Potential Anthelmintic Properties of Dried Grape Marc

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Introduction

Grape marc is currently a waste and environmentally damaging by-product of the wine industry and to date no practical or sustainable use has been found for the bulk of this material in Marlborough. Around 50,000 tonnes are produced annually but it is predicted the region will eventually have to deal with 70,000T annually. Grape marc is composed of around 51% skins and pulp, 47% seeds, and 2% stalks.

Tests done on grape marc (GM) in 2019, principally from the Sauvignon Blanc grape and dried and milled at the PacRim facilities near Blenheim, showed the product had a feed value equivalent to grain. Hence it is a potentially a very useful animal food source with an ME of 12 MJ/kg DM, Crude Protein of 9 % ww DM and Fat of 5.8 % ww DM.

The analysis also showed that the Sauvignon Blanc Marc (SBM) was a rich source of polyunsaturated fatty acids, particularly linoleic acid, and polyphenols – condensed tannins (CT). (Linoleic acid – 69.4%, Oleic acid 11.6%). CTs have been shown to influence rumen fermentation products, including reducing methane production, improving protein availability, and reducing the incidence of ruminal acidosis. They also have post ruminal effects including reducing N excretion in the urine and improving growth performance and carcase traits, but their most useful role could be that of their influence on Gastro-intestinal nematode parasites (GINs).

Grape seeds are an important component of SBM as they contain a high content of Gallic acid, a powerful anti-oxidant as well as being a component of Tannins. Because a high percentage of grape seeds in non-milled GM pass undigested through the gut of ruminants the GM used in the following trial is dried and milled Sauvignon Blanc marc.

In vitro studies have shown that CTs inhibit the hatching, development and mobility of free living stages of GINs, and as a result should reduce pasture contamination and parasite challenge to their grazing hosts. They are also known to lessen the effect of an infection and thus improve animal performance.

Infection by gastrointestinal nematodes (GINs) is a very significant cause of reduced performance in production animals – sheep, cattle, deer and goats. Parasitism in these animals has been effectively controlled in the last 60-70 years by synthetic anthelmintics, at a significant cost to our low cost pastoral farming systems. However, in recent times the effectiveness of these anthelmintics has declined markedly as resistance to them has developed, not only by several parasite species to single anthelmintic action families but by some parasite species to combinations of anthelmintics.

There is therefore an urgent need to find new and potentially cheaper anthelmintics or alternatives to synthetic anthelmintics. The possibility of finding that dried and milled GM as well as being a useful feed supplement is a useful parasite control option needs to be investigated. Being a natural remedy also suggests increased merit and value for environmental and social reasons as well as marketing options.

Materials and Methods

During 2019 several feeding trials were undertaken in the Nelson and Marlborough areas with sheep, goats and cattle to determine the acceptance and palatability and safety of feeding dried GM both milled and non-milled. No side effects or issues with palatability were experienced feeding up to one-third daily intake. These feeding trials were overseen by G J Batten (Nelson) and P V A Anderson (Marlborough).

Initial trials used goats as they have a more significant lack of natural resistance to GINS than other ruminants and digest high tannin feedstuffs more efficiently than most other species. The dairy goat industry also has a pressing need to find an alternative to the use of synthetic anthelmintics as these create milk withholding difficulties. Initial trials investigated the acceptability of different GM formulations, and the practicality of large scale paddock feeding.

In March of 2020 sixty recently weaned Cashmere type kids on a farm near Nelson were randomly split into two mobs of 30/ mob. These were grazed on two adjacent paddocks of very similar in topography, aspect and pasture species. Half way through the study the mobs swapped paddocks. On top of good quality pasture both mobs were supplemented daily with 100-150 gms bread/animal. This was bread that had gone past its shelf life and was regularly collected from a Nelson Supermarket. One mob, the Treatment group, was also supplemented daily with 150gm/head of SBM from the 24th March until the 10th June.

At the start and end of the study the average weights of the two groups was collected. Ten individual but random faecal samples were collected from each group on day 1 and again at approximately fortnightly intervals throughout the trial period. Samples were sent to the Gribbles Animal Health Lab in Auckland where individual faecal egg counts (FECs) were done as well as pooled larval cultures.

