

PESTS ASSOCIATED WITH TRUFFLE PLANTATIONS IN SPAIN.

Barriuso, J., Martín, M., Sánchez, S.

THE 6th INTERNATIONAL WORKSHOP ON EDIBLE MYCORRHIZAL MUSHROOMS (IWEMM6), Rabat, Morocco from 06 to 10th April 2011.



Universidad
Zaragoza



Problems identified

- **In nursery**

- Fungus
 - Contaminants
 - Phytopathogenic
- Insects



- **In plantations**

- Pathogens
- Parasites



- **In truffle**

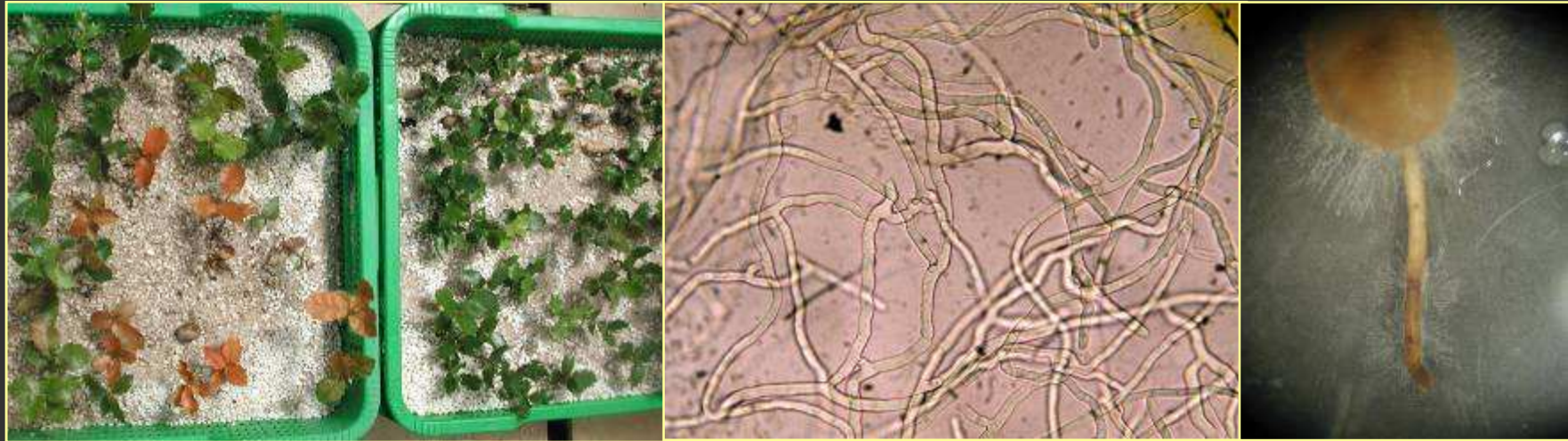
- Mycophagous organisms



Problems identified in nursery



Inventory (greenhouse):

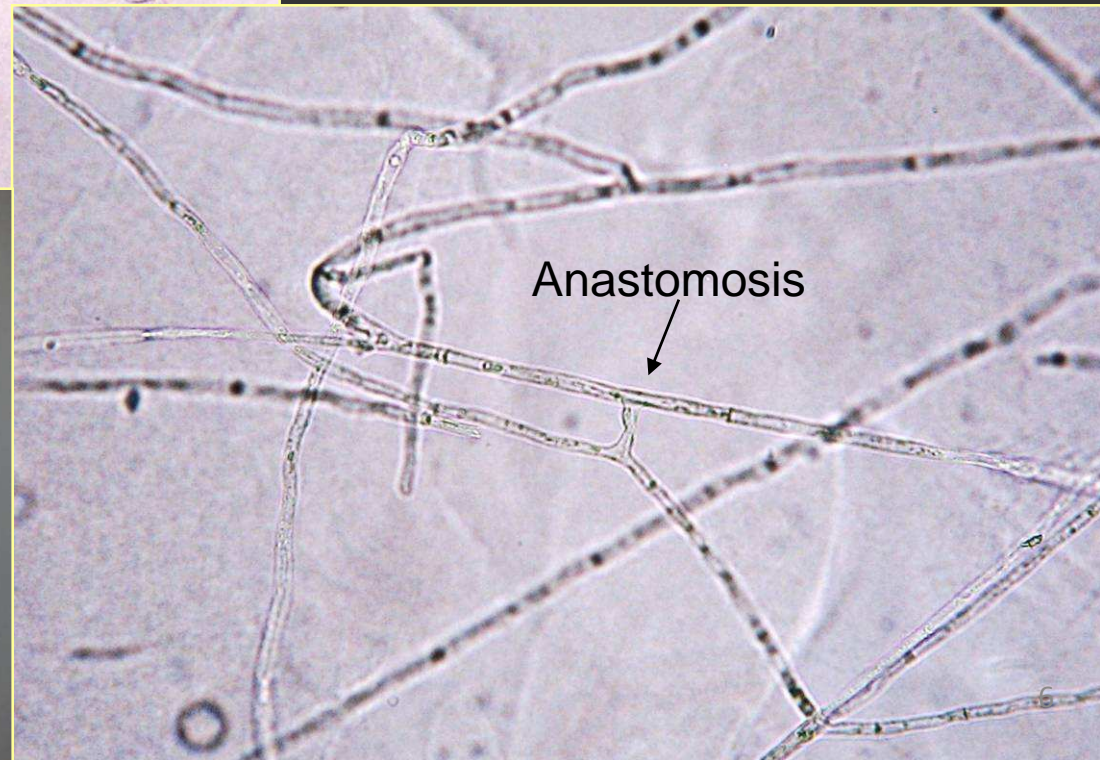
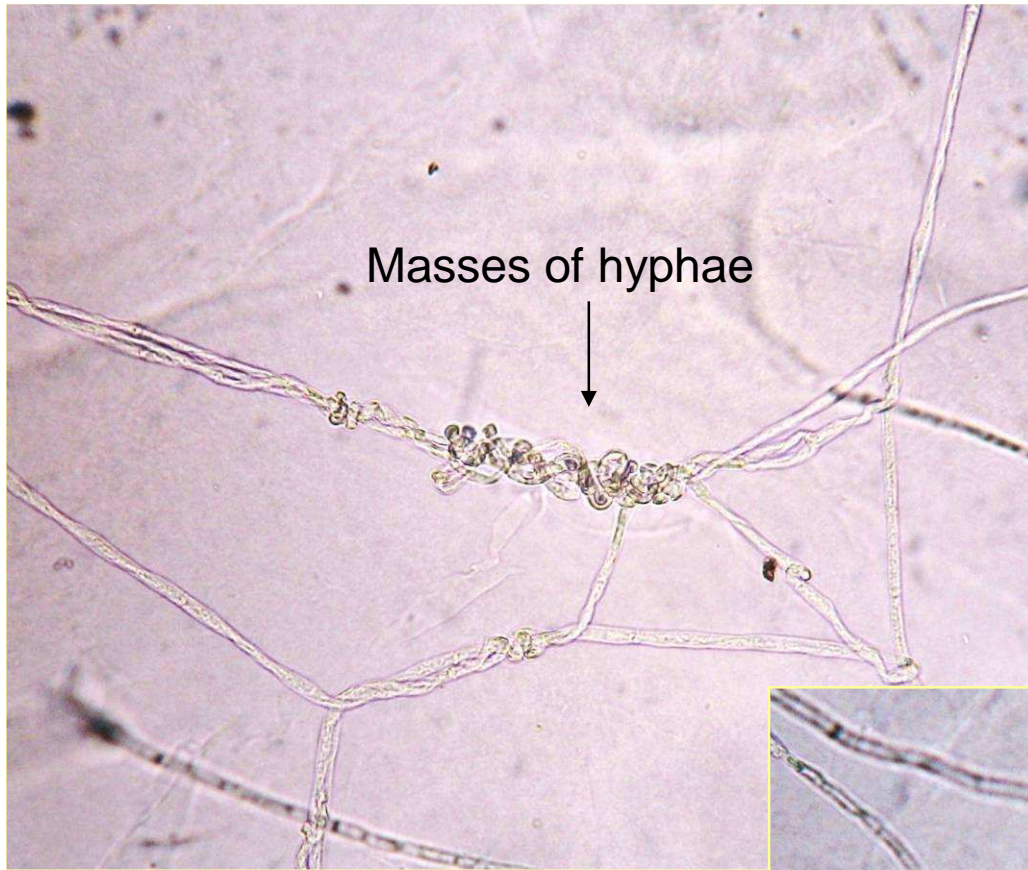


***Rhizoctonia* sp. binucleated**

New pathogen confirmed in nurseries, for production of inoculated seedlings

Potentially **dangerous** (¿?). To watch.

