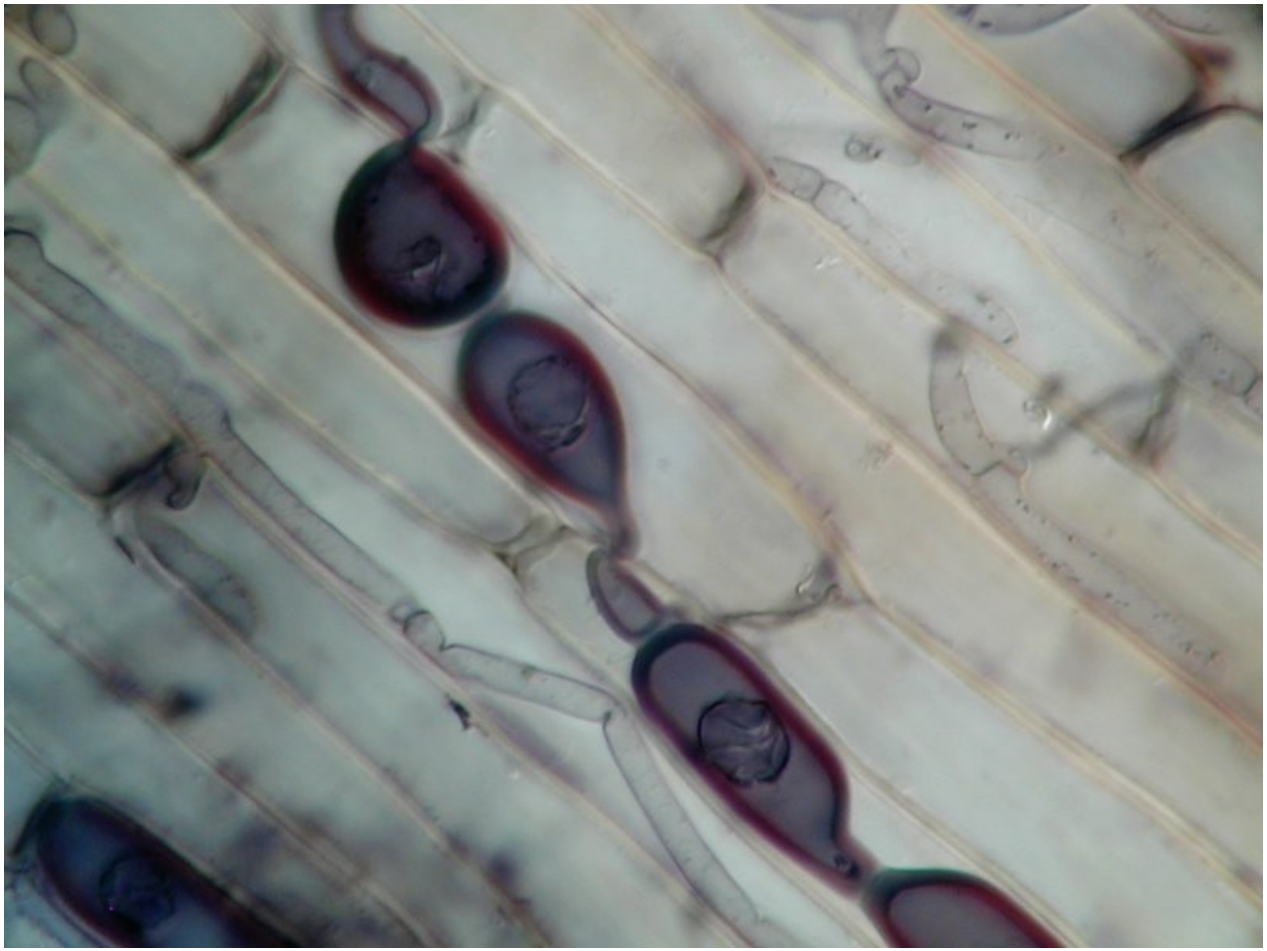
Plant endophytes



Here fungi enter the scene

Fungal endophytes:

1) Inhabit every plant;

