LOLIUM ENDOPHYTE LEVELS IN COMMERCIAL PERENNIAL RYEGRASS SEED LINES

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Abstract

A survey of perennial ryegrass seed lines received for testing in 1982 revealed different Lolium endophyte infection level characteristics for different cultivars. Grasslands Ruanui had low infection levels, Ellett had high and Grasslands Nui and other perennial ryegrass samples had variable infection levels. Differences in infection levels are ascribed to the infection status of the original cultivar material and the storage period between harvest and sowing during the seed multiplication process. The problems associated with providing a seed testing service for Lolium endophyte are also discussed.

INTRODUCTION

The discovery of an association between the *Lolium* endophyte and ryegrass staggers (Fletcher & Harvey, 1981) prompted the need for a reappraisal of the incidence of *Lolium* endophyte in perennial ryegrass (*Lolium perenne* L.) seed lines. Previous surveys (Neill, 1940; Lloyd, 1959) have shown a variable incidence of infection, depending on the source and age of the seed concerned.

A preliminary survey of perennial ryegrass seed samples from the 1981 harvest confirmed the presence of infection in many seed lines. However, these tests were carried out at least six months after harvest and it was considered that the results did not accurately reflect the levels of viable infection which would have been present immediately after harvest.

A further survey was initiated early in 1982 to determine the levels of viable

A further survey was initiated early in 1982 to determine the levels of viable infection present in freshly harvested perennial ryegrass seed, and to determine if there were any differences in levels of seed infection between different perennial ryegrass cultivars.

MATERIALS AND METHODS

In February and March 1982, samples of perennial ryegrass seed received at the Seed Testing Station for routine purity and germination tests were set aside for *Lolium* endophyte tests. All samples of Government certified pre-basic (breeders) and basic seed of named cultivars received during this period were tested as a first priority. In addition, a proportion of samples of certified first generation and uncertified seed were tested as necessary to ensure that approximately equal numbers of seed lines of different cultivars were tested. The testing was discontinued once a clear trend in results became apparent.

A similar test method to that described by Neill (1940)—was-used-in this survey. Seeds were germinated on blotting paper substrate at 20°C for 16 days, after which time 50 seedlings per sample were prepared for examination. From each seedling a five millimetre length of leaf, cut off just above and below the end of the leaf sheath, was used. On each microscope slide three lengths of leaf were mounted in 1-2 drops of staining fluid (50 ml of lactic acid to 100 ml of 0.1% aqueous aniline blue). The lengths were punctured and flattened using a needle,

then covered with a coverslip and left overnight. The preparations were examinedfor the presence of endophytic hyphae using a compound microscope.

RESULTS

Test results (Table 1) show distinctly different infection level characteristics for different cultivars. Grasslands Ruanui had consistently low levels of endophyte infection while Ellett samples had consistently high infection levels. Infection levels in Grasslands Nui samples were highly variable ranging from 10% to 86%. Mean infection levels in basic Grasslands Nui seed samples were higher than in pre-basic seed samples. In samples of both certified New Zealand perennial ryegrass and uncertified perennial ryegrass infection levels were variable.

Table 1: INFECTION LEVELS OF LOLIUM ENDOPHYTE IN RYEGRASS SEED LINES HARVESTED AND TESTED IN 1982

Cultivar	Certification Class	No. of Samples Tested	Endophyte infec Mean	tion (%) Range
Ellett	Pre-basic	1	92.0	
	Basic	1	86.0	
	Uncertified	1 3	86.8	70-96
	Total	15	87.1	70-96
Nui	Pre-basic	4	28.5	1 0-48
	Basic	1 0	65.8	20-86
	Total	14	55.1	1 0-86
Ruanui	Basic	-2	6.4	4-8
	1 st Generation	1 2	10.2	2-20
	Total	14	9.6	2-20
N.Z. Perennial				
Ryegrass	Permanent Pasture	7	36.2	4-90
Perennial				
Ryegrass	Uncertified	8	45.3	12-88

Differences in infection levels in freshly harvested seed lines found in this survey reflect differences in the infection levels of parent seed crops. Higher levels of infection in parent seed crops would first arise through the intentional or unintentional incorporation of infected plants into the original cultivar material. Thereafter high levels of infection would be maintained only by uninterrupted seed multiplication through successive generations (Neill, 1940). Any

DISCUSSION-

interruption in the process of multiplication, such as when parent seed stocks are stored for at least 12 months from harvest until sowing will allow the endophyte levels to decline, the rate of decline depending on the storage conditions (Latch. 1983).

Suggestions have been made that all perennial ryegrass seed lines should be routinely tested at the Seed Testing Station for endophyte infection, and the results reported on seed analysis certificates. However, there are a number of factors which must be considered before this can be done.

- Almost four thousand samples, representing at least 11,000 tonnes of perennial ryegrass seed, are received at the Seed Testing Station each year. Unless fast and reliable techniques for detecting viable endophyte infection are developed, the Station cannot cope with the testing of all perennial ryegrass seed samples.
- Endophyte levels decline quite rapidly under commercial seed store conditions, consequently, test results would quickly become outdated. Frequent retesting would be necessary, otherwise test results could be misleading.
- 3. The relative importance of the ryegrass endophyte with respect to ryegrass staggers and resistence of pastures to Argentine stem weevil has yet to be fully determined. It is considered to be somewhat premature to provide seed test information at a time when the results may be difficult to interpret and apply.
- 4. Concern has been expressed by the commercial seed industry about the implications of a testing service to their domestic and export seed trading activities, particularly in the immediate future. They would prefer a post-ponement for at least 12 months when more information will be available, and clearer guidelines can be given to their farmer clients (P.R.W. Ellis, pers. comm.). This extra time would allow indentification of parent seed lines with high and low endophyte levels, which in turn would allow orderly planning of multiplication and provide future stocks of seed with the required levels of infection.

The current plan for 1983 is that the Seed Testing Station will continue to monitor endophyte levels in freshly harvested perennial ryegrass seed lines by testing samples of all pre-basic and basic seed lines, and a proportion of samples of first generation, second generation and uncertified seed.

ACKNOWLEDGEMENTS

Miss S.F.Cane for undertaking the endophyte testing.

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