Improved milk production from Palm Kernel treated with a Trichoderma extract

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Proceedings of the Australian Dairy Science Symposium, 2018, pp 124-128.

ABSTRACT

The objective of this study was to quantify productive responses to the treatment of Palm Kernel Expeller (PKE) with an exogenous *Trichoderma* extract (VistaPre-T {VPT}; AB Vista) under commercial New Zealand dairy conditions.

In the first study, 205 pregnant cows at approximately 170 days in milk (DIM) were randomly allocated to either control (138) or treatment (67) groups. PKE was offered at 3.4 kg/cow/d via PKE troughs following the morning milking only, whilst cows grazed a turnip crop. Cows receiving VPT treated PKE (0.75 ml/kg DM) produced more milk solids (+106 g MS/cow/d, *P* = 0.038) than cows fed the untreated PKE.

In the second study, non-pregnant cows at two different stages of lactation (100 cows @ 300 DIM and 163 cows @ 75 DIM), were randomly allocated to control or treatment (+VPT) groups. All cows were offered 3.5 kg/cow/d of a commercial feed blend during milking (50% PKE, 30% canola, 10% sugar, 10% soya hull pellets). VPT was applied to the treatment blend at 0.75 ml/kg DM. The milk solids response to VPT was significant in early lactation (75 DIM) group (+117g MS/cow/d, *P* = 0.045), whereas in the later lactation group (300 DIM), there was a tendency to increased milk solids production (+124 g MS/cow/d, *P* = 0.067).

These two studies indicate that VPT treatment of PKE can improve milk solids yield by over 100g MS/cow/d.

Introduction

Palm Kernel Expeller (PKE) is fed extensively to New Zealand dairy cows to enhance lactation yields. With approximately 2 million MT of PKE imported into New Zealand annually, this represents a significant proportion of the supplementary feed offered to the national dairy herd. The nutritive value of PKE is typically 88-95% dry matter, 10.5-11.5 MJ/kg DM metabolizable energy and 14-16% crude protein (Dias, 2010), which is a suitable nutrient profile for a supplementary dairy feed forming a proportion of a ration. The current work quantifies the production responses to feeding PKE treated with a crude extract of *Trichoderma,* with the hypothesis that supplementation of PKE with this extract will increase milk yields, confirming international work (Walker and Povey, 2016).

Materials and methods

Two experiments were conducted in a commercial dairy herd to quantify the milk production responses to feeding palm kernel treated with a *Trichoderma* extract.

In experiment 1, 205 mixed aged and parity pregnant cows at approximately 170 days in milk (DIM) were randomly allocated to control and treatment groups, with approximately 2/3 of the cows allocated to the control group (138 cows) and 1/3 to the treatment group (67 cows), as only three PKE troughs were available. The cows were auto-drafted during the morning milking into the two separate herds, which then grazed the same paddock of turnips, with the daily allocation divided 2/3 and 1/3, for the control and treatment herds, respectively. The PKE was fed via the PKE troughs placed in the divided turnip paddock during the day, for a total of 45 days. Following the afternoon milking, both herds were combined and grazed fresh pasture.

The crude extract of *Trichoderma* (VistaPre-T, {VPT}, AB Vista, UK) was applied at a rate of 0.75 ml/kg PKE DM. Approximately 500L of water was first added to all PKE troughs. VPT was added to the treatment trough only, then thoroughly mixed to ensure that the VPT was fully dispersed in the water prior to the PKE being added, and again thoroughly mixed, thereby ensuring that the VPT contacted all of the treatment PKE. PKE troughs were prepared in the evening, approximately 15 hours prior to feeding. Cows were offered 3.4 kg/d of PKExtra 20 (AgriFeeds, Hamilton, New Zealand), which contained approximately 20% molasses added to the PKE.

In experiment two, using only non-pregnant mixed aged and parity cows, 163 cows at approximately 75 DIM (early lactation) and 100 cows at approximately 300 DIM (late lactation), were randomly allocated to control and treatment groups, within DIM. Cows were treated identically, including feeding 3.5 kg/cow/d of a blend (50% PKE, 30% canola meal, 10% sugar and 10% soy hull pellets), fed in-shed during each milking, with the exception that the treatment group blend was supplemented with VPT at a rate of 0.75ml/kg PKE DM, diluted 1:10 in water. The VPT was added at a commercial blend plant up to 4 weeks prior to feeding. All cows grazed fresh pasture between milkings as a single herd, for 14 weeks.

Milk yield parameters were recorded for each milking with in-shed, individual cow Afimilk data recording.

An analysis of variance between the treatment means was performed with SAS using Proc ANOVA (SAS, 2011).

Results

In experiment one, VPT supplementation of the PKE fed via the PKE troughs resulted in significantly higher milk solids (+106 g MS/cow/d, *P* = 0.038) than cows fed the untreated PKE (Table I). There were no significant differences in fat or protein percentages as a result of VPT treatment. Body weight changes were similar between the two groups, with both groups losing weight over the experimental period.

