Grass-endophytes in plant protection

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Agriculturists have long known that certain grass species infected with systemic fungal endophytes are highly resistant to both vertebrate and invertebrate herbivores. Increased deterrence and toxicity to herbivores is attributable to alkaloids such as lolines, ergotamines and peramines produced by the fungi. In addition to increasing herbivore resistance, these endophytes, at least in some introduced agricultural grasses, increase plant competitive abilities, germination success, resistance to drought and water stress and resistance to seed predators. The benefits to the host plant appear to be more pronounced in nutrient rich environments. Because the fungus receives nutrition and protection from the host plant and in grasses also asexual dispersion by growing into the host's seeds, grass-endophytes have usually been labelled as plant mutualists.

It is noteworthy that in grass endophyte symbiosis, fungal hyphae grow systemically throughout the above-ground tissues of the host plant including developing inflorescence and seeds, and thereby to all offspring of the host. Thus, these endophytes are comparable to other inherited properties of host plants, and could be employed, e.g. in biological control through improved pest resistance in grass cultivars. Our recent studies support this. For example, Neotyphodium uncinatum endophyte increases resistance of meadow fescue (Schedonorus pratensis) to aphid herbivores (Rhopalosiphum padi), and more importantly decreases plant virus infections (the Barley Yellow Dwarf Virus) transferred by viruliferous aphids. These results suggest that,systemic grass endophytes may have economical value when applied to agricultural practices.

In this context, however, endophytic fungi have been largely ignored in European agro-ecosystems, including official variety trials, although numerous agronomically important grass species are infected with endophytes.