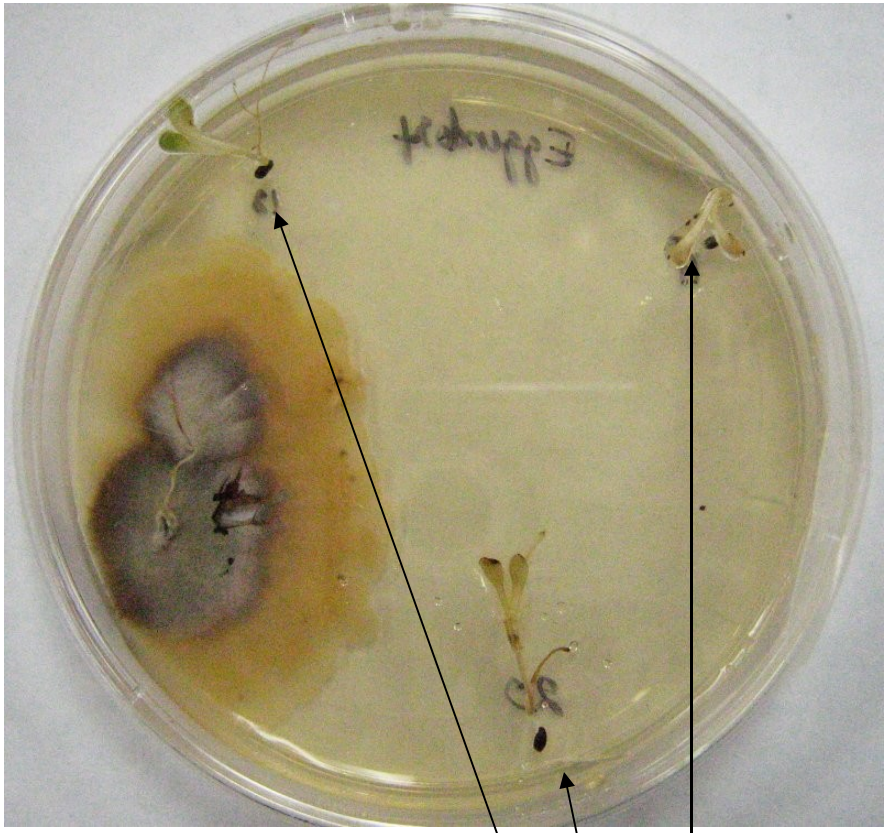
2) Produce many chemicals solely or in the interaction with host plant;

3) Have full spectrum from parasitism to commensalism (but most of them are not parasites — Ganley, Brunsfeld & Newcombe, 2004).

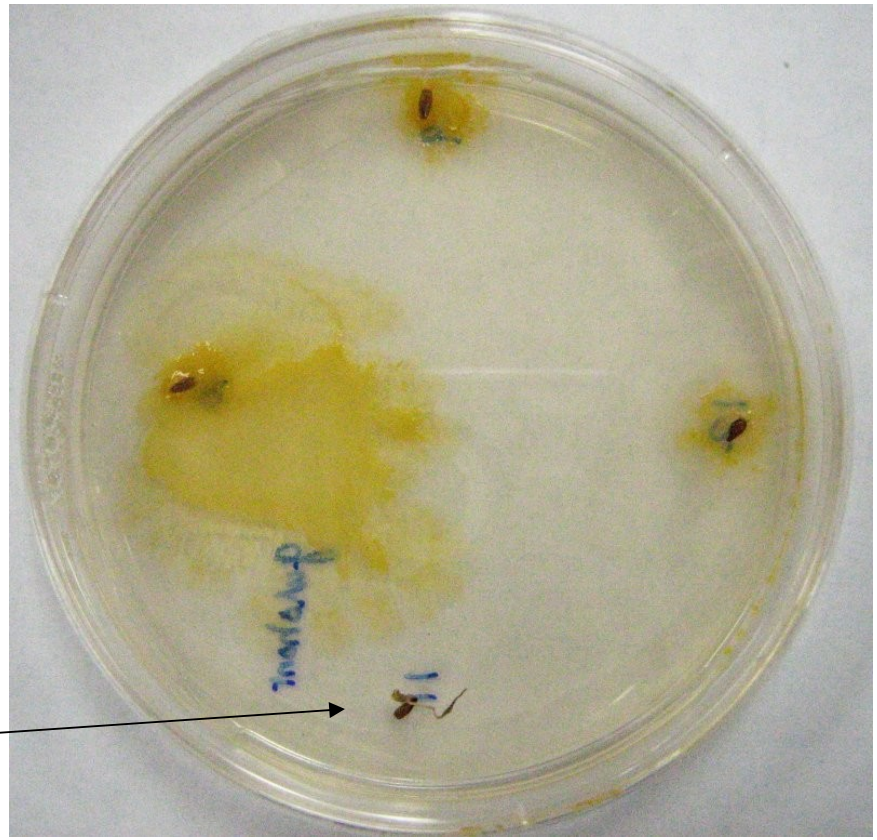
Are endophytes involved in the creation of "weed of mass destruction"?

Isolation

Endophytes are usually isolated from the achenes of knapweed



endophyte-free achenes



Endophyte-free plants

Plants from natural habitats are usually rich of endophytes (70%–90% of seeds). If vertical transmission accounted for the presence of endophytes in seeds of surveyed plants, then infected plants would produce seeds from which we would isolate endophytes at field incidence. This is not the case: seeds have been free of endophytes.

