

利用红色荧光蛋白标记的轮枝镰孢研究病原菌对玉米根系的系统侵染和定殖

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Root Infection and Systematic Colonization of DsRed-labelled *Fusarium verticillioides* in Maize

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摘要

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摘要 采用农杆菌介导法将红色荧光蛋白基因*DsRed*转入轮枝镰孢Fv-1菌株, 利用荧光显微镜观察轮枝镰孢在玉米自交系B73根部定殖和生长的规律。土壤中的轮枝镰孢首先侵染玉米的须根等组织, 并在其中大量增殖, 随后沿主根向上侵染, 以菌丝的形式扩展到地上组织。有些孢子附着在根表皮的纹理中, 萌发形成菌丝而扩展; 有的则向内侵染附着的细胞, 然后再继续向周边侵染。由根内部向上侵染的菌丝多沿着细胞间隙上行, 有些也会穿行在不同细胞之间。分析接种不同时间轮枝镰孢在玉米根和茎基部组织形成的单菌落数量(CFU)发现, 轮枝镰孢在根部的CFU值随时间逐渐减小, 而茎基部的CFU值则呈逐渐增大的趋势。这说明土壤中的轮枝镰孢能够通过根系侵染途径危害地上部组织。本研究的结果为进一步探明轮枝镰孢和玉米之间的互作关系, 以及其他土传真菌与植物之间的互作提供了有益的参考。

关键词: 玉米 轮枝镰孢 DsRed 互作 系统定殖 CFU (colony forming unit)

Abstract: *Fusarium verticillioides* (Sacc.) Nirenberg [syn. *F. moniliforme* J. Sheld., teleomorph: *Gibberella fujikuroi* (Sawada) Ito in Ito & K. Kimura] is an important causal agent of diseases in maize (*Zea mays* L.) worldwide, which invades maize plants at all growth stages. This filamentous fungus not only incites obvious symptoms on maize ear, stem, root, and seedling, but also is able to infect plants without any visible symptom (endophytic infection). This makes difficult to detect interaction between this fungus and its hosts. Fluorescent reporter gene-labelled filamentous fungus permits *in vitro* and *in planta* monitoring growth and development of the fungus. In this study, gene *DsRed* encoding red fluorescent protein was delivered into *F. verticillioides* strain Fv-1 via *Agrobacterium tumefaciens*-mediated transformation. Using the *DsRed*-tagged *F. verticillioides*, systemic colonization of the fungus in roots and stems of the susceptible maize inbred line B73 was investigated. The aim of this study was to understand the interaction between *F. verticillioides* and maize. The fungus invaded and multiplied inside the lateral root tissues. Some conidia tended to colonize on the veins of the maize root surface and grew along the veins after their germination. Others penetrated the plant cells where they attached and formed hyphae for attacking other cells nearby. Usually, the mycelia migrated from root to stem through intercellular parts of tissues, while some mycelia run across different host cells. Analysis of colony forming unit (CFU) from diseased plants demonstrated that following inoculation the CFU values from roots tended to decrease, but those from stems inclined to increase. This indicates that *F. verticillioides* is able to attack the aboveground parts of plant via systemic colonization on roots. The results from the present study are useful in disclosing the interaction between *F. verticillioides* and maize, and can be extended to studying interactions between other soil-borne fungi and plants.

Keywords: Maize *Fusarium verticillioides* DsRed Interaction Systemic colonization CFU (colony forming unit)

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