



## Feed Planning

# Understanding pasture endophytes

To maximise your home grown feed, it is important to have pastures that provide good yield, nutritional value and persistence. Where perennial ryegrass can be grown, it is a superior pasture in terms of yield and nutritional value, but it can be susceptible to stresses, which reduces persistence. Endophytes can improve pasture persistence by protecting pastures where specific insect pests are prevalent.

Commercial ryegrass and fescue seed is sold with or without endophyte, and different pasture cultivars can contain different kinds of endophyte. Some cultivars are available with more than one type of endophyte. When resowing your pastures, it is important to consider which cultivar and which endophyte, if any, would be best for your situation. Consider using the Dairy Australia Forage Value Index (FVI) to help select a perennial ryegrass (PRG) cultivar for your farm.

### What is an endophyte and what do they do?

When talking about pastures, the term endophyte refers to a fungus that lives harmoniously in the plant. The endophyte deters insect pests by producing a range of chemicals (alkaloids) thus reducing pasture damage. Some of these chemicals can also cause animal health issues. In return, the plant gives the fungus a place to live. Endophytes occur naturally, and there are many different strains.

Note: If there is old endophyte-infected seed existing in the paddock at resowing, and the seed germinates, this endophyte could still be present.

### Choosing the right endophyte

When you are purchasing ryegrass seed with endophytes, consider which alkaloids the endophyte will produce and the effect it will have on your plants. Endophytes produce alkaloids that can be categorized into three groups: affects insects (green), affects stock (blue), and affects insect and stock (overlap).

### Guidelines to assist in choosing appropriate cultivar and endophyte for your farm

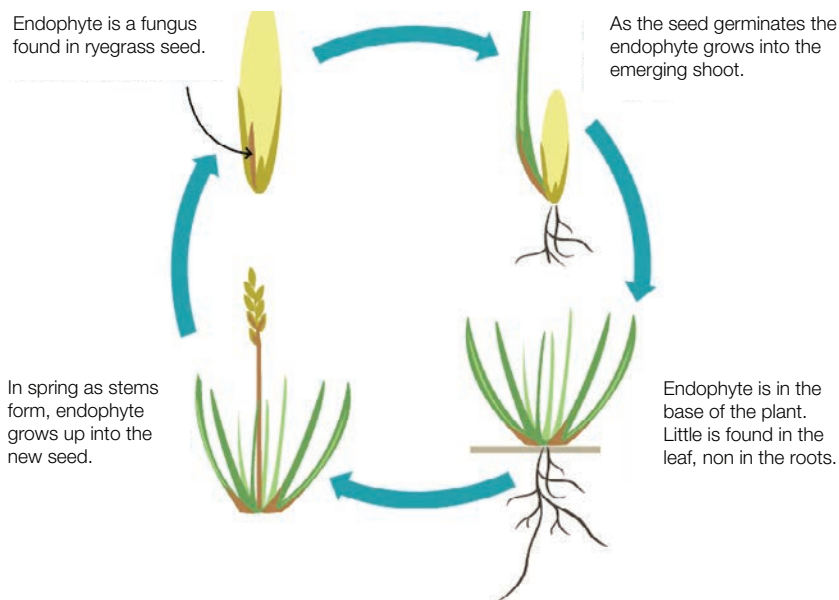
- › Select a number of cultivars that are suitable for your situation
- › Prior to sowing identify which insect pest(s) might affect your newly sown pasture

### Key messages

- ✓ Endophytes can boost pasture persistence where insect pressure occurs
  - ✓ The right endophyte can help pastures withstand insect pests while remaining safe for cattle
  - ✓ Endophytes produce a range of chemicals to protect pasture grasses but can also cause animal health issues
  - ✓ Consider endophyte viability when sowing pasture seed containing endophyte.
- › Consider choosing a cultivar with an endophyte strain that produces alkaloids that provide protection against insect pests but is safe for animals
  - › No endophyte will protect against all pasture insect pests. Different endophytes are more effective than others at protecting your pasture against specific insect pests
  - › Keep in mind that good management practice (e.g. paddock rotation, change of diet) can help alleviate the negative effects caused by endophytes on stock