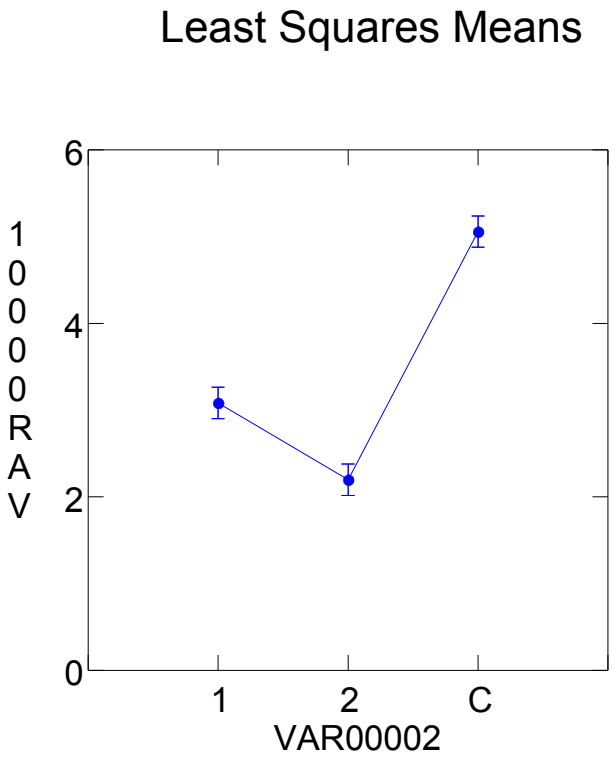
Competition experiment

E+ knapweed and fescue

Fescue alone: control

Endophyte-free (E–) knapweed and fescue

The differences in fescue biomass are statistically significant

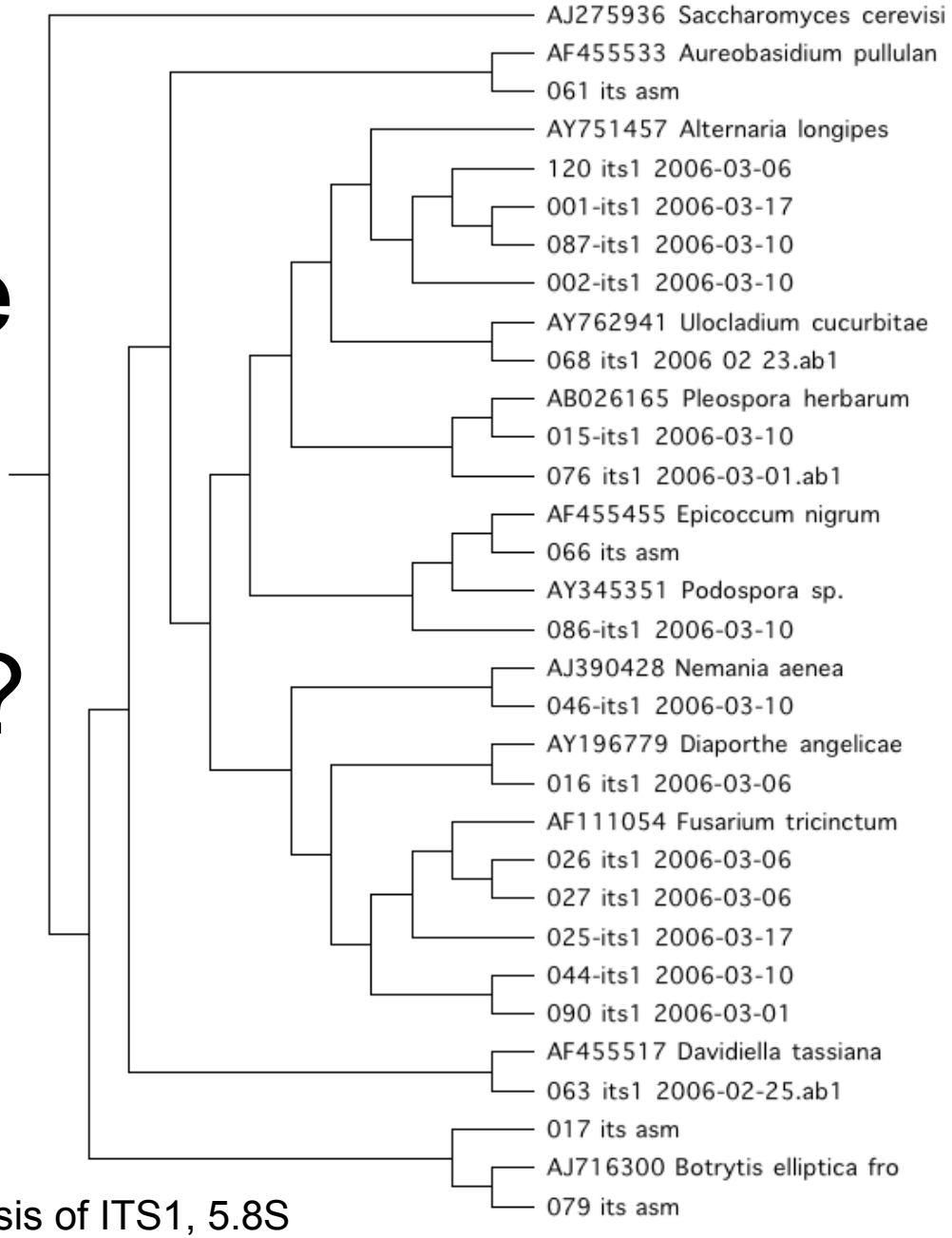


