1925

Some Amanitas from Eastern Iowa

G. W. Martin

State University of Iowa
SOME AMANITAS FROM EASTERN IOWA

G. W. MARTIN

Amanita is a striking and clearly marked genus of the Agaricaceae or gill fungi, characterized by hyaline spores which are white in mass, and by the possession of both an annulus and a volva. The volva, or cup at the base, is composed of the remnants of the outer or universal veil, a tissue which surrounds the young sporophore in the button stage and which is broken when the stipe elongates. When the pileus is fully expanded the volva may remain as a loosely sheathing, cuplike structure at the base of the stipe; or the lower part may be left firmly appressed to the usually bulb-like base of the stipe while the upper part remains on the pileus in the form of warts or patches on top of the cap; or it may be of a mealy, friable nature, crumbling into pieces around the base of the stipe and collected only with difficulty. The annulus represents the remnants of the inner or partial veil, which covers the gills in the younger stages and remains, after the pileus expands, as a more or less well-marked membranous ring around the stipe. In rare cases the inner veil is torn away from the stem as the cap spreads out, and then hangs as patches and fragments from the gills and edge of the cap. The gills are either free from the stipe or reach it by a thin line.

The genera most resembling Amanita are Amanitopsis, which has a volva but no annulus, and Lepiota, with an annulus but lacking a volva. All are white spored, with mostly free gills, and all include species which are large and striking, as well as common in Iowa.

The chief interest in the Amanitas is due to the fact that some of the species are among the most poisonous plants known. The overwhelming majority of the deaths and serious illnesses due to mushroom poisoning may be traced to species of Amanita, and for this reason no amateur should attempt to eat any Amanitas, even though a few species are known to be excellent. None of the species of Amanitopsis are known to be poisonous, and only two or three of the Lepiotas are poisonous, but because of the danger of confusing Amanita with species belonging to the two related genera, extreme caution should be used in collecting any of these forms for table use.
In his papers on the saprophytic fungi of eastern Iowa, Macbride (5) describes five species of Amanita as occurring in the state, namely, *A. muscaria*, *A. verna*, *A. phalloides*, *A. virosa* and *A. pantherina*. Several additional species have been collected during the past two seasons, and other species, not yet reported from the state, occur in neighboring states in such situations as make it seem certain that they must occur in Iowa. The preparation of a complete account of this important genus as it occurs in this state is greatly to be desired, but the material at hand at the present time does not warrant this. It is with the hope that interest may be stimulated and wider collections made that this preliminary account of some of the Iowa species is presented.

A great deal has been written on this genus. The most valuable works for the American mycologist are those of Coker (2) and Kauffman (4). Murrill’s treatments of the genus (6, 7, 8), under the name Venenarius, are also useful, and present a contrasting view of the taxonomy. In addition to these, the standard European works of Cooke (3) and Ricken (9) have been consulted in the preparation of this paper, as well as the original descriptions of the species concerned, so far as they have been available.

The specimens studied have all been collected within twenty miles of Iowa City, and most of them are now in the mycological herbarium of the State University. Unfortunately, it has been impossible to examine the older collections upon which Macbride’s accounts were based, and the comments upon his determinations are subject to this very serious limitation.

The spores, as already stated, are white in mass; colorless as seen under the microscope. In shape, they are spherical or oval, each with a marked apiculus. In some species, each spore contains, as a rule, a single large guttule; in others the contents are granular, and these features have a certain taxonomic value. The surface is described as smooth, and is, in all the specimens here reported upon. A single specimen, not identified, but apparently close to *A. spreta*, not here included in the list of Iowa species, had when freshly collected strongly reticulate spores. Mounts from the dried specimen showed only the smooth ovate spores of the ordinary Amanita type.

The taxonomic value of spore characters in this genus seems to have been overemphasized. Coker’s Illustrations of the spores show striking variations in the size and shape of the spores from different individuals of the same species, and this same variation
has been observed in the case of the species collected in Iowa, as is noted more particularly in connection with the remarks on the individual species. Beardslee, cited by Murrill (6), found the spores of \textit{A. cothurnata} in America and \textit{A. paterina} in Europe, which he regards as the same species, to be globose in fresh specimens, changing to oval after the dried plants have been kept for several weeks. Buller (1) cites observations of Hanna on spores of \textit{Coprinus sterquilinus}. The average length of spores from different fruit bodies, each derived from a monosporous culture, varied from 15 \(\mu\) to 22 \(\mu\). Obviously, the shape and size of spores is of limited value in determining species, in cases where they are so variable.

