Efficacy of sucrose and milk chocolate product or dried porcine solubles to increase feed intake and improve performance of lactating sows[1]

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ABSTRACT: Two experiments were conducted to determine the voluntary feed intake and performance of lactating sows fed diets containing a sucrose/milk chocolate product (MCP) blend (Exp. 1) or dried porcine solubles (DPS; Exp. 2). Dried porcine solubles is a coproduct of heparin extraction from porcine small intestines. In Exp. 1, mixed-parity sows (n = 108) at two research centers were assigned to a corn-soybean–meal–based diet formulated to contain 0.9% total lysine or a similar diet that contained 4% sucrose and 2% MCP on an as-fed basis. Sows were allowed ad libitum access to dietary treatments from the day of farrowing until pigs were weaned at approximately 21 d postpartum. Diet had no significant effect on voluntary feed intake of sows during lactation, backfat depth, or postweaning interval to estrus, but it had variable effects on body weight changes. Inclusion of the sucrose/MCP blend in diets elicited a 2% improvement in litter weaning weight at one research center and a 6% depression in litter weaning weight at the other center (diet × research center, $P < 0.05$). Litter size throughout lactation was unaffected by dietary treatment. In Exp. 2, mixed-parity sows (n = 119) at two research centers were assigned to corn-soybean meal–based diets formulated to contain 0.9% total lysine with 0, 1.5, or 3.0% added DPS. Sows were assigned to dietary treatments within research center, farrowing group, and parity at parturition. Dried porcine solubles tended to increase ($P < 0.10$) total feed consumed in the first 9 d of lactation and average daily feed intake over the entire lactation (6.03, 6.53, and 6.30 kg) for sows fed 0, 1.5, and 3.0% DPS, respectively. Litter size and weight on d 18 of lactation were not affected by concentration of DPS in the diet. Days from weaning to estrus and percentage of sows displaying estrus were not influenced by diet. We conclude that inclusion of the sucrose/MCP blend in the diet for lactating sows had no consistent effect on voluntary feed intake of sows and weight gain of nursing pigs. Inclusion of DPS at 1.5 or 3.0% tended to improve feed intake of lactating sows but had no significant influence on litter performance.

Key Words: Lactation, Meat Byproducts, Milk Chocolate, Sows, Sucrose

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Introduction

Lactating sows often do not consume enough feed to satisfy their energy and nutrient needs for milk production (Boyd et al., 2000; Trottier and Johnston, 2001). Consequently, sows catabolize body tissue to supply the energy and nutrients not supplied by the diet. Numerous researchers have demonstrated that reproductive performance is depressed when sows endure an extended or severe catabolic state during lactation (Johnston et al., 1989; Koketsu et al., 1996; Clowes et al., 2003). One way to reduce the severity of maternal body catabolism during lactation is to increase lactational feed intake. Adding specialty ingredients to diets at low concentrations may increase voluntary feed intake of lactating sows and improve performance.

Flavoring agents can improve the voluntary feed intake of nursery pigs and may improve diet acceptability for lactating sows (Orr and Tribble, 1977). Young pigs consume more of a diet containing elevated levels of sucrose (5%) compared with pigs fed diets based on corn, soybean meal, and dried whey when offered a choice of diets (Wahlstrom et al., 1974). Yang et al. (1997) reported that nursery pigs expressed a clear preference for diets that contained milk chocolate product (**MCP**), a by-product of food manufacture for humans.

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Dietary dried porcine solubles (**DPS**), the residues remaining after extraction of heparin from porcine intestines, improved the growth performance of weaned pigs (Zimmerman et al., 1997; Lindemann et al., 1998). Experiences under commercial conditions suggest that the feed intake of lactating sows may be enhanced by the inclusion of DPS in diets. No studies under controlled conditions have been conducted to document these observations.

Our objectives were to determine the voluntary feed intake and performance of lactating sows fed diets containing a sucrose/milk chocolate product blend (Exp. 1) or dried porcine solubles (Exp. 2).