1 E– plants

2 E+ plants

C Control (*Festuca idahoensis* alone)

How diverse are knapweed endophytes?



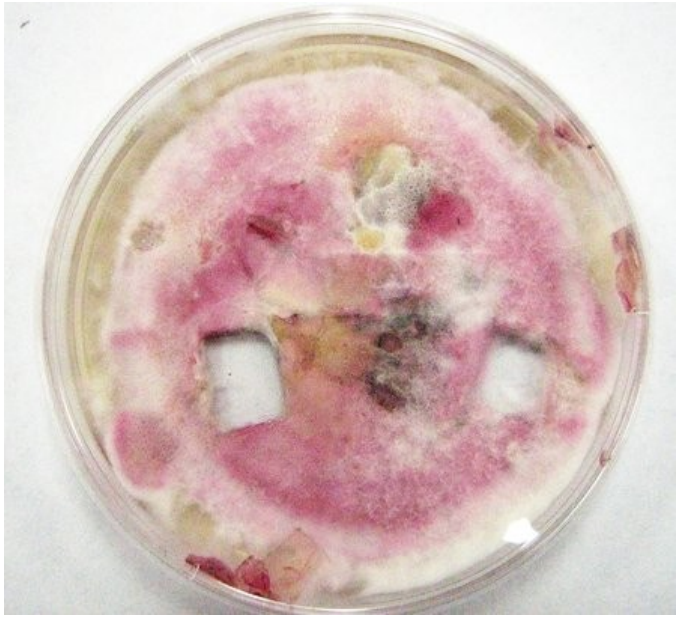
MP tree from phylogenetic analysis of ITS1, 5.8S and ITS2 gene sequences

