

FATTORE Sandrine (2019): Influence of endogeic earthworm *Allolobophora ictERICA* on belowground tritrophic interactions between maize, insect herbivores and entomopathogenic nematodes

ABSTRACT

Great agroecological potential lies in the indirect defence strategy of maize against phytophagous larvae of beetle *Diabrotica spp.* Consisting in releasing (*E*)- $\beta$ -caryophyllene ( $E\beta c$ ), a volatile attractant to insect-killing nematodes that helps reduce herbivore damage to the plant, such strategy relies on higher trophic levels including the natural predators of herbivores (tritrophic interactions). Entomopathogenic nematodes (EPN) such as *Heterorhabditis megidis* have been extensively studied as biocontrol agents against pest crop, yet little has been explored on the contribution of belowground fauna and soil on these tritrophic interactions. Therefore, the influence of endogeic earthworm *Allolobophora ictERICA* was tested on maize indirect defence to root-feeding by *Diabrotica balteata*. A semi-field experiment was conducted to understand the response of *H. megidis* to earthworms in diverse cropping systems (mono vs polyculture). Hypothetical mechanisms were experimented separately in laboratory: influence of contact between plant and earthworms or mucus on plant growth,  $E\beta c$  emission and EPN response; EPN response to  $E\beta c$  in earthworm-worked soil; impact of *in vivo* transport in earthworm intestinal tract on EPN survival and virulence. (1) Results indicated that EPN response to  $E\beta c$  was two-fold higher in earthworm-bioturbed soil in both semi-field and laboratory conditions. (2) Cropping system influenced maize performance but not EPN response. (3) Substrate-mediated influence of endogeic earthworms on maize enhanced plant growth but impact on  $E\beta c$  emission and EPN response remains undetermined (?). (4) Similarly, mucus considerably increased herbivore-induced  $E\beta c$  emission but its adverse effect on EPN response remains unclear (?). (5) Finally, nematode survival and infectivity were severely impaired after passing through *A. ictERICA*'s gut.

**Keywords:** endogeic earthworms, *Allolobophora ictERICA*, maize, insect herbivores, *Diabrotica balteata*, entomopathogenic nematodes, belowground tritrophic interactions, biological pest control, agroecology

