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Diversity and biomass of soil fungal community related to experimental fires in Mediterranean maquis (Southern Italy)

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The role of species diversity in below-ground processes is still little investigated and it is not adequately assessed in Mediterranean- type ecosystems which are typically affected by disturbance and stress. Two factors determine the relative adaptability of the soil biota: diversity and plasticity. Fungi are important in driving or controlling the nutrient cycling and energy flux and influencing the composition of the whole community within the ecosystems. There is little information on soil fungal species that contribute to fungal biomass in response to different environmental patterns and management conditions. Fire, a key agent of disturbance in Mediterranean environment, can lead to a modification of composition and functioning of fungal community and to a subsequent new situation in a competitive advantage of different parts of community.

We have analysed the effects of experimental fire disturbance on some quantitative and qualitative properties of soil fungal community such as total mycelium, active mycelium, fungal fraction of microbial carbon, species abundance and species density. The two last ones are referred to total mycoflora, xerotolerant and heat stimulated fungi.

This study was carried out at "Castel Volturno" Nature Reserve (Southern Italy), covered by Mediterranean maquis, where experimental fires with two different intensities (low and high) were performed in the July of 2000. Soil sampling was carried out during the first two years after experimental fires in burned and unburned plots, the last ones used as control.

After low- and high- intensity fires soils showed decreased total and active fungal mycelium, during the whole study period. Fungal fraction of microbial carbon, representing the relative importance of fungal and bacterial components within the soil community, was also lower in burned than in unburned soils, indicating a persistent alteration of microbial community structure still two years after fires, with an increase in the bacterial component versus the fungal components. This trend is in accordance with Vazquez et al. (1993) and Carballas et al. (1993) which emphasized the negative effect of wildfire on fungal populations. Bååth et al. (1995) observed in burned soils a decrease of whole microbial community with fungi appearing more seriously reduced than bacteria.

Active mycelium and fungal fraction of microbial carbon reach higher values for both control and treated plots on sampling times corresponding to higher soil water content values (Rutigliano et al., 2002). Similarly, abundance and species density of total mycoflora increased in sampling times with a more favourable moisture condition of soil, but decreased during the post-fire summer. This trend confirms the influence of water availability on fungi as also observed by other authors (Nordgren et al., 1983, among others). We can suppose that fire represents a disturbance superimposed to the soil water stress in the dry season in Mediterranean ecosystems.

Xerotolerant fungi significantly increased only in terms of abundance 147 and 245 days after low- and high experimental fires. So fire allows a realistic competition for water between species which advantages the xerotolerant component of fungal community. Heat stimulated fungi acquired a more relevant role within the community, in fact they trended to a significant increase both in abundance and species density in treated plots, in time. Fire provides a temporary refuge for heat stimulated fungi which are otherwise unable to compete in undisturbed soils.

Bååth, E., Frostegård, Å., Pennanen, T., Fritze, H., 1995. Microbial community structure and pH response in relation to soil organic matter quality in wood-ash fertilized, clear-cut or burned coniferous forest soils. Soil Biology and Biochemistry, 27: 229-240.

Carballas, T., Acea, M. J., Cabaneiro, A., Trasar, C., Villar, M. C., Diaz-Raviña, M., Fernandez, I., Prieto, A., Soa, A., Vazquez, F., J., Zëhner, R. & Carballas T., 1993. Organic matter, nitrogen, phosphorus and microbial population evolution in forest humiferous acid soils after wildfires. In: Trabaud, L., Prodon R. (eds), Fire in Mediterranean ecosystems. Ecosystems Research Report N. 5, pp. 379-385. Commission of The European Community, Brussels.

Nordgren, A., Bååth, E., Söderström, B., 1983. Microfungy and microbial activity along a heavy metal gradient. Applied and Environmental Microbiology, 45, 1829-

1837.

Rutigliano, F.A., D'Ascoli R., De Marco A., Virzo De Santo A., 2002. Soil microbial community as influenced by experimental fires of different intensities. In: Trabaud L., Prodon R. (eds.) Fire and Biological Processes. Backhuys Publishers, Leiden, The Netherlands, pp. 137-150.

Vazquez, F. J., Acea, M. J., Carballas T., 1993. Soil microbial population after wildfire. FEMS Microbiology Ecology, 13: 93-104.