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The Effect of Feeding VVC Premix in Lactation Diets on Sow and Litter Performance

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Summary

A total of 94 mixed-parity sows (DNA 241, DNA Genetics, Columbus, NE) were used to evaluate the effects of feeding a blend of benzoic acid and essential oils (VVC Premix, dsm-firmenich, Animal Nutrition & Health, LLC, Pendergrass, GA) in lactation diets on sow and litter performance. Sows, in three farrowing groups, were moved into the farrowing house on d 110 of gestation and blocked by parity then randomly assigned to one of two dietary treatments consisting of a control diet or the control diet with VVC Premix included at 7 lb/ton. There were 47 sows per treatment. Sows were fed treatment diets from d 110 of gestation until weaning with sows receiving up to 6 lb/d of their respective treatment diets before farrowing and then were given ad libitum access to their assigned treatment diet until weaning. Sow BW, backfat, loin depth, and caliper score changes were unaffected by VVC Premix. Sows fed the control diet had increased (P = 0.002) ADFI from entry until farrowing. However, during the lactation period, sows fed diets with VVC Premix had a marginally increased (P = 0.065) ADFI compared with the control. Total born, total born alive, stillborn, and mummified pigs did not differ between treatment diets. Litter size, piglet BW, litter ADG, and piglet ADG on d 0, 2, 10, and at weaning were not influenced by treatment diet. Preweaning mortality from d 2 to weaning was reduced (P = 0.009) when sows were fed VVC Premix. In conclusion, these data suggest minimal differences in sow and litter performance with VVC Premix inclusion in lactation diets, although increased lactation feed intake and reduced preweaning mortality were observed.

Introduction

Preventing the presence of pathogens in feed plays a vital role in herd health and profitability of the swine industry. VVC Premix (dsm-firmenich, Animal Nutrition & Health, LLC, Pendergrass, GA) is a blend of benzoic acid (VevoVitall) and essential oils (CRINA) commonly included in sow diets for its in-feed antiviral properties against

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porcine epidemic diarrhea virus (PEDV)[3], African swine fever virus (ASFV)[4], and porcine reproductive and respiratory syndrome virus (PRRSV)[5]. There are many studies published regarding the growth performance benefits of organic acids and essential oils added separately in nursery pig diets. However, there are limited data available that demonstrate the impact of VVC Premix on sow and litter performance when included in lactation diets fed to sows. Therefore, the objective of this study was to evaluate the effects of VVC Premix on sow and litter performance.

Procedures

The Kansas State University Institutional Animal Care and Use Committee approved the protocol used in this experiment. The study was conducted at the Kansas State University Swine Teaching and Research Center. Sows were housed in individual farrowing stalls measuring 6 × 8 ft, including sow and piglet area. Each crate was equipped with an automatic dry self-feeder (Gestal Quattro Opti, Jyga Technologies, St-Lambert-de-Lauzon, QC, Canada) and a cup waterer. Feeders were calibrated for each treatment diet at the beginning of all farrowing groups. All diets were manufactured at the Kansas State University O.H. Kruse Feed Technology Innovation Center (Manhattan, KS) and fed in meal form.

Animals and diets

A total of 94 mixed-parity sows (Line 241; DNA Genetics, Columbus, NE) and litters (DNA 241 × 600) were used across three batch-farrowing groups from March to June 2026. On d 110 of gestation, sows were moved into the farrowing house, weighed, blocked by parity and assigned to one of two dietary treatments. Two experimental corn-SBM-DDGS-based diets were manufactured with or without VVC Premix included at 7 lb/ton at the expense of ground corn to form the treatments. From entry until farrowing, sows were offered up to 6 lb/d of their respective treatment diet and then had ad libitum access from farrowing to weaning. Diets were formulated to 1.05% SID Lys and met or exceeded other NRC[6] requirement estimates (Table 1).