In experiment two, the early (75 DIM) lactation cows produced more milk solids as a result of VPT supplementation (+117g MS/cow/d, *P* = 0.045, Table II). In the later lactation group (300 DIM), there was only a numeric tendency towards increased milk solids production (+124 g MS/cow/d, *P* = 0.067, Table III). Milk volume was significantly increased over both stages in lactation (+1.54 l/d, *P* = 0.039 for the early lactation group, and +1.61 l/d, *P* = 0.040 for the late lactation group. There were no significant changes in body weight in experiment 2, with both groups of cows gaining weight.

Discussion

Both experiments showed improved milk solids production following the addition of the crude extract of *Trichoderma* to PKE, confirming the hypothesis of elevated milk production. These responses were consistently recorded across the three stages of lactation evaluated, suggesting that elevated milk production responses to the supplementation of PKE with *Trichoderma* can be expected throughout lactation.

Despite both groups of cows in experiment one losing weight during the experimental period, the supplementation of VPT generated a higher milk solid yield (+106 g/d, *P* = 0.038), which confirmed previous international work (Walker and Povey, 2016). This improvement in milk solid production was attributed to a significant increase in fat yield and a trend towards increased protein yield (Table I). There was no significant difference in milk volume as a result of VPT treatment in experiment one.

Experiment two recorded significantly elevated milk volume responses for both the early and late lactation groups. This was accompanied by significantly higher milk solid yields for the VPT supplemented group in early lactation; however, this difference was only a trend for the later lactation group. There were no significant treatment differences for fat or protein percentages, confirming that the recorded differences in milk solids were largely due to the improvement in milk volumes. These improvements in productive indices confirm earlier work (Walker and Povey, 2016).

Conclusion

These two experiments have demonstrated the positive effect of VPT on milk production indices in a commercial herd fed PKE. The responses in milk solid yield have been consistent across the three stages of lactation investigated and were similar whether the VPT was delivered directly on-farm into the PKE troughs, or applied off farm into commercial blends. These data confirm that VPT addition to PKE can result in elevated milk solids production.

References

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Table I – mid-lactation (170 DIM) milk production and body weight data following the feeding of PKE supplemented with a *Trichorderma* extract, as fed via PKE troughs (Experiment 1)

	Control		VPT		Trt effect (%)	SED	*P*
	Start	Change	Start	Change			
Milk solids (kg/d)	1.98	-0.28	1.98	-0.18	+0.11 (5.4)	0.0048	0.038
Volume (l/d)	23.94	-3.28	23.82	-2.42	+0.87 (3.6)	0.2904	0.127
Fat yield (kg/d)	1.09	-0.17	1.10	-0.10	+0.66 (6.0)	0.0037	0.033
Fat %	4.57	-0.06	4.68	0.06	+0.12 (2.6)	0.0010	0.106
Protein yield (kg/d)	0.89	-0.12	0.87	-0.08	+0.04 (4.8)	0.0032	0.056
Protein %	3.72	0.02	3.67	0.06	+0.04 (0.9)	0.0006	0.133
Body wt (kg)	528.7	-8.2	533.0	-7.6	+0.59 (0.1)	0.4988	0.699

Table II – early lactation (75 DIM) milk production and body weight data following the feeding of PKE supplemented with a *Trichorderma* extract, as fed via a commercial blend (Experiment 2)

	Control		VPT		Trt effect (%)	SED	*P*
	Start	Change	Start	Change			
Milk solids (kg/d)	2.19	-0.05	2.04	+0.07	+0.12 (5.7)	0.0012	0.045
Volume (l/d)	27.50	-0.74	25.40	+0.80	+1.54 (6.1)	0.4339	0.039
Fat yield (kg/d)	1.20	-0.03	1.11	+0.04	0.06 (5.7)	0.0009	0.066
Fat %	4.40	0	4.39	0	0 (0.09)	0.0013	0.958
Protein yield (kg/d)	0.99	-0.02	0.93	+0.04	0.05 (5.7)	0.0008	0.047
Protein %	3.65	+0.02	3.68	+0.01	-0.01 (0.03)	0.0017	0.597
Body wt (kg)	498.4	-6.8	491.1	+2.8	+2.4 (0.5)	0.6499	0.146

Table III – late lactation (300 DIM) milk production and body weight data following the feeding of PKE supplemented with a *Trichorderma* extract, as fed via a commercial blend (Experiment 3).

	Control		VPT		Trt effect (%)	SED	*P*
	Start	Change	Start	Change			
Milk solids (kg/d)	1.69	0	1.49	+0.10	+0.12 (8.3)	0.0011	0.067
Volume (l/d)	19.48	-0.13	17.12	+1.52	+1.61 (9.4)	0.3884	0.040
Fat yield (kg/d)	0.95	+0.01	0.84	+0.06	+0.05 (6.4)	0.0009	0.178
Fat %	4.92	+0.06	4.96	-0.06	-0.12 (1.8)	0.0013	0.274
Protein yield (kg/d)	0.74	0	0.64	+0.07	+0.07 (1.4)	0.0008	0.019
Protein %	3.80	+0.03	3.78	+0.06	+0.03 (0.9)	0.0008	0.253
Body wt (kg)	533.0	+4.6	537.3	+5.8	+1.1 (0.2)	0.668	0.472