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## DIET PREFERENCE AND GROWTH PERFORMANCE IN WEANLING PIGS FED DIETS WITH *Morinda citrifolia* (NONI)

C. Feoli, J. D. Hancock, and K. C. Behnke<sup>1</sup>

### Summary

Two experiments were conducted to determine the effects of adding 5% *Morinda citrifolia* (noni; Morinda Agricultural Products, Orem, UT) to diets for weanling pigs. In Exp. 1, 48 pigs (initially 9.3 lb) were used in a 29-d preference study. There were 6 pigs per pen and 8 pens total. The pens were equipped with 2 identical feeders (for diets without and with noni puree), and position of the feeders was switched each afternoon to prevent feeder location from affecting diet consumption. The diets were corn-soybean meal-based, pelleted, and had 1.8% lysine for d 0 to 5, 1.6% lysine for d 5 to 15, and 1.4% lysine for d 15 to 29. Feed and water were consumed on an ad libitum basis. No differences were noted among diets without and with noni for pelleting ease and pellet durability index (PDI). Feed intake was increased for d 0 to 5 (0.11 vs. 0.23 lb/d,  $P < 0.05$ ) and d 0 to 15 (0.15 vs. 0.37 lb/d,  $P < 0.006$ ) when noni was added to the diets. However, this effect disappeared for d 15 to 29 so that overall feed intake was not different (0.40 vs. 0.50 lb/d,  $P > 0.39$ ) for d 0 to 29. In Exp. 2, 96 pigs (initially 14.8 lb) were used in a 29-d growth assay. There were 6 pigs per pen and 8 pens per treatment. The diets were the same as those used in the first experiment. Results indicated no differences ( $P > 0.29$ ) in ADG, ADFI, and F/G for d 0 to 5 and 0 to 15 between pigs fed diets without and with noni. However, for d 15 to 29 and overall (d 0 to 29), ADG and ADFI were decreased ( $P <$

0.04) for pigs fed diets with noni compared with the control. In conclusion, there was a preference for diets with noni for the first 15 d of the preference study. In the growth assay, prolonged feeding of diets with noni resulted in reduced feed intake and, ultimately, decreased rate of gain.

Key words: diet preference, *Morinda citrifolia*, noni, weanling pigs

### Introduction

*Morinda citrifolia* (noni) has been used in Polynesian folk remedies for more than 2,000 years. It is thought to have antioxidant, antibiotic, bactericidal, and anticarcinogenic properties and contains phytochemicals that have been suggested to be biologically active (e.g., enhanced immune function, antibiotic-like functions, and decreased potential for cancer in laboratory rats). Swine producers always are searching for means to improve productivity of their pigs and profitability of their operations. Because the use of noni in diets for pigs is a relatively new research area, we designed 2 experiments to determine the effects of noni on feed preference and growth performance in weanling pigs.

### Procedures

For Exp. 1, 48 weanling pigs (initially 9.3 lb) were used in a 29-d preference study. The pigs were blocked by weight and sorted into

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pens on the basis of gender and ancestry. There were 6 pigs per pen and 8 pens total in the environmentally controlled nursery room. Each 4-ft × 4-ft pen was equipped with woven-wire flooring, 2 identical feeders (for diets without and with noni puree), and 1 nipple waterer. Feeder positions were switched each afternoon to ensure that any preference for one diet vs. the other would not be affected by familiarity with a feeder's location.

The diets (Table 1) were corn-soybean meal-based and formulated to 1.8% lysine for d 0 to 5, 1.6 % lysine for d 5 to 15, and 1.4% lysine for d 15 to 29. Treatments were 5% test premix (80% water and 20% corn) for the control vs. 5% noni (Morinda Agricultural Products, Orem, UT). The diets for d 0 to 5 and 5 to 15 were steam conditioned at 140°F for approximately 20 sec before passing into a pelleting press (CPM Master Model HD) equipped with a 1¼-in.-thick die having 5/32-in. openings. The diets for d 15 to 29 were steam conditioned at 180°F and pelleted through the same press but with a 7/8-in.-thick die. Samples of the processed diets were collected, and pellet durability index (PDI) was determined by using the tumbling-box technique. Additionally, the PDI procedure was modified to induce more stress on the pellets by adding 5 hexagonal nuts into the tumbling box.