Sow BW was measured on d 110 of gestation, after farrowing, and at weaning. Sow backfat and loin depth were measured on d 110 of gestation and at weaning at the last rib, 2 in. from the midline on the right side of the sow, using an IBEX Pro ultrasound system (E.I. Medical Imaging, Loveland, CO). A caliper device was used for caliper scoring at entry and at weaning. Sow ADFI and feeders were managed to ensure sows were not wasting feed. Piglets were individually weighed at birth, 48 h after birth and after cross-fostering (d 2), on d 10, and 1 d before weaning. Cross-fostering occurred

[3] Gebhardt, J. T., J. C. Woodworth, C. K. Jones, M. D. Tokach, P. C. Gauger, R. G. Main, J. Zhang, Q. Chen, J. M. DeRouchey, R. D. Goodband, C. R. Stark, J. R. Bergstrom, J. Bai, and S. S. Dritz. 2019. Determining the impact of commercial feed additives as potential porcine epidemic diarrhea virus mitigation strategies as determined by polymerase chain reaction analysis and bioassay. Transl. Anim. Sci. 3:93–102. doi:10.1093/tas/txy100.

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[6] National Research Council. 2012. Nutrient Requirements of Swine: Eleventh Revised Edition. Washington, DC: The National Academies Press. doi:10.17226/13298.

within treatment and within 48 h after birth to equalize litter size. All occurrences of piglet mortalities were recorded and accounted for when determining preweaning mortality. Wean-to-estrus interval was determined for all sows.

Statistical analysis

Performance data were analyzed using R software (version 4.5.0, R Foundation for Statistical Computing, Vienna, Austria) using the lme4 package as a generalized randomized block design with treatment as a fixed effect and farrowing group and parity block nested within farrowing group as random effects. Count data were analyzed using a Poisson distribution with a log link function. Proportion data, including total born, total born alive, stillborn, and mummified pigs were analyzed using a binomial distribution with a logit link function. Total born was used as a covariate for percentage born alive, stillborn, and mummified. Results were considered significant at $P \leq 0.05$ and marginally significant at $0.05 < P \leq 0.10$.

Results and Discussion

Sow BW at entry, farrowing, and weaning, and the corresponding lactation weight change, were unaffected by dietary treatment (Table 2). Additionally, no significant differences were observed between the dietary treatments for the sows' backfat, loin depth, or caliper score from entry to weaning. ADFI before farrowing was greater ($P = 0.002$) in sows fed the control diet compared with sows fed the diet containing VVC Premix. However, a tendency for increased ($P = 0.065$) ADFI from farrow to wean was observed for sows fed the diet with the VVC Premix.

For litter performance (Table 3), total born, total born alive, stillborn, and mummified pigs did not differ between treatments. Feeding sows VVC Premix had no effect on litter size, litter weight, piglet BW, litter ADG, or piglet ADG on d 0, 2, 10, or at weaning, although preweaning mortality from d 2 until weaning was reduced ($P = 0.009$) in litters of sows fed the diet with VVC Premix.

In conclusion, this study provides evidence that feeding VVC Premix in sow lactation diets reduced preweaning mortality and may increase lactation feed intake.

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Table 1. Diet composition (as-fed basis)[1]

Ingredients, %	Control	VVC Premix[2]
Corn	60.61	60.23
Soybean meal, 46.5% CP	18.57	18.59
Corn DDGS	15.00	15.00
VVC Premix	---	0.35
Soybean oil	1.00	1.00
Calcium carbonate	1.48	1.48
Monocalcium phosphate, 21.5% P	1.05	1.05
Sodium chloride	0.50	0.50
L-Lys-HCl	0.47	0.47
DL-Met	0.06	0.06
L-Thr	0.16	0.16
L-Trp	0.04	0.04
L-Val	0.09	0.09
Vitamin and trace mineral premix[3]	0.50	0.50
Titanium dioxide	0.50	0.50
Total	100.0	100.0
Calculated analysis		
SID AA, %		
Lys	1.05	1.05
Ile:Lys	58	58
Leu:Lys	144	143
Met:Lys	31	31
Met and Cys:Lys	55	55
Thr:Lys	65	65
Trp:Lys	19	19
Val:Lys	75	75
SID Lys:NE, g/Mcal	4.27	4.28
NE, kcal/lb	1,117	1,112
CP, %	18.6	18.6
Ca, %	0.90	0.90
STTD P, %	0.50	0.50

[1] Diets were fed from approximately d 110 of gestation until weaning.

[2] dsm-firmenich, Animal Nutrition & Health, LLC, Pendergrass, GA

[3] Phytase was included in the vitamin and trace mineral premix; HiPhorius 2400 (dsm-firmenich, Animal Nutrition & Health, LLC, Pendergrass, GA) included at 1,980 FYT/kg provided an estimated release 0.12% STTD P.

