Increasing vetch dry matter production through the application of gibberellic acid

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Key findings

- When comparing the average yield of all varieties, vetch dry matter yields were increased by up to 0.27 t DM/ha with applications of Gibberellic acid at 20 g/ha.
- Rates of Gibberellic acid at 10 g/ha did not increase dry matter (DM) when compared to the nil treatment.
- The highest yielding vetch varieties (2.09 t DM/ha - 2.10 t DM/ha) were Studenica and Timok.

Why do the trial?

Vetch is a common rotational option in the Mid-North region and is widely utilised within mixed farming systems as a low-input grazing option.

Gibberellic acid (GA) is a plant hormone used within the horticultural industry to manipulate crop production and flowering dates. Gibberellic acid is also used within highly intensive grazing systems to stimulate pasture production in grasses, commonly phalaris, cocksfoot and perennial or annual ryegrass.

Limited research is published on the use of GA within the agricultural industry, specifically vetch production. This trial investigates the use of GA with the aim to increase vetch dry matter (DM) prior to grazing livestock.

How was it done?

Plot size	1.75 m x 10.0 m	**Fertiliser**	DAP (18:20) + 1% Zn + Impact @ 80 kg/ha
Seeding date	April 20, 2020		
Seeding rate	45 kg/ha		
Location	Hart, SA		

The trial was a split plot block design with three replicates, three GA treatments and three varieties, including; Morava, Timok and Studenica.

Vetch varieties achieved 115% establishment (80 plants/m^2) after good April rainfall. Gibberellic acid treatments (Table 1) were applied to vetch plots on June 11 at branching, 7 weeks after seeding. Post application conditions were relatively warm and dry with rainfall for June totalling 24 mm.

Observations from previous research has shown that maximum plant growth is typically observed between 21-28 days after GA application as labelled. In this trial, biomass cuts were taken 28 days after GA application, on July 9, 2020.

To determine vetch dry matter (t DM/ha), 1 x 1 m^2 cuts were taken from each plot at ground level. Samples were then dried at 60°C for 48 hours and weighed. A feed quality analysis was conducted using Near Infrared (NIR) technology to observe the effect of GA on vetch crude protein (CP%), acid detergent fibre (ADF%), neutral detergent fibre (NDF%), metabolisable energy (ME) (MJ/Kg DM) and digestibility (%). It is important to note that the feed quality analysis conducted in this trial is un-replicated and should be used as a guide only.

Table 1. Gibberellic acid treatments applied at Hart in 2020.

Treatment	Product name	Active Ingredient	Rate (g/ha)
1	Nil	N/A	N/A
2	ProGibb	Gibberellic acid	10
3	ProGibb	Gibberellic acid	20

Results and discussion

Dry matter yield

There was no interaction observed between vetch variety and GA application this season at Hart.

A response to the application of GA was observed, irrespective of variety (Figure 2). The total average vetch DM yield was increased when GA was applied at 20 g/ha, providing a yield benefit of 0.27 t DM/ha when compared to the nil treatment. No yield increase was observed for applications of GA at 10 g/ha.

This trial was conducted under dry winter conditions with 27 mm rainfall received post application, however favourable conditions for applications of GA are cold and wet environments when minimal plant growth is observed. Visual observations showing increased plant height were seen seven days after application (Figure 1). Plots treated with GA also displayed pale discolouration on leaves. Seasonal conditions providing increased rainfall and cooler winter conditions may increase physiological plant responses to GA.

Similar research conducted in North Central Victoria showed applications of GA at equivalent rates did not increase hay yield (t DM/ha) when applied to Morava and Poppany vetch mid-winter (BCG 2019). A second trial conducted in Murray Plains, SA similarly found no GA effect on Morava, Timok or Studenica hay yields (t/ha) when applied at 20 g/ha at two timings; mid and late winter. Biomass cuts were taken at commercial hay timing, late September (MSF 2019).

These studies suggest the response to GA is variable and most commonly, no response in DM has been observed for vetch, more specifically, hay yield.

When analysed alone, there were differences in DM production at Hart between vetch varieties trialed. Morava was lower yielding (1.88 t DM/ha) when compared to Timok and Studenica which had a yield average of 2.09 t DM/ha and 2.10 t DM/ha, respectively (Figure 3).

Figure 1. (L-R) Morava (nil treatment) and Morava + gibberellic acid at 20 g/ha, seven days after application.

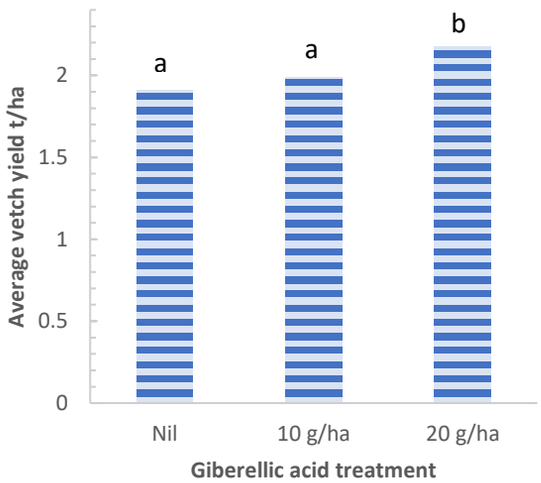

Figure 2. Gibberellic acid treatments showing average yield (t DM/ha) for all vetch varieties. Bars with different letters are significantly different.

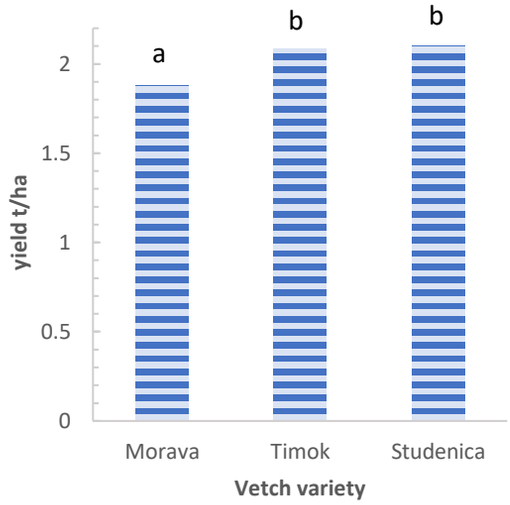

Figure 3. Average vetch yield (t DM/ha) for Morava, Timok and Studenica. Bars with different letters are significantly different.

Snapshot of Timok feed quality

Applications of GA did not affect feed quality in treated plots of Timok vetch (Table 2). The CP%, ME%, and digestibility feed values in GA treated plots were similar to the nil treatment. ADF% and NDF% increased slightly as GA rates increased. ADF% can lead to lower feed digestibility as it comprises tough, indigestible fibres (Moran 2005). However, digestibility remained similar to the nil treatment, meaning no adverse effects were seen with the increase in ADF%.

Table 2. Feed quality analysis data for Timok vetch and GA treatments on crude protein (CP%), acid detergent fibre (ADF%), neutral detergent fibre (NDF%), metabolisable energy (ME) (MJ/Kg DM) and digestibility (%).

Treatment	Crude protein (CP) (%)	Acid detergent fibre (ADF) (%)	Neutral detergent fibre (NDF) (%)	Metabolisable energy (ME) (MJ/Kg DM)	Digestibility (%)
Nil	29.9	22.7	34.7	11.8	72.8
ProGibb @ 10 g/ha	29.9	24.8	34.1	11.9	73.5
ProGibb @ 20 g/ha	29.4	25.3	35.4	11.6	72.1

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