EXPLORING HIDDEN ECONOMIC LOSSES IN SUB-CLOVER PASTURES

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KEY MESSAGES

- The timing of brownout had no significant effect on the germination rate. This may have been due to a simulated "cultivation" immediately prior to sowing.
- Significant differences were found in the germination levels between varieties; Woogenellup is an older variety that is thought to be more susceptible to root diseases. The varietal difference suggests that root disease may be an issue across the region.
- Demonstration site responses to metalaxyl seed treatments in sub-clover germination suggests that root disease may be present and affecting establishment and persistence.

Figure 1: Root disease affecting sub-clover pasture growth in the field.
Photo courtesy of Prof.M.Barbetti, UWA

Background

The project aims to quantify the level and effects of sub-clover root disease in pastures across the south-east region of South Australia. It aims to understand the production and economic impact of root disease and, through the evaluation of chemical and cultural control methods, establish cost-effective solutions to manage these diseases.

The main soil-borne pathogens that effect sub-clover include *Pythium sp., Phytophthora sp., Aphanomyces sp.*and R*hizoctonia.* These pathogens usually exist as a disease complex that can affect establishment and persistence, reduce germination, destroy roots, reduce plant size and cause failure of nodulation and persistence of pastures. The prevalence of each of these diseases across the region is currently not fully understood.

The project consists of three key elements;

1. Understanding the level of sub-clover root disease by quantifying the extent of root disease across the region,
2. Improving sub-clover establishment by understanding chemical or cultural control methods to increase the initial sub-clover germination, growth and survival, and
3. Managing existing sub-clover stands by investigating products that may be able to improve the regeneration and persistence of sub-clover pastures.

By the end of the project, we will have increased our understanding of the levels of root diseases in sub-clover in the high rainfall areas of the south-east of South Australia, the pathogens involved, and the potential production and economic impact of these diseases. We will have investigated best practice methods to both improve pasture establishment and maintain legumes in our annual pasture stands, and assessed these methods for their economic viability.

Methodology

Eight demonstration strips (100 seeds/m row) were established across the region where the variety *Trikkala* was sown into existing pastures with or without (+/-) Apron seed dressing (Metalaxyl). Figure 2 shows the way the demonstration sites were set up with pasture cages protecting the rows. Germination and survival assessments of these plots were then conducted at approximately 21, 60 and 90 days after seeding.

Two additional replicated trial sites were established to assess the effect of brownout following knockdown spray application on sub-clover germination and survival.

Fig 2: Demonstration site at Keilira

At the trial sites, eight replicated 1m strips of clover seed were sown (100 seeds/m row) at 0,7,14 and 28 days after initial application of glyphosate. Assessments of these plots were then conducted at approximately 21, 60 and 90 days after seeding.

Fig 3: Brownout establishment trial site at Clothiers, Woolumbool

Two varieties were used in each treatment; Trikkala (a commonly grown variety across the south-east region) and Woogenellup (the variety used as the standard for root disease assessments across Australia).

Additional trials were conducted to assess the effectiveness of post-emergent sprays (metalaxyl and phos-acid) on existing sub-clover stands to determine if there was potential to improve plant survival and regeneration through the use of these applications. These sprays were applied following second trifoliate leaf emergence (late July) and biomass assessments were conducted at 40 and 160 days after treatment.

Results and Discussion

Demonstration Sites*

At the demonstration sites, there appeared to be a general response in the germination and survival of Trikkala sp. where the seed was treated with metalaxyl. Figure 4 shows the compilation of results across all demonstration sites where after 85 days, the increase in survival of sub-clover plants was 15%. The demonstration sites were established to quantify the extent of root disease; and how widespread it is. These results would suggest there is an issue. Some sites had greater differences between treated and untreated strips; the biggest increase being at Wrattonbully where there was a 25% increase in survival of metalaxyl treated plants after 86 days.