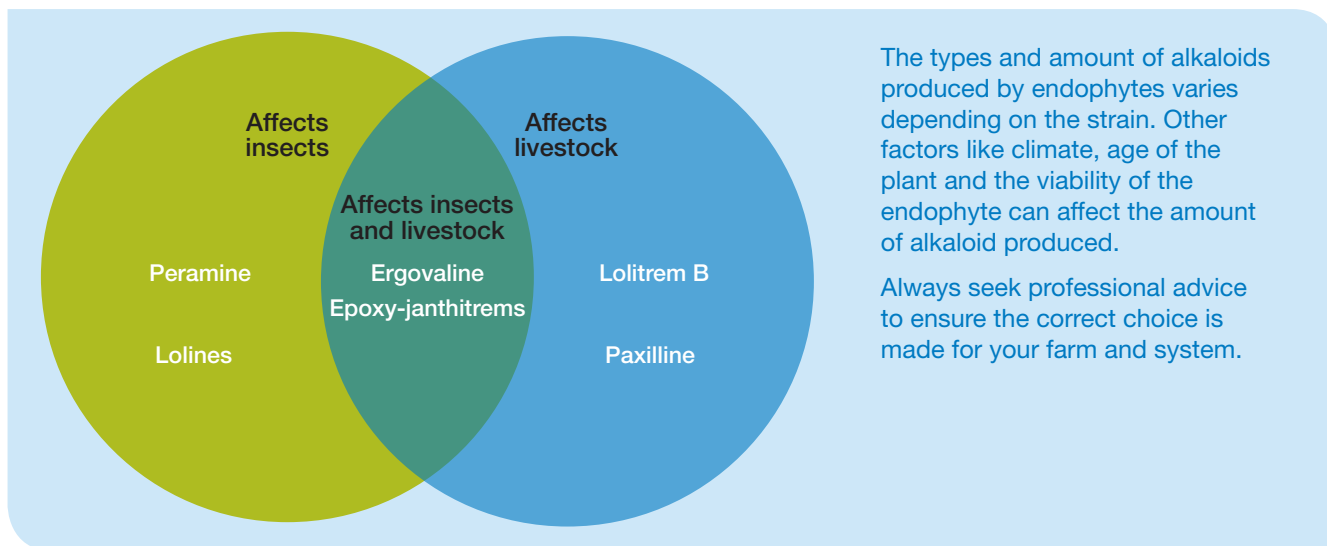
- › Request an endophyte certificate from the seed supplier through your rural retailer to ensure that seeds contain viable endophyte at sowing
- › Endophyte viability in seed can drop off over time if it is not adequately stored (high temperatures, long storage times and humidity negatively affect viability)
- › Consider using other management strategies such as seed treatment, in conjunction with endophytes, that provide immediate protection at germination to improve pasture establishment and maximise pasture protection.

**Figure 1** Life cycle of an endophyte in a pasture plant



Source: DairyNZ

**Figure 2** Commonly known alkaloids produced by ryegrass and tall fescue endophytes that affect stock, insects or both.



