

# ECOLOGY AND APPLICATIONS OF FUNGAL ENDOPHYTES FROM WILD GRASSES

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**CSIC**

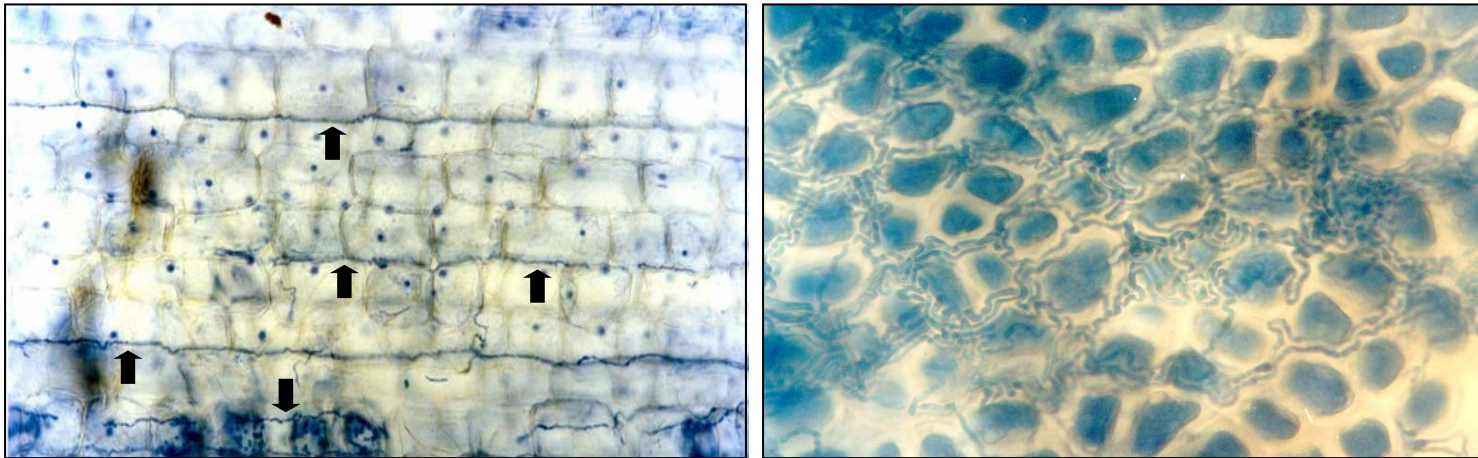
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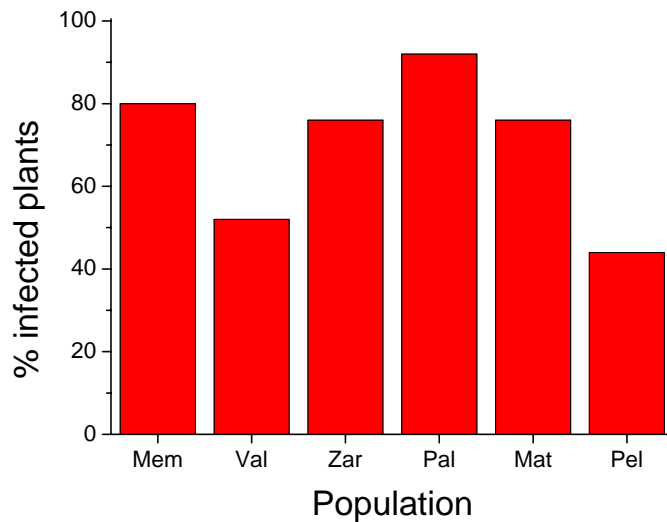
## *Festuca rubra* - *Epichloë festucae* association

- Systemic infection of aerial plant organs
- Very efficient seed transmission of endophyte

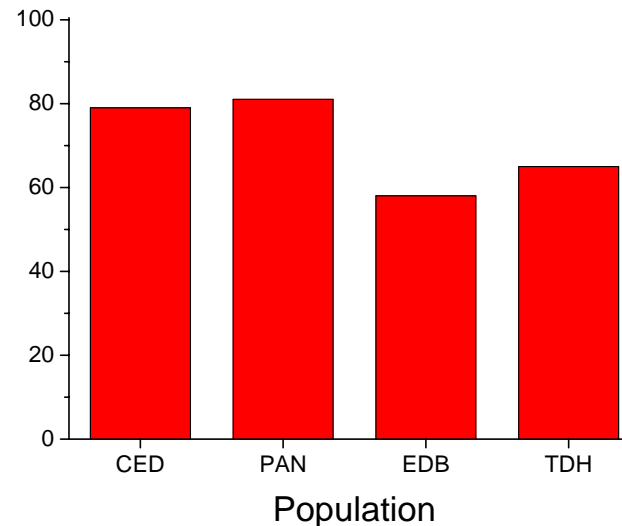


- Toxic alkaloids produced by fungus
  - ✓ High toxicity: ergot alkaloids
  - ✓ Low toxicity: peramine, lolines

# Incidence of *Epichloë festucae* in wild populations of *Festuca rubra*



**semiarid grasslands: 70.0 ± 7.4%**



**sea cliffs: 70.8 ± 5.5%**

1999. *Grass and Forage Science* 54:91-95

2006. *Grass and Forage Science* 61:71-76

## Three way simbioses with viruses

- *Epichloë festucae* virus 1 (EfV1) *Victorivirus, Totiviridae*
- *Epichloë festucae* virus 2 (EfV2)
- 73 % of wild *E. festucae* strains are infected by viruses

