Department of Primary Industries and Regional Development
GOVERNMENT OF WESTERN AUSTRALIA

GRDC GRAINS RESEARCH & DEVELOPMENT CORPORATION

Assessing the palatability and nutritional value of matricaria to grazing sheep.

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Key messages

- Spray topping remains the most effective control option for matricaria in pastures.
- Sheep did not graze matricaria at any growth stage and the use of MCPA in a spray-graze scenario did not increase grazing of matricaria. Grazing would not be a reliable control method for matricaria, even when paired with chemical manipulation, in an average year.
- Matricaria had good feed value but had less crude protein and metabolisable energy than the other green feed in the paddock.
- Mowing or weed wiping to control matricaria at the flowering stage was significantly less effective in reducing biomass and number of flowers and had significantly more regrowth compared to district practice spray topping.

Aims

- Determine whether sheep graze on matricaria (palatability of the weed) in a mixed species pasture and, if so, at which growth stages the weed is palatable.
- Estimate the feed value of matricaria at various growth stages compared to other available feed.
- Evaluate the use of MCPA to increase matricaria palatability.
- Evaluate the efficacy of late flowering mowing or weed wiping to control matricaria, compared to district practice of spray topping.

Background

Matricaria is found throughout the eastern wheatbelt and is spreading into surrounding agricultural regions. In 2017 and 2018, the GRDC Kwinana East RSCN network identified it as a priority issue. Although matricaria is easy to control within cereal crops, control options within pastures are limited. Many growers also believe that matricaria is unpalatable to sheep and the lack of grazing of the weed is leading to populations increasing on eastern wheatbelt farms.

Trials established in 2017 and 2018 used feeding exclusion cages in a pasture paddock located in Warralakkin infested with matricaria. These trials aimed to determine if and when sheep grazed matricaria and found that sheep will graze the weed, if there are very limited feed options available, until the plant becomes woody (after grazing or flowering). Both the 2017 and 2018 seasons experienced below-average rainfall and pasture quality at the trial site was very poor in both seasons. In the 2020 season, green feed levels in naturalised pastures were higher than in previous years due to good growing season rainfall, which presented the opportunity to

determine if sheep will choose to graze matricaria when more favourable pasture species are present.

Information on matricaria control in pastures is also limited and, as such, a number of novel options were investigated with the intention of fitting in to a grazing regime. These included attempting to increase matricaria palatability through a spray graze treatment, the use of a weed wiper to control matricaria growing higher than favourable species, the use of mowing to remove matricaria flowers in an attempt to stop seed set and the common practice of spray topping.

Method

Nangeenan grazing trial

A trial was established in a farmer-managed pasture paddock located at Nangeenan with a large infestation of matricaria. Within a one-hectare area in the infestation, 16 feeding exclusion cages of 1.25m^2 were erected to observe if grazing decreased as matricaria plants matured. Four of these cages were removed two weeks after trial establishment, four removed four weeks after trial establishment, four treated with MCPA two weeks after trial establishment with the cage removed another two weeks after the application, and the final four remained for the entirety of the monitoring period. A further four points throughout the site of 1.25m^2 were marked out for monitoring grazing without exclusion with pegs placed two metres away from the monitoring points to avoid any potential deterrent to grazing sheep.

To determine pasture/weed population densities across the site, both the matricaria and other species were sampled when the exclusion cages were erected. Samples were also taken of small matricaria plants in the vegetative growth stages, larger plants which had reached a reproductive growth stage and a representative mixture of the other plant species present (no segregation of growth stage) for feed test analysis.

Samples to measure the amount of matricaria being grazed was conducted at two weeks after each cage removal comparing grazed areas to ungrazed (caged) areas. Samples were oven dried at 40°C in sample drying ovens for approximately 48hrs until dry, and weighed.

MCAP at a rate of 1.35 L/ha was applied to the MCPA treatments on 28 August using a backpack sprayer with three nozzle hand held boom.