Most frequent ITS haplotypes

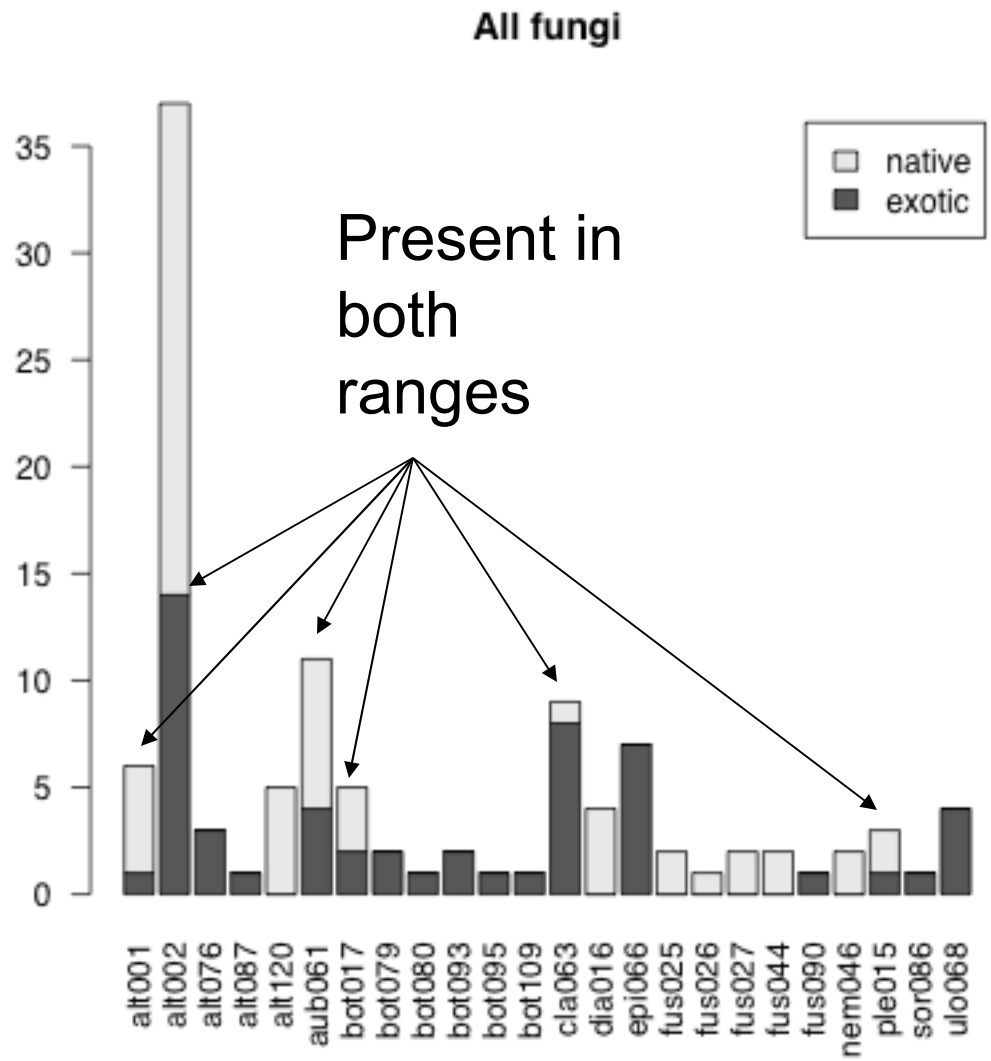
Botrytis spp., 6 ITS haplotypes

Alternaria spp., 5

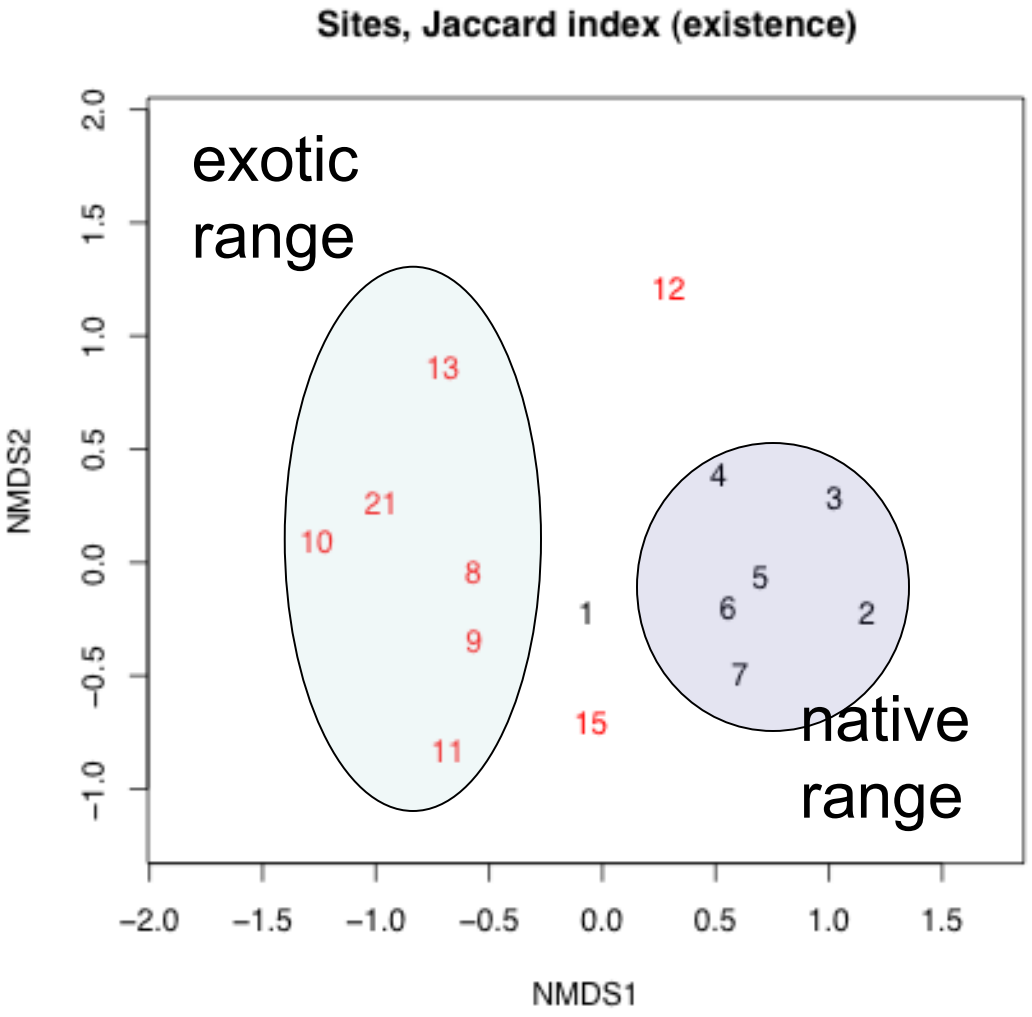
Fusarium spp., 5 (all are new to GenBank)



