

# Mayapple Rust Resurrection

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Here's an interesting plant to be on the lookout for this spring when you're searching the woods for morels. And it's associated with a pretty fungus too. But you'll have to get out your loupe (hand lens) in order to fully enjoy its beauty. The fungus is called mayapple rust, and you guessed it, this fungus is a pathogen of mayapple (*Podophyllum peltatum* L., family Berberidaceae), a very common springtime wildflower in the eastern woodlands of North America.

All eastern morel hunters should be familiar with mayapple, as it blooms just after the morels emerge, and they frequently occur in the same habitat (Fig. 1). The umbrella-shaped plant is an easy one to recognize and it takes its name from, presumably, the fact that the leaf resembles the toes on a foot (*pod* = foot; *phyllum* = leaf). The yellow,



Figure 2. Mayapple fruits, courtesy B. Bunyard.

lemon-like berry (Fig. 2) is absolutely delicious and safe to eat, although the entire rest of the plant is poisonous (mayapple is also known as “wild mandrake”). I'd argue that mayapple fruits are just about the best wild fruit in North America and it seems wildlife agree as they're hard to spot once they ripen during summertime; most are quickly gobbled up by other woodland residents!

It is during the summer when you notice the leaves of mayapple taking on a spotty or blotched appearance (Fig. 3), telltale signs of mayapple rust fungus. Turn over an infected leaf and you'll be impressed to see the striking orange aecial cup-like eruptions of this fungus (Fig. 4). If you look closely, you'll notice the bright orange aeciospores.

Mayapple rust fungus has long gone by the name *Puccinia podophylli* Schwein. *Puccinia* Pers. is the largest genus of the order of rust fungi, Uredinales, with