Merredin grazing trial

A secondary trial was established at Merredin on a farmer-managed pasture paddock with a medium infestation of matricaria using five feeding exclusion cages of 1.5m^2. These cages were erected shortly after sheep were introduced to the paddock and were left on for the entirety of the grazing period (erected on 28/07/2020 and removed on 4/9/2020, approximately 38 grazing days). Samples were taken of the matricaria and other pasture species present at the time the cages were erected to determine starting biomass. At the conclusion of grazing, samples were taken inside the cages and from two metres outside each cage to determine biomass of both the matricaria and the other pasture species after the grazing period. Samples were dried and weighed to determine dry biomass, in the same manner as for the Nangeenan trial.

Nangeenan control strips

Adjacent to the feeding exclusion cage trial site at Nangeenan, three treatments were applied in strips to the matricaria infested area stage to evaluate control methods. These treatments were weed wiping with glyphosate and ester at early flowering and mowing and spray topping at late flowering. Weedwiping and spray topping was performed by the farmer using a commercial implement and the mowing treatment was applied using a whipper snipper. Measurements were made of the plant biomass as well as number of flowers and amount of regrowth in each treatment. Feeding exclusion cages were also erected on the weed wiping treatment to observe if the treatment increased matricaria palatability.

Results

Nangeenan feed tests

Samples were taken at cage erection to analyse the feed value of the various species present in the pasture, including small (vegetative) and large (reproductive) matricaria. Both of the matricaria samples are largely equivalent to either oat grain or oaten hay in crude protein, metabolisable energy and acid detergent fibre. As the samples were fresh when tested the dry matter is far lower and cannot be fairly compared. Although quite similar, the weedy pasture mix is seemingly of higher feed quality with higher crude protein and metabolisable energy and lower acid detergent fibre (Table 1).

Table 1. Feed test analysis results from small (vegetative) matricaria, large (reproductive) matricaria and weedy pasture mix (includes capeweed, volunteer wheat, barley grass, radish and medic). Comparisons of oat grain and oaten hay as feed sources for sheep have been included, figures taken from the DPIRD Sheep Feed Value Guide 2018.

Measurement	Small Matricaria	Large Matricaria	Weedy Pasture	Oats	Oaten Hay
Dry Matter (%)	19.8	26.8	16.7	91	90
Crude Protein (% of dry matter)	11.2	10.6	13.0	5.5-13.5 (9.0)	7.0-12.5 (8.5)
Estimated Metabolisable Energy (Calculated) (MJ/kg DM)	9.6	11.3	11.7	10.4-11.3 (10.7)	8.8-10.2 (9.1)
Acid Detergent Fibre (% of dry matter)	29.1	23.2	16.8	16.0-21.5 (18.5)	25.0-32.0 (30.0)
Neutral Detergent Fibre (% of dry matter)	40.4	35.1	13.0		
Digestibility (DMD) (% of dry matter)	65.1	75.4	77.1		
Digestibility (DOMD Calculated) (% of dry matter)	62.0	70.7	72.2		
Moisture (%)	80.2	73.2	83.3		
Fat (% of dry matter)	N.S	3.8	4.0		
Ash (% of dry matter)	18.3	5.5	17.0		
Relative Feed Value (RFV) (% of dry matter)	152.5	187.6	195.0		

Sheep feed with acid detergent fibre contents of less than 30% and neutral detergent fibre contents of less than 40% is generally classified as high quality and therefore all samples tested in this trial can be considered high quality. Small plants have a larger stem to leaf material ratio compared to large plants, which is likely why the large matricaria plants tested as more digestible than the small plants despite their woody stems.

These results align with similar tests conducted in 2018 which also showed that matricaria has a good feed value and is comparable to standard sheep feed, however in the case of the previous tests small matricaria was of a higher feed quality than large matricaria.

Nangeenan Feeding Exclusion Cages

Biomass of both matricaria and broadleaf weeds from 0.5m^2 quadrats was measured at each assessment timing. Biomass of matricaria at the Nangeenan trial site showed no significant difference at any observation timing (Figure 1). Biomass increased slightly as time progressed due to growth and there was no visible reduction from grazing at any growth stage. Biomass was slightly lower following on the areas treated with MCPA, however this was a reflection of plant necrosis from the herbicide and not grazing.