The following provisional key to the Iowa species includes all species previously reported from Iowa with the exception of \textit{A. pantherina} (in which case it is assumed that the form so reported is what is here called \textit{A. cothurnata}), whether represented in the recent collections or not; all species not heretofore reported, but represented by the recent collections and identified beyond reasonable doubt, and two species not yet reported from the state so far as is known, but quite probably occurring within its limits. It is known to be incomplete, as several additional species have been collected, but not identified. In most of these cases the collections have been scanty. Some of them are represented by specimens or notes in the herbarium of the State University; of some no record is available. It seems desirable to defer complete descriptions of the species recognized for a later, and it is to be hoped fairly complete account of the genus as it occurs in Iowa, but brief mention of some of the distinctive features of the species noted is here given. In the preparation of the key, Kauffman's treatment has been found most useful, and where the nomenclature varies, his judgment is accepted.

**KEY TO IOWA SPECIES OF AMANITA**

Volva membranous, cup-like, free from the bulbous base of the stipe...1
Volva otherwise...4

1. Pileus deep yellow to orange, striate on margin, glabrous, gills yellow, 1. \textit{A. caesaria}^1
2. Pileus olive, varying to umber or smoky, gills white...2. \textit{A. phalloides}
3. Pileus white...2

2. Pileus pure white, conical at first; inner veil adhering to gills on edge of pileus, hence annulus lacking or shredded...3. \textit{A. virosa}
3. Pileus at first convex to subcampanulate, annulus well developed...3

4. Sporophore robust, pure white, basidia 4-spored, annulus thick...4. \textit{A. verna}
3. Sporophore slender, pileus often yellowish on disk, basidia 2-spored; annulus rather thin
4. Pileus orange or yellow
5. Pileus neither orange nor yellow
6. Flesh of stem changing to reddish when bruised or old, color rather dull, often brownish
7. Flesh of stem not turning red, color usually bright
8. Stem slender; volva breaking up into irregular flocculent yellow masses on bulb and pileus
9. Entire sporophore becoming reddish when bruised or with age
10. Sporophore not turning reddish
11. Pileus straw yellow to umber, with greenish tints, and bearing irregular pinkish patches of the veil; volva with narrow free margin, often lobed
12. Pileus grayish white, dull yellow or smoky on disk; volva attached except for close-fitting rolled margin
13. Sporophore white to grayish, stout, with pronounced bulb and long, tapering root

1. *Amanita caesarea* Fries

One of the largest of all mushrooms, the cap, under favorable circumstances attaining a diameter of a foot. Known by its smooth, strongly striate, yellow to orange pileus and the pale yellow gills, stem and annulus. This is a southern species, not yet reported from Iowa, but as it occurs in Minnesota, it is probably to be included in our flora.

2. *Amanita phalloides* Fries

This is the typical representative of a group of closely allied species, all of which are equally poisonous, and which are more or less confused with each other in the literature. According to Kauffman, this species is especially characterized by its loose, cup-like volva; its umber-brown to smoky olive, glabrous pileus, which is viscid when moist; its ample, pendant, white annulus and its spherical ovate spores. It is reported by Macbride but has not been identified in the recent collections, and from his description, I think it probable that Macbride's specimens represent forms here referred to *A. bisporigera*. Both Coker and Atkinson (1) recognize forms of *A. phalloides* having no free volva or a very shallow free ring at the top of the bulb. Kauffman puts such forms in *A. mappa* and I am inclined to follow him in this respect, especially since the Iowa specimens so referred differ very

---

1 Not reported from Iowa, but probably occur.
distinctly from typical specimens of *A. phalloides* which I have collected elsewhere. Except for the somewhat more ample volva, Cooke's illustration of *A. phalloides* (his Fig. 2) is strikingly similar to what I have called *A. mappa*, even to the flesh-colored fragments on top of the pileus. The typical form of *A. phalloides* is to be expected in Iowa, and it will be strange if it is not found to occur.