Rhizoctonia sp. binucleated



Inventory (greenhouse):



- *Sphaerospora brunnea*

- Dangerous **competitor** in nurseries. Prevents the mycorrhization with *T. melanosporum*.
- Economic importance. Difficult to eradicate.
- Are being tested different methods of biological control.



Trichoderma



Bacterias

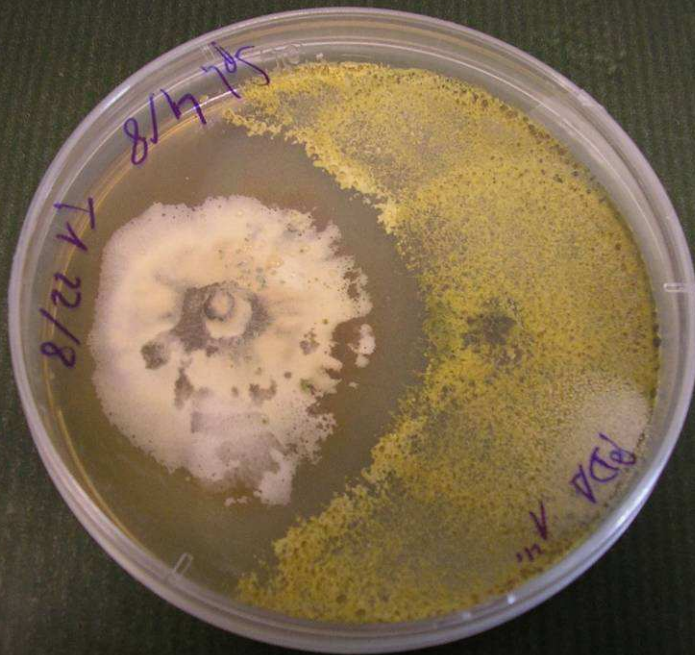
Sphaerosporella brunnea

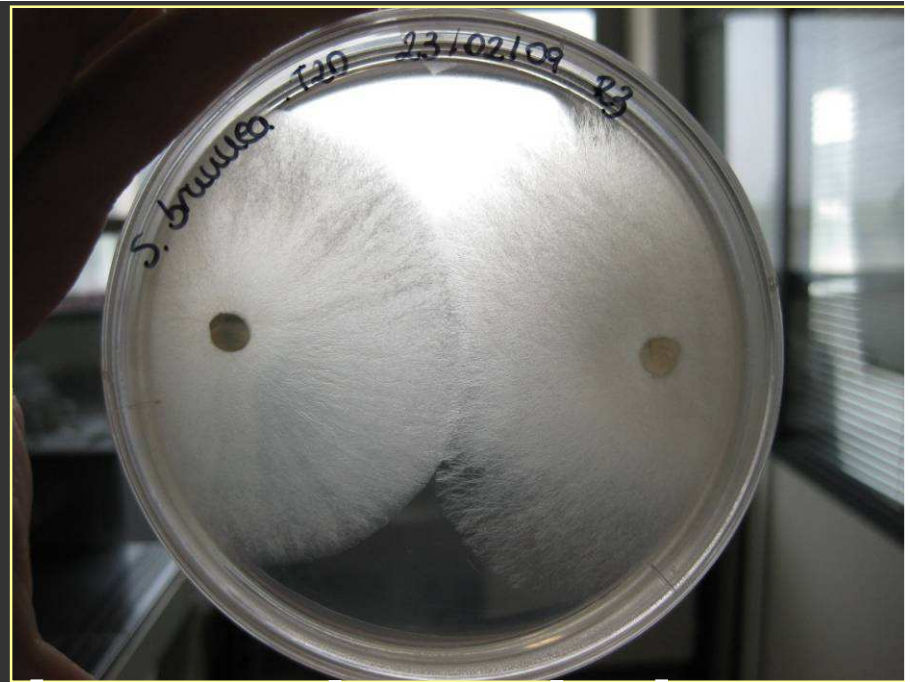


Sphaerosporella brunnea



Confrontation *Sphaerosporella*- *Trichoderma*