Distribution among native and exotic ranges

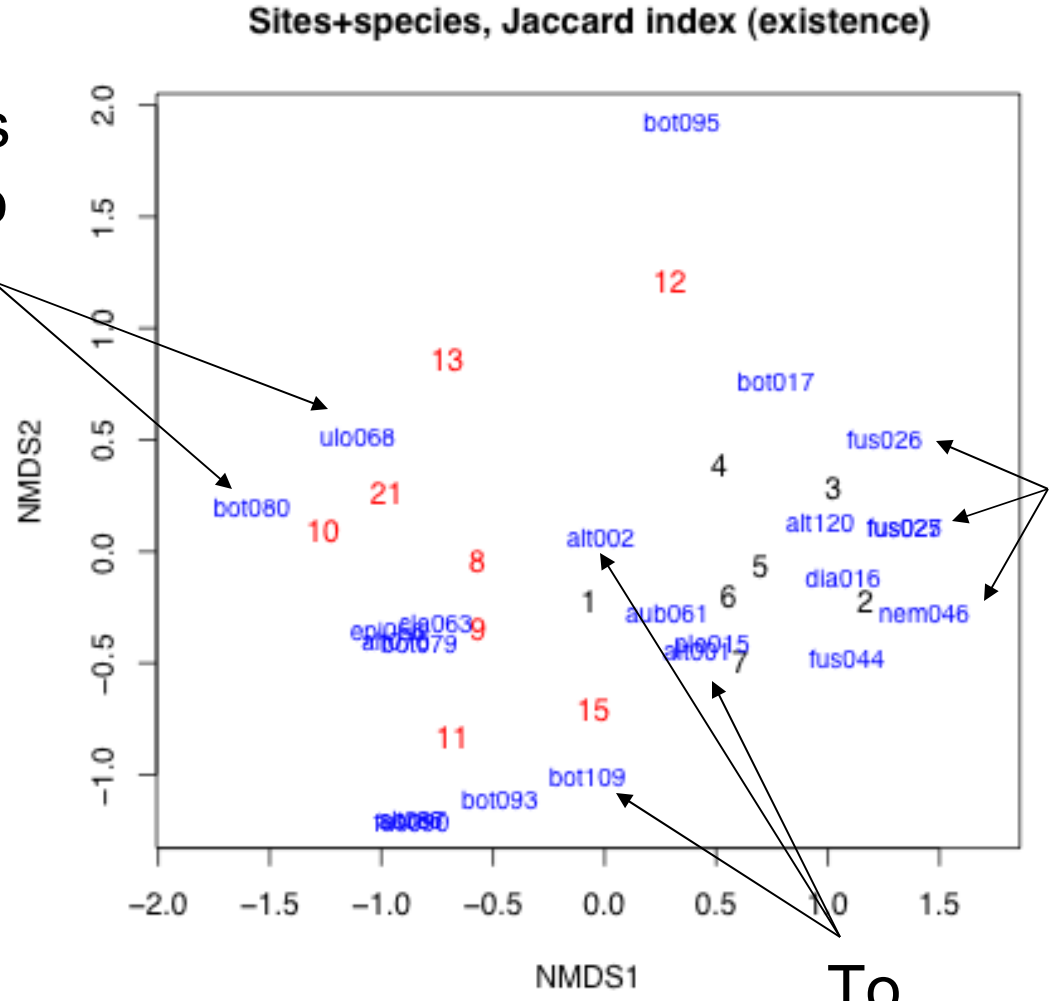


Are endophyte communities different?