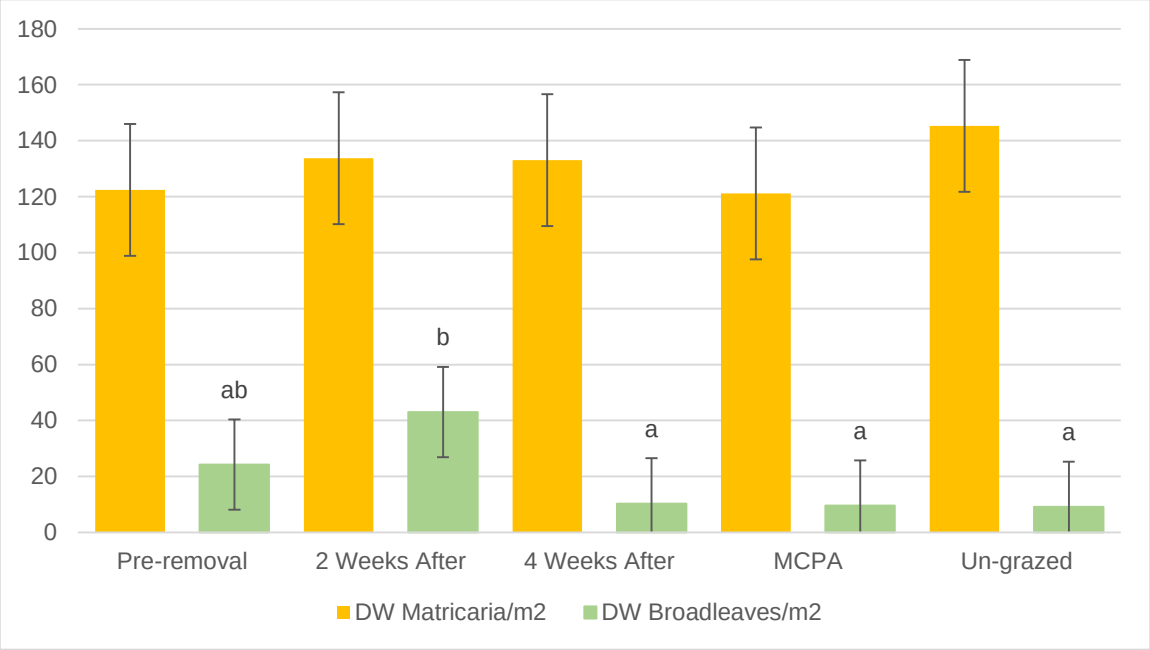

Figure 1. Dry weight (g) of matricaria and broadleaves per m^2 at Nangeenan prior to cages being erected on 7 August, 2 weeks after cages removed on 21 August, 4 weeks after cages removed on 7 September, from cages treated with MCPA (sprayed 28 August and cage removed 7 September) and in un-grazed (permanently caged) plots. Treatments with the same letters indicate statistically similar results and error bars represent LSD (P<0.05).

Broadleaf weed biomass was significantly lower at later observation timings which was most likely a reflection of competition with the matricaria plants and not grazing, indicating the sheep were only moving through the matricaria infested area at this later

stage. This result supports the expected behaviour of grazing sheep in seasons where multiple feed options are available.

Nangeenan Control Strips

Biomass in the control strips using the same method as in the feeding exclusion area. Spray topping reduced matricaria dry weight by more than half compared to the untreated and was the only control method to result in a significant biomass reduction. Weed wiper and mowing treatments also reduced biomass; however, regrowth had occurred by the time biomass was measured, and reduction was not significant compared to the untreated (Figure 2).

