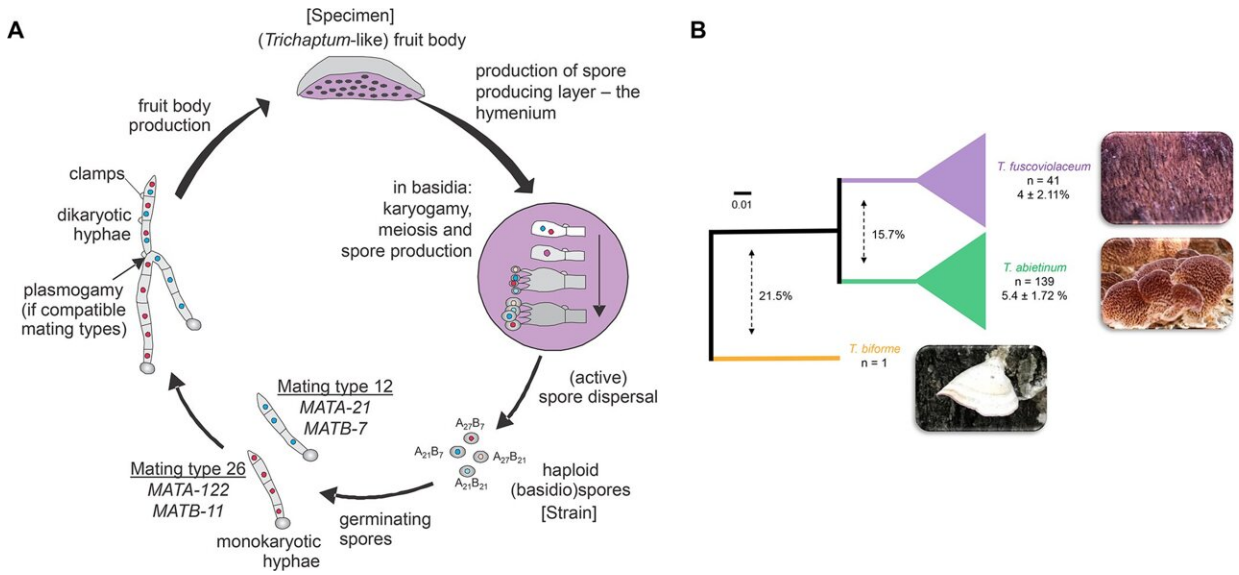
Trichaptum mushrooms found to have more than 17,000 gender alleles

April 21 2022, by Bob Yirka



Trichaptum abietinum and T. fuscoviolaceum are sister-species. A) Schematic representation of the Trichaptum life cycle. As an example, MATA and MATB types, generating two compatible mating types are indicated. A specimen was the original dikaryotic sample, i.e. TA[Number], isolated from the wild environment and stored in a national museum or in our laboratory. Strains were isolated from fruiting bodies and due to their monokaryotic character, we added an M[Number] to the specimen name, TA[Number]M[Number]. Strains are stored in our personal collection at -80°C. B) Schematic Neighbor-Joining (NJ) phylogenetic tree reconstructed using (100 –ANI)/100 values. ANI values go from 100% (identical genomes) to 0% (distinct genomes). In a format (100 –ANI)/100, these values represent divergence. Full NJ and ASTRAL phylogenetic trees can be found in S1 Fig and in iTOL: https://itol.embl.de/shared/Peris_D. The number of strains (n) and the average

(100 –ANI)/100 within species are indicated for each species clade. The L15831 genome is included increasing the T. abietinum collection to 139 strains. Dashed arrows indicate the average (100 –ANI)/100 of pairwise strain comparisons for the compared species. Colors highlight the species designation after the whole genome sequencing analysis. Credit: *PLOS Genetics* (2022). DOI: 10.1371/journal.pgen.1010097

A team of researchers with several members from the University of Oslo and one with the University of Michigan has found that Trichaptum mushrooms have more than 17,000 gender alleles. They have published a paper detailing their work on the open access site *PLOS Genetics*.

Trichaptum mushrooms, also known as shelf fungi, are quite common. They are often found growing on fallen logs or on trees in forests in many parts of the Northern Hemisphere. In this new effort, the researchers studied how such mushrooms reproduce.

Fungi in general reproduce through the creation of spores that are released by adult fungi. The spores float through the air and eventually land somewhere and grow into new fungi. Prior research has shown that reproduction and gender are controlled by regions of the fungi genome known as MATA and MATB and that two fungi can mate with one another only when these two regions differ from one another to a certain degree. In this new effort, the researchers studied the DNA of these two regions, looking specifically for variants (alleles). They note that little work has been done to study the two genome regions because they have such a rich diversity. But now, more advanced technology that is also easier to use makes such work possible.

The group began by collecting samples, some by themselves, some via contributions by colleagues. In all, they were able to gather 180

specimens from three species of Trichaptum. The researchers collected spores from each of the samples and allowed them to grow into adults as a means of studying the maturation process and to provide material for genetic testing. For such testing, they used long-read sequencing, which allowed them to identify the parts of the MATA and MATB regions that contributed to reproduction. It also allowed them to count the number of genetic variations they found, which added up to 17,550 unique combinations—an unusually high number for any organism.

The researchers suggest the high number of alleles helps to prevent inbreeding while also increasing the odds of two mushrooms residing in the same vicinity being able to reproduce.

More information: David Peris et al, Large-scale fungal strain sequencing unravels the molecular diversity in mating loci maintained by long-term balancing selection, *PLOS Genetics* (2022). DOI: 10.1371/journal.pgen.1010097