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Fungal biomarkers in peatlands under nutrient load

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Peatlands store a globally significant soil carbon (C) pool due to accumulation of organic matter in anoxic conditions caused by a high water-table level. In bogs, deposition-fed nutrient-poor and acid peatlands, the organic matter is primarily made up of recalcitrant peat moss litter. These ecosystems are characterized by slow rates of decomposition and nitrogen (N) mineralization. However, increased nutrient availability, e.g., N availability boosted by atmospheric deposition, may promote vascular plant growth in bogs, which can affect their C sequestration capacity. In nutrient poor peatlands, ericaceous shrubs benefit from symbiosis with mycorrhizal fungi, which exchange N obtained from recalcitrant peat for C allocated by the plants. How N deposition affects C accumulation in peatlands through effects on mycorrhizal fungi is not known.

We determined how nutrient addition influences fungal biomass at one of the longest-running nutrient addition experiment on peatlands, Whim Bog, United Kingdom. The treatments receive an additional load of 0.8-5.6 N g m-2 y-1 either as ammonium (NH4) nitrate (NO_3) with or without phosphorus (P) and potassium (K), alongside unfertilized controls. We measured fungal biomarkers, namely ergosterol and chitin, at different peat depths and in the roots of ericaceous shrubs.

Our results suggest that N deposition providing easily available N does not suppress growth of mycorrhizal fungi. Ergosterol concentration (a marker of living biomass) has not changed due to treatments and is higher in 0-10cm peat than in 10-20cm. The trend is opposite for chitin (marker of living and dead biomass) after addition of NH4Cl +PK or $NaNO_3$, which can point to fungal necromass accumulation. In addition, root content of chitin has changed showing higher results under NH4Cl and NH4Cl PK treatments. Further analysis will reveal the net effects of N deposition on the C sequestration potential of peatlands.