

# Low cost feeding strategies in nursery production - Feeding simplified diets with feed enzymes

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## Take Home Message

There was no difference in average daily gain between newly weaned pigs fed a simple diet compared with a conventional complex diet over a four-week experimental period although the conventional diet supported superior growth during the first week of the post-weaning period. Also, pigs fed the simple diet had greater feed efficiency during the four-week observation. Dietary supplementation with a multicarbohydase (cocktail of enzymes) improved feed efficiency irrespective of nursery diet complexity. Considering the unit cost of the diets used in the study, feeding a simple diet decreased the total feed cost per pig and feed cost per kilogram of body weight gain by approximately \$3.02 and \$0.20, respectively. Furthermore, the addition of multicarbohydase into the nursery diet tended to lower feed cost per kilogram of body weight gain by \$0.02.

## Introduction

In nursery pig production, highly digestible and palatable ingredients are included in the diet to minimize post-weaning challenges such as impaired gut morphology and high incidences of diarrhea. This practice increases the complexity of diet composition which, in turn, leads to increased feed costs. However, significant reductions in cost may be achieved if conventional ingredients can be replaced with various low-quality alternatives while maintaining growth performance. Additionally, including multicarbohydase (MC) to nursery diets has been shown to increase feed efficiency and nutrient digestibility. In this trial we investigated a series of simplified nursery diets formulated with alternative ingredients with and without MC supplementation to determine the impact on growth performance and feed costs compared with feeding conventional complex diets.



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## The trial

A total of 144 weaned piglets (21 days of age, 6.70 kg of body weight, 1:1 male to female ratio) were assigned to one of six dietary treatments in a 3x2 factorial arrangement based on diet complexity (complex1, complex2, and simple) and MC addition (0 vs 0.1%). Diets were provided in a two-phase feeding program with phase one (day one to 14) and phase two regimes (day 15 to 28). Complex1 was formulated to mimic a conventional weaner diet with blood plasma, fish meal, dried whey, and skim milk powder. Complex2 partially or totally replaced these ingredients with various plant-based alternatives such as barley, DDGS, wheat middlings, canola meal, field peas, and flaxseed meal. The simple diet consisted primarily of corn, wheat and soybean meal. The MC contained cellulase, pectinase, mannanase, galactanase, xylanase, glucanase, amylase, and protease. Within each phase, calculated nutrients

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and metabolizable energy content were similar in all diets and met or exceeded requirements according to NRC (2012).

### Results and interpretation

**Diet performance:** Pigs fed the complex1 diet had greater average daily gain (ADG), average daily feed intake (ADFI), and feed efficiency than those fed with the complex2 or simple diet in the first week after weaning (Table 1). This may be because the highly palatable and digestible ingredients increased feed intake and thus provided sufficient nutrients and energy to support adequate growth performance immediately after weaning. However, no differences in ADG or ADFI were observed between pigs fed the complex1 and simple diets throughout the 28-day period, whereas the complex2 diet led to lower ADG and ADFI compared with the complex1 diet. Furthermore, feed efficiency was greater in pigs fed the simple diet compared

**Table 1. Effects of diet complexity and multicarbohydase (MC) supplementation on growth performance in weaned pigs**

Item	Diet complexity			Multicarbohydase		P-value	
	Complex1	Complex2	Simple	(+)	(-)	Complexity	MC
<b>Average daily gain, g/d</b>							
d 1 to 7	316 <sup>x</sup>	233 <sup>y</sup>	238 <sup>y</sup>	255	270	<0.01	0.344
d 0 to 28	477 <sup>x</sup>	441 <sup>y</sup>	470 <sup>xy</sup>	464	461	<0.05	0.785
<b>Average daily feed intake, g/d</b>							
d 1 to 7	350 <sup>x</sup>	300 <sup>y</sup>	286 <sup>y</sup>	309	315	<0.01	0.635
d 0 to 28	752 <sup>x</sup>	690 <sup>y</sup>	707 <sup>xy</sup>	705	728	<0.05	0.164
<b>Gain to feed ratio, g/g</b>							
d 1 to 7	0.91 <sup>x</sup>	0.77 <sup>y</sup>	0.83 <sup>y</sup>	0.83	0.85	<0.01	0.30
d 0 to 28	0.63 <sup>y</sup>	0.64 <sup>xy</sup>	0.67 <sup>x</sup>	0.66	0.63	<0.05	<0.05