Patterns of co-occurrence

Haplotypes common to exotic range



Haplotypes common to native range

To both

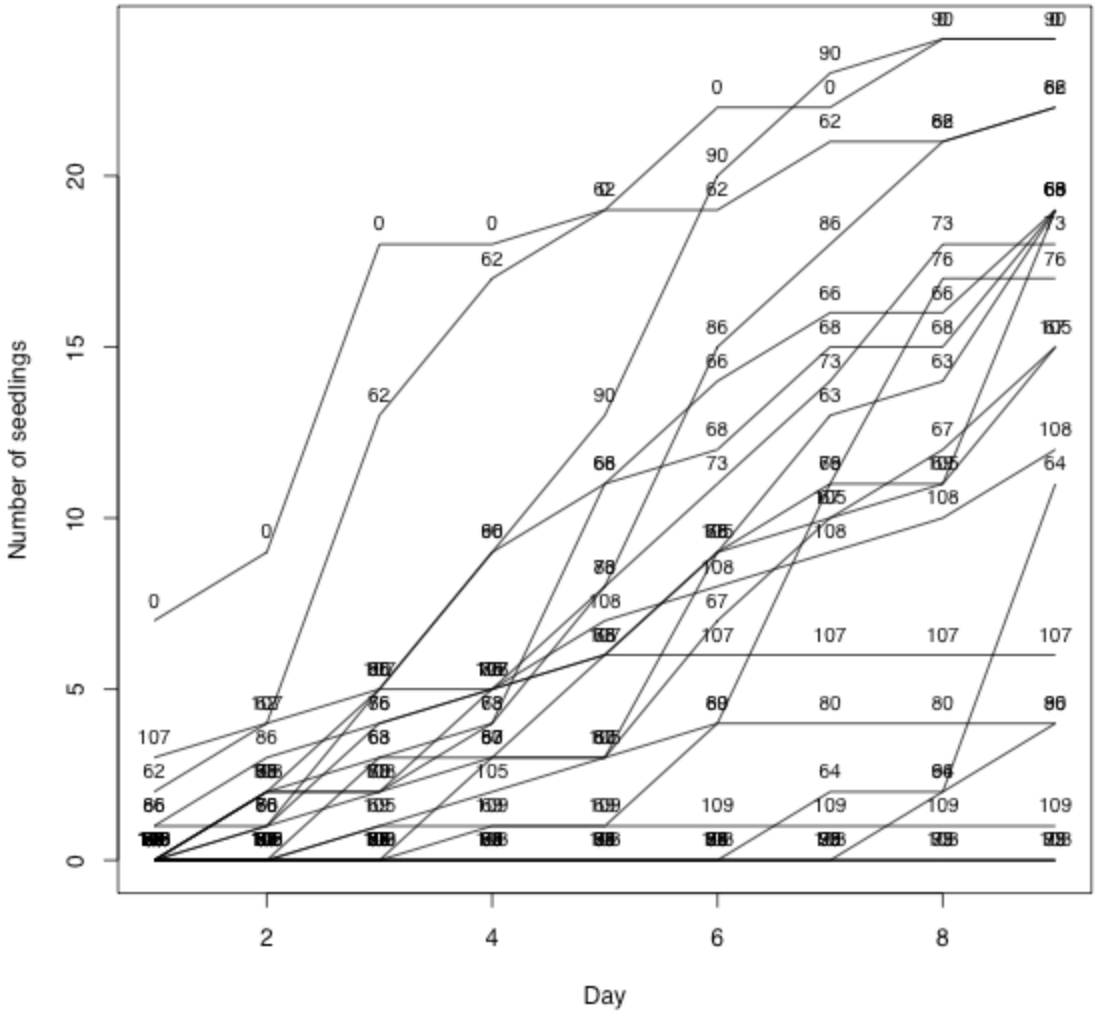
Host-jumping vs. co-introduction

- Endemic or nearly endemic ITS haplotypes;
- Explanation of effect from Callaway et al.;
- Communities form two “clouds” on ordination

- 6 (25%) identical ITS haplotypes from both ranges;
- Eurasian origin of some sequences;
- Some communities are “intermediate” on ordination