### EfV1



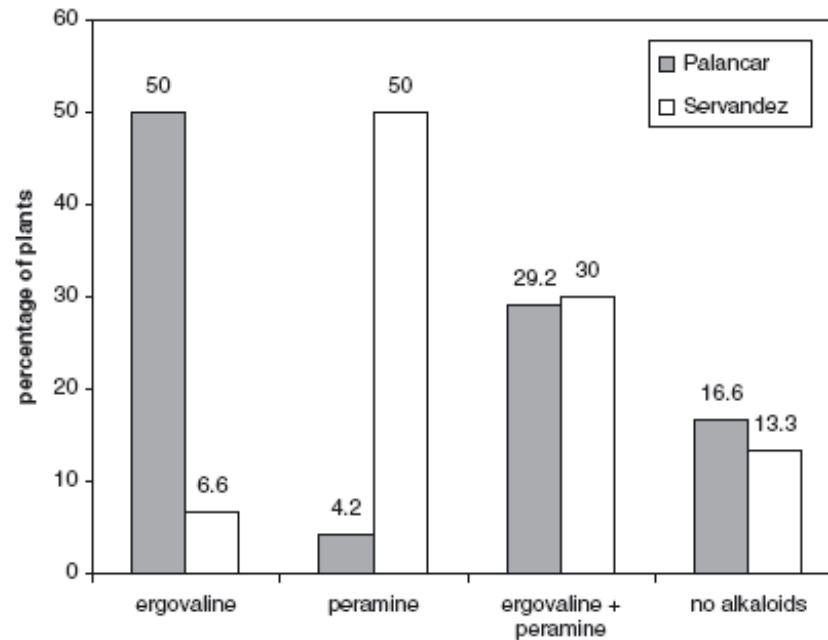
2007. *Virus Research* 124:38-43

# Genetic and alkaloid diversity in wild populations of *Epichloë festucae*

1. AFLP genotyping of *E. festucae* populations

$G_V$ : intra- and interpopulation

2. Remarkable variability in alkaloid content of infected plants

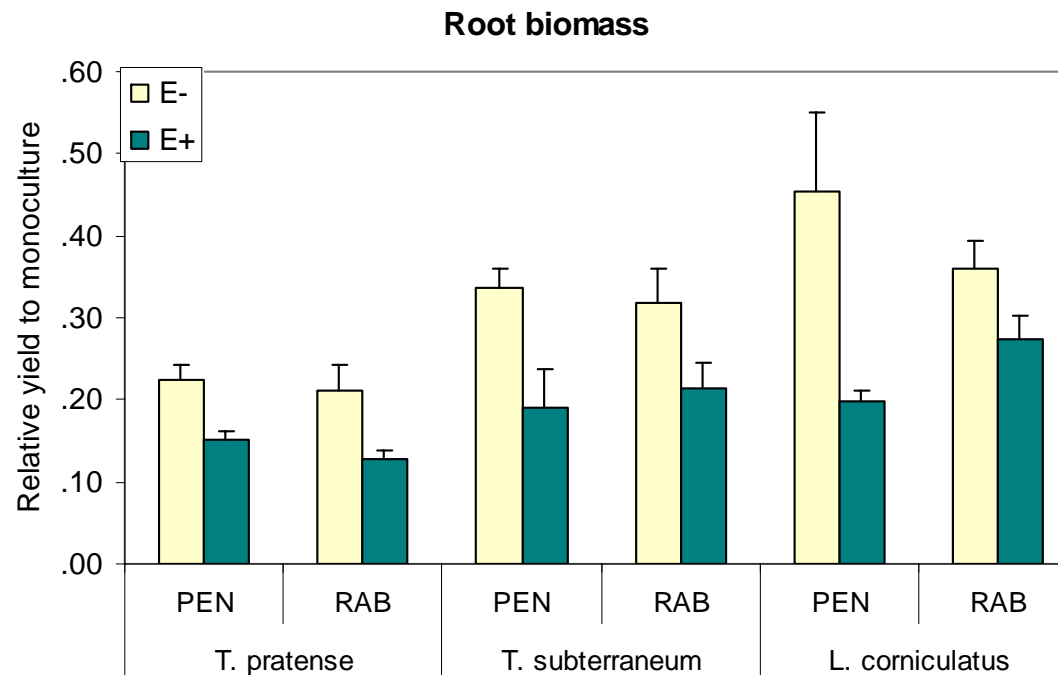


2002 *Molecular Ecology* 11:355-364  
2010 *Annals of Applied Biology* 156:51-61

# Why endophyte infection rates are high?

- Greater phosphorus content in E+ plants
  - ✓ In P poor soils
  - ✓ In P rich soils
  - ✓ In the absence of root endophytes

- Allelopathy



# What plant breeders can do, endophytes can improve

- Adequate strains for cultivar improvement must have custom alkaloid profiles and affect plant performance.
- European wild populations are a reservoir of endophyte germplasm useful for grass improvement
- Nature of the symbiosis is still not well understood