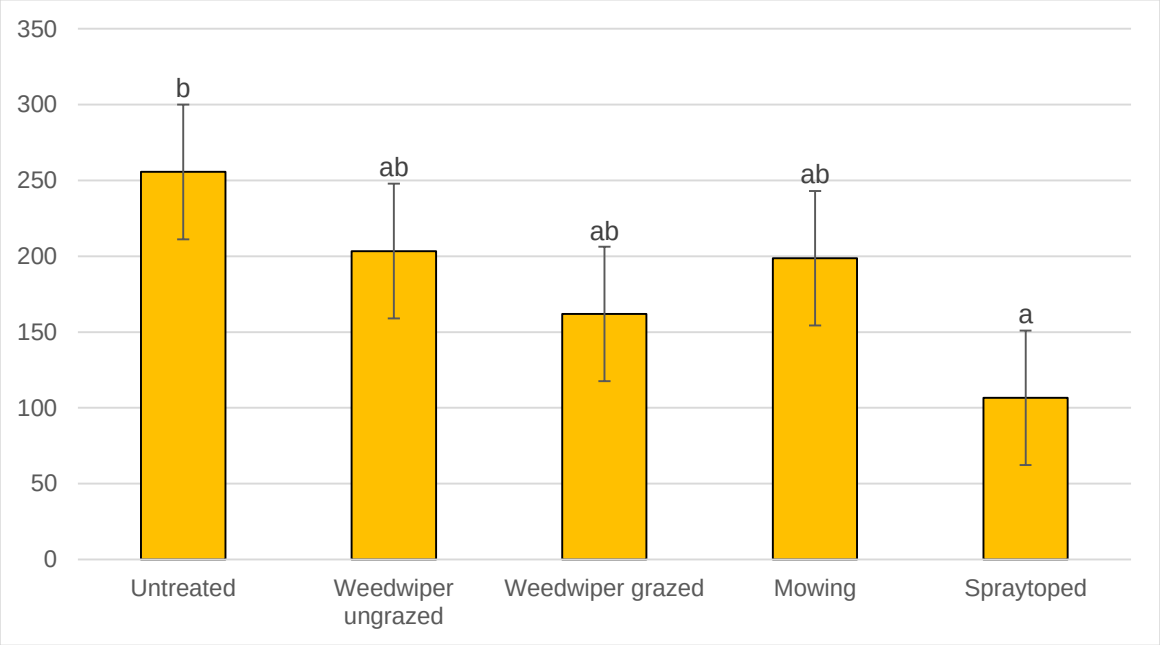

Figure 2. Dry weight (g) of matricaria per m^2 in weed wiping, mowing and spray topped demonstration strips compared to untreated pasture. Weed wiping was split into grazed and ungrazed treatments, using feeding exclusion cages. Treatments with the same letters indicate statistically similar results and error bars represent LSD ($P<0.05$).

A small, but not statistically significant, reduction in biomass was observed in the grazed weed wiper treatment compared to the same treatment ungrazed, suggesting the herbicide may have improved the palatability of the matricaria. However, as the reduction was not significant and did not prevent regrowth, any improvement in palatability was only temporary and would likely not be a viable control option in heavy infestations.

Spray topping reduced the number of matricaria flowers in a heavily infested area by more than 99%, which would contribute to a significant reduction in seed set. (Table 2). Weed wiping provided close to 95% reduction in number of flowers, which was similar to the spray topping treatment; however, regrowth was evident at the time of assessment. Delaying the weed wiping treatment application by a few weeks may have provided better control with reduced regrowth. However, it would still be critical to time the application accordingly to prevent seed set. Only minimal regrowth occurred in the spray topping treatment and this was less than weed wiping and significantly less than mowing. Mowing proved largely ineffective in the trial with high regrowth and a minimal

reduction in flower number. A second mowing as the matricaria began to regrow may have increased the efficacy of the treatment and prevented re-flowering. A second mowing is, however, time consuming and so may not be adopted on-farm.

Table 2. Average number of matricaria flowers, percentage of flower reduction and average number of matricaria plants with regrowth following either weed wiping, mowing or spraytopping.