3. *Amanita virosa* Fries

Similar to *A. phalloides* in most respects, but differing in its pure white color, in the conical shape of the cap, and in the fragile character of the veil, which is often separated from the stipe as the pileus expands, becoming torn into fragments which remain attached to the gills and the edge of the pileus. Reported by Macbride, but not recognized in the recent collections.

4. *Amanita verna* Fries

A robust, pure white species, differing from *A. virosa* in the rounded pileus when young, and in the ample white, rather thick, pendant volva. These characteristics are well shown in the accompanying illustrations (Figs. 1-3). Reported by Macbride as rather rare. It has been rather common in the vicinity of Iowa City during the past two seasons, appearing in late summer and fall. The basidia are four-spored as a rule, but the occurrence of 1-, 2-, and 3-spored basidia scattered among the others is not unusual. The spores from different individuals vary in shape from almost globose to distinctly elliptical. The globose spores average 7-8 µ in diameter, the largest oval spores measured were 9-11x6-7.5 µ.

5. *Amanita bisporigera* Atkinson

Much like *A. verna* in character of pileus, annulus, volva and spores, but differing in its regularly 2-spored basidia and in its distinctively slender habit. The pileus is often yellowish or smoky on the disk. Murrill (9) regards this species as synonymous with *A. phalloides*; Coker reduces it to a form of *A. verna*. It is one of the two commonest species in Johnson County, and has frequently been collected in the same woods as *A. verna*, although never in very close proximity to that species. The illustration (Fig. 3) well brings out the difference in habit between the two species although *bisporigera* is usually considerably larger than the specimen photographed. The 2-spored basidia alone would scarcely seem to warrant specific separation, but the habit, while difficult to express in taxonomic terms, is so constant and striking.
as to leave no doubt that we are here dealing with two distinct species, in any reasonable sense of the term. Numerous field collections have shown no intermediate forms, both *A. verna* and *A. bisporigera* being easily recognizable at a glance.

The spores in all specimens studied are globose to broadly elliptical, usually 7-8 µ in diameter. Giant spores, often more or less flattened, are not uncommon.

6. *Amanita mappa* Fries

A medium sized form with pileus, in our collections, varying from sordid yellowish to greenish straw color, nearly always greenish on the disk. The viscid pileus often bears irregular flakes or patches of the volva, which are notably flesh colored in the fresh specimens. The annulus is dull white. The base of the stem is enlarged abruptly into a bulb, to which the often pinkish or brownish volva is closely appressed, except for a narrow and rather irregularly lobed margin. The spores are uniformly globose, 7-8.5 µ in diameter. In coloring, our specimens agree very closely with Cooke's illustration of *A. phalloides* (Pl. 2), but differ in the character of the volva. It would not be difficult to refer them to that species. The flesh colored fragments on top of the pileus seem to be quite characteristic.

7. *Amanita muscaria* Fries

Known by its bright yellow to orange yellow cap, covered with rather regular whitish to pale yellow warts. The annulus is large, thick and white. The volva is in the form of a scaly bulb, above which usually occur several scaly rings. A pale form is said to occur, also a dwarf form.

Macbride describes this species as not rare although usually small. But one specimen is represented among the recent collections; a single small but otherwise typical fruiting body, collected in open pastured woods at North Liberty. The spores are subglobose and 6-8x5-7 µ, somewhat smaller than the dimensions as given by Coker and considerably smaller than those given by Kauffman.

8. *Amanita cothurnata* Atkinson

A medium sized to fairly large form with whitish, viscid pileus, dull yellow or smoky on the disk, and covered with white or dingy yellowish pyramidal warts. The base of the stipe is swollen into a rather abrupt oval or spherical bulb, to which the close-fitting volva is firmly attached except for a shallow rim with a distinctly rolled edge. This species is closely related to if not identical with
A. pantherina of Europe, and is evidently the form reported by Macbride under that name as "rather rare." We have found it to be rather common in the vicinity of Iowa City. Kauffman describes the spores as globose, 8-9µ in diameter; Coker states that they are elliptic, mostly 9.7x7.4µ. The spores found in our specimens agree very closely with Coker's measurements. We have found that this species poisons flies, which fact is also noted by Murrill (7).