<sup>x,y</sup>Means within the main effect of diet complexity and within row lacking a common superscript letter differ (P <0.05).

with those fed the complex1 diet over the four-week period.

In the simple diet, relatively high amounts of soybean meal containing anti-nutritional factors might have elicited a clinical allergic reaction and contributed to poorer performance in the first week compared to the complex1 diet. However, it seems that hypersensitivity to the antigens in soybean meal

could be transient, indicating digestive adaptation to the diet.

**Economic Analysis:** Based on growth performance data and unit costs of the experimental diets, the total feed cost/pig and feed cost/kg of body weight were compared among treatments (Table 2). The total feed cost/pig on the simple diet was 26.4 per cent lower than that fed the complex1, due to the lower unit cost of the simple diet. Better feed efficiency as well as lower feed costs resulted in a \$0.21 reduction in the cost/kilogram of body weight gain when pigs were fed the simple rather than the complex1 diet. Our findings indicate that feeding weaned pigs the simple diet rather than a conventional complex diet is economically beneficial by lowering feed costs for the four-week post-weaning period without compromising final body weight.

**Multicarbohydase supplementation:** The addition of MC increased feed efficiency throughout the experimental period (Table 1). This suggests that the MC used had feed saving effects in nursery production, mainly due to the improvement of nutrient digestibility. The effect of MC on the simple and complex2 di-

**Table 2. Economic analysis for diet complexity and multcarbohydrase (MC) supplementation in weaned pigs**

Item	Diet Complexity			MC		P-value	
	Complex1	Complex2	Simple	(+)	(-)	Complexity	MC
<b>Feed cost, \$/ton</b>							
Phase I	642	510	502				
Phase II	459	362	365				
Total BW gain, kg	13.36x	12.33y	13.17xy	13.00	12.91	<0.05	0.78
Total feed cost per pig, \$/pig	10.87x	7.85y	8.00y	8.82	9.00	<0.01	0.37
Feed cost/kg of BW gain, \$/kg/pig	0.82x	0.64y	0.61y	0.68	0.70	<0.01	0.08

<sup>x,y,z</sup>Means within the main effect of diet complexity and within row lacking a common superscript letter differ (P <0.05).

ets was expected to be greater than on the complex1 diet because the former regimes contained higher levels of complex carbohydrates. However, no interaction effects between diet complexity and MC were observed, suggesting that

the MC had similar effects irrespective of diet complexity. Due to the relatively inexpensive price of MC (calculated at \$5/kg) and its benefits for feed efficiency, MC tended to decrease the feed cost/kg of body weight gain during the 28

days of nursery production.

### Limitations and future research

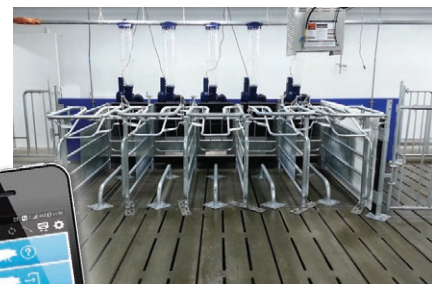
Taken together, the results imply that economic benefits may be achieved by feeding a simple corn-wheat-soybean meal-based diet with MC supplementation in the four weeks of nursery production without compromising growth performance. However, scaling up to commercial production would be necessary to determine the economic and performance benefits in a commercial setting. Further investigation is also needed into whether the nursery regime affects subsequent growth performance and carcass characteristics.

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