Materials and Methods

General Animal Management. Experimental protocols for both experiments were reviewed and approved by the University of Minnesota Institutional Animal Care and Use Committee. Mixed-parity sows from two herds were used in these experiments. Sows at the West Central Research and Outreach Center, in Morris, MN, were Yorkshire-Landrace crossbred females mated to terminal-line Hampshire boars. The Southern Research and Outreach Center, in Waseca, MN, provided data from PIC Line 14 Camborough sows mated to PIC Line 327 boars. Data collection for Exp. 1 began in August and ended in October of the same year. Sows farrowing from September through December of the same year were used for Exp. 2. Sows were moved to confinement farrowing rooms on about d 110 of gestation. All sows were fed 2.04 kg/d of a 14% crude protein gestation diet based on corn and soybean meal from entry to the farrowing room until farrowing in Exp. 1. In Exp. 2, sows received 2.04 kg daily of the control diet from entry to the farrowing room until farrowing. On the day of farrowing, feed offered to sows was switched to the appropriate dietary treatment. Sows were provided ad libitum access to the designated experimental diet throughout lactation. Feed was added to each feeder at about 0800 and 1430 daily. Feed added was weighed and recorded at each feeding. Amount of feed added was adjusted daily to ensure that sows had continuous access to feed without accumulation of feed in the storage hopper or feed bowl. Unconsumed feed was weighed on d 7 and 14 postpartum and at weaning (Exp. 1) or d 9 and 18 postpartum and at weaning (Exp. 2).

Litter management practices reflected those commonly employed in the commercial swine industry. Within 3 d after farrowing, all litters were adjusted, irrespective of dietary treatment, to a minimum of nine pigs. Every effort was made to maintain at least nine pigs per litter during the experiments. If a pig died during lactation, a pig of similar weight from a litter not involved in the experiment was used to replace the dead pig within 18 h. Pigs had their ears notched, tails docked, and needle teeth clipped within 24 h of birth. An injection of iron was administered by d 3 after farrowing. Creep feed was not offered to litters, but pigs had access to sow feed.

Table 1. Composition of experimental diets on an as-fed basis (Exp. 1)

Ingredient	Control	Sucrose/MCP[a]
	%	
Corn	70.0	64.0
Soybean meal 47%	24.5	24.5
Soybean oil	1.0	1.0
Sucrose/MCP	—	6.0
Dicalcium phosphate	2.65	2.65
Limestone	0.70	0.70
Salt	0.50	0.50
Vitamin premix[b]	0.30	0.30
Trace mineral premix[c]	0.10	0.10
Wheat midds[d]	0.25	0.25
Calculated analysis		
Metabolizable energy, kcal/kg	3,225	3,258
Lysine, total, %	0.90	0.90
Methionine, total %	0.27	0.26
Fat, %	3.91	3.85
Laboratory analysis		
Crude protein, %	18.03	17.74
Calcium, %	0.95	0.87
Phosphorus, %	0.93	0.87

[a]MCP = Milk chocolate product.
[b]Provided per kilogram of final diet: vitamin A, 6,615 IU; vitamin D_3, 1,654 IU; vitamin E, 27.5 IU; menadione, 4.4 mg; riboflavin, 6.6 mg; niacin, 13.2 mg; pantothenic acid, 26.5 mg; vitamin B_{12}, 33 mg; pyridoxine, 0.88 mg; folic acid, 1.1 mg; biotin, 0.22 mg; choline, 584 mg; thiamine, 0.66 mg.
[c]Provided per kilogram of final diet: Fe, 100 mg; Zn, 100 mg; Mn, 30 mg; Cu, 6.6 mg; I, 0.6 mg; Se, 0.1 mg, as ferrous sulfate, zinc oxide, manganese oxide, copper sulfate, ethylenediamine dihydriodide, sodium selenite, respectively.
[d]Used as a carrier in a base mix that included macrominerals, microminerals, and vitamins.

On the day of weaning, sows were separated from their litters and moved to a confinement breeding facility. Sows were checked daily for signs of estrus using a mature boar. Estrus was recorded when sows stood to be mounted by a boar; days from weaning to estrus were recorded. Sows were removed from the experiment when they displayed estrus or on d 15 postweaning, whichever occurred earlier. If a sow was anestrous through d 15 postweaning, a weaning-to-estrus interval was not recorded for that sow. These sows had missing data for weaning-to-estrus interval in their record.

Experiment 1. One hundred eight sows (54 sows from each research center) were assigned, based on parity and expected farrowing date, to one of two experimental diets (Table 1), which were formulated to contain 0.9% total lysine. The sucrose/MCP blend consisted of two-thirds sucrose and one-third MCP. This blend when included in the diet at 6% at the expense of corn provided 4% sucrose and 2% MCP to the final diet.

