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Effects of substitution of soybean meal by Superworm defatted meal on rumen fermentation and digestibility of beef cattle by using *in vitro* gas production technique (#339)

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Introduction

Global population growth, increasing wealth, and urbanization, particularly in Asia and Africa, create changes in global consumption patterns, lifestyles and food preferences, leading to an increase in animal protein demands [1]. The security of livestock feed is been becoming critical in terms of both quantity and quality, particularly the protein sources, lack of which results in low productivity. Currently, insects are being considered as potential alternative protein sources for industrialized feed, such as poultry, pig, and cultivated species of fish like African catfish [2]. More over mealworm (*Tenebrio molitor*) based feed at 50% to replace fish meal can offer an economic advantage [3]. It can provide higher growth performance to white shrimps with a more efficient way to fight pathogens without any toxicity. However, the effect of substitution of soybean meal by Superworm defatted meal on rumen fermentation and digestibility of beef cattle is currently unknown. Therefore, the objective of this study was to determine the effect of effect of substitution of soybean meal by super worm defatted meal on rumen fermentation and digestibility of beef cattle by using *in vitro* gas production technique.

Methods

The experimental design was a CRD to receive 4 substitution levels of SBM by Super worm defatted meal at 0, 33, 67 and 100% in concentrates. Dietary samples were dried at 60 °C, then ground to pass a 1-mm sieve (Cyclotech Mill, Tecator, Sweden) and used for chemical analysis and in the *in vitro* gas test. The samples were analyzed for DM, OM, CP using the procedures of [5], NDF, ADF according to [6]. Cumulative gas production data were fitted to the model of [7]. The percent loss in weight was determined and presented as *in vitro* dry matter degradability (IVDMD). The dried feed sample and residue left from above was ashed at 550°C for determination of *in vitro* organic matter degradability (IVOMD) [8]. All data were analyzed as a CRD using the PROC GLM of [9]. Multiple comparisons among treatment means were performed by Duncan's New Multiple Range Test (DMRT) [10].

Results

Cumulative gas production for each of the substrate treatments presented as gas production and the values for estimated parameters obtained from the kinetics of gas production models for substrates studied are given in Table 1 and Figure 1.This studied revealed that substitution of soybean meal by Superworm defatted meal un affected ($P<0.05$) on the intercept value (a), the insoluble fraction (b), rate constant for the insoluble fraction (c), potential extent of gas production (a+b), cumulative gas production at 96 h, and IVOMD. However, it was found that non-significant difference between substitution of soybean meal by Superworm defatted meal at 0%, 33% and 67%. The beneficial of insects are being considered as potential alternative protein sources for industrialized feed, such as poultry, pig, and cultivated species of fish like African catfish [2]. Moreover, mealworm (*Tenebrio molitor*) based feed at 50% to replace fish meal can offer an economic advantage [3]. It can provide higher growth performance to white shrimps with a more efficient way to fight pathogens without any toxicity.

Conclusion

Superworm defatted meal could substitution of soybean meal with un affected on a, b, c, a+b and IVOMD, while IVDMD of 0%, 33% and 67% of substitution was similar. Superworm defatted meal could alternative protein source for ruminants. However, further research should be conducted the used of Superworm defatted meal in *in vivo* trial.

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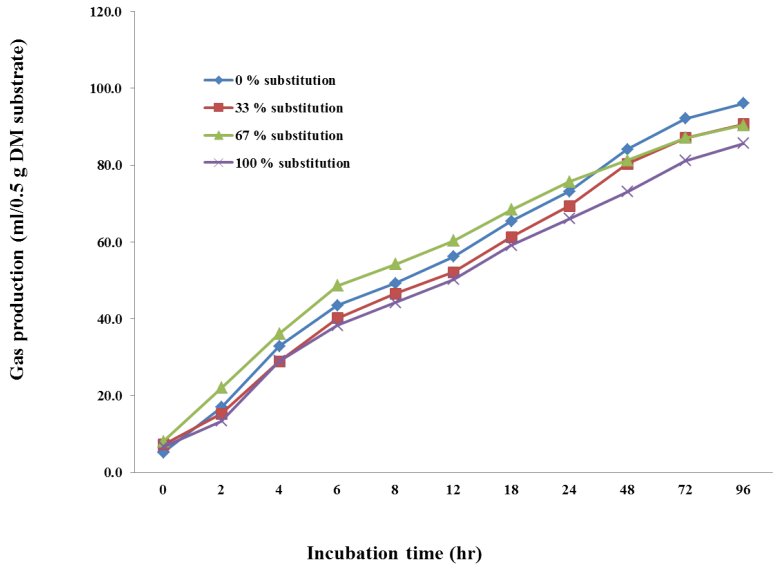
Notes



Figer 1. Cumulative gas production affected by substitution of soybean meal by Super worm defatted meal.

Substitution levels[1]	Gas kenetics[2]				Gas (96 h) ml/0.5 g DM substrate	*In vitro*[3] degradability (%)	
	a	b	c	a+b		IVDMD	IVOMD
0%	8.59	82.41	0.07	91.00	96.03	70.87[a]	75.21
33%	8.87	77.87	0.07	86.75	90.63	70.34[a]	73.99
67%	10.00	75.29	0.07	85.29	90.36	67.36[ab]	71.59
100%	7.66	72.72	0.07	80.38	85.27	65.50[b]	70.01
SEM	0.782	3.069	0.001	2.662	2.598	0.887	0.968
Ortogonal polynomial							
linear	ns	ns	ns	ns	ns	*	ns
quadratic	ns	ns	ns	ns	ns	ns	ns

[a,b,c,d,e] Value on the same row with different superscripts differ (P<0.05), *P<0.05, ns = non-significant different, SEM=Standard error of the mean.
[1]Substitution of soybean meal by Super worm defatted meal levels.
[3]a= The gas production from the immediately soluble frection, b= The gas production from the insoluble frection, c= The gas production rate constant for the insoluble fraction (b), a+b = The gas potential extent of gas production.
[2]IVDMD= *in vitro* dry matter degradability, IVOMD= *in vitro* organic matter degradability.

Table 1. Effect of substitution of soybean meal by Super worm defatted meal on gas production kinetic and degradability from *in vitro* incubation with rumen fluid.

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