the antifungal mechanism in the devil 's urn has not yet been resolved .