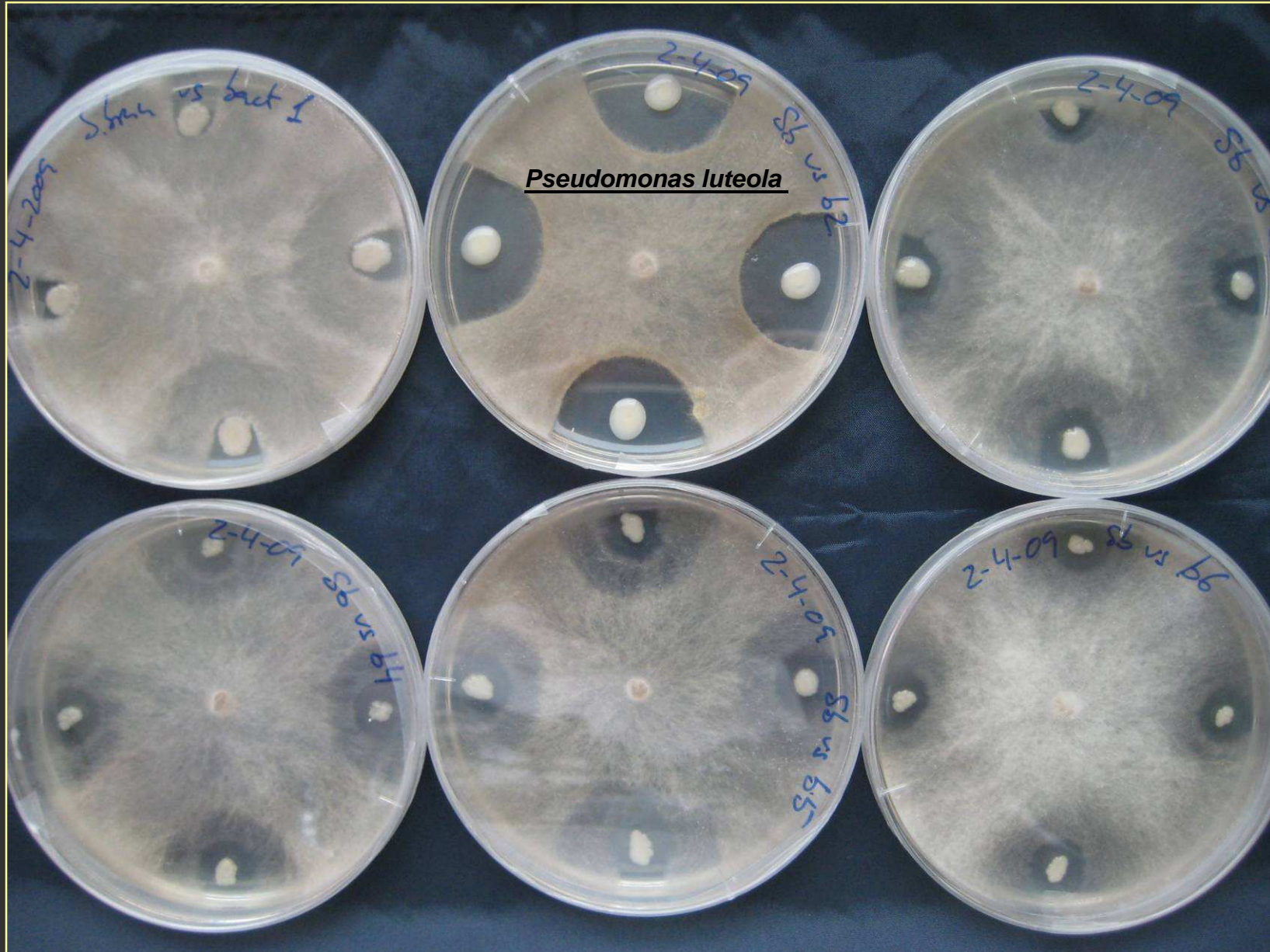




Confrontation, inhibition and predation

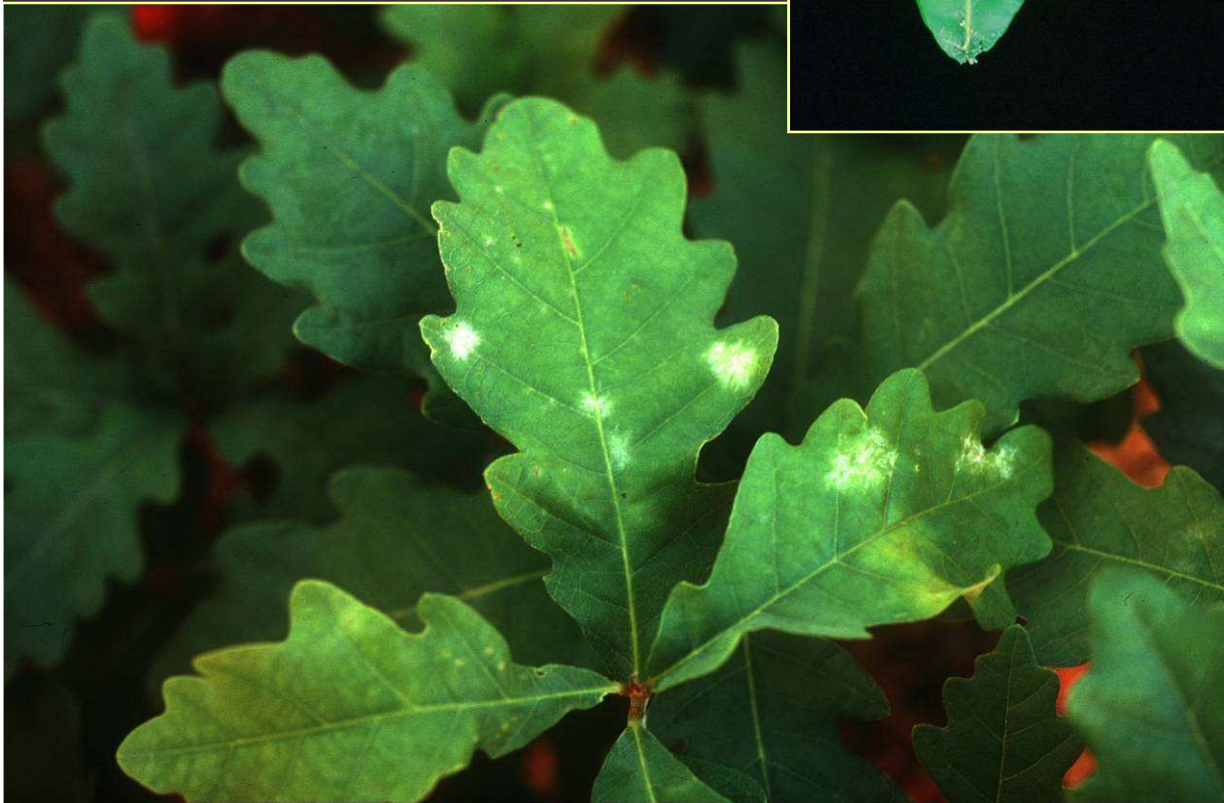
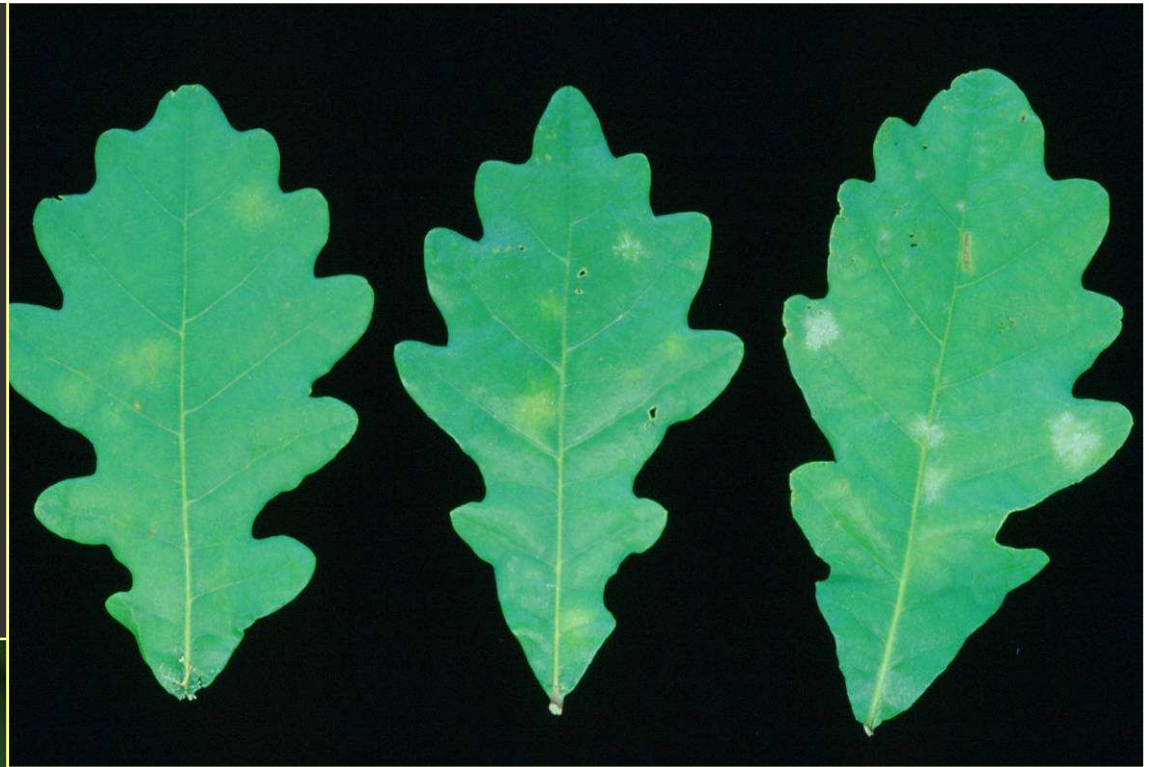


Bacterial inhibition vs.-*Sphaerosporella brunnea*



Inventory (greenhouse):

Oak oidium
(*Microsphaera*
alphitoides)



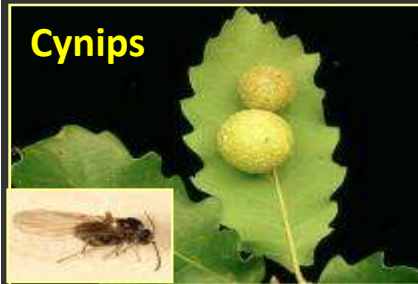
- **Can be caused by excess moisture**
Caution with sulfur treatments

Problems identified in field



Current situation

Field inventory:



Labidostomis spp.