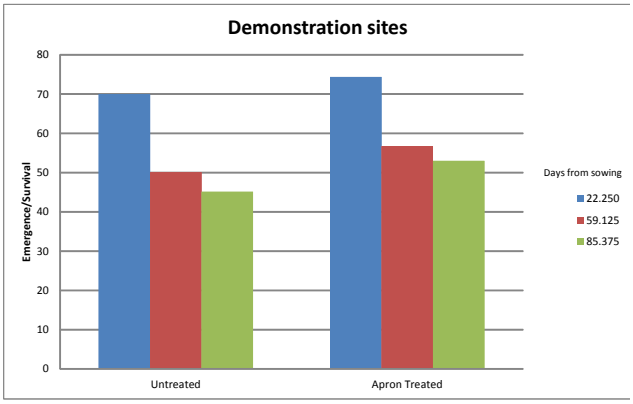

Figure 4: Combined response* at demonstration sites to germination and survival of Trikkala sp. with Apron seed dresssing.

**NB These were demonstration sites only; there is no statistical data associated with this data*

Trial Sites – Sub-clover establishment

At the replicated brown-out trial sites, there were significant varietal effects found, with the site at Furner having more consistent results. The site at Woolumbool experienced transient waterlogging at certain times of sowing, complicating the results. The extent of waterlogging is shown in Figure 5.

Figure 5: Waterlogging at Woolumbool site

The differences between time of the knockdown (brownout) and the time of sowing was not found to be significant. The lack of response is thought in part to be due to the soil disturbance applied at the time of sowing; a simulated "cultivation" occurred prior to each sowing (shown in Figure 6). This soil disturbance is in contrast to the common use of knife points (which couldn't be used in this trial) and it is thought that may have had a great enough effect to nullify the brownout effects that were expected to be seen.

Figure 6: Soil disturbance at sowing

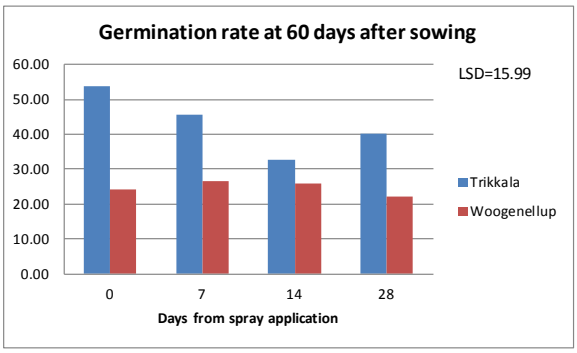

Figure 7: Varietal differences in germination rates and establishment in single rows.

There was a significant varietal difference; Trikkala was consistently higher in its germination rate and survival when compared to the older variety Woogenellup at all sites, and across all treatments (although not always significantly higher). Figure 7 shows the results in germination/survival rate of the different varieties at the different times of sowing post brownout application at the Furner site.

Trial Sites – Existing sub-clover stands

There was no significant difference found between products or rates in the post-emergent sprays used. This was consistent with results in other regions in 2014.

None of the applications produced a significantly higher amount of biomass when compared with the untreated control.

Varieties used

Woogenellup was chosen as the standard variety to be used in all treatments, as it is an older variety and quite susceptible to root diseases. By using this variety, all data generated in these trials have the potential to feed into a larger database.

Trikkala is a commonly grown variety in the south-east and is thought that it has become adapted to this environment, and appears to have an improved tolerance to some of the root diseases.

The significant varietal differences in germination and survival in untreated seed suggests that there is root disease present in the region, and that is potentially having an effect on the sub-clover stands.

The SARDI Predicta-B test has recently been expanded and developed to include the identification of soil borne pathogens that affect pasture. This test will be utilised in the coming seasons to ensure that sites with high levels of root disease are selected. It will also enable an improved understanding of the pathogens affecting the germination and survival of sub-clover species.

Conclusions

The difference between varieties in the replicated trial work, and also the increase in germination levels and survival of sub-clover plants across the region with the addition of metalaxyl seed dressing all suggest that root disease is having an effect on the germination and survival of sub-clover across the south-east region of South Australia, and that further investigation is warranted.

The identification of the pathogens present, the level of these, varietal response, and the actual impact that they are having on production will hopefully be established by the conclusion of the project.

Figure 8: Producer Field Day at the Furner site
Photo courtesy of J.Squires, Rural Directions

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