9. Amanita solitaria Fries

This is a large and robust, dull white species, with large, pyramidal warts on the pileus, and smaller ones on the bulb. Below the bulb the stem is prolonged into a striking root-like base. Not known from Iowa, but reported from Minnesota and probably occurs in this state.

10. Amanita rubescens Fries

A large, and in spite of its dull colors, a handsome species, the entire mushroom varying from pale cinnamon buff to a rich mahogany shade when old (Fig. 5). All parts of the basidiophore turn dull red when handled or broken. The pileus is covered with soft, pale reddish warts, the annulus is very large and at first white, becoming tinged with red. The base of the stem is swollen into a conspicuous bulb with which the bulk of the universal veil is merged, so that the volva is evanescent or lacking. The spores are elliptical, 6.5-8x5-6µ in our specimens, somewhat smaller than reported by Coker and Kauffman.

This species is common in the vicinity of Iowa City. It is reported as edible. I have eaten it and find it good, but not sufficiently unusual in flavor to warrant making an exception to the good rule of avoiding the entire genus for food.

11. Amanita flavorubescens Atkinson

Pileus yellowish to brownish, often covered with powdery or floccose chrome-yellow fragments of the friable volva. The rather long, often somewhat tortuous stipe is bulbous at the base and slowly turns reddish when bruised, especially below. Coker gives the spore measurements as 6.6-7.8x4.4-4.8µ; Kauffman as 8-10x-6-8. I find them in one specimen to be 7.5-9x5.5-7µ.

This species is rather common in the vicinity of Iowa City.

12. Amanita flavoconia Atkinson

With A. bisporigera, one of the two commonest Amanitas in Johnson County. The entire basidiocarp is tinged more or less
with yellow (Fig. 6). The pileus is of medium size, viscid, chrome yellow to orange yellow, at first covered with numerous yellow flocculent masses of the universal veil, later often bare. Stem slender, yellowish; somewhat floccose. Annulus yellowish. Volva in the form of loose chrome yellow pulverulent masses which tend to remain in the ground when the mushroom is collected. This is the species described and illustrated by Coker as *A. frostiana*, which is regarded by Kauffman as an entirely different form. *A. frostiana* in Kauffman's sense is not known to occur in Iowa.

The spores in our specimens are oval or rarely subglobose, usually about 7-9x5-6.5 µ. Giant spores are not uncommon.

The species has been regarded with suspicion, as probably poisonous. I ate a small piece of the stipe, approximately one-third of a cubic centimeter in size, at about eleven o'clock in the morning. I felt no ill effects during the afternoon or night and had forgotten about it the following day. About noon the next day I began to be troubled with a headache, which increased in severity and was accompanied by a slight nausea until eight o'clock, when I went to bed. The symptoms had entirely vanished by ten o'clock. I am not addicted to headaches and attribute this one to the small piece of mushroom eaten.

THE PRESERVATION OF AMANITAS

Amanitas retain many of their distinctive characters when carefully dried. Best results are secured by placing them on paper on a wire frame, supported a few inches over a steam radiator or hot air register. When the specimens have become flaccid, but before they become brittle, a light weight carefully applied will not only flatten them out so that they may be more conveniently preserved, but will actually improve their usefulness as herbarium specimens. Such specimens, when accompanied by accurate notes as to color, odor, measurements when fresh, description of habitat, and especially by careful drawings or good photographs, are almost always identifiable.

LITERATURE CITED

1. ATKINSON, G. F. Mushrooms, edible, poisonous, etc. Ithaca, 1901.

*State University of Iowa.*
EXPLANATION OF PLATES

PLATE I

Fig. 1. *Amanita verna.* As growing naturally.
Fig. 2. *Amanita verna.* Same specimen as in Fig. 1, two days later, when fully expanded.

PLATE II

Fig. 3. *Amanita verna* (left) and *A. bisporigera* (right) to show comparative habit, not size.
Fig. 4. *Amanita cothurnata.*

PLATE III

Fig. 5. *Amanita rubescens.*
Fig. 6. *Amanita flavoconia—* young.