Botanicals for Pigs – Peppermint II

Palmer J. Holden, professor of animal science,
and
James McKean, professor of veterinary medicine,

ASL-R649

Summary and Implications

Botanicals have been proposed as a substitute for antimicrobials in swine diets because of their natural antibacterial activity. In the 1998 ISU Swine Research Report, peppermint (*Mentha piperita*), a botanical that grows in Iowa, was compared with a standard antibacterial nursery dietary regimen. Pig performance on all treatments was similar, including the positive and negative controls. At the tested inclusion levels (0, 0.5, 2.5, and 5.0%), peppermint displayed no advantage over the five-week nursery study compared with a "positive" control diet consisting of 50 g/ton Mecadox or with a "negative" control regimen containing no antibacterial inclusions. Increasing levels of peppermint did not influence the muscle characteristics evaluated.

This experiment evaluated Mecadox and 0, 0.5, and 1.0% peppermint levels under a similar feeding regimen, plus a 12-week post-nursery evaluation to observe any carryover effects. Peppermint failed to elicit a positive nursery response and those pigs performed less well statistically compared with the Mecadox-fed pigs. Pigs on the Mecadox diet maintained their advantage when cumulative performance was evaluated for the additional 12 weeks, but performance within each weighing period was not statistically different after the nursery phase. Under the conditions of this experiment, peppermint (as in the 1998 report) was not an efficacious addition to swine nursery diets meant to improve performance.

Introduction

The historic use of herbal remedies to treat and prevent infectious disease has been supplanted with the emergence of specific synthetic chemotherapeutic and antibacterial agents. However, selected herbs are known to possess natural antibacterial qualities as well as other characteristics that could be useful in value-added animal protein production. Peppermint (*Mentha piperita*) grows under a wide range of conditions. The major medicinal components of peppermint are the volatile oils predominantly found in the aerial portions of the plant.

Menthol possesses carminative (relieving intestinal gas), antispasmodic, and cholerectic (antiabdominal pain) properties. It also has been recommended for treatment of the common cold and other members of the mint family have demonstrated significant antiviral capability. Peppermint also inhibits antimicrobial activity against *Streptococcus pyogenes, Staphylococcus aureus, Pseudomonas aeruginosa,* and *Candida albicans*. Treatment dosages are not well established in humans, and limited data are available for animals.

A peppermint study reported in the 1998 ISU Swine Research Report (1) found no statistical differences between Mecadox and various inclusions of peppermint, with numeric values for Mecadox and the 0.50 and 2.50% peppermint treatments usually exceeding the negative control as well as the 5.0% peppermint inclusion. Because the lower levels of peppermint numerically were greater than the 5% inclusion, it was proposed that lower levels of peppermint might be efficacious. This experiment was designed to compare peppermint inclusions of 0.0, 1.5, and 1.0% to Mecadox.

Materials and Methods

The experiment was conducted at the ISU Swine Nutrition and Management Center in a temperature-regulated nursery room starting in March 2000. Eric Franzenberg, 6925 19th Ave, Van Horne, IA 52346, produced the peppermint. One hundred pigs were weaned at an average of 18 days (14 to 21) and 13.7 lb (6.25 kg). Pigs were allotted to pens at random by litter and initial weight. There were 20 pens of five pigs each, providing four replications of five dietary treatments. Each pen of six pigs received 176 lb (80 kg) of the prestarter treatment and then was switched to the starter treatment diet for the remainder of the five-week study (Table 1). The positive control diet contained 50 g of Mecadox (carbadox) per ton and the other treatments consisted of the same diet without Mecadox. Increasing levels of peppermint (0.00, 0.25, 0.50, and 1.00%) replaced corn. The 0% peppermint treatment group was considered to be the negative control. Pigs were grown in 4 x 4-ft. raised-deck pens and the average room temperature was 75 ± 5°F. Heat mats supplied supplemental warmth. Pigs were weighed and feed disappearance was measured weekly for five weeks. Upon completion of the nursery phase, pigs were fed the standard farm grower (40 g Tylan/ton) and finisher (30 g BMD/ton) diets and weight gains were measured every four weeks for 12 weeks to evaluate any long-term effects of the peppermint additions. Data were analyzed using the GLM procedure of SAS with the pen as the experimental unit.

One pig from each of the peppermint treatments was taken to the ISU Meat Laboratory, slaughtered, and various muscles were evaluated for sensory and quality characteristics at the end of the nursery trial.

Results and Discussion

One pig was removed from the 0.25% peppermint diet. Reported data are cumulative from the start of the experiment as well as weekly. Least square means are presented in Tables 2 and 3. Average daily gain (ADG) was

statistically improved (P < .05) by the addition of Mecadox in all cumulative periods (Table 2) compared with the three additions of peppermint, except week 1. Average daily feed (ADF) showed similar statistical significance for all nursery periods (P<.05). Feed per gain (F/G) was improved with Mecadox in the 0-3 and 0-4 week periods.

Within-week data for the first three weigh periods (Table 3) favored the Mecadox diet when compared to the other diets for ADG and ADF (P<.01). F/G had a quadratic response for the peppermint levels in week 1-2, with efficiency improved for pigs fed the 0.25 and 0.50% peppermint. Pig performance in the post-nursery periods was not statistically different from the Mecadox diet, although in the cumulative ADG the carry-over advantages from the nursery were maintained by the Mecadox group for the 12-week grow-finish period. Pig muscle characteristics (Table 4) did not appear to be affected by peppermint additions.

In general, pigs fed non-Mecadox diets grew more slowly and ate less feed, with no negative effects on feed efficiency. Peppermint additions, in this herd, did not prove beneficial to performance during the nursery phase or the follow-up grow-finish evaluation for average daily gain.

Table 1. Basal diet composition.

