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Bioturbation of three endogeic earthworms - *A. caliginosa, A. chlorotica* and *A. icterica* - depending on organic matter location

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Earthworms alter soil structure through their bioturbation activity: the creation of burrow paths and the production of casts in their burrows or at soil surface. Thus, they may alter some soil functionnal properties (e.g. hydraulic conductivity) and ecosystem services. In cultivated fields, earthworms are a key structuring process and play a major role in the maintenance, the improvement and even the degradation of soil structure. However, bioturbation patterns of the different endogeic species are still not precisely known. This study aims at describing the burrowing and casting activity of three endogeic earthworm species with two different organic matter (OM) locations.

Cylindrical microcosms (15 cm high) were set up with a silt-loam soil and 0.6 per cent of dry grass leaves was added at two locations: mixed with soil or dropped at its surface; three endogeic species were studied in monospecific microcosms: *Allolobophora chlorotica, Allolobophora icterica* and *Aporrectodea caliginosa*. Microcosms were kept for 60 days at 12°C. They were then stripped centimeter by centimeter and, on each layer the bioturbated area, number of bioturbated areas (= objects), blocking cast area (casts that prevent earthworms from passing), non-blocking cast area and the angles of burrow paths were assessed.

In this study, the rate of non-blocking cast is stable whatever the species and the OM location. Regardless of the species, there are fewer objects but a greater percentage of blocking cast with mixed OM than with surface OM. Only *A. chlorotica* and *A. caliginosa* have a greater bioturbated area with mixed OM than with surface OM. With OM at soil surface: *A. icterica* has a higher bioturbated area and generates more objects than *A. caliginosa*, which has a higher bioturbated area and generates more objects than A. chlorotica. Interestingly, there are very few differences between the three species with mixed OM.

The bioturbation activity of earthworms is also affected by depth: the bioturbation activity of *A. chlorotica* is mainly into the first three centimeters with mixed OM whereas it linearly decreases with surface OM. With both OM locations, the bioturbated area of *A. icterica* linearly increases with depth. To conclude, the acquired knowledges have been integrated in a model of soil structure simulation.