## References

- Clay, K., and Schardl, C. L. (2002). Evolutionary origins and ecological consequences of endophyte symbiosis with grasses. *Am. Nat.* 160, S99–S127. doi: 10.1086/342161
- Karpyn Esqueda, M., Yen, A. L., Rochfort, S., Guthridge, K. M., Powell, K. S., Edwards, J. & Spangenberg, G. C. (2017) A review of perennial ryegrass endophytes and their potential use in management of African black beetle in perennial grazing systems in Australia. *Frontiers in Plant Science* 8, 1–21.
- Aston, H., Christensen, M., Eerens, J., Fletcher, L., Hume, D., Keogh, R., Lane, G., Latch, G., Pennell, C. & Popay, A. (2001). Ryegrass endophyte: a New Zealand grassland success story. *Proceedings of the Conference-New Zealand Grassland Association.* 37–46.
- Gallagher, R. T., Campbell, A. G., Hawkes, A. D., Holland, P. T., Mcgaveston, D. A., Pansier, E. A. & Harvey, I. C. (1982). Ryegrass staggers: the presence of lolitrem neurotoxins in perennial ryegrass seed. *New Zealand Veterinary Journal*, 30, 183–184.
- Smith, W.L., N. Gay, J.A. Boling, and M.W. Crowe. 1986. Post-grazing response of steers previously consuming high- and low-endophyte fescue. *J. Anim. Sci.* 63:296.
- Wiewióra, B., G. Zurek, and M. Zurek. 2015. Endophyte-mediated disease resistance in wild populations of perennial ryegrass (*Lolium perenne*). *Fungal Ecology.* 15: 1–8. <https://doi.org/10.1016/j.funeco.2015.01.004>.
- Tian, P., Le, T.-N., Smith, K. F., Forster, J. W., Guthridge, K. M. & Spangenberg, G. C. 2013. Stability and viability of novel perennial ryegrass host–*Neotyphodium* endophyte associations. *Crop & Pasture Science*, 64, 39–50.
- Pasture Improvement Initiative fact sheet: *Endophytes and pasture – a complex relationship.* Retrieved on 21/12/2018. [http://pastureimprovementinitiative.com.au/wp-content/uploads/2015/02/PII-pasture-snapshot\\_endophytes\\_final\\_150226.pdf](http://pastureimprovementinitiative.com.au/wp-content/uploads/2015/02/PII-pasture-snapshot_endophytes_final_150226.pdf)

**Table 1** Example of commonly known alkaloids produced by endophytes in perennial ryegrass, tall fescue and festulolium.

Commercial endophytes	Grass type	Lolines	Peramine	Lolitre B	Ergovaline	Epoxy-Janthitrem	Comments
Standard endophyte (SE)	PRG		✓	✓	✓		It is a naturally occurring-endophyte found in older (and some current) ryegrass cultivars. SE can cause severe ryegrass staggers, and has been shown to reduce both milk production in cows and liveweight gain in sheep. It provides insect protection against pasture mealy bug, Argentine stem weevil, black beetle and root aphid.
AR1®	PRG		✓				It provides moderate insect control and is safe for livestock. AR1 gives very good control of Argentine stem weevil and pasture mealy bug. AR1 pastures are susceptible to root aphid and black beetle.
AR37®	PRG					✓	It supports good animal performance but may cause ryegrass staggers in sheep, which on occasion can be severe if not managed carefully. AR37 provides very good insect control of Argentine stem weevil larvae, pasture mealy bug, rootaphid and good control of black beetle.
Endo 5®	PRG		✓		✓ (very low)		It does not cause ryegrass staggers and has been selected for low levels of ergovaline. It provides some protection against root aphid, black beetle, pasture mealy bug and Argentine stem weevil.
NEA2	PRG		✓	✓ (very low)	✓ (low-medium)		Supports good animal performance and does not cause ryegrass staggers in cattle, however there is a slight chance it could occur in sheep. It provides good control of Argentine stem weevil, pasture mealy bug and black beetle, and moderate control of root aphid.
Edge	PRG		✓		✓ (low)		Does not affect animal performance and protects against a range of insects that include: adult black beetle, Argentine stem weevil, root aphid and pasture mealy bug.
Max P®	TF	✓	✓				It supports good animal performance and protects fescue against a range of insects that include: argentine stem weevil, fall armyworm, European corn borer, birdcherry oat aphid, greenbug aphid, black beetle and Japanese beetle.
GrubOUT® U2	FL	✓					It supports good animal performance and protects meadow fescue against a range of insects that include: grass grub larva, porina caterpillar, black field cricket, argentine stem weevil, red headed pasture cockchafer, black beetle adult and larva.
Happe	PRG	✓					It protects against a range of insects that include: adult black beetle, porina, Argentine stem weevil, root aphid and pasture mealy bug.

PRG = perennial ryegrass; TF = tall fescue; FL = festulolium

Adapted from Pasture Improvement Initiative fact sheet: [Endophytes and pasture – a complex relationship](#)

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