	Mean no. of flowers/m^2	% flower reduction	Mean no. of plants with regrowth/m^2
Untreated	1377.3	-	-
Weed wiper	72	94.8	2.7
Mowing	917.3	33.4	22.7
Spray topping	12.7	99.1	1.3

Merredin feeding exclusion cages

At the Merredin site, no significant reduction in matricaria biomass was observed at any location in the paddock, with grazed and ungrazed points having largely similar matricaria biomass (Figure 3). Matricaria biomass increased over the course of the trial as the weed population grew and matured. As with the Nangeenan site, this result supports the expected behaviour of grazing sheep where multiple feed options are available.

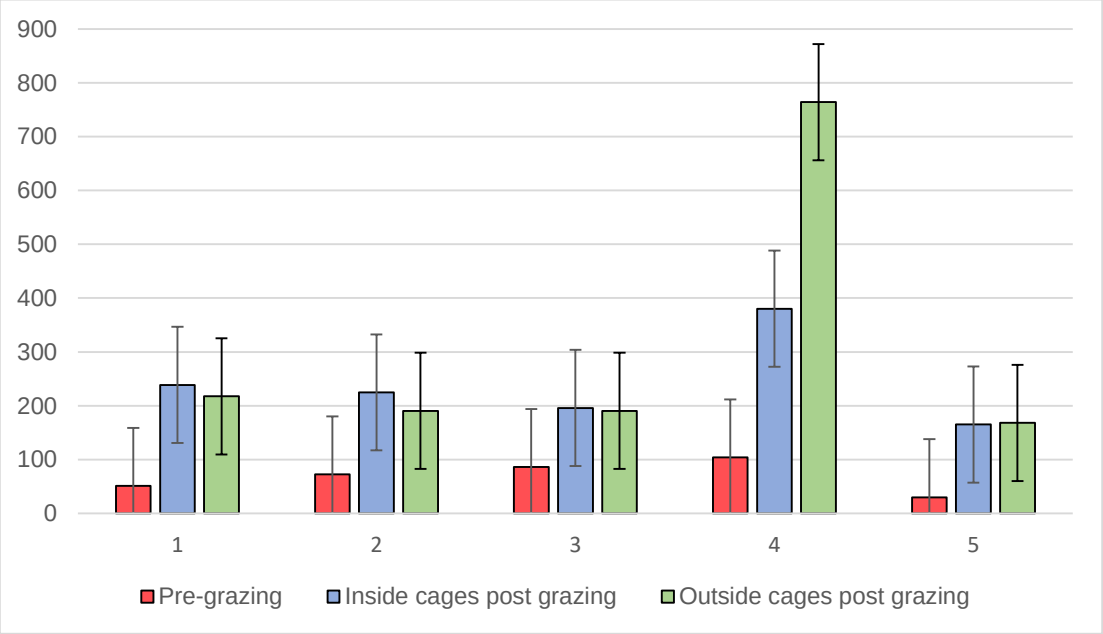

Figure 3. Dry weight biomass of matricaria (g/m^2). Samples were taken pre-grazing at time of feeding exclusion cage installation and post grazing both within the area covered by feeding exclusion cages and 2m outside of the area covered by the feeding exclusion cages. Numbers on the horizontal axis denote cage number (5 in total). Treatments with the same letters indicate statistically similar results and error bars represent LSD ($P<0.05$).

Grazing of grasses was visible at both the start and conclusion of the trial. There was a significant reduction in grass biomass in grazed areas compared to ungrazed areas (Figure 4). Given there was no difference in the same location with matricaria, this suggests sheep were selectively grazing against matricaria and preferred grass species at the site. This differs from the Nangeenan site and may be a result of the infested area being smaller in size and a grass-dominant pasture.