Coroebus sp.



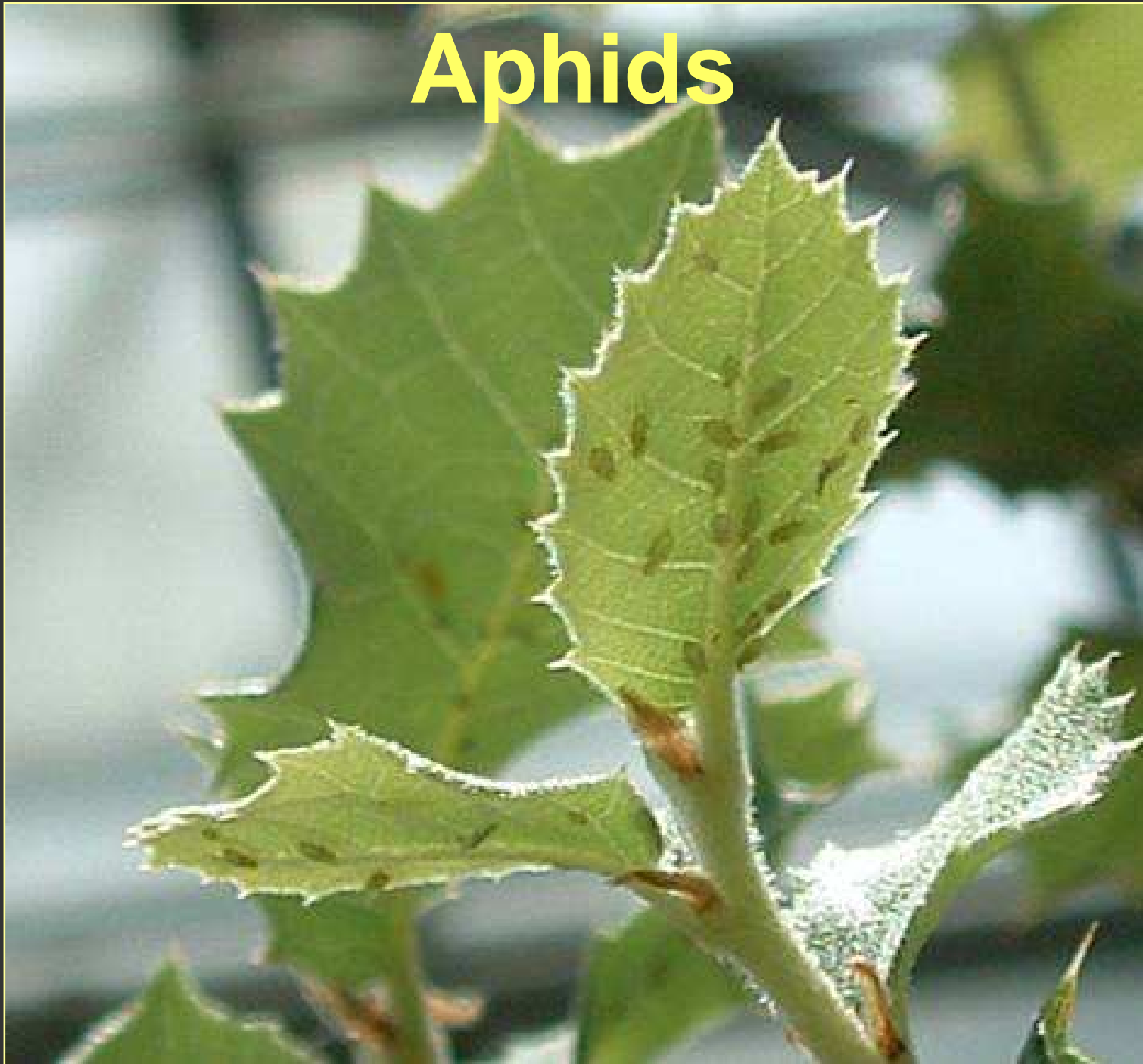
Aphids

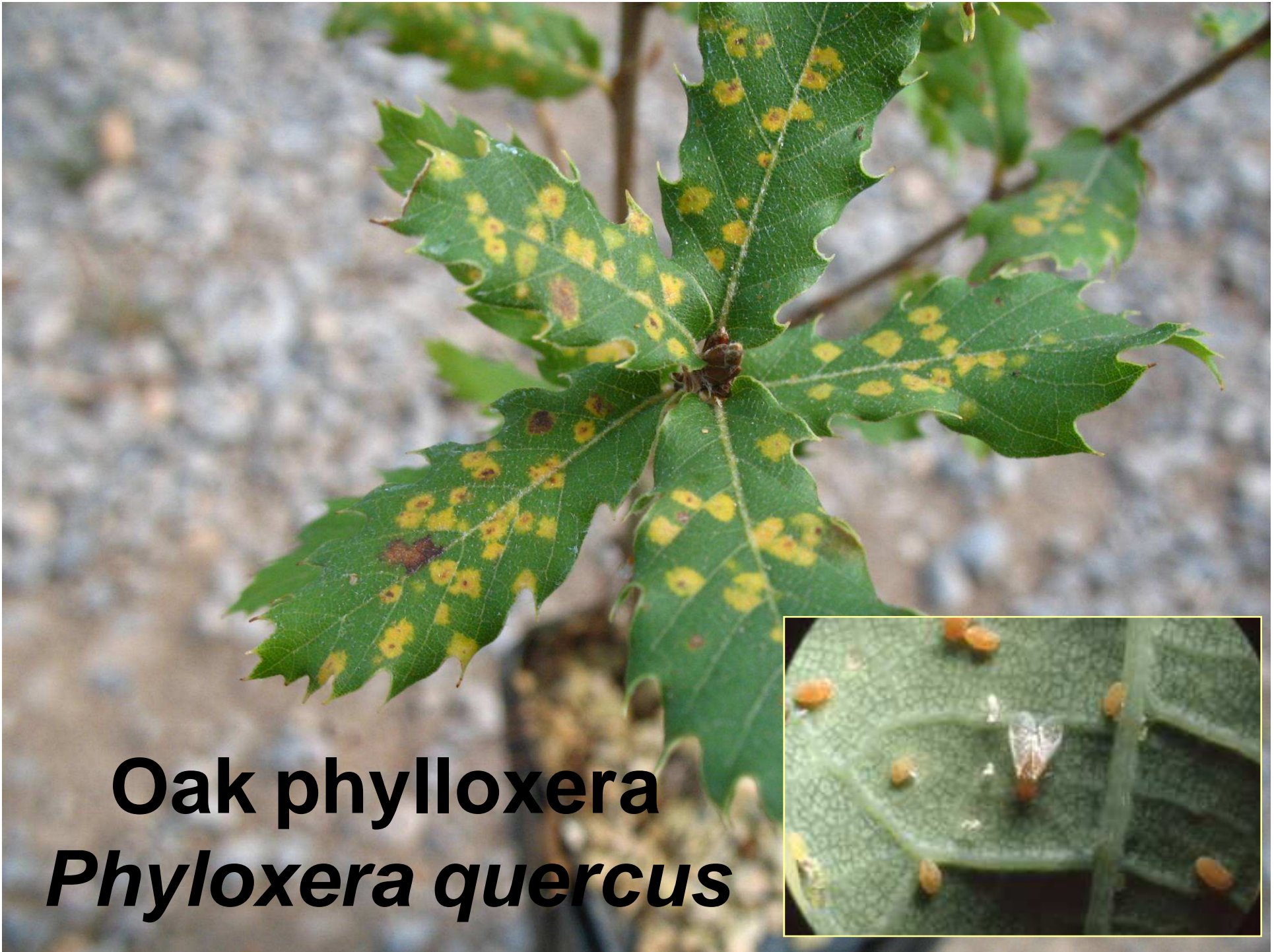


Aphids



Aphids





Oak phylloxera
Phylloxera quercus

VOLES.

