Benomyl effects on plant productivity through arbuscular mycorrhiza restriction in a Greek upland grassland

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Introduction Interactions between plants and microbes are important for plant community structure. Many plants establish symbioses with arbuscular mycorrhizal (AM) fungi, which play a central role in soil fertility, plant nutrition and the maintenance of stability and biodiversity within plant communities by improving uptake of nutrients and water. AM fungi can improve growth/performance in a variety of plant species by influencing intra- and interspecific competition of neighbouring plants and thus regulate coexistence and diversity in mixed communities. The aim was to study AMF effects on plant productivity and diversity in Greek upland grasslands.

Materials and methods The experimental site (40°48´N, 21°23´E at 1340 m), on a Typic Xerothrent soil (average depth <35cm), faced south with 805 mm annual precipitation. Four blocks of two treatments (control, benomyl at 2.5 g benlate (DuPont)/m^2) were randomly arranged in 4.25 x 4 m plots. Above-ground vegetation was harvested from two 50 x 50 cm quadrats randomly selected in each plot every 14 days (starting on 29 April) and dried at 75^o C for 48h. Undisturbed root samples of *Agrostis capilaris*, *Phleum pratense* and *Plantago lanceolata* from each of the blocks were collected with steel cylinders (10 cm x 20 cm long) on 7 July. 50g soil collected from the 0-15cm soil layer was mixed and AMF spores counted with a dissecting stereoscope at 160x magnification. Roots from each plant were stained with methyl blue, following Koske & Gemma (1989). The extent of colonisation was assessed by gridline intersection. Data were statistically analysed using ANOVAs.

Results AM colonisation of *Agrostis*, *Phleum* and *Plantago* was significantly reduced after benomyl application, while spore numbers were not (Figure 1). Aboveground biomass production tended to be reduced with benomyl applications for plant community, grasses and forbs and individual species.

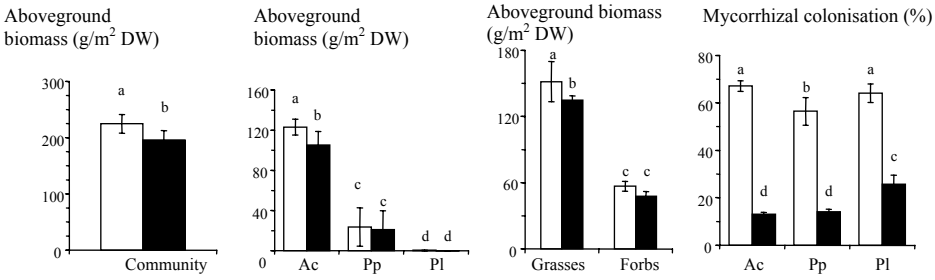

Figure 1 Effects of benomyl (mean ± 1 SE) on above ground biomass (Ac = *Agrostis*, Pp = *Phleum* and Pl = *Plantago*), and mycorrhizal colonisation: different letters = difference at $p = 0.05$

Conclusions Herbaceous grasslands in northern Greece, at altitudes >1000 m, consist of perennial C_3 species and are dominated by grasses and limited by water, N and P (Mamolos *et al.*, 2005). Benomyl application a) reduced colonisation of AM of *Agrostis capilaris*, *Phleum pratense* and *Plantago lanceolata*, b) tended to reduce aboveground productivity by restricting growth of dominant species, but c) did not affect AMF spore abundance. The initial data indicate that AM associations can influence productivity and plant diversity in such grasslands.

References

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