Endophytes and seed germination

Some endophytes are capable to terminate seed growth

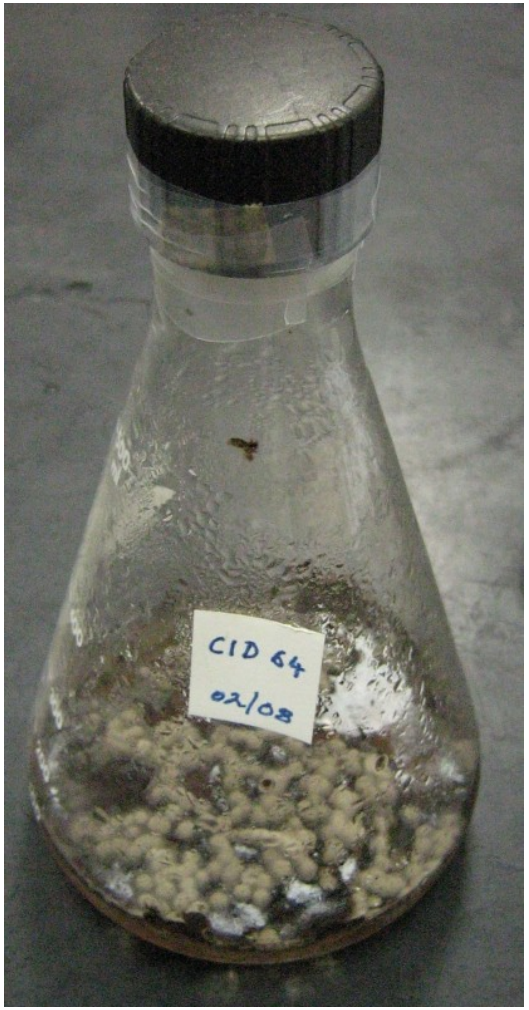


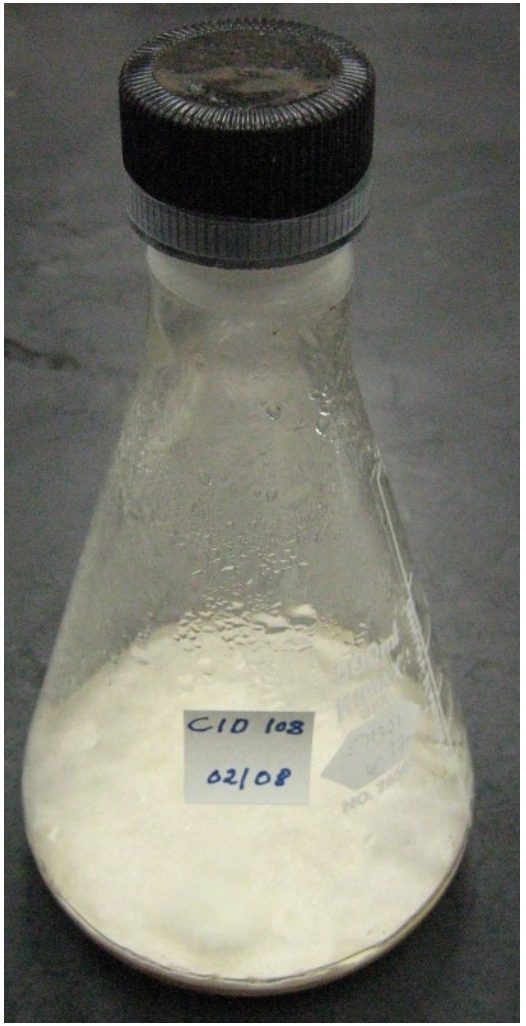
no termination

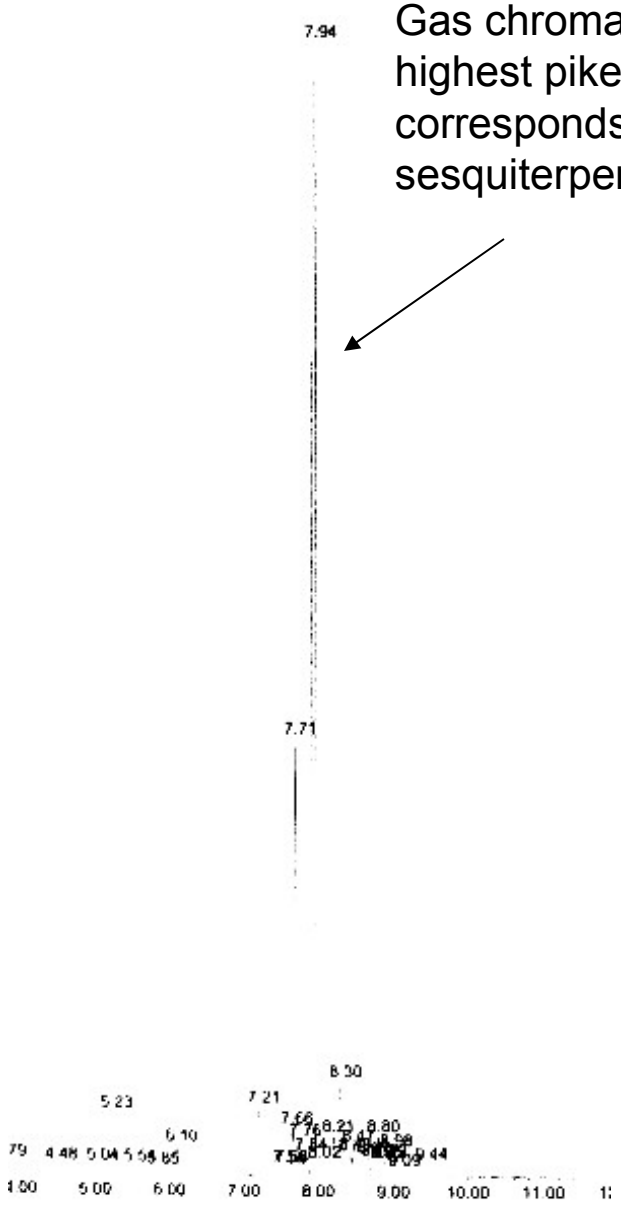
intermediate "behavior"

heavy termination

Liquid cultures and volatile compounds







Gas chromatogram: highest pike corresponds with sesquiterpene

At least some endophytes can produce sesquiterpenes

Conclusions

- There are huge diversity of fungal endophytes in the knapweed (> 24 species), endophyte communities are also different

- The endophytes of knapweed are capable (a) to inhibit the growth of fescue grass, (b) to terminate the germination of seeds, (c) to produce volatile compounds (sesquiterpenes)