Significance of the spore mat in *Tuber*

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Conference paper presented at the 6th TAUESG Conference
26-28 August 2015, University of East Anglia, Norfolk, UK
Tuber aestivum/uncinatum European Scientists Group

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Keywords: *Tuber*, mitotic, spore, mats, reproduction

Abstract

In 2004 Urban et al. saw mitosporic spore mats being produced by *Tuber borchii* and *Tuber oligospermum*. A decade later Healy et al. (2013) saw spore mats associated with another species of *Tuber* and other Pezizales. Very extensive spore mats are also formed by *Morchella* during their cultivation (Xiong pers. comm.). This raises the question as to what these structures are, and whether they have not been seen in, for example, *Tuber aestivum*, because in most species of *Tuber* they generally form below the soil surface.

In New Zealand *T. borchii* spore mats have been seen on at least 3 sites, all during May (Southern Hemisphere) and at a time when precocious, immature truffles are often found. Indeed, truffles have been found not only adjacent to these spore mats but appear to be part of them. Furthermore the precocious truffles have a lumpy appearance which strongly suggests that they are a product of the spore mats.

Morcillo (2014) posed the question of whether *Tuber* was able to reproduce asexually. However, we suggest that Urban et al.'s first suggestion that they pose in their paper is in fact the more likely: "*Are the anamorphs hitherto overlooked states in the lifecycles of sexually reproducing Tuber species*, or are they the reproductive structures of mitotic lineages that have evolved from teleomorphic ancestors (holomorphic anamorphs)?" (quote from Urban et al. 2004). In other words the mitospores formed in the mats were acting as spermatia in truffle sexual reproduction as suggested by Healy et al. (2013).

In our talk we will show some recent photographs that illustrate the structures we have seen. If indeed the spore mats are an essential part of the life cycle of truffles then we must debate what we must do to first foster their production and then protect them so that truffles are produced and mature.

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6th TAUESG Conference, Norfolk, 26-28 August 2015

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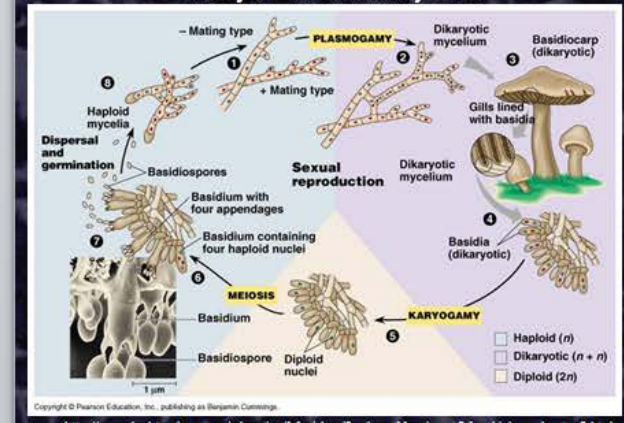
1

