beef+lamb new zealand

FACT SHEET

SEPTEMBER 2020

SUBTERRANEAN CLOVER TOLERANCE TO WATERLOGGING

Subterranean clover is an annual legume capable of producing high quality feed in early spring. But which subspecies is best for pastures which experience winter waterlogging?

Key summary point: Waterlogging significantly reduces sub clover production but ssp. *yanninicum* ('Monti') was less affected than ssp. *subterraneum*, and ssp. *brachycalycinum*.

There are three main subspecies (ssp.) of sub clover; ssp. *subterraneum*, ssp. *yanninicum* and ssp. *brachycalycinum*. The three subspecies are found naturally in slightly different environments. Ssp. *subterraneum*, the most common subspecies grown in New Zealand, is found in acid-neutral well drained soils. Subspecies *yanninicum* is found in acidic, poorly drained soils and ssp. *brachycalycinum* in neutral-alkaline stony soils.

Subspecies *subterraneum* may not be suited to some hill country areas that experience winter waterlogging, such as North Island mudstone soils, as it naturally grows in well drained soils. Recent work at Lincoln University suggests ssp. *yanninicum* should be included in a mix for these soils.

WATERLOGGING YIELD RESPONSE

An experiment conducted at Lincoln University investigated the waterlogging tolerance of two sub clover cultivars, 'Monti' (ssp. *yanninicum*) and 'Coolamon' (ssp. *subterraneum*). Waterlogged plants were grown in plastic troughs dug into the ground to allow the accumulation of water. The other treatments were grown in bottomless troughs to allow drainage. The water level in the waterlogging treatment was kept 2-3 cm above the soil level (Plate 1).

Waterlogging resulted in a decrease in yield for both treatments. However, 'Monti', the *yanninicum* cultivar only had a 46% reduction in dry weight compared with 83% for 'Coolamon' (Figure 1). When 'Coolamon' was inundated with water three times a week yield was also decreased but the yield of 'Monti' increased.

Plate 1. Example of waterlogged treatment (top), compared with the control (bottom) five weeks after the start of treatments.

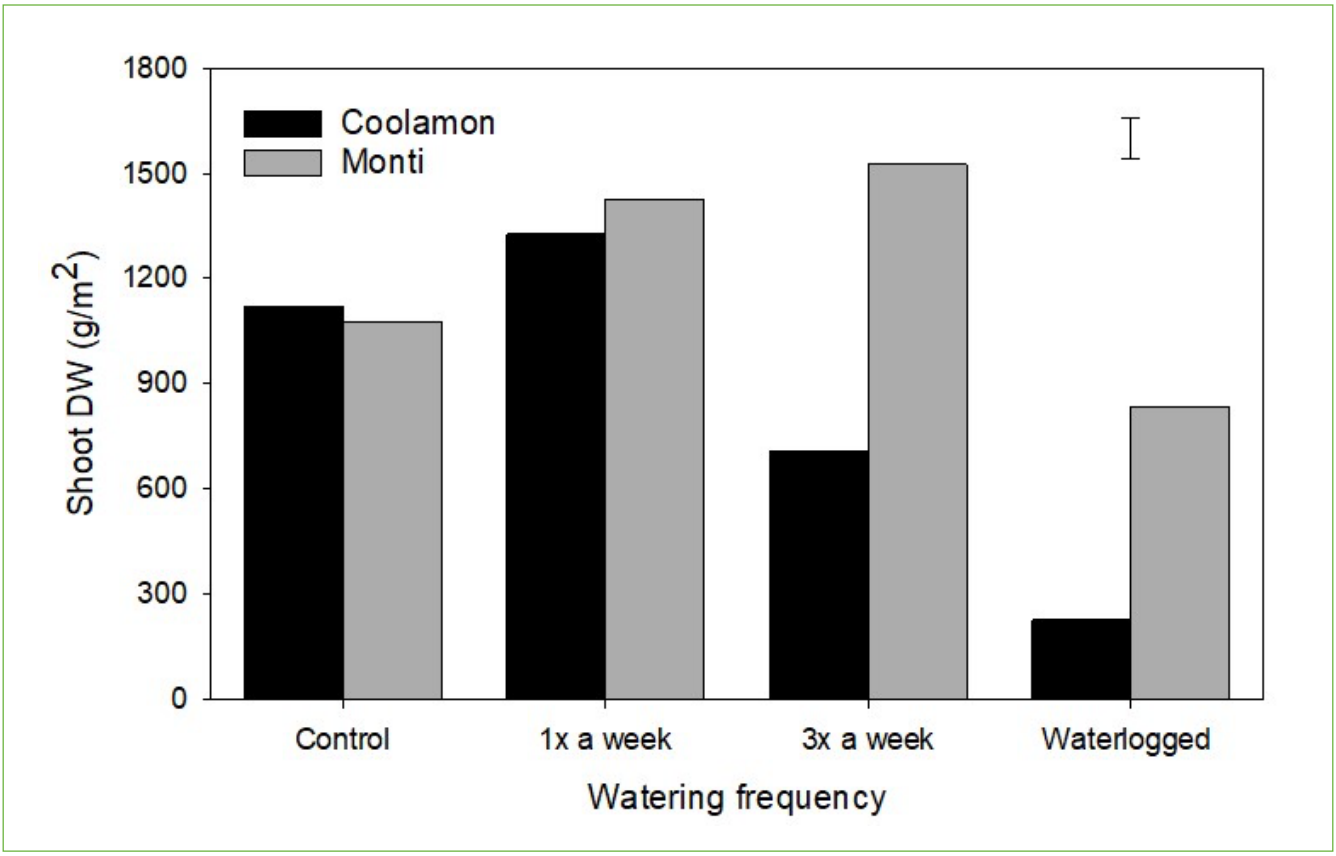

Figure 1. Mean shoot dry weight (DW) of 'Coolamon' and 'Monti' sub clovers from four watering treatments, on 24/10/2018 at Lincoln University.