	Prestarter	Starter
Corn, yellow	36.43	51.57
Whey, dried	25.00	10.00
Plasma protein	5.00	0.00
Soybean meal, dehulled	29.20	33.50
Dicalcium phosphate	1.65	2.19
Limestone	0.90	0.78
Salt	0.00	0.25
L -Lysine HCl	0.20	0.20
Methionine, DL	0.10	0.10
Vitamins, trace minerals	0.52	0.41
Animal fat, stabilized	1.00	1.00
Additive	-	-
Total	100.00	100.00

Calculated analyses of control diets (%)

	Prestarter	Starter
Lysine	1.46	1.28
Methionine + cystine	0.88	0.66
Calcium	0.79	0.79
Phosphorus, total	0.72	0.70
Phosphorus, available	0.48	0.41

Reference

Holden, P., et al. 1998. Botanicals for pigs – Peppermint (ASL-R1561). 1998 ISU Swine Research Report, AS-640. pp. 31-33. Iowa State University, Ames, IA 50011.

Acknowledgements

This research project was supported through a grant from the Leopold Center for Sustainable Agriculture, Iowa State University, Ames, IA.

Table 2. Cumulative effect of peppermint on pig performance.

		Peppermint level, %			
	Mecadox	0.00	0.25	0.50	1.00
Week 1					
ADG, lb	0.13	0.09	0.07	0.07	0.09
ADF, lb[a]	0.31	0.31	0.24	0.24	0.29
F/G	2.38	3.57	4.17	3.45	3.45
Weeks 0–2					
ADG, lb[b]	0.40	0.29	0.31	0.29	0.26
ADF, lb[b]	0.55	0.51	0.44	0.42	0.44
F/G [cd]	1.43	1.72	1.43	1.52	1.67
Weeks 0-3					
ADG, lb[b]	0.64	0.53	0.51	0.46	0.48
ADF, lb[b]	0.88	0.77	0.68	0.66	0.73
F/G[c]	1.35	1.47	1.39	1.43	1.49
Weeks 0–4					
ADG, lb[b]	0.36	0.29	0.28	0.28	0.27
ADF, lb[b]	0.52	0.44	0.41	0.42	0.43
F/G	1.45	1.52	1.49	1.52	1.61
Weeks 0–5					
ADG, lb[b]	0.95	0.84	0.79	0.79	0.77
ADF, lb[b]	1.41	1.28	1.19	1.19	1.23
F/G	1.49	1.52	1.47	1.52	1.61
Weeks 0–9					
ADG, lb[b]	1.17	1.08	1.06	1.06	1.01
Weeks 0–13					
ADG, lb[b]	1.34	1.26	1.26	1.21	1.21
Weeks 0–17					
ADG, lb[b]	1.54	1.50	1.48	1.43	1.34

[a] Mecadox vs. all, P < .007
[b] Mecadox vs. 0.25, 0.50, and 1.00, P < .05
[c] Mecadox vs. all, P < .05
[d] Peppermint quadratic, P < .005

Table 3. Periodic effect of peppermint on pig performance 9915C.

		Peppermint level, %			
	Mecadox	0.00	0.25	0.50	1.00
Week 1–2					
ADG, lb[a]	0.64	0.51	0.53	0.48	0.46
ADF, lb[ab]	0.79	0.71	0.62	0.62	0.62
F/G [cd]	1.23	1.41	1.18	1.23	1.35
Week 2–3					
ADG, lb[a]	1.15	0.97	0.88	0.84	0.93
ADF, lb[e]	1.52	1.30	1.21	1.17	1.28
F/G	1.32	1.33	1.35	1.39	1.39
Week 3–4					
ADG, lb[a]	1.23	1.01	0.95	1.04	0.88
ADF, lb[d]	1.94	1.59	1.54	1.54	1.59
F/G	1.59	1.56	1.64	1.52	1.82
Week 4–5					
ADG, lb	1.54	1.61	1.54	1.48	1.54
ADF, lb	2.45	2.45	2.29	2.29	2.45
F/G	1.59	1.52	1.47	1.54	1.59
Week 5–9					
ADG, lb	1.85	1.79	1.79	1.79	1.72
Week 9–13					
ADG, lb	3.61	3.44	3.46	3.35	3.33
Week 13–17					
ADG, lb[f]	5.80	5.73	5.66	5.47	5.14

[a] Mecadox vs. all, P < .01
[b] Mecadox vs. 3, 4, and 5, P < .01
[c] Peppermint quadratic, P < .001
[d] Mecadox vs. 2, P < .005
[e] Mecadox vs. all, P < .001
[f] Mint linear, P < .05

Table 4. Effect of peppermint on pig muscle 9915C.

	Peppermint level, %			
Peppermint, %	0	0.25	0.50	1.00
Juiciness	7.7	8.0	7.0	7.0
Tenderness	9.0	8.7	8.0	8.3
Chewiness	1.3	1.7	2.7	2.3
Pork flavor score	1.3	1.3	1.3	2.0
Off-flavor score	1.7	4.3	2.3	2.3
Off-flavor	Sour	Sour	Liver	sour & livery
Peppermint score	No peppermint flavors were detected			

Values are from one pig per treatment after five weeks on the treatment.
For all the sensory attributes, 1=lowest degree of the attribute and 10=highest degree of the attribute such that for juiciness: 1 = not juicy, 10 = very juicy
For tenderness: 1 = not tender, 10 = very tender
For chewiness: 1 = not chewy, 10 = very chewy
For pork flavor: 1 = no pork flavor, 10 = intense pork flavor
For off-flavors: 1 = no off flavor, 10 = intense off flavor
For juiciness, tenderness and pork flavor, the higher the number the better. For chewiness and off-flavors, the lower the score the better.