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Effect of fire on soil microbial composition and activity in a Pinus canariensis forest and over time recovery

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Wildfires are recurrent disturbances to forest ecosystems of Pinus canariensis, but their effects on soil microbial communities are not well characterized and have not previously been compared directly. Effects of fires on soil biotic properties are strongly dependent on the intensity of the fire, as well as on the type of soil and vegetation cover. This study aims at developing a comprehensive picture of the soil and vegetation dynamics to natural fries in an experiment comprising prescribed burning. The study was conducted at sites with similar soil, climatic, and other properties in a Canary pine forest in the Canary Islands, Spain. Soil microbial communities were assessed following four treatments: control, burnt soil the day after the fire, burnt soil three months after the fire and burnt soil six months after the. Burn treatments were conducted by the stuff from Cabildo de Canarias (Spain) on the 4th and 5th of June 2014. As a general rule, the organic carbon and the microbial biomass tend to decrease in the surface horizon after the fire, but the system responds increasing microbial activities and restoring soil variables in the subsequent months after the burning. Microbial biomass carbon significantly decreased in the burnt soils with their maximum negative effect immediately after the fire and during autumn, six months after the fire. Microbial biomass nitrogen also decreased in the burnt site immediately after the fire but increased in the following months, probably because of microbial assimilation of the increased amounts of available NH4+ and NO_3- due to burning. Bacterial community composition was analyzed by metagenomics analyses Illumina showing strong variations amongst horizons and burning treatment both in total numbers and their composition. Changes in plant community were also monitored at the level of germination and plant recovery. Although fire negatively affects germination, seedling survival improves by increased growth rates of seedlings and improves root establishment. Community composition was significantly different among burning treatments, with the greatest differences between the two recovery times after burning. The sequencing of DNA revealed distinct distributions of bacterial divisions among the treatments. Gamma- and Alphaproteobacteria were highly characteristic of the A horizon in the recovered treatment. Where there were dna left in the burnt site three months after the fire, Betaproteobacteria and members of Bacillus were the only representative microorganisms. Wildfire had a very pronounced negative effects on the soil microbial community not only in terms of its resistance to fire, but in regard their recovery.