ROOT RESPONSE

One of the main mechanisms responsible for the higher waterlogging tolerance of 'Monti' was increased root production when waterlogged (Plate 2). Lateral root dry weight was increased by 60%. Waterlogged soils are low in oxygen which can result in root death. Producing lateral roots near the soil surface, where there is more oxygen, increases the amount of oxygen absorbed by the roots. 'Coolamon' had no increase in lateral roots compared with its control. Based on these results we recommend including a cultivar of the *yanninicum* sub species in any sub clover pasture mix on winter wet soils.

ANTHOCYANINS

Leaf reddening was seen in 'Monti' sub clover when waterlogged (Plate 3). Leaf reddening is caused by anthocyanin production which can be produced as a protective response. Anthocyanins in waterlogged plants may help maintain leaf water due to the increase in solutes.

REFERENCES

Taylor, B.J.O. 2019. Yield and botanical composition of subterranean clover in response to ALS inhibiting herbicides and waterlogging. Master thesis, Lincoln University, Canterbury, New Zealand. 137 pp. Online: https://hdl.handle.net/10182/11438.

FURTHER INFORMATION

For further information please contact Prof Derick Moot at Derrick.Moot@lincoln.ac.nz.

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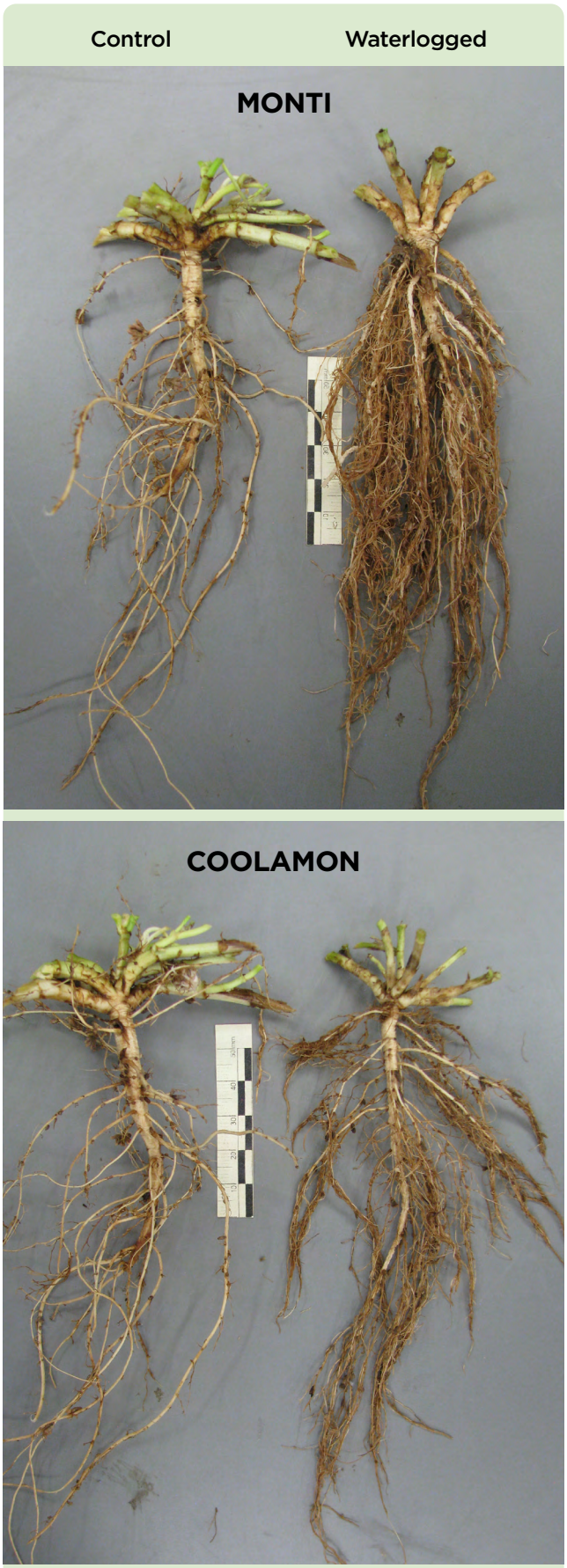

Plate 2. Effect of waterlogging treatments on root growth of 'Monti' (top) and 'Coolamon' (bottom) sub clovers after eight weeks.

Plate 3. Leaf and petiole reddening of 'Monti' sub clover after eight weeks of waterlogging.

More information

For further information freephone Beef + Lamb New Zealand on 0800 BEEFLAMB (0800 233 352) or email enquiries@beeflambnz.com or visit www.beeflambnz.com