European Commission

Science for Environment Policy

Soil quality to decline as climate change hinders litter decomposition by soil fauna

07 November 2019
Issue 534
[Subscribe](#) to free weekly News Alert

Source: Yin, R., Eisenhauer, N., Auge, H., Purahong, W., Schmidt, A., & Schädler, M. (2019). Additive effects of experimental climate change and land use on faunal contribution to litter decomposition. *Soil Biology and Biochemistry*, 131:141–148. DOI.org/10.1016/j.soilbio.2019.01.009.

Contact: rui.yin@ufz.de

Read more about:
Agriculture, Biodiversity, Climate change and energy, Land use, Soil

To cite this article/service: "Science for Environment Policy": European Commission DG Environment News Alert Service, edited by SCU, The University of the West of England, Bristol.

The warmer, drier conditions expected under on-going climate change will reduce the rates at which soil fauna and microbes decompose plant litter, suggests new research from Germany. This may have important implications for agriculture and natural ecosystems worldwide, as litter decomposition is a key process in cycling and distributing nutrients throughout ecosystems.

Soil fauna (such as earthworms, springtails and mites) and microbes (such as bacteria and fungi) are essential to soil quality. They break up dead plant matter and bury surface litter, which supplies nutrients to soil, enhances microbial decomposition, and helps to regulate the global carbon cycle. It is unclear, however, how soil fauna communities will react to the interacting environmental effects that will accompany future climate change, such as changing temperatures and water availability.

This study provides 'real world' evidence of the potential effects of climate change on litter decomposition. The researchers conducted a two-year experiment on ten plots of a global-change experimental research station in Saxony-Anhalt, central Germany.

On half of these plots, they simulated future climate conditions, as predicted by regional climate models for the period 2070 to 2100. Shelters and panels increased night air temperatures (5 cm above the ground) by 0.55 °C, and soil temperatures by 0.62 °C (1 cm deep) and 0.5 °C (15 cm deep). In addition, roofs reduced rainfall by 20% during summer months, but irrigation systems increased water supply by 10% during spring and autumn. On the remaining five plots, no changes were made to the climate conditions.

The researchers were also interested to learn if there was any interaction between climate change and land-use management. To explore this, they created five sub-plots on each of the ten plots, each representing a different form of agricultural management:

1. conventional farming (with pesticide use);
2. organic farming;
3. intensively used meadow (an agricultural system with high levels of labour and input regarding the cultivation, fertilisation, irrigation and harvesting of crops);
4. extensively used meadow (a low-input system that instead relies upon natural characteristics of soil, climate, water, and so on); and
5. extensively used pasture (with sheep grazing).

The researchers also compared the effects of different types of soil organism (microbes versus fauna) on litter decomposition under the different climate conditions. Half of the samples of soil were taken from fine-mesh bags (with 0.02 mm holes) kept in the ground. These allowed microbes, such as bacteria and fungi, to enter, but not fauna. The other soil samples were taken from coarse-mesh bags with 5 mm holes, which allowed soil fauna to enter, as well as microbes.

Throughout the two-year experiment, the researchers assessed how climatic conditions and land use influence litter decomposition rates. They found that decomposition rates fell significantly (by 9%) under future climate conditions, but saw no evidence of interacting effects between climate and land-use management. This demonstrated that the effects of climate change were consistent across all the land-use types.

Continued on next page.

European Commission

Science for Environment Policy

Soil quality to decline as climate change hinders litter decomposition by soil fauna (continued)

07 November 2019
Issue 534
[Subscribe] **to free weekly News Alert**

These lower decomposition rates were mainly due to the higher temperatures and lower water supply during the summer months. While high temperatures can increase decomposition rates, the results confirm that this effect is counteracted if there is low soil moisture. Furthermore, the higher water supply during spring and autumn was not enough to counter the damaging effects of the dry summer. This suggests that summer droughts under climate change are of particular concern.

Moreover, the results show that litter decomposition was lower under future climate conditions in the coarse mesh bags, which contained both fauna and microbes, than in the fine-mesh bags, which only contained microbes. The decreased decomposition rates were thus driven by soil fauna, but not soil microbes. The results also indicate that the responses of different soil organisms to climate change differ in magnitude.

Source: Yin, R., Eisenhauer, N., Auge, H., Purahong, W., Schmidt, A., & Schädler, M. (2019). Additive effects of experimental climate change and land use on faunal contribution to litter decomposition. *Soil Biology and Biochemistry*, 131:141–148. DOI.org/10.1016/j.soilbio.2019.01.009.

Contact: rui.yin@ufz.de

Read more about:
Agriculture, Biodiversity, Climate change and energy, Soil

To cite this article/service: "Science for Environment Policy": European Commission DG Environment News Alert Service, edited by SCU, The University of the West of England, Bristol.