The pigs were allowed to consume feed and water on an ad libitum basis. Feeder weights were collected on d 0, 5, 15, and 29 of the experiment to allow calculation of ADFI. All data were analyzed by using the MIXED procedure of SAS with pen as the blocking criterion and feeder as the experimental unit. A significant F test was considered sufficient to declare a difference among treatment means.

For Exp. 2, 96 weanling pigs (initially 14.8 lb) were used in a 29-d growth assay. There were 6 pigs per pen and 8 pens per treatment. The pigs were sorted and housed as

in Exp. 1 except that the pens had only 1 feeder. Diets (Table 1) were the same as those used in Exp. 1 (without and with noni), and feed and water were consumed on an ad libitum basis.

Pig and feeder weights were collected on d 0, 5, 15, and 29 of the experiment to allow calculation of ADG, ADFI, and F/G. All data were analyzed by using the MIXED procedure of SAS with initial weight as the blocking criterion and pen as the experimental unit. A significant F test was considered sufficient to declare a difference among treatment means.

## Results and Discussion

In Exp. 1 (Table 2), observations made during feed processing indicated that all diets pelleted with ease and with only slight improvements (2 to 4%) in PDI for diets with noni. Pigs fed the control ate less for d 0 to 5 (0.11 vs. 0.23 lb/d,  $P < 0.05$ ) and d 0 to 15 (0.15 vs. 0.37 lb/d,  $P < 0.006$ ) than pigs fed diets with noni. However, preference for diets with noni disappeared during d 15 to 29 so that overall feed intake (d 0 to 29) was not different (0.40 vs. 0.50 lb/d,  $P > 0.39$ ) for the control vs. noni treatments. The loss of the preference response could have resulted from prolonged consumption of the diets with a high concentration (5%) of noni. Alternatively, it could be that extended storage (2 to 4 weeks) of diets with noni lead to development of anti-palatability factors. Regardless what factors eventually led to loss of preference, our data demonstrate that piglets preferred diets with 5% noni for the first 2 wk after weaning.

In Exp. 2 (Table 3), when the same feed used in the preference determination was used in a growth assay, there were no differences ( $P > 0.29$ ) in ADG, ADFI, and F/G for d 0 to 5 and 0 to 15 between pigs fed diets without and with noni. Overall (d 0 to 29), ADG ( $P < 0.04$ ) and ADFI ( $P < 0.02$ ) were decreased for pigs fed diets with noni. Thus, results of the

growth assay tend to support those of the preference determination in that diets with a high concentration of noni that are fed for a prolonged period may begin to adversely affect feed intake and, thus, rate of gain.

In conclusion, there was a preference for diets with noni for the first 15 d of the preference study. In the growth assay, prolonged feeding of diets with noni resulted in reduced feed intake and, ultimately, decreased rate of gain.

