

Green fluorescent protein (GFP) - A tool to identify roots in mixed plant stands

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Although roots take up most of the resources required by the plant, the lack of efficient research tools hinders the understanding of the root system. This is even more evident when research focuses is not on the single plant but on plants, which share the same soil resources. None of the available methods enables the desired simple, inexpensive, and objective assignment of the observed roots to a target plant in a mixture. Here we demonstrate that transgenic plants expressing the GFP, combined with the minirhizotron technique, are the key to overcoming the methodological limitation to investigate root interactions in situ. We planted transgenic maize (*Zea mays* L.) together with either its corresponding wild type or Italian ryegrass (*Lolium multiflorum* Lam.). The fluorescence enables the observation of the relative distribution of the roots of each plant type and, thus, their interaction with each other. The selected plants are suitable for model experiments to unravel fundamental belowground ecological processes. Because the genetic transformation of plants is an established technique, which can be applied to a large set of plant species, this method is of wide scope.

Keywords: root interactions, green fluorescent protein (GFP), root research methodology, plant communities