An opportunity arose to collect gut samples for worm counts at the end of the trial when the owner decided to harvest 4 animals for home consumption.

Results

Acceptance by the goats in the treatment group of the SBM was not immediate, taking several days before they all started to eat it. It wasn't until day 9 that all goats were eating their full ration.

Faecal Egg Counts

The faecal egg counts in the treatment group were significantly lower than the control group in all weeks except in the last week of collection (2019-06-25, 2 weeks after treatment group stopped receiving grape marc) (Table 1). The faecal egg count remained consistently low in the treatment group throughout the study compared to control group. In contrast, a spike in faecal egg count was observed in 2019-04-20, 2019-05-11, and 2019-06-11 for control group which corresponds with an increase in several larval species, Haemonchus and Ostertagia (2019-04-20, 2019-05-11) followed by Trichostrongylus on 2019-06-11 (Figure 1).

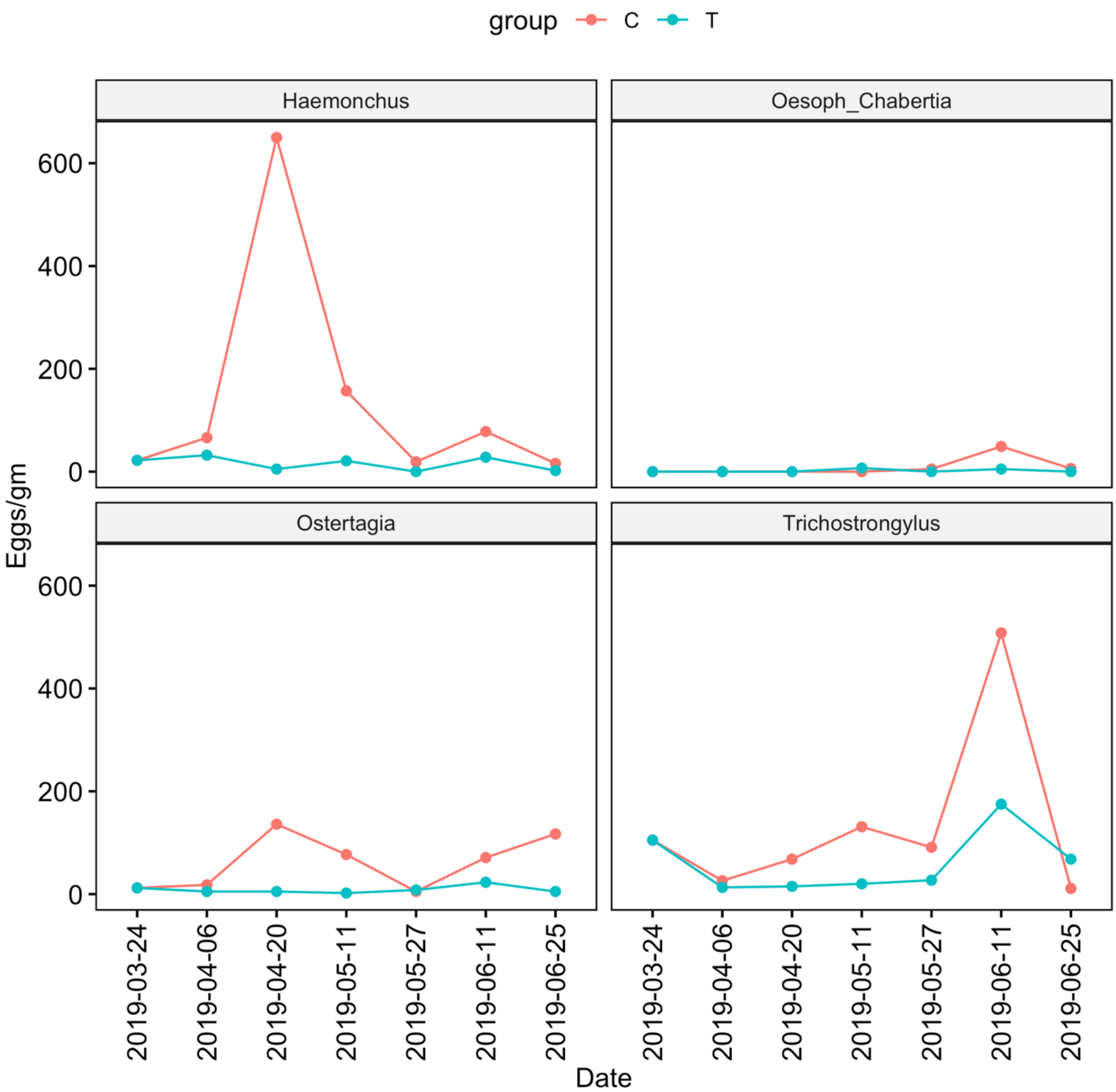
Table 1. Fecal egg count (Median (IQR)) collected from Cashmere type kid on a farm near Nelson in 2019 supplemented (Treatment) and not supplemented (Control) with Sauvignon Blanc Marc.