Microtus duodecimcostatus and *M. arvalis*



Wormwoods.
Leopard moth
borer
(*Zeuzera pirina*)



Coccid oak (*Quercus ilex*):

Kermes vermilio / *K. ilicis*



Fight with insecticides is not effective.

Pruning of the plant affected is necessary.

Coccid oak. (Kermes vermilio)



Galls, wasps (Cynips)



Depending on the host species, as well as the wasp species in question, the gall will be different.

Malformations

Plagiotrochus quercusilicis



Malformations

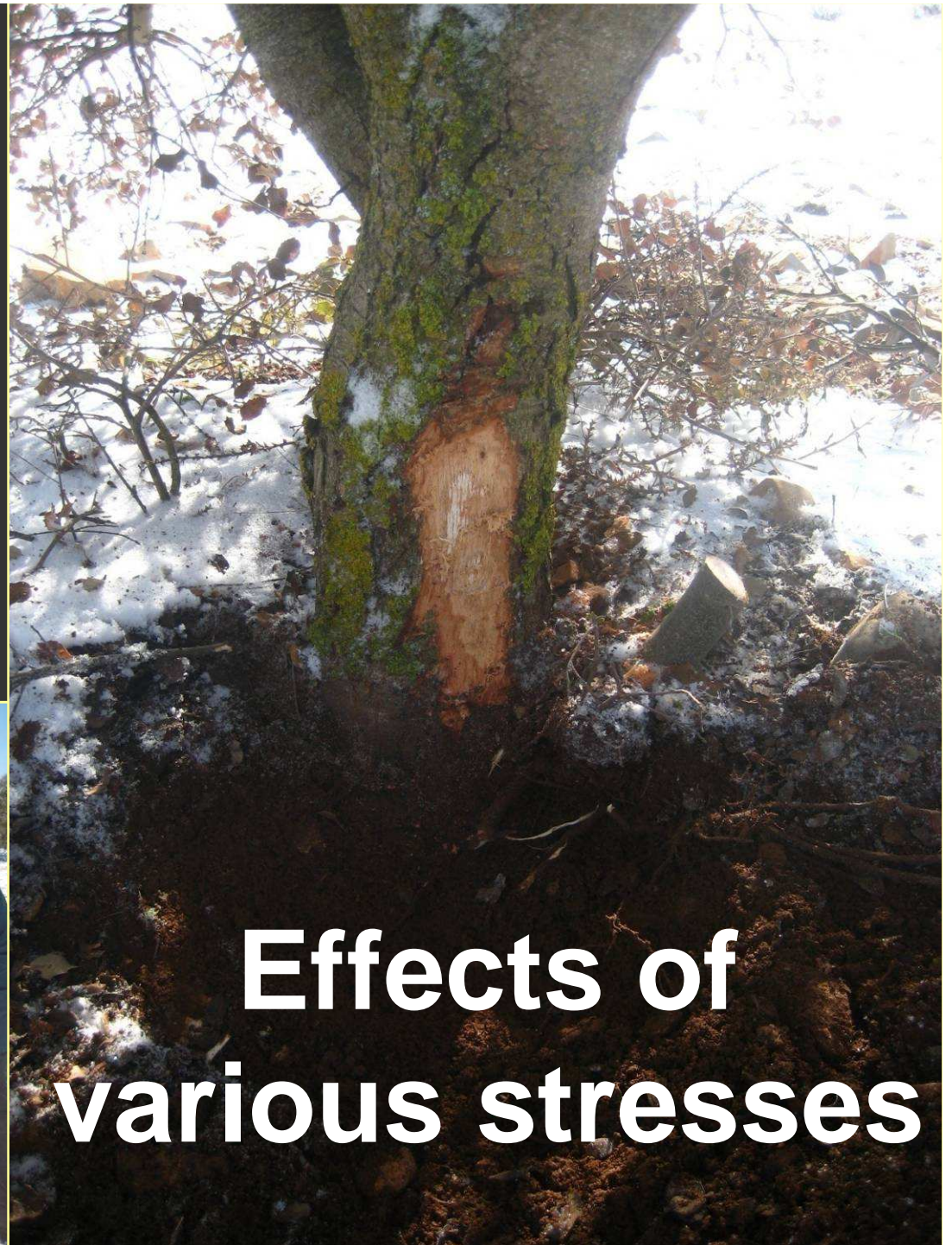


Mites: *Eriophyes ilicis*



The oak decline ("seca") *Phytophthora* sp.



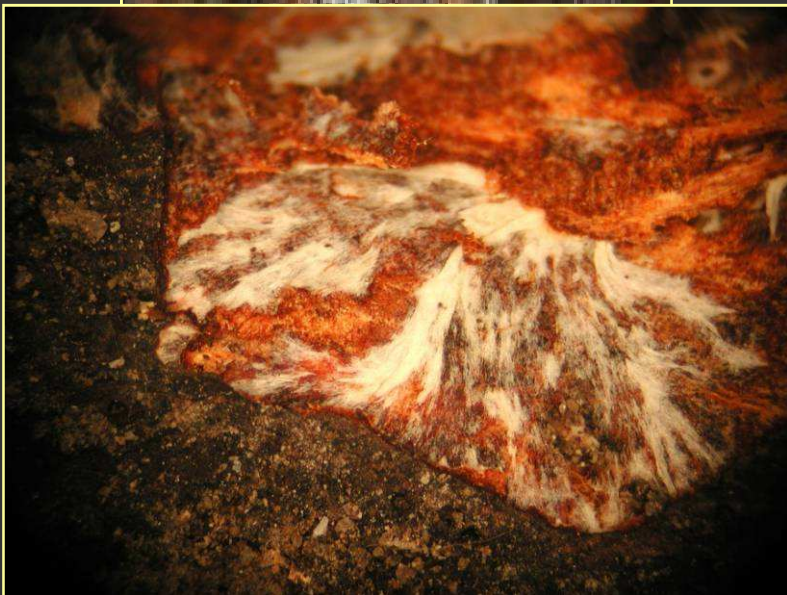


**Effects of
various stresses**

Other pathogens of wood and root



Armillaria mellea





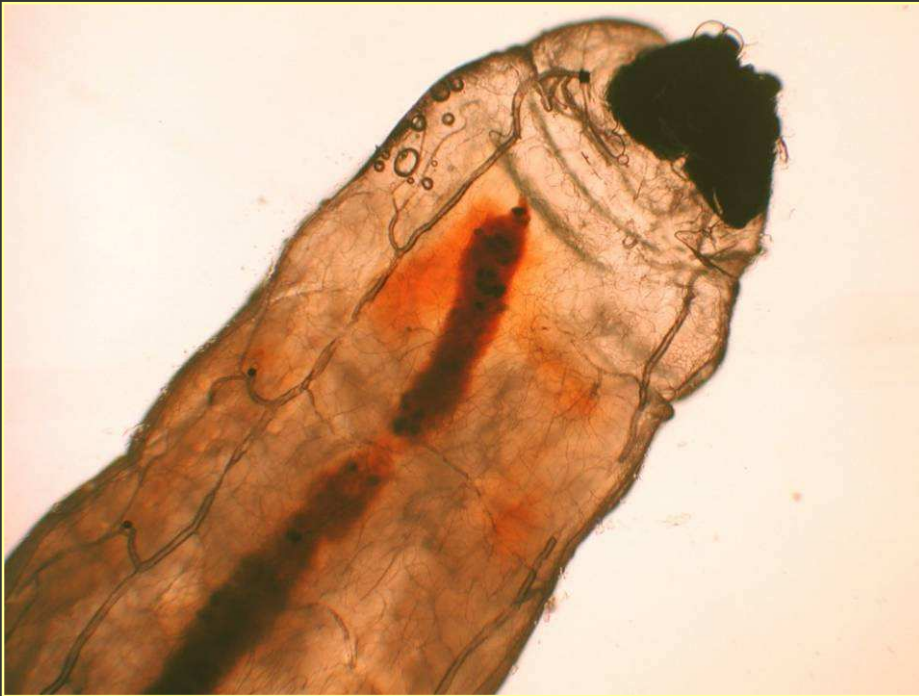
Snails

Problems identified in truffle.