Table 2. Effect of feeding VVC Premix in lactation diets on sow performance[1]

	Dietary treatment[2]			
Item	Control	VVC	SEM	*P* =
Count, n	47	47	---	---
Parity	2.01	1.98	0.367	0.924
Lactation length, d	17.8	17.4	0.244	0.161
Sow BW, lb				
Entry	525.2	524.7	18.802	0.943
Farrow	497.5	495.5	17.272	0.794
Wean	490.6	485.8	16.453	0.514
Lactation change (entry to wean)	-35.5	-39.3	6.129	0.497
Lactation change (farrow to wean)	-8.2	-10.9	4.879	0.553
Sow backfat, mm				
Entry	12.7	12.7	1.102	0.992
Wean	10.5	10.6	0.506	0.784
Lactation change (entry to wean)	-2.0	-2.1	0.777	0.734
Sow loin depth, mm				
Entry	58.8	58.7	1.111	0.908
Wean	55.5	56.6	0.957	0.222
Lactation change (entry to wean)	-3.3	-2.1	0.738	0.219
Sow caliper score, caliper units				
Entry	16.4	16.4	0.274	0.930
Wean	14.8	14.7	0.316	0.861
Lactation change (entry to wean)	-1.6	-1.7	0.189	0.683
Sow ADFI, lb				
Pre-farrow	5.45	5.33	0.251	0.002
Farrow to wean	16.17	16.92	0.409	0.065
Pre-farrow to wean	12.53	12.83	0.312	0.311
Wean-to-estrus interval, d	5.41	5.59	0.186	0.140

[1] A total of 94 mixed-parity sows (Line 241, DNA, Columbus, NE) and litters were used from d 110 of gestation until weaning. Litters were cross-fostered within treatment group to equalize litter size up to 48 h after farrowing. 2Treatments followed a one-way treatment structure comparing sows fed diets with or without VVC Premix. VVC was included in the diet at the expense of ground corn at 7 lb/ton.

Table 3. Effect of feeding VVC Premix in lactation diets on litter performance[1]

	Dietary treatment[2]			
Item	Control	VVC	SEM	*P* =
Litter characteristics				
Total born, n[3]	17.0	17.5	0.61	0.585
Born alive, %	91.8	90.1	1.15	0.203
Stillborn, %	4.2	5.2	1.02	0.270
Mummy, %	3.8	4.3	0.73	0.606
Litter size, n				
d 0	15.4	15.4	0.573	0.979
d 2	14.6	14.7	0.559	0.893
d 10	14.0	14.4	0.553	0.584
Wean	13.6	14.0	0.546	0.579
Litter weight, lb				
d 0	51.9	51.9	1.905	0.996
d 2	57.2	57.2	1.405	0.972
d 10	110.4	109.8	2.754	0.869
Wean	177.0	179.4	4.017	0.627
Mean piglet BW, lb				
d 0	3.45	3.41	0.093	0.765
d 2	3.97	3.91	0.092	0.622
d 10	7.92	7.64	0.179	0.190
Wean	13.1	12.8	0.249	0.339
Litter ADG, lb/d				
d 2 to 10	6.78	7.05	0.172	0.241
d 10 to wean	8.34	8.70	0.233	0.167
d 2 to wean	7.58	7.92	0.183	0.127
Piglet ADG, lb/d				
d 2 to 10	0.49	0.49	0.018	0.907
d 10 to wean	0.62	0.62	0.017	0.867
d 2 to wean	0.56	0.57	0.016	0.797
Preweaning mortality, %				
Birth to d 2	5.65	6.34	0.905	0.576
d 2 to wean	6.67	3.55	1.231	0.009
Birth to wean	12.12	9.79	1.211	0.156

1A total of 94 mixed-parity sows (Line 241, DNA, Columbus, NE) and litters were used from d 110 of gestation until weaning. Litters were cross-fostered within treatment group to equalize litter size up to 48 h after farrowing.

[2] Treatments followed a one-way treatment structure comparing sows fed diets with or without VVC Premix. VVC was included in the diet at the expense of ground corn at 7 lb/ton.

[3] Total born was used as a covariate for percentage born alive, stillborn, and mummified.