Date	Control	N (Control)	Treatment	N (Control)	P-value	Significance
2019-04-06	100 (50-150)	10	50 (0-87.5)	10	0.0352	s
2019-04-20	825 (725-962.5)	10	0 (0-0)	10	0.000053	s
2019-05-01	NC	-	50 (0-87.5)	10	0.000815	
2019-05-11	325 (262.5-425)	10	50 (0-87.5)	10	0.004490	s
2019-05-27	100 (62.5-150)	10	25 (0-50)	10	0.000741	s
2019-06-11	550 (450-837.5)	10	225 (150-337.5)	10	8.50e-04	s
2019-06-25	100 (100-137.5)	10	75 (12.5-200)	10	0.146000	ns

ns: Values between two groups are not significantly different

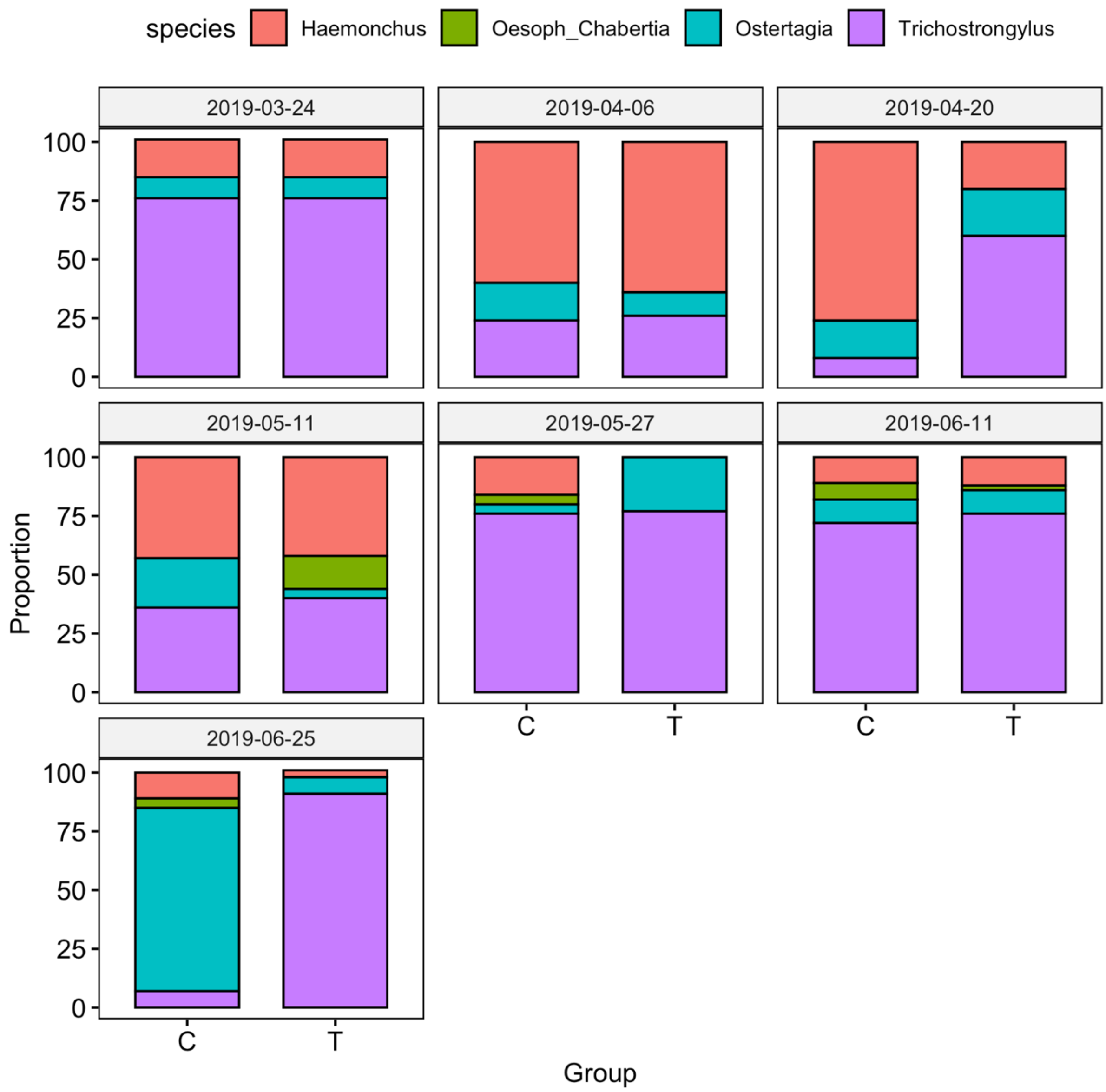
NC: Not collected

Figure 1. The fecal egg counts of different parasite species (Haemonchus, Oesoph/Chabertia, Ostertagia, Trichostrongylus) collected from Cashmere type kids on a farm near Nelson that were supplemented (T) and not supplemented (C) with Sauvignon Blanc Marc.



Larval species profile

Figure 2. The relative proportion of parasite species in the faecal egg count samples collected from Cashmere type kids on a farm near Nelson that were supplemented (T) and not supplemented (C) with Sauvignon Blanc Marc. Proportions were calculated for each group and date by FEC (species)/Sum of FEC (all species).



The dominant larval species was Trichstrongylous in both groups during the study except on 2019-04-06 where the dominating species was Haemonchus. In the control group, Haemonchus continued to be the dominating species on 2019-04-20 and Ostertagia became the dominating species on 2019-06-25 (Figure 2).

Worm Counts

There was no obvious effect on Total worm counts with SBM feeding. Table 2.

Table 2: Total worm counts from 2 Control and 2 SBM treated goats

	C1	C2	T1	T2
Haemonchus	0	200	0	0
Ostertagia	400	800	700	900
T.axei	1100	6300	2500	4900
Trichostrongylus	3200	2200	4100	3200
Trichuris	140	80	60	100
Oesophagostunur	60	100	20	80

C1 & C2 = Control goats. T1& T2 = SBM fed goats.