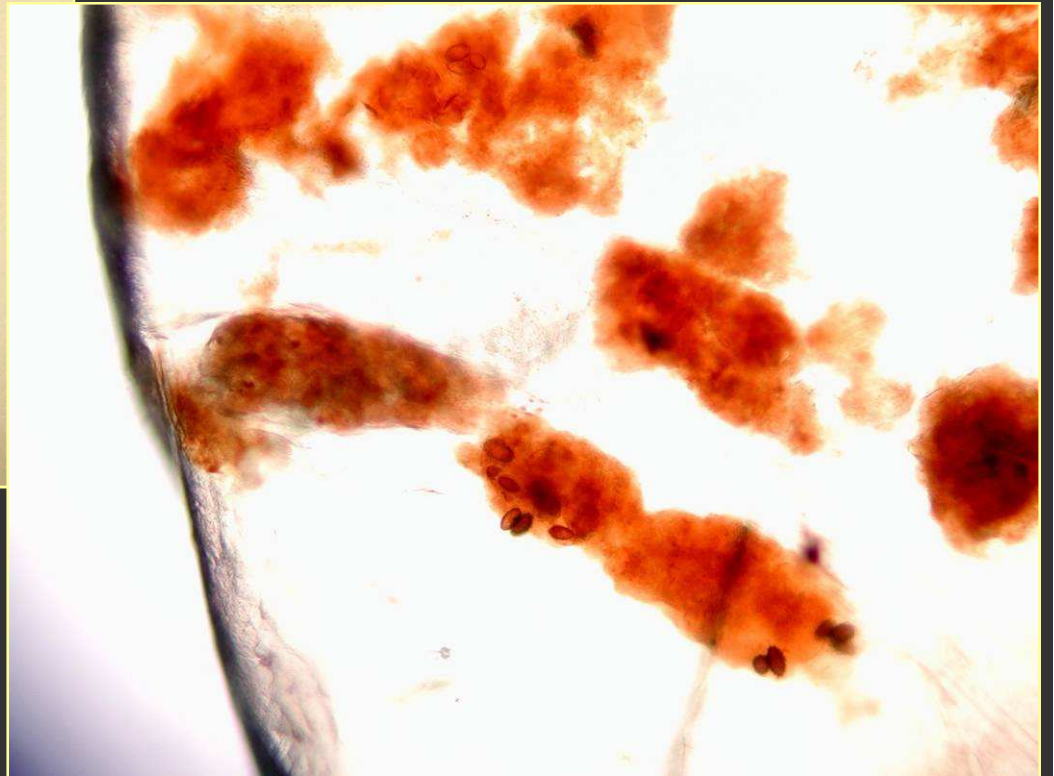
1.- Parasites of truffle.



Helomyza gigantea
**(*Suilla gigantea*,
S. tuberivora)**



Helomyza
gigantea: larvae



Helomyza gigantea: pupa



Helomyza gigantea: adults



Drosophila funebris



Megaselia sp.

Inventory of diptera truffle parasites:



Helomyza gigantea: adult



larvae



pupa



Megaselia spp.



Drosophila funebris

¡New parasites found!

Leiodes sp.

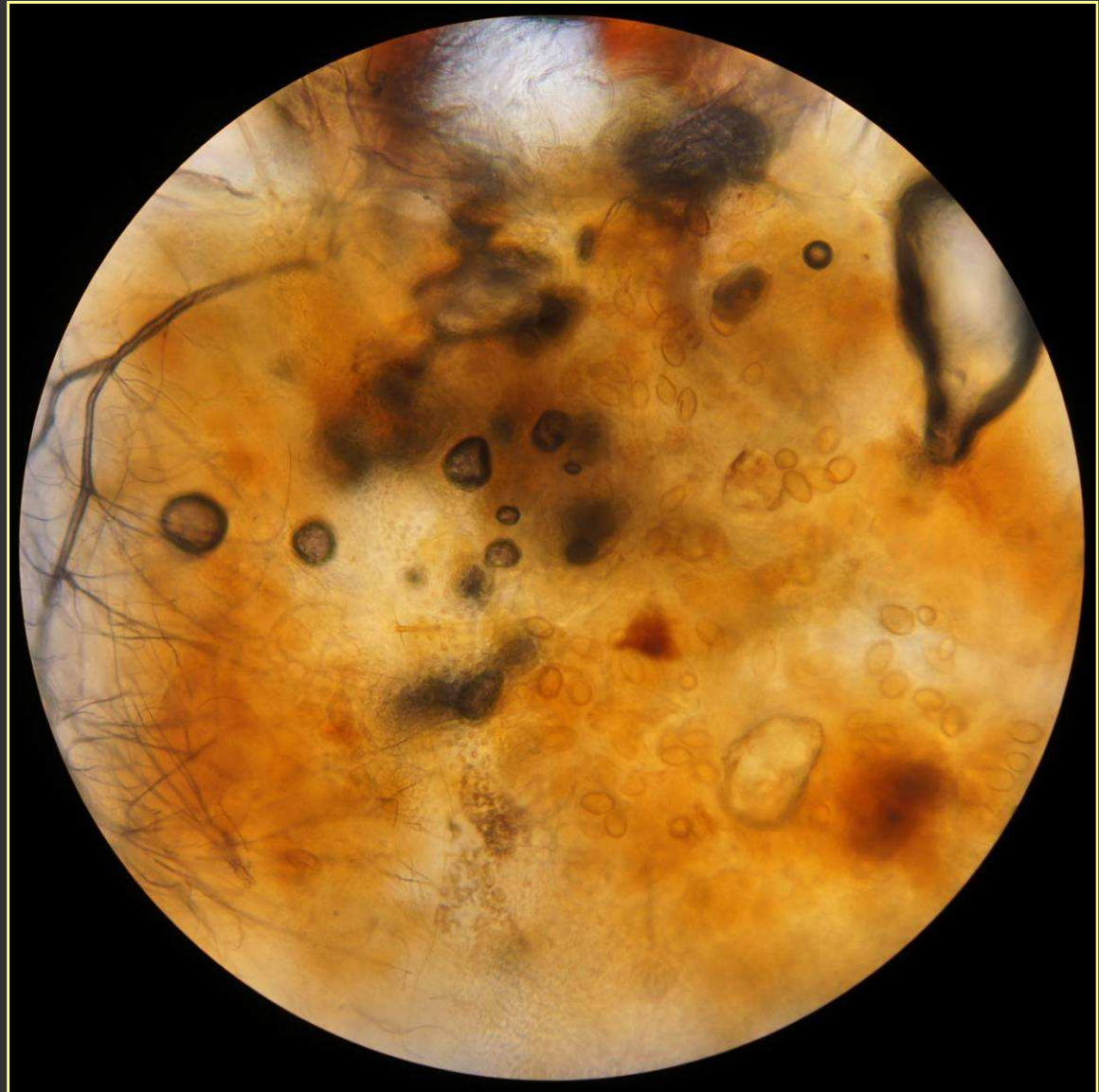
(Much more voracious than diptera)



Leiodes: adults

larva

Leiodes larvae



Problems identified in truffle.

