Grass endophytes for insect management and improved pasture productivity

John Caradus

Grasslanz Technology Ltd, PB 11008, Palmerston north New Zealand

Fungal endophytes (*Neotyphodium* species) form mutualistic associations with several grass genera. Their success in deterring insect pests is related to the bioactive compounds they produce in their host plant. However, some of these bioactives also cause health and welfare issues for grazing animals. Selection of novel endophytes that produce predominantly insecticidal bioactives has led to their successful commercialisation in many temperate grassland areas. There is evidence that these endophytes may also improve abiotic stress tolerance of the grass plant.

Neotyphodium endophytes complete their whole lifecycle in the grass host plant. The endophyte is in the embryo of the seed and then moves into the emerging leaf as the seed germinates. The endophyte is concentrated in the base of the shoot and is not found in the root system. When a reproductive tiller forms the endophyte moves with the extending inflorescence and grows into the seed head.

The effectiveness of *Neotyphodium* endophytes is due to their diverse chemistry. The type of bioactives produced depends on the fungal strain, while the host plant impacts on the level of expression. There are 4 main groups of known bioactives that are active against insects – peramine, ergovaline, indole diterpenoids, and lolines. Collectively these deter the major insect pests found in New Zealand pastures – African black beetle, Argentine stem weevil, root aphid, pasture mealy bug, porina and grass grub. However, not all of these bioactives are produced by a single endophyte strain and some such as ergovaline and indole diterpenoids can cause animal health and welfare issues. It has been a case of balancing the upside of insect resistance with the downside of animal health and welfare that ahs lead to the successful commercial release of several endophytes – such as AR1and AR37 in ryegrass and MaxQ in tall fescue.