ENDOPHYTE AFFECTS THE PERFORMANCE OF IRRIGATED PERENNIAL RYEGRASS (*LOLIUM PERENNE*) IN THE SUBTROPICS OF AUSTRALIA

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The hot, humid summers in subtropical southern Qld and northern N.S.W. reduce growth and persistence of perennial ryegrass (*Lolium perenne*) (Lowe *et al.* 1999). Fungal endophytes (*Neotyphodium* spp.) confer varying degrees of protection to ryegrass against predation by insects and diseases and there is also evidence that they reduce drought stress and improve persistence (Latch 1994). This experiment investigated whether the presence of endophyte improves the growth and persistence of ryegrasses under subtropical conditions.

Seed of 4 cultivars of ryegrass, containing either no endophyte, the novel endophyte (AR1) or the wild-type endophyte was sown in 2002 into a cultivated seedbed at Gatton Research Station in south east Queensland (27^o 34' S, 152^o 20' E; altitude 95 m). Gatton has a humid, subtropical climate with 60% of its rainfall in summer but up to 30 frosts in winter. The experimental plots were fully irrigated. Yield was monitored by defoliating swards to 5 cm in height every month for 3 years. Persistence was assessed annually as % occurrence in fixed quadrats.

Table 1. The effect of endophyte on the seasonal yield and persistence of four perennial ryegrasses in a subtropical environment

Treatment	Seasonal yield (t DM/ha)								Percent occurrence at end of:	
	Spr 02	Aut 03	Spr 03	Sum 03/04	Aut 04	Win 04	Spr 04	Aut 05	Sum 03/04	Aut 05
Endophyte strain										
Nil	5.33^a	1.42^a	2.95^a	1.10^a	1.60^a	1.57^a	1.36^a	0.46^a	50.0^a	9.1^a
AR1	5.61^b	1.66^b	3.25^b	1.49^b	2.29^b	1.88^b	1.65^b	0.80^b	58.2^{ab}	13.9^{ab}
Wild-type	6.15^b	1.86^c	3.35^b	1.61^b	2.43^b	2.13^b	1.97^c	0.89^b	62.5^b	16.2^b
l.s.d. (P=0.05)	0.39	0.11	0.21	0.18	0.36	0.13	0.13	0.28	9.1	5.6

In Year 1 only the wild-type endophyte significantly increased the yield of ryegrass (P<0.05) but in Years 2 and 3, both endophytes increased yields compared with no endophyte. There were no endophyte by cultivar interactions. Endophyte affected yield in all four seasons and this effect increased as the pastures aged (Table 1). Endophyte did not increase yields significantly in summer 02/03 and 04/05 or winter '02 and '04 but trends were still positive. Overall, the wild-type was more effective than AR1. Generally, ryegrass persisted better when in conjunction the wild-type endophyte (P<0.05) but with the novel, AR1 strain, persistence was no better than with the nil treatment.

Table 2. The level of endophyte alkaloids (ppm ±15%) in the tissues of Impact perennial ryegrass in response to infection by either the wild-type or AR1 endophyte in February 2003

	AR1 endophyte		Wild-type endophyte		
Alkaloid	Leaf	Pseudostem	Leaf	Pseudostem	Dead
Lolitrem B	0.0	0.0	0.5	3.0	3.0
Peramine	20	25	24	22	1
Ergovaline	0.0	0.0	0.2	0.8	0.0

No ergovaline or lolitrem B alkaloids were produced in ryegrass tissue containing AR1 endophyte (Table 2), suggesting that animals grazing ryegrass with this endophyte should not suffer from ryegrass staggers and should gain liveweight faster than those grazing ryegrass with wild-type endophyte. AR1 and the wild-type endophytes produced similar levels of peramine and this means that they should confer equal resistance at least to Argentine stem weevil and possibly other insect pests. All four cultivars of ryegrass had similar levels of alkaloid.

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