2.- Coprophagous.
Spore spreaders.



Coleoptera. Aphodiidae
Psammodytinae: *Aphodius* sp.(?)



In healthy truffles, do not usually appear.

Take advantage of putrescence created by other insects

Class Diplopoda. *Schizophyllum salulosum*



Take advantage of holes created by other insects



Thanks for your attention

Merci de votre attention

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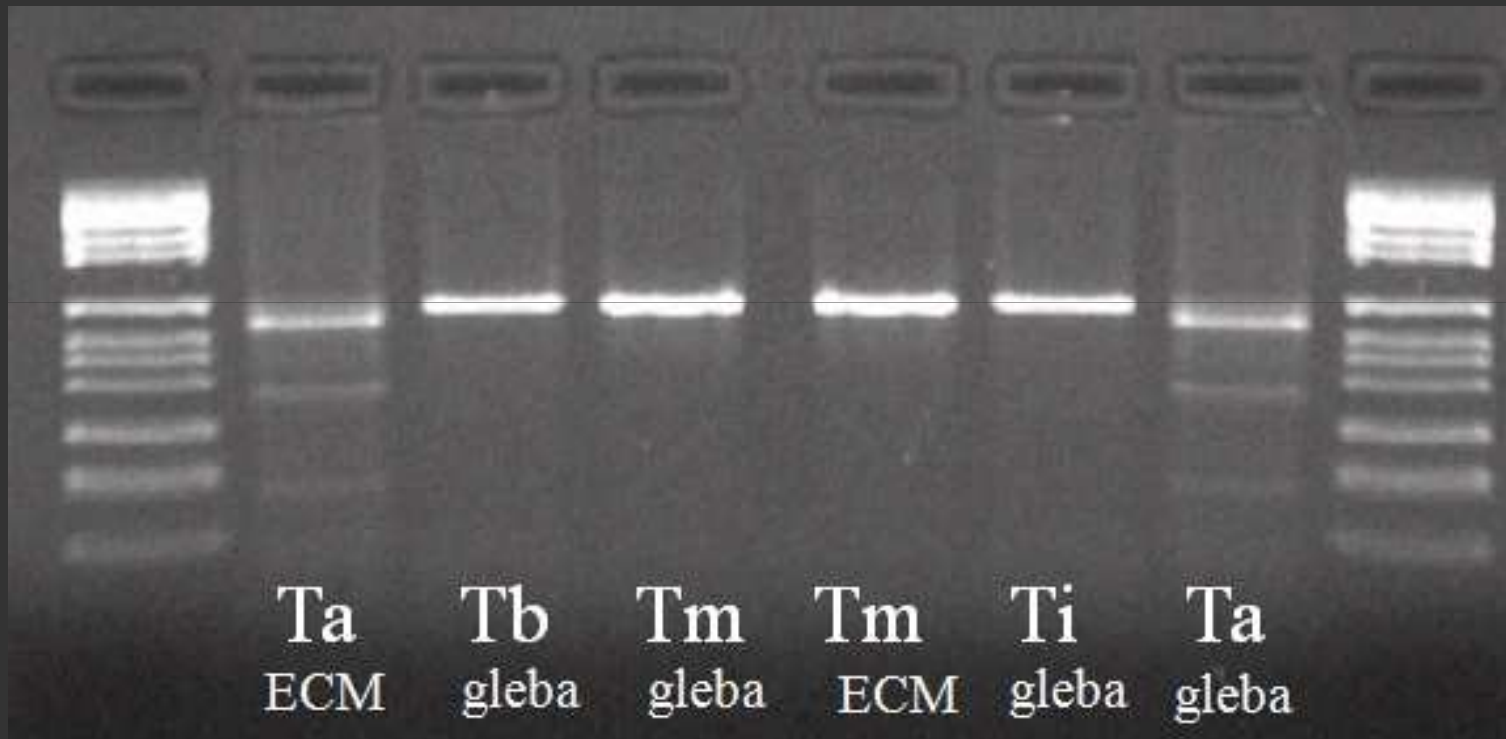


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Undesirable contaminations with other truffles

- *Tuber indicum*
- *Tuber aestivum*
- *Tuber brumale*

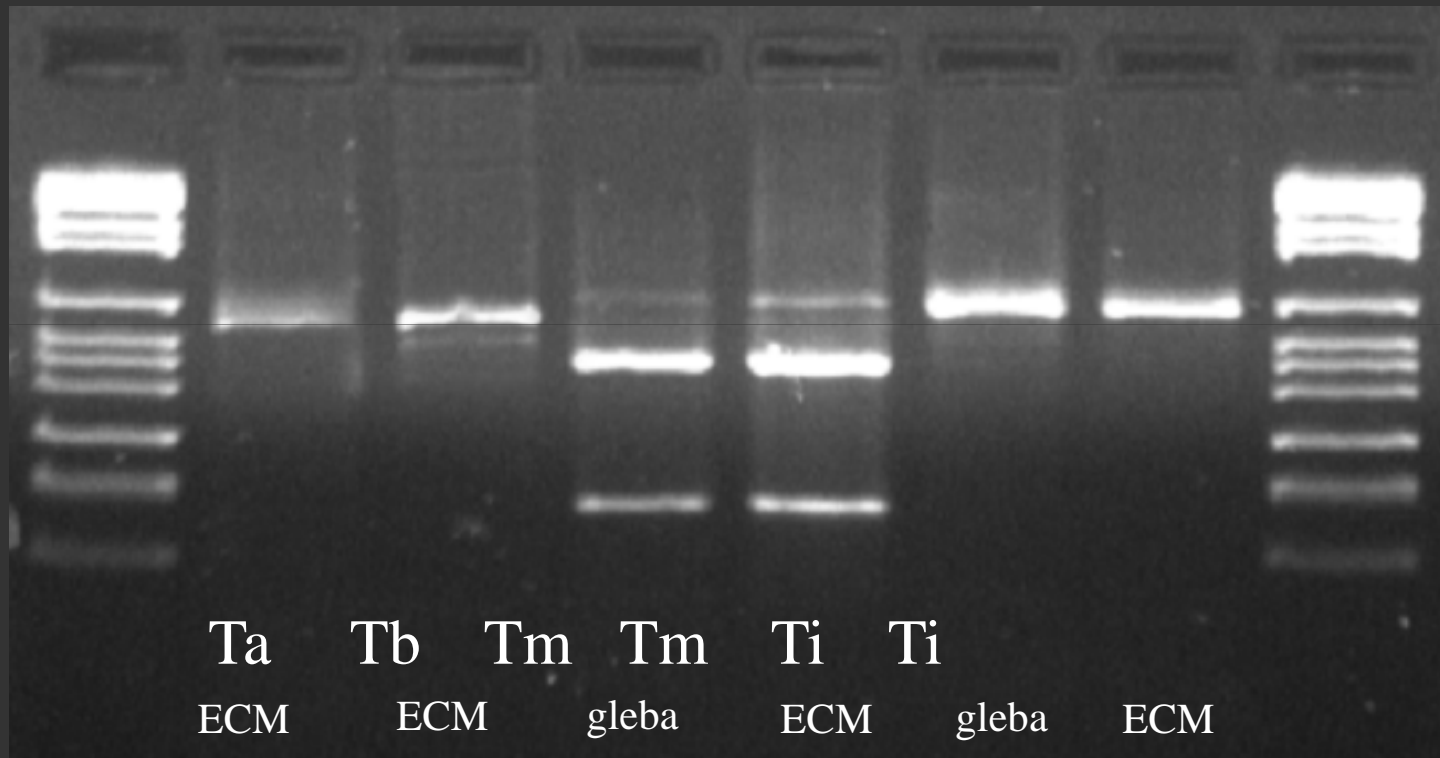
MOLECULAR IDENTIFICATION OF TRUFFLES



Banding pattern after the ECORI enzym cutting.

