The impact of post-harvest residue on tall fescue seed production

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Introduction and Aims

Tall fescue (*Festuca arundinacea*) is a perennial plant originating from Europe. Perennial seed crops do not have to be re-established each season. However, to maintain high yielding seed crops the residue from the previous harvest needs to be managed. Because **high yields are a direct result of reproductive tiller numbers**. As tall fescue has an obligate vernalisation requirement, the reproductive tillers are set up the previous autumn.

The aim of these experiments was to assess if keeping the crop shorter will increase the yield potential for the following year, by increasing light penetrating the canopy and therefore the number of reproductive tillers.

Materials and Methods

The trial site was split into two randomized complete block design experiments (Figure 1, Figure 2) of Volupta tall fescue (a continental forage type cultivar), which ran alongside each other. Both trials had straw load (1500 kg DM/ha) retained from the previous harvest. Both experiments were harvested the 12th of January 2021.

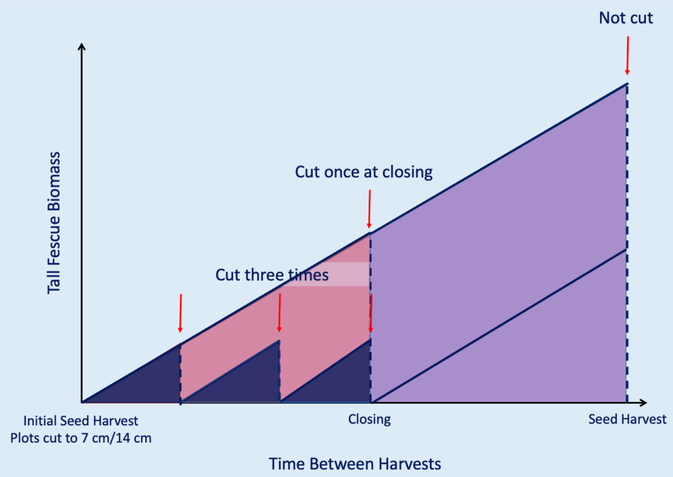

Figure 1. Experiment 1. had plots cut to either 7 cm or 14 cm and three cutting regimes

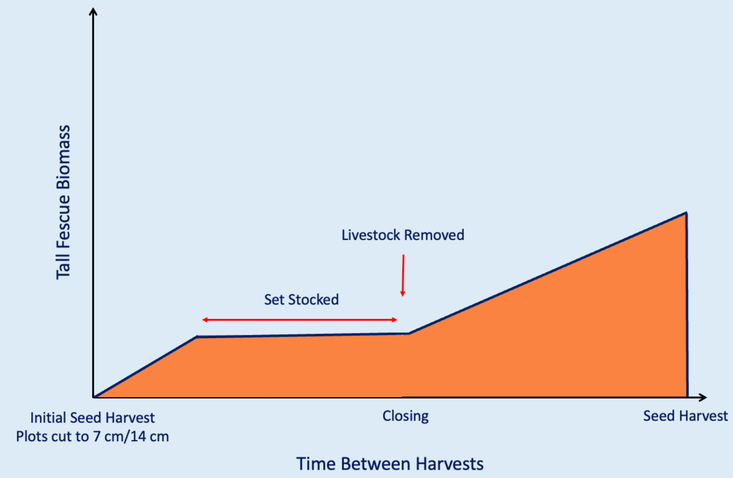

Figure 2. Experiment 2. had plots cut to either 7 cm or 14 cm and was set stocked with calves and lambs.

Results

Under Cutting Regimes

- No defoliation post harvest caused a 53% yield loss compared to defoliation (Figure 3).
- Standard practice of defoliating to 14 cm gave the highest yields.
- No effect of number of defoliations.
- Defoliating to 7 cm reduced yield by 40%.
- Reproductive tiller number was strongly correlated ($R^2 = 0.88$) to seed yield (Figure 5).

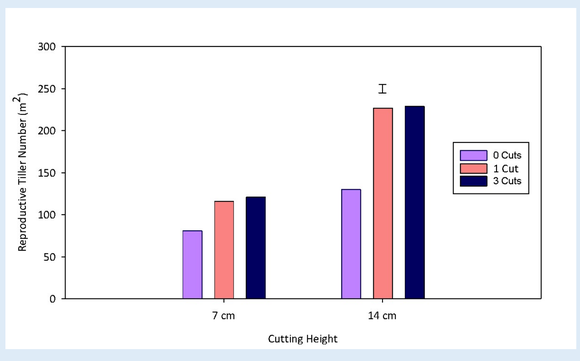

Figure 3. Seed yield under cutting regimes.

