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SECOTIUM AGARICOIDES, A STALKED PUFFBALL<sup>1</sup>.

BY HENRY S. CONARD.

Last autumn a considerable number of specimens of that odd fungus, *Secotium agaricoides*, were brought to our laboratory. It seems desirable to record the following observations:

*Secotium* was found in October (1911) in three localities. One was a potato field in Marshall silt loam soil, which was then occupied by a crop. The fungus was confined to an area of about thirty feet in diameter. Another patch about six feet in diameter was near the edge of low timber, on ground that had been cleared during the preceding winter, but had long been more or less browsed and trampled by cattle, horses and hogs. The particular spot occupied by the fungus appeared to have had some brush burned over it. The third spot was in an open grazing pasture in a valley. The fungi occupied an area about ten feet in diameter. The field was lightly grazed by cattle, and largely overgrown with ragweed (*Ambrosia artemisiaefolia*). The two latter localities are on the Miami silt loam.

Specimens from the first locality vary from 55 mm. to 24 mm. tall by 53 mm. to 25 mm. in diameter. Mostly more or less globular in shape, many are depressed, and a few elongate or even umbonate. The proportions run about thus:

Height.	Width.	Proportion of height to width.
55 mm.	41 mm.	1:0.74
54	51	1:0.94
25	42	1:1.68
29	37	1:1.27
Av. of 20—39.1	39.9	1:1.02
Mean—35.58*	39.17†	1:1.10

Most of the specimens were sessile, but a few are prolonged below into a tapering stipe, buried in the ground. The surface of some is smooth, of others squamose. As the larger and older ones are squamose, this is probably the normal mature condition. The surface is white when young, becoming dull brownish with chestnut brown scales. None of these specimens had dehisced, but many had the peridium loosened from the stipe at base. There was evident in some specimens a tendency for the columella to become slender in the middle of the fungus, and even to disappear.

The other two localities are within about a quarter of a mile of each other. Both were found on the same day, and the collections were not kept separate. These specimens show variations in size and shape about as described above. For example:

Height.	Width.	Height:Width.
73 mm.	42 mm.	1:0.57
67	32	1:0.48
45	44	1:0.98
22	38	1:1.73
Av. 20—46	42.25	1:0.92
Mean—45.16*	39.42†	1:0.87

<sup>1</sup>*Secotium agaricoides* (Czern) Holl.=*C. Warnei* Peck.

\*Average of 7 measurements between 30 and 40 mm.

†Average of 23 measurements between 30 and 50 mm.

These specimens tend to a taller form than the former lot, as shown both by measurement and by general appearance. Several were distinctly umbonate at top. One specimen had dehisced by breaking loose of the peridium from the stem at its base; the peridium then split into segments and spread irregularly. Another had dehisced by breaking open at the apex of the stalk, followed by splitting and spreading of the peridium. In both the process was very irregular, and may have been due to injury. None of the others had dehisced at all. Some specimens in this lot had the trama more or less suppressed on one side of the columella—in one case completely so—thus tending toward a continuous spore-bearing mass without columella.

The spores are olive brown in color when seen in mass. They are oval in shape, and measure 0.005 mm. by 0.007 mm. They have smooth thick impervious walls. They are borne in fours, on rather long slender sterigmata, upon clavate basidia, which at maturity are 0.006 mm. in diameter, and about 0.022 mm. long.

The interior of this fungus can only be described as intermediate between a puffball and a mushroom. A stalk, (columella) which is either stuffed or hollow (to use mushroom terminology) runs vertically up the center of the body and joins the peridium. At base the stalk is often prolonged into the ground as in *Collybia radicata*. From the peridium, which is thick and fleshy, many anastomosing and crumpled gills extend toward the stalk. Most of these do not actually join the stalk, though their basidia are closely pressed against it. But some are actually confluent with the stalk. As Macbride has said, one would take the object for an abortive or unopened agaric. Sections of young specimens are remarkably like sections of a button mushroom. But the spore mass has a color such as is seen only in puffballs.

Secotium may be regarded as a morphological intermediate between the agarics and gasteromycetes. It is a most important form as helping one to understand the relation of these two groups. It may be regarded as a mushroom arrested in the button stage, but with a complicated gill system. Let the stalk be suppressed, or invaded by hymenial growth—as actually happens in some of our specimens—and we have a real puffball. Now if the framework of the gills is reduced until only cottony fibres remain, we should have a *Lycoperdon*.

We must not, however, assume that *Secotium* is really an ancestral form. It simply shows some of the possibilities of the knob of fungus "meristem" which forms the first stage of all the higher fleshy fungi.

\**Secotium agaricoides* (Czern.) Holl.=*C. Warnei* Peck.

\*Average of 6 measurements between 40 and 50 mm.

†Average of 24 measurements between 30 and 50 mm.