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Towards a methodology for removing and reconstructing soil protists with intact soil microbial communities

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Soil ecological theories on the role of soil fauna groups in soil functions are often tested in highly artificial conditions, i.e. on completely sterilized soils or pure quartz sand re-inoculated with a small selection of these fauna groups. Due to the variable sensitivity of different soil biota groups to gamma irradiation, the precise doses that can be administered, and the relatively small disturbance of soil physical and chemical properties (relative to e.g. autoclaving, freezing-thawing and chemical agents), gamma irradiation has been employed to selectively eliminate soil organisms. In recent research we managed to realistically estimate on the contribution of the entire nematode communities to C and N mineralization in soil, by selective removal of nematodes at 5 kGy gamma irradiation doses followed by reinoculation. However, we did not assess the population dynamics of protozoa in response to this irradiation, i.e. we could not assess the potential contribution of protists to the mineralization process. Selective removal of protists from soils with minimal disturbance of the soil microflora has never been attempted and constitutes a highly challenging but potentially groundbreaking technique in soil ecology. Accordingly, the objective of this research is to modify the successful methodology of selective elimination of nematodes, to selectively eliminate soil fauna including nematodes and protists with minimal effects on the soil microbial community and reconstruct soil protists and microbial communities in completely sterilized soil. To this end, we here compared two different approaches: 1) remove nematodes and protists while keeping the microbial community intact (through optimizing gamma irradiation doses); 2) reconstruct protists and microbial communities in sterilized soil (through adding multicellular fauna free pulverized soil). The experiment consists of 7 treatments with soil collected from 0 to 15 cm layer of an organically managed agricultural field: 1) non-irradiated (control); 2-6) irradiated with doses of 5, 7.5, 10, 12.5 and 15 kGy; 7) irradiated with 25 kGy followed by inoculation with multicellular fauna free soil powder. All treatments were incubated using Magenta™ vessels GA-7 which allow air exchange but exclude microbial infection, and we monitor nematode and protist populations after 0, 2, 4 and 8 weeks of incubation by destructive sampling. We also measure the degree of disturbance to the microbial community composition in all treatments as compared to the control soil at the end of incubation. The experiment is ongoing and the data will be presented at the conference.