The multi-target biocontrol plant concept and demonstration for multi-pest management in agrosystems

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Résumé

Biocontrol plants could be an alternative solution to conventional pest management. This has been demonstrated through the plant functional diversity concept, with reports confirming that plant functional diversity could be efficient in pest suppression. Several strategies behind biocontrol signalling biocontrol plant roles have been reported: repellent plants, banker plants, non-prey foods, insectary plants, trap plants/ catch crops, indicator/ sentinel plants, barrier plants, bio-fumigation cover crops and nematicidal/ biocide plants. However, the majority of these reports have been about the interaction between one biocontrol plant and one pest species. This is despite crops suffering multi-attacks from several pest species, often necessitating multiple solutions to manage these pests. But how about killing two birds (pests) with one stone (biocontrol plant)? For this, we introduce the concept of multi-target biocontrol plants (MBPs). This is when one biocontrol plant, an MBP, can be manipulated to regulate several pest species in a cropping system. This concept is lacking, not well defined or well described in the literature. Further, we lack a well-defined methodology to identify existing MBPs used in the agrosystems. Using tomato as a crop model as it suffers several pest species threats, we propose a method to identify existing MBPs. With this method, we report a clear synthesis of the start of the art knowledge of MBPs uses and their potential in tomato agrosystems. Our results show that existing studies in tomato are largely between one biocontrol plant and pest attacker, with the biocontrol working efficiently but failing sometimes. Less than 20 out of 68 studies were on the MBP phenomenon. Two-thirds of these studies only cover aerial pests, with about a third on nematodes. We found only one study of an MBP dealing with both aerial pests and nematodes. In total, we present 23 potential MBPs. We highlight results from our recent case study on the application of the MBP concept in a greenhouse set-up. There is a need for more experiments to test the MBP candidates on several pests on a crop in one study and determine how they could be implemented in agrosystems. However, it remains to be seen if the concept of an MBP is more resilient or not or sustainable than the use of the combination of biocontrol plants.

Mots-Clés: multi, pest management

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