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QUERCUS ILEX L. ECOSYSTEMS : FUNCTION, DYNAMICS AND MANAGEMENT
ECOSYSTEMES A QUERCUS ILEX L. : FONCTIONNEMENT,
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ECOSISTEMAS DE QUERCUS ILEX L. : FUNCIONAMIENTO,
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ABSTRACTS / RESUMES / RESUMENES

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EFFECTS OF FIRE ON "QUERCUS ILEX L." FOREST SOILS FROM PRADES MOUNTAINS (CATALONIA, NE SPAIN)

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Forest fires are one of the main risk factors of desertification on mediterranean ecosystems. Burned forest soils could be affected by nutrient losses, by biological degradation, and by changes in physical properties resulting in modified water balance. The importance of short-term environmental hazards in the post-fire ecosystems regeneration has been emphasized (De BANO & CONRAD, 1978; WALKER et al, 1988). This paper shows some results of the first year of an integrated study on the effects of an experimental forest fire upon soil physical, chemical and biological properties.

EXPERIMENTAL DESIGN AND FIRE CHARACTERISTICS

A fire of medium intensity was simulated in a 800 m² experimental plot of 40-60 years old holm oak forest. All vegetation was previously cut down and trunks and big branches removed. Remaining branches and leaves (87.2 Mg/ha fresh weight) were uniformly distributed over the soil surface and burned. Fig.1 shows the evolution of temperature during the combustion phase. Organic level of soil reached a maximum of 300 °C, but at a depth of 2.5 cm temperature did not exceed 60 °C. At 0, 0.5 and 1 m above soil surface, temperatures often went beyond 600°C. Front fire potential was estimated to be 9350 cal/cm/s which can be considered a medium value.

![Soil temperature evolution in the experimental fire.](image)

Figure 1. Soil temperature evolution in the experimental fire.

EFFECTS OF FIRE ON SOIL PROPERTIES

Almost all plant biomass and some 45% of the forest floor organic matter disappeared by direct combustion. Ashes covering soil surface were mixed during the first year after the fire with residual and scorched forest floor and some mineral soil from erosion.
Nutrient losses by combustion or volatilization were very important for N: a 65% of the total N present in the biomass deposited and in the forest floor. Otherwise, only a 0.5% of the remaining N from organic horizons was exported out of the plot the year after the fire by leaching and erosion. Ecosystem regeneration could be severely limited by N shortage.

Litter decomposition did not show great differences between burned and control plots, weight loss amounted 15-20% one year after fire.

Field soil respiration, including root respiration, is higher in burned and control plots (fig 2, data from G.Fusté), but differences started the spring after fire, and with great fluctuations. This fact can be explained by different microclimatic conditions, ash fertilization, and the growth of annual herbaceous plants in burned plots compared to natural forest. Soil respiration levels are the same range as those reported by RAICH & NADELHOFER (1989) for forest ecosystems at similar latitude and very close to Quercus ilex forest in France (BILLES et al., 1971, LOSSAINT, 1973).

Figure 2. Soil respiration evolution before and after the fire.

Surface levels has been down 3 cm due to the destruction of the organic horizons during burning. Another cm has gone down by surface compaction and redistribution of ashes and mineral particles.

REFERENCES