**Table 1. Composition of diets**

| Ingredient, %                 | d 0 to 5 | d 5 to 15 | d 15 to 29 |
|-------------------------------|----------|-----------|------------|
| Corn                          | 22.97    | 42.57     | 58.19      |
| Soybean meal (47.5% CP)       | 27.10    | 29.15     | 33.00      |
| Whey                          | 20.00    | 15.00     | ---        |
| Lactose                       | 10.00    | ---       | ---        |
| Soy oil                       | 2.00     | ---       | ---        |
| Test premix <sup>1</sup>      | 5.00     | 5.00      | 5.00       |
| Spray-dried plasma            | 5.00     | 2.50      |            |
| Fish meal                     | 5.00     | 3.00      |            |
| Monocalcium phosphate (21% P) | 0.80     | 0.66      | 1.30       |
| Limestone                     | 0.69     | 0.85      | 1.11       |
| L-lysine HCl                  | 0.21     | 0.21      | 0.32       |
| DL-methionine                 | 0.19     | 0.14      | 0.14       |
| L-threonine                   | 0.05     | 0.03      | 0.10       |
| Salt                          | 0.20     | 0.30      | 0.35       |
| Vitamin premix                | 0.25     | 0.25      | 0.25       |
| Mineral premix                | 0.15     | 0.15      | 0.15       |
| Copper sulfate                | ---      | ---       | 0.09       |
| Zinc oxide                    | 0.39     | 0.19      | ---        |
| Calculated analysis           |          |           |            |
| Lysine, %                     | 1.80     | 1.60      | 1.40       |
| Ca, %                         | 0.90     | 0.80      | 0.75       |
| Total P, %                    | 0.80     | 0.70      | 0.67       |

<sup>1</sup> *Morinda citrifolia* (noni) was used to replace the test premix that was 80% water and 20% corn.

**Table 2. Effects of diets without and with *Morinda citrifolia* (noni) on pellet quality and diet preference in weanling pigs (Exp. 1)<sup>1</sup>**

| Item                         | Control | Noni | SE   | P value          |
|------------------------------|---------|------|------|------------------|
| PDI, % <sup>2</sup>          |         |      |      |                  |
| d 0 to 5                     | 97      | 99   | N/A  | N/A              |
| d 5 to 15                    | 90      | 94   | N/A  | N/A              |
| Modified PDI, % <sup>3</sup> |         |      |      |                  |
| d 0 to 5                     | 95      | 98   | N/A  | N/A              |
| d 5 to 15                    | 88      | 92   | N/A  | N/A              |
| ADFI, lb                     |         |      |      |                  |
| d 0 to 5                     | 0.11    | 0.23 | 0.03 | 0.05             |
| d 5 to 15                    | 0.15    | 0.37 | 0.04 | 0.006            |
| d 0 to 29                    | 0.40    | 0.50 | 0.07 | --- <sup>4</sup> |

<sup>1</sup> A total of 48 weanling pigs (6 pigs/pen and 8 pens total) with an initial weight of 9.3 lb.

<sup>2</sup> Pellet durability index (ASAE, 1991).

<sup>3</sup> Modified by adding 5 hexagonal nuts (0.5-in. diameter) to the tumbling box.

<sup>4</sup> Dashes indicate  $P > 0.15$ .

**Table 3. Effects of diets without and with *Morinda citrifolia* (noni) on growth performance of weanling pigs (Exp. 2)<sup>1</sup>**

| Item      | Control | Noni | SE   | P value          |
|-----------|---------|------|------|------------------|
| d 0 to 5  |         |      |      |                  |
| ADG, lb   | 0.39    | 0.42 | 0.14 | --- <sup>2</sup> |
| ADFI, lb  | 0.40    | 0.40 | 0.02 | ---              |
| F/G       | 1.03    | 0.95 | 0.50 | ---              |
| d 0 to 15 |         |      |      |                  |
| ADG, lb   | 0.49    | 0.46 | 0.02 | ---              |
| ADFI, lb  | 0.62    | 0.58 | 0.09 | ---              |
| F/G       | 1.27    | 1.26 | 0.18 | ---              |
| d 0 to 29 |         |      |      |                  |
| ADG, lb   | 0.86    | 0.80 | 0.03 | 0.04             |
| ADFI, lb  | 1.12    | 1.03 | 0.11 | 0.02             |
| F/G       | 1.30    | 1.29 | 0.09 | ---              |

<sup>1</sup> A total of 96 weanling pigs (6 pigs per pen and 8 pens per treatment) with an initial weight of 14.8 lb.

<sup>2</sup> Dashes indicate  $P > 0.15$ .