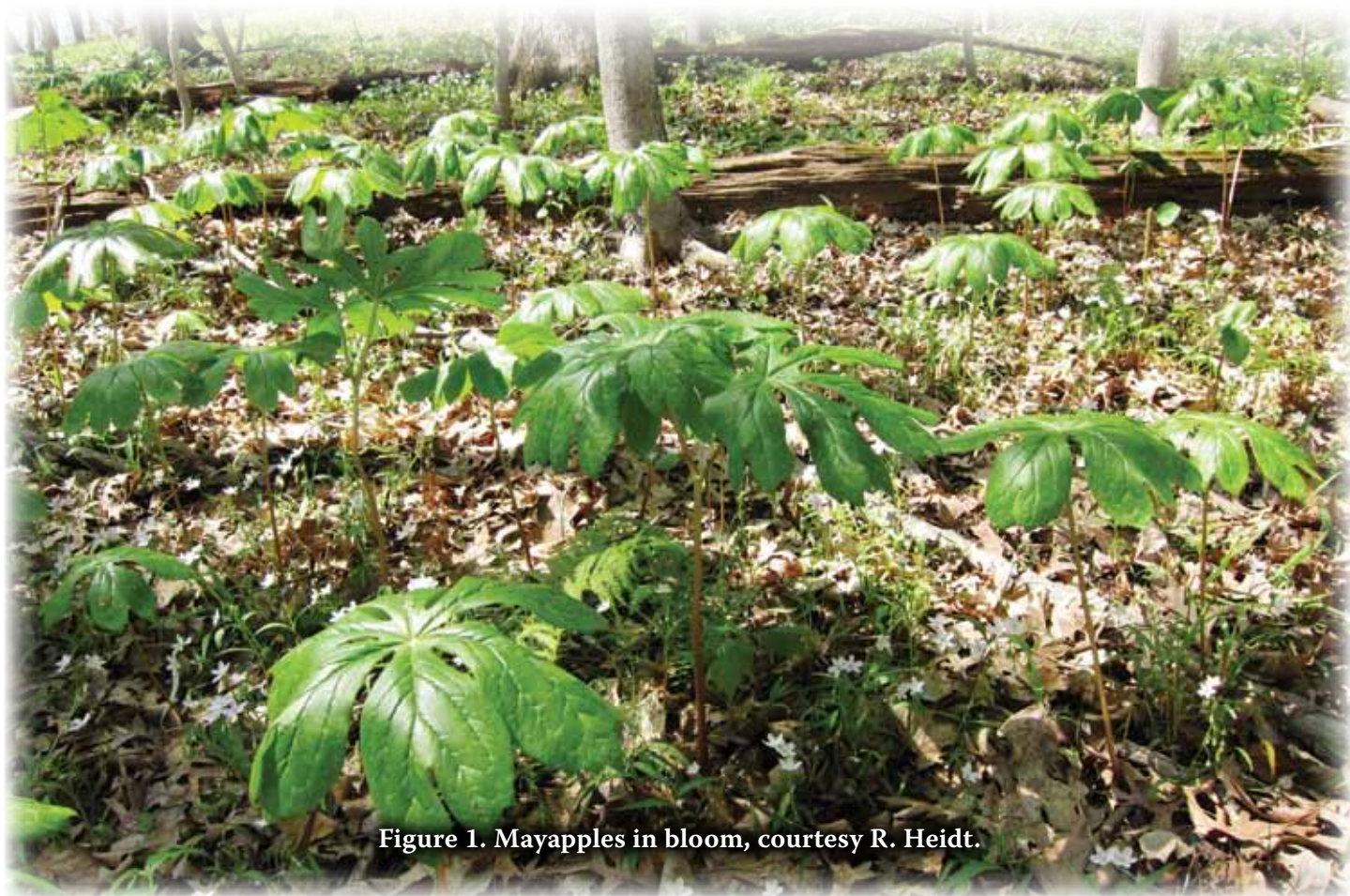


Figure 1. Mayapples in bloom, courtesy R. Heidt.





Figure 3. Infected mayapple leaves, courtesy P. Harvey.



Figure 4. Mayapple rust aecia close-up, courtesy R. Heidt.

about 3,000 to 4,000 species (Cummins and Hiratsuka, 1983). Historically (and for reasons of convenience), most rust species were either placed in *Puccinia* or *Uromyces* and scientists agree that these are artificial groupings, as many species aren't that closely related (Aime, 2006). Recently, Andrew Minnis and others determined that this was the case with mayapple rust fungus—it's only distantly related to large groups of species within the genus *Puccinia*.

Mayapple rust was first named *Puccinia podophylli* in 1822 by Schweinitz. In 1906, J.C. Arthur noted a number of morphological features of this fungus that were unique from *Puccinia* and so placed it in a newly

erected genus *Allodus*. Evidently the name never got much traction and it's remained *P. podophylli*. In their 2012 paper in the journal *Mycologia* Minnis et al. have resurrected *Allodus podophylli* as the accepted name for this species; their DNA sequence analysis of this species and dozens of other rusts, agree with Arthur's microscopic analysis of a century ago. Over the years, 41 other rust species have been assigned to *Allodus*, but it is unknown currently how many of these will form a monophyletic group and thus remain in the genus.

Rusts are some of the most fascinating fungi of all (for a review, see Cummins and Hiratsuka, 1983). Many of the more economically important (and

thus better studied) rust pathogens feature life cycles where five different reproductive stages produce spores from different parts of the host plant or plant debris. Many must pass, alternately, through two different plant host species to complete their life cycles (and knowledge of this has led to control of some serious pests). *Allodus* is distinguished from the majority of *Puccinia* species as it lacks host alternation and a uredinial stage in its life cycle.

#### Description

Spores: teliospores 2-celled, with long spines from both cells, cinnamon-brown, 1.5-2  $\mu$ m thick evenly around the two cells; aeciospore walls nearly hyaline,

verrucose; uredia lacking.

Diagnostic macroscopic feature: this is the only rust known on *Podophyllum*

Diagnostic microscopic feature: teliospores have distinctive spines

Nutritional mode: obligate parasite

Substrate: telia, basidia, aecia and spermatia on leaves of mayapple, *Podophyllum peltatum*

Habitat: woodland

Fruiting Season: spring, summer

#### References Cited

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- Minnis, A.M., McTaggart, A.R., Rossman, A.Y., and M.C. Aime. 2012. Taxonomy of mayapple rust: the genus *Allodus* resurrected. *Mycologia* 104(4): 942-950. ♣

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