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Protocol on the miniaturized screening system used for testing bioherbicide compounds

Chips and tiny model plant to reveal efficiency of candidate molecules

Plants synthetize numerous molecules to integrate environmental signals and to interact with other living organisms. They constitute a not yet fully exploited “reservoir” of bioactive compounds. A microfluidic strategy is developed to evaluate the activity of candidate bioherbicides.

State-of-the Art

Microfluidic approach is an emerging and promising technology in plant studies. Chips are designed for following the growth of plantlets in real time with high resolution microscopy. They are used to test the effect of small quantities of candidate molecules at the cellular and tissue levels.

Mode-of-Action Studies

Seedlings of the thale cress (Arabidopsis thaliana, a model plant in basic research) are integrated in chips for root growth assays. The chips are produced by casting a channel structure (straight square channels with 200 µm x 200 µm width) in transparent polydimethylsiloxane (PDMS) and sealing it with a thin glass cover slip to enable visual inspection. A chip usually contains three similar root-channels with separate inlets and outlets and an additional opening to enter the root of the seedling. Plantlets are germinated *in vitro* on tips and transferred to the chips. Main roots are then allowed to growth within the channels. The device is subjected to a continuous flow rate of liquid culture medium supplemented with candidate bioherbicides and the root growth is monitored under a microscope. The mode of action of the compounds is also studied by using special *A. thaliana* lines expressing green fluorescent markers of the cytoskeleton, a central regulator for growth.

Applications

The miniaturization of our screening system allows a real-time tracking of root growth defects for both applied and basic research investigations. This technology offers a high degree of flexibility enabling reversion of drug-induced phenotypes after culture medium refreshment.

Fonds européen de développement régional (FEDER)
Europäischer Fonds für regionale Entwicklung (EFRE)

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Der Oberrhein wächst zusammen: mit jedem Projekt.
Dépasser les frontières, projet après projet.

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