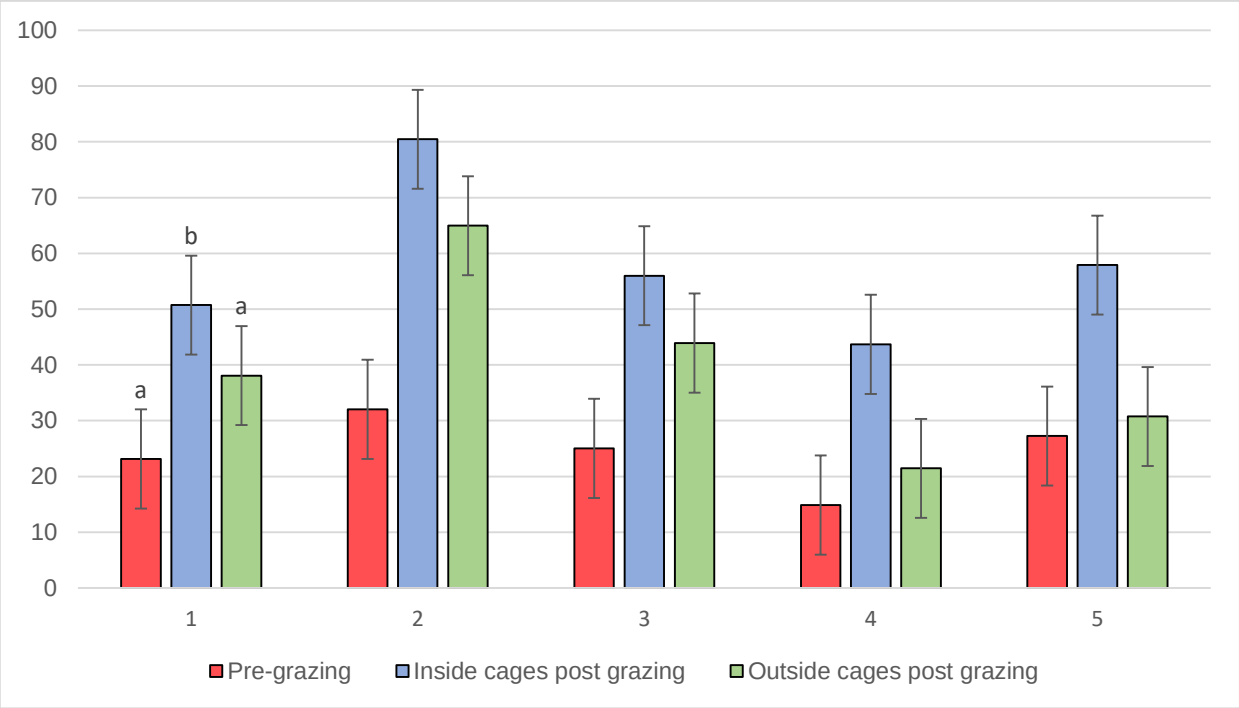

Figure 4. Dry weight biomass of grasses (mixture of barley grass and ryegrass) (g/m^2). Samples were collected pre-grazing, when the feeding exclusion cages were installed, and post-grazing, from both within the area covered by the feeding exclusion cages and 2m outside of the area. Numbers on the horizontal axis denote cage number (5 in total). Treatments with the same letters indicate statistically similar results and error bars represent LSD (P<0.05).

Conclusion

Sheep did not graze matricaria at any growth stage and common techniques to increase palatability did not induce grazing. When matricaria density is high, sheep may avoid grazing within a matricaria-infested area completely. We assume that this behaviour will apply to any season like 2020 with average to above-average rainfall and adequate green feed.

Generally, matricaria at various growth stages compared favourably with cereal hay in terms of its nutrition but was not as good as the mixed pasture at the time of sampling. It is likely that the sheep found matricaria much less palatable in taste, texture and odour compared to the other available feed.

The use of MCPA in a spray-graze scenario did not increase matricaria palatability and would be unlikely to provide satisfactory control of matricaria on its own in a season where feed is abundant.

Mowing or weed wiping to control matricaria at the flowering stage provided some control of matricaria with reductions in biomass and number of flowers. However, regrowth in both treatments occurred and was significantly less effective compared to the district practice of spray topping.

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Important disclaimer