Fruiting in Basidiomycetes begins with a hyphal mat

2

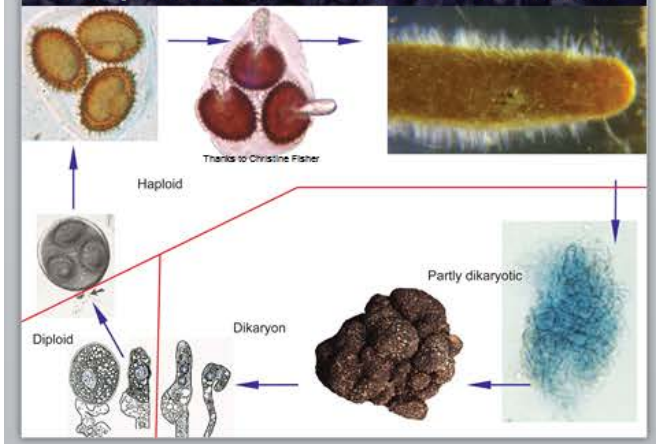
Life cycle of Basidiomycetes



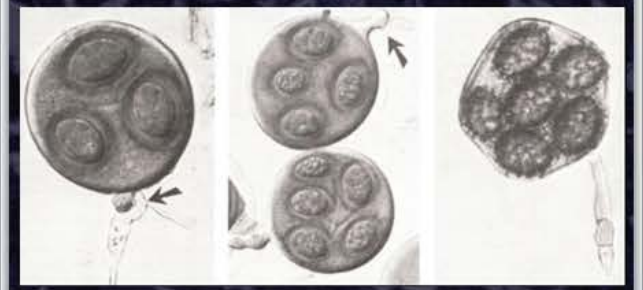
http://www.desktopclass.com/education/fafsc/classification-of-fungi-part-2-f-so-biology-chapter-8.html

3

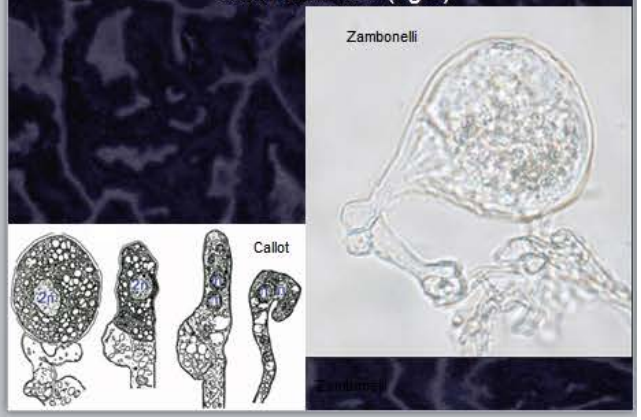
Life cycle of truffles – from our talk in Vienna, 2009



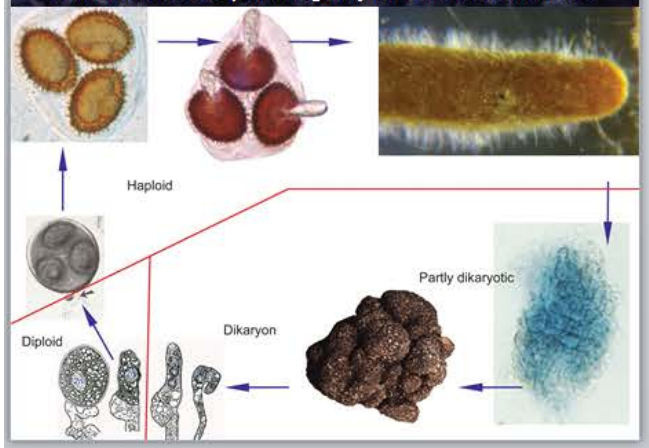
Crozier formation in *Tuber aestivum* (Minter 1985)



Croziers of *Tuber melanosporum* (left) and *Tuber aestivum* (right)

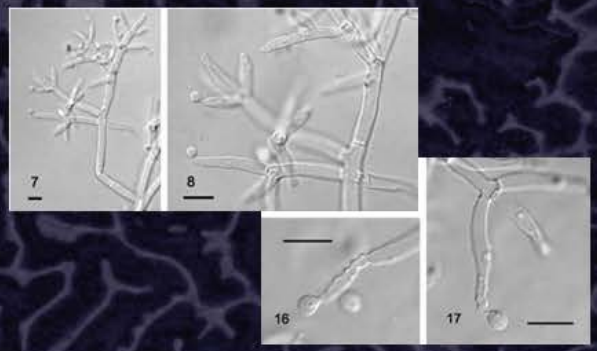


But where does plasmogamy occur in the truffles?