Under Grazing

- If original cut was 7 cm yield post grazing was reduced by 22% (Figure 4).
- Plants grazed after initial cut at 14 cm had 33% more reproductive tillers.
- Reproductive tiller number was strongly correlated ($R^2 = 0.88$) to seed yield (Figure 5)

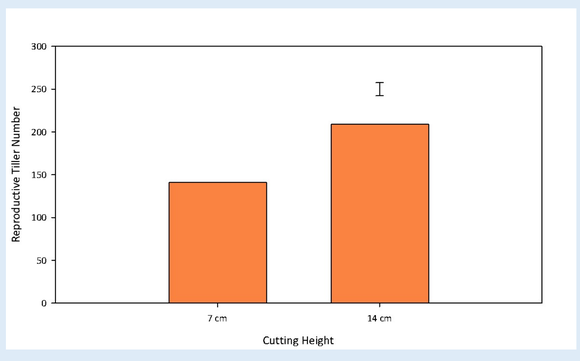

Figure 4. Seed yield under a grazing regime

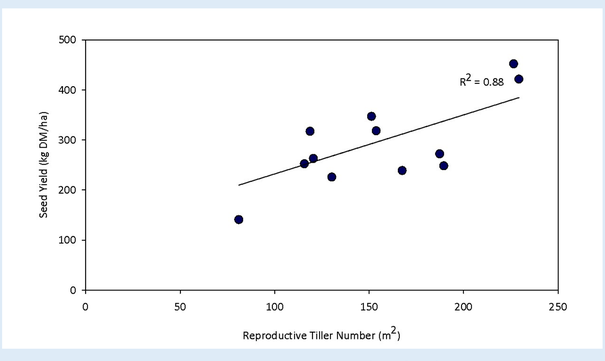

Figure 5. Regression of seed yield (kg/ha) vs reproductive tiller number (tillers per m2).

Figure 6. The initial cutting heights of 14 cm (left) and 7 cm(right) showing the amount of leaf tissue remaining.

Recommendations and Future Research

Recommendations

- Cut crop to 14 cm after harvest.
- Take at least one cut, more is possible.
- For grazing, initial cutting height drives foraging behavior.

Future Research

- Replicating experiment with cultivars from different ecotypes to determine if there is a genetic effect.
- Looking more in depth at the vernalisation requirements of Volupta.
- Directly measuring carbohydrate stem reserves.

Discussion

The initial hypothesis was that by mowing to open the sward, more light would penetrate the canopy therefore increasing final seed yield. The results reject this hypothesis. Plots cut to 7 cm had lower seeds yields than crops left at 14 cm, irrespective of whether the crop was cut or grazed.

To initiate reproductive tillers, carbohydrates are needed. Cutting the crop to 7 cm would reduce photosynthesis as the leaf tissue was removed (Figure 6). This reduction resulted in less carbohydrate reserves leading to less tillers initiated (Figure 7). Under grazing the same trend was observed as livestock only grazed the crop to the height it was initially cut to. Not cutting the crop had the same effect because lodging within the nil cut treatment reduced the area available for photosynthesis, and therefore carbohydrate reserves (Figure 7).

The number of times the crop was cut back to 7 or 14 cm did not impact the results because our cutting regime didn't keep the crop from accumulating the necessary amount of carbohydrate reserves to assume tiller initiation. Brougham (1957) found that crops took up to 24 days to replenish carbohydrate reserves. Our shortest defoliation regime was 28 days.

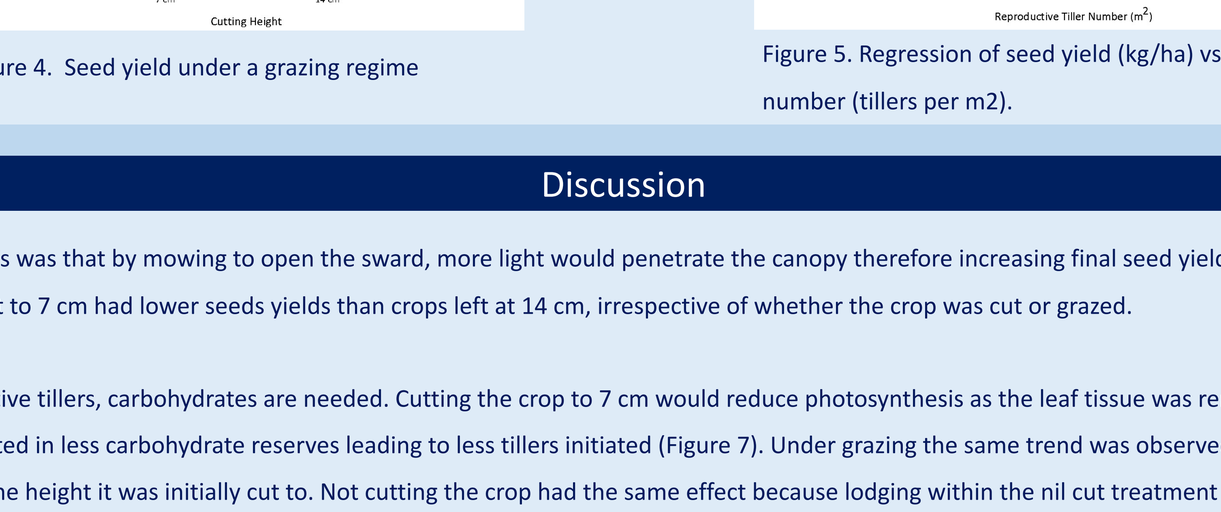

Figure 7. The effect of cutting the crop to 7 cm (left), and not cutting the crop (right) has on reproductive tillers.

Reference: Brougham, R. 1957. Some factors that influence the rate of growth of pasture. Proceedings of the New Zealand Grassland Association 19: 109-116.

I would like to acknowledge SIRC for funding and PGG Wrightson seeds for their support for this project.