Body Weights

While the growth rates of all the goats were low during the 3 winter months of the trial the SBM fed group gained more weight, over twice that of the Control Group. Table 4.

Table 4: Weight Results

	6-Apr Kg (ave)	10-June Kg (ave)	Range Kg	Gain Kg	% initial wt	Growth rate Gm/d
Control	14.16	14.82	8 - 22	0.66	4.77	10
SBM Treated	13.39	15.40	10 - 25	1.47	10.65	23

Discussion

The aim of this pilot study was to see if the feeding of Sauvignon Blanc grape marc to goats had any influence on their GI parasites. While we acknowledge that the groups were run in different although similar paddocks and that the treated group had access to an extra ration (less than 20% of their diet) the differences observed certainly suggests that the SBM had an influence on the GINs and their productivity and pathogenicity. This reduction in FEC was for all GIN species.

While total worm counts could only be collected from 4 animals (2 Control and 2 Treatment) the lack of any obvious difference between treatments in total worm burdens might suggest that the effect of SBM was on parasite reproductive performance and possibly pathogenicity rather than a direct influence on adult parasite survival. The weight gain response from the treated group would also suggest that parasites under the influence of the SBM had a lower pathogenicity, or as has been postulated, the Tannins improved the animal's immune response to the parasites.

These findings certainly advocate further research be done into the benefits of dried Grape Marc as a practical means of controlling parasites in grazing animals. Meanwhile the dried SBM as produced in Blenheim by PacRim can be recommended as a useful feed supplement with possible anthelmintic properties.

Acknowledgement

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