Sow weight was recorded on entry to the farrowing quarters, within 24 h after farrowing, on d 14 of lactation, and on the day of weaning. Lactation length averaged 21 d (CV = 7.73%). Backfat depth was determined ultrasonically (Lean-Meater, Renco Corp., Minneapo-

Table 2. Composition of experimental diets on an as-fed basis (Exp. 2)

	Level of dietary DPS, %		
Ingredient	0	1.5	3.0
Corn	69.90	69.37	69.02
Soybean meal 47%	25.00	24.09	22.97
Soybean oil	1.00	1.00	1.00
Dicalcium phosphate	2.50	2.42	2.42
Limestone	0.70	0.74	0.74
Vitamin premix[a]	0.30	0.30	0.30
Trace mineral premix[b]	0.10	0.10	0.10
Salt	0.50	0.48	0.45
DPS 30[c]	—	1.50	3.00
Calculated analysis			
ME, kcal/kg	3,232	3,238	3,245
Calcium, %	0.90	0.90	0.90
Phosphorus, %	0.81	0.80	0.80
Salt, %	0.50	0.50	0.51
Sodium, %	0.31	0.35	0.39
Chloride, %	0.34	0.34	0.33
Laboratory analysis			
Crude protein, %			
Southern Research Center	17.07	16.82	17.55
West Central Research Center	16.59	17.68	17.02
Lysine, total %	0.91	0.99	0.97
Met + Cys, %	0.54	0.58	0.56

[a]Provided per kilogram of final diet: vitamin A, 6,615 IU; vitamin D_3, 1,654 IU; vitamin E, 27.5 IU; menadione, 4.4 mg; riboflavin, 6.6 mg; niacin, 13.2 mg; pantothenic acid, 26.5 mg; vitamin B_{12}, 33 mg; pyridoxine, 0.88 mg; folic acid, 1.1 mg; biotin, 0.22 mg; choline, 584 mg; thiamine, 0.66 mg.
[b]Provided per kilogram of final diet: Fe, 100 mg; Zn, 100 mg; Mn, 30 mg; Cu, 6.6 mg; I, 0.6 mg; Se, 0.1 mg, as ferrous sulfate, zinc oxide, manganese oxide, copper sulfate, ethylenediamine dihydriodide, sodium selenite, respectively.
[c]Dried porcine solubles.

lis, MN) 60 mm lateral to the dorsal midline opposite the last rib within 24 h after farrowing and at weaning. Litter size and weights of individual pigs were recorded at birth, on d 14 of lactation, and at weaning.

Experiment 2. One hundred nineteen sows (n = 66 and 53 for the West Central and Southern Research Centers, respectively) were assigned to three dietary treatments during lactation. Corn-soybean meal–based diets were formulated to contain 0.9% total lysine and 0, 1.5, or 3.0% DPS (Table 2). Dried porcine solubles were included in the appropriate diets using DPS-30 (Nutra-Flo Protein Products, Sioux City, IA). Sows were assigned to dietary treatments based on parity and expected farrowing date within each station.

Sows were weighed when they entered the farrowing quarters, within 24 h after farrowing, on d 9 and 18 of lactation, and at weaning. Mean lactation length was 21.0 d (CV = 8.85%). Backfat depth was determined ultrasonically at the last rib about 60 mm off the midline at farrowing and at weaning. Number and weight of individual pigs were recorded at birth. Total litter weight and number of pigs per litter were recorded on d 9 and 18 of lactation and at weaning.

Statistical Analyses. Data were analyzed by least squares analysis of covariance (Gill, 1978) using the GLM procedure of SAS (SAS Inst. Inc., Cary, NC). In Exp. 1, parity was used initially as a class variable and included in the statistical model. However, the very small number of advanced-parity sows at the Southern Research Center caused extreme adjustments in the least squares means for many response variables, which was considered misleading. Consequently, linear and quadratic parity terms were included as covariates in the analysis of all response variables for the final statistical analysis. Lactation length was the covariate for sow feed intake, backfat depth of sows, litter weight at weaning, and postweaning interval to estrus. Prefarrowing sow weight was the covariate for subsequent sow weights. Litter weight after cross-fostering was used as a covariate for subsequent litter weights and daily litter weight gain data. In Exp. 2, parity was used as a covariate for analysis of all response variables. Number of pigs per litter after cross-fostering and lactation length were used (in addition to parity) as covariates for subsequent litter size and litter weight data. Parity and lactation length were used as covariates for analysis of dietary influences on sow feed intake and postweaning interval to estrus.