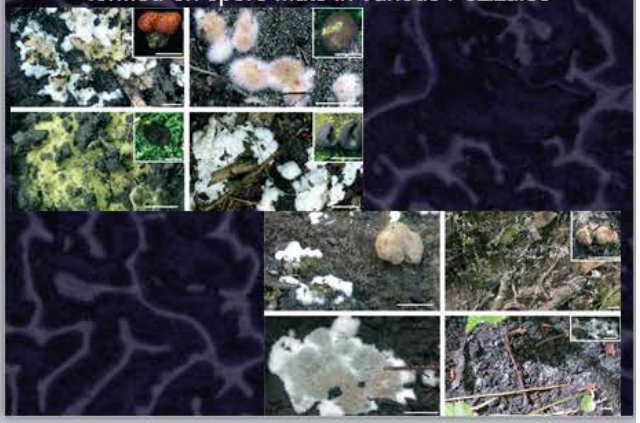
7

In 2004 Urban et al. saw small spores being produced on spore mats by *Tuber borchii*.



8

Healey et al. (2013) also saw small spores being formed on spore mats in various Pezizales

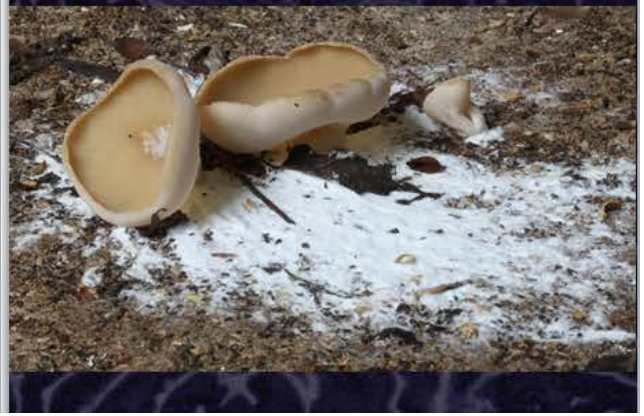


9

And Tedersoo *et al.* (2013) in *Pachyphloeus*

Here is *Chromelosporium fulvum the* anamorph of *Peziza ostrachoderma*

Here is another spore mat around *Peziza*



Cultivated *Morchella*, also a member of the Pezizales, produces massive spore mats. This one was 40 m long.

13

Here is a close-up showing mitospore production

14

Fruiting in *Morchella* begins a few weeks later

15

Greg Bonito and Ian also observed spore mats in *Tuber borchii* truffières in New Zealand – this one near Queenstown

This one near Nelson

These precocious, surface forming immature *T. dryophilum* truffles in New Zealand were also associated with spore mats

19

Spore mats formed by *Tuber brumale* - thanks to Michael Hyson

20

Healy et al. found that the mitospores produced by spore mats do not germinate. So Marcos Morcillo's (10 November 2014) suggestion they are involved in asexual reproduction seems unlikely.

Instead we think the only tenable conclusion regarding spore mats is the hypothesis posed by Urban *et al.* in 2004

The spores act as spermatia and are part of the sexual apparatus.

21

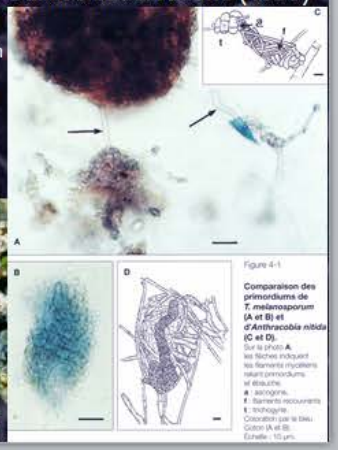
If the spore mats are so important in truffle production then we must learn how we can trigger their production in truffières

22

We must also reconsider Callot's observations (1999)

"An early stage in the formation of a *Tuber melanosporum* primordium with the fusion of a haploid antheridium and oogonium to form the dikaryon" (right)

Anthracobia nitida
www.sites.google.com/site/fungiparadise/ascomycota/pezizales/pyronemataceae/anthracobia-nitida-boud-1907



23

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24