EGU2020-4706, updated on 19 May 2021
https://doi.org/10.5194/egusphere-egu2020-4706
EGU General Assembly 2020

Impacts of conservation agriculture on soil nitrogen pools and microbial physiology

Jörg Schnecker[1] and Gernot Bodner[2]
[1]University of Vienna, Department of Microbiology and Ecosystem Science, Wien, Austria (joerg.schnecker@univie.ac.at)
[2]University of Natural Resources and Life Sciences, Department of Crop Sciences, Tulln, Austria

Conservation or regenerative agriculture, i.e. reduction of mechanical soil disturbance, introduction of crop rotations, and especially cover crops as a form of natural soil amendment, has been shown to increase soil organic matter contents as well as soil health. One mechanism behind the increase in organic carbon under regenerative agriculture could be an increase in microbial biomass, as well as an enhanced carbon use efficiency (CUE) of the soil microorganisms in these systems. Such changes in microbial biomass and activity could also influence soil nitrogen (N) cycling. Here we show first results of on-farm research at four sites in Austria comparing crop fields under regenerative agriculture practices with conventional practices, and nearby perennial grasslands at each site. The four sites span different climate gradients, soil types and textures.

Soil organic carbon (SOC) content ranged from 1 to 2.3% in the agricultural soils and was significantly higher under regenerative management compared to conventional practices in two out of four sites. SOC contents in perennial grasslands were up to 5% and always higher than in agricultural fields. Extractable organic carbon was similar in the two agricultural fields of the respective site, while grasslands diverged. Microbial biomass carbon was highest in grasslands at all sites and significantly higher in fields under regenerative agriculture compared to conventional agriculture at three out of four sites.

Total nitrogen was highest in perennial grasslands at all sites, and similar in regenerative and conventional fields. The form of N however differed between soils under conventional and regenerative agriculture. Dissolved N, expressed per g total N was significantly higher or tended to be higher in conventional compared to regenerative agricultural fields. From this dissolved pool a higher proportion was in inorganic N forms that are more prone to leaching and gaseous loss compared to organic N forms. In soils from regenerative agricultural fields a higher proportion of the total N was found in the microbial biomass. This pool is considered to be highly dynamic, but also protected against losses. Less N in dissolved and inorganic form as well as a higher proportion of N in the microbial biomass indicates that the N cycle is more closed in soils managed regeneratively versus conventional.

A greater importance of the microbial biomass could also have effects on soil C cycling. Higher microbial biomass is often related to increased carbon use efficiency, which in turn could indicate increased soil carbon sequestration. The already mentioned results will thus be discussed with

further measurements of microbial respiration, growth and CUE.