In both experiments, parity accounted for a significant portion ($P < 0.05$) of the variation in response variables. In most instances, the covariates other than parity also accounted for a significant portion ($P < 0.05$) of the variation in response variables. The statistical model used for analysis of both experiments included the main effects of station, dietary treatment, the nested effect of farrowing group within station, all possible two-way interactions among main and nested effects, and the appropriate covariates mentioned above. Where appropriate, linear contrasts were used to separate means. Chi-square analysis was used to evaluate the effects of dietary treatment on the occurrence of behavioral estrus by d 15 postweaning. Data are reported as least squares means.

Results and Discussion

Experiment 1. Significant interactions were observed between research center and dietary treatment for lactational weight change of sows and litter performance data. Significant effects of research center were also observed for many response variables. However, effects of research center will not be discussed because the primary focus of this investigation was to determine the effects of a sucrose/MCP blend on sow performance.

Inclusion of a sucrose/MCP blend in a standard corn-soybean meal diet had no significant influence on average feed intake of lactating sows (Table 3). Research center and diet interacted ($P < 0.05$) to influence weight changes of sows during lactation. Sows at the Southern Research Center lost body weight during lactation regardless of the diet to which they were assigned, whereas sows at the West Central Research Center lost weight when fed the control diet and gained weight when fed the diet containing sucrose/MCP. Neither

Table 3. Effect of research center and a sucrose/milk chocolate product (MCP) blend on sow performance (Exp. 1)

	Southern Research Center		West Central Research Center		
Trait	Control	Sucrose/MCP	Control	Sucrose/MCP	SEM
No. of sows	27	27	27	27	—
Parity	1.8	1.8	3.6	3.9	—
ADFI, kg/d as-fed	5.67	5.70	5.54	5.65	0.15
Sow wt., kg					
24 h postpartum[a]	213.4	209.2	205.9	204.3	1.70
14 d postpartum	211.7	209.4	205.2	208.3	2.04
Weaning[b]	209.0	204.4	200.9	207.7	2.19
Lactational change[ab]	–4.4	–4.8	–5.0	3.4	1.90
Sow backfat depth, mm					
Parturition	18.0	17.8	22.2	21.8	0.74
Weaning	16.5	16.3	20.6	20.8	0.66
Lactational change	–1.5	–1.5	–1.6	–1.0	0.35
Weaning-to-estrus interval, d	5.7	6.3	5.0	5.4	0.30
Sows displaying estrus, %[c]	44.4	60.7	81.4	88.8	—

[a]Effect of diet ($P < 0.10$).
[b]Research center × diet interaction ($P < 0.05$).
[c]Chi square within Southern ($\chi^2 = 1.86$; $P < 0.18$) and West Central ($\chi^2 = 0.59$; $P < 0.45$) Research Centers.

backfat depth of sows nor change in backfat depth was influenced by dietary treatment.

Weaning-to-estrus interval was not influenced significantly by dietary treatment for sows that displayed estrus by d 15 postweaning. This is not surprising given the fact that dietary treatments did not have a large influence on feed intake and only subtle effects on changes in body composition of sows. However, NCR-89 (1990) reported a significantly shorter interval from weaning to estrus in sows that received a diet containing 2.5% feed-grade sucrose during lactation. In that study, addition of sucrose to the diet did not significantly influence voluntary feed intake or body composition of sows, which is similar to the study reported herein.

Over the entire experiment regardless of station, 63% of sows fed the control diet expressed estrus by d 15 postweaning whereas 76% of sows fed the sucrose/MCP blend expressed estrus. These differences were not significant ($\chi^2 = 2.14$; $P < 0.15$). The poor rebreeding performance of sows at the Southern compared with the West Central Research Center may be explained partially by age of the sows. Mean parity of sows at the Southern Research Center was 1.8 vs. 3.8 for sows at the West Central Research Center (Table 3). Other researchers (Rasbech, 1969; Newton and Mahan, 1993; Yang et al., 2000) demonstrated improved postweaning reproductive performance with increasing parity of the sow. In the article by NCR-89