Ta: *T. aestivum*; Tb: *T. brumale*; Tm: *T. melanosporum*; Ti: *T. indicum*; ECM: ectomycorrhiza. Weight marker VI Roche.

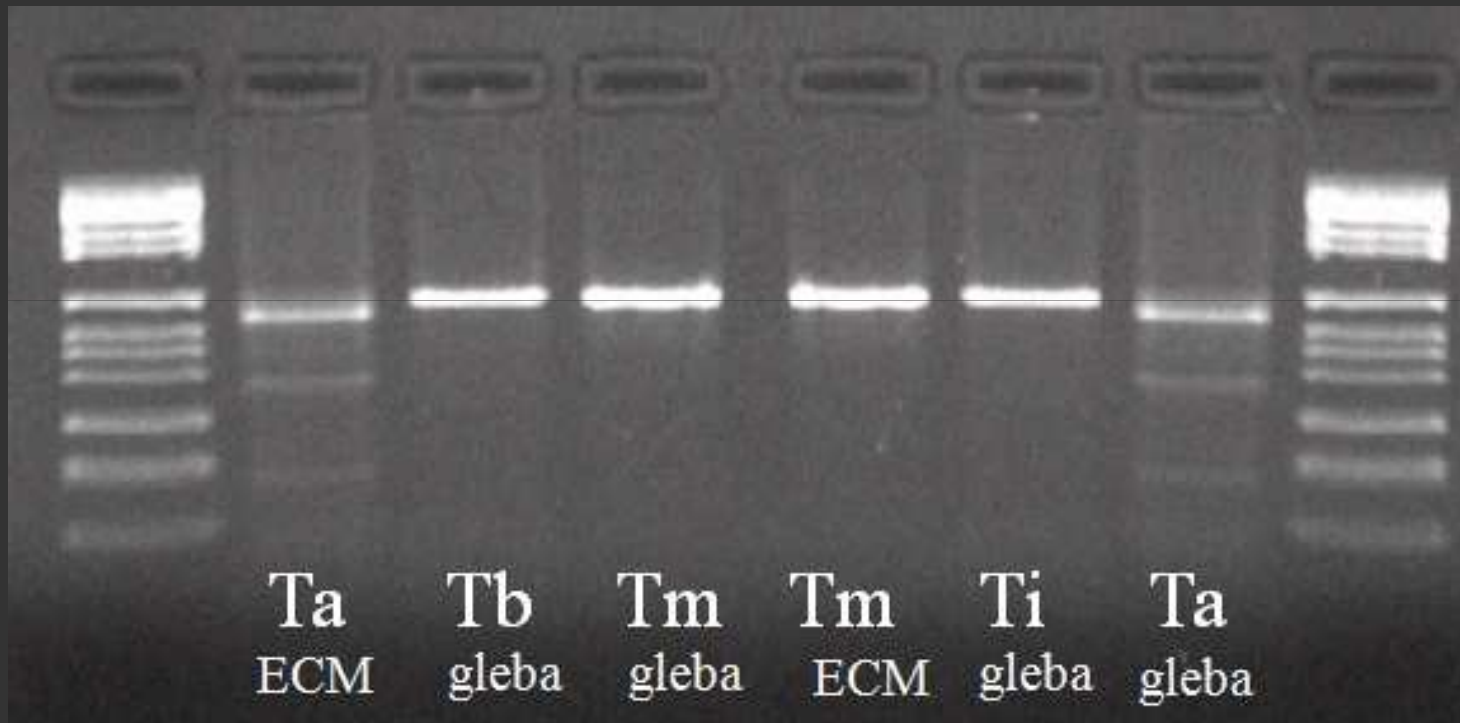
MOLECULAR IDENTIFICATION OF TRUFFLES



Banding pattern after the BSP1407I enzym cutting

Ta: *T. aestivum*; Tb: *T. brumale*; Tm: *T. melanosporum*; Ti: *T. indicum*; ECM: ectomycorrhiza. Weight marker VI Roche.

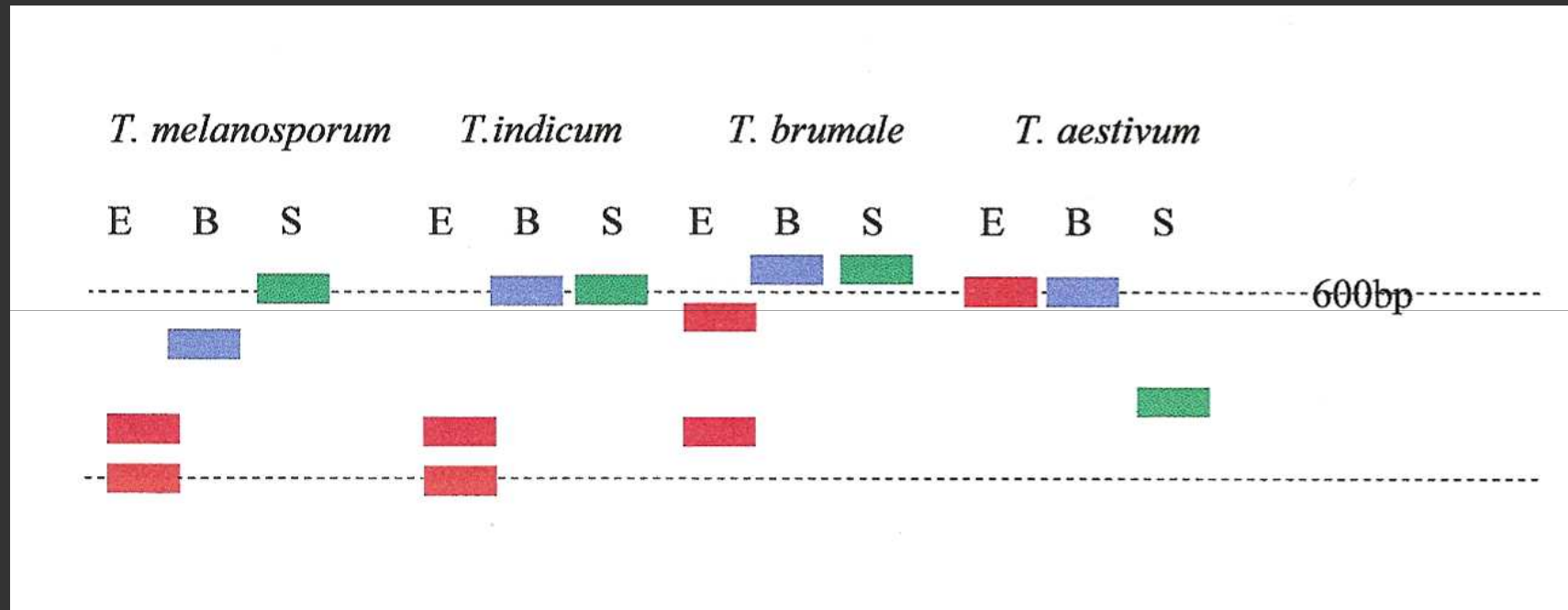
MOLECULAR IDENTIFICATION OF TRUFFLES



Banding pattern after the *Sma*I enzym cutting .

Ta: *T. aestivum*; Tb: *T. brumale*; Tm: *T. melanosporum*; Ti: *T. indicum*; ECM: ectomycorrhiza. Weight marker VI Roche.

MOLECULAR IDENTIFICATION OF TRUFFLES



Pattern RFLP of the four species of Tuber studied

Restriction enzymes used ECO: ECORI (red); BSP: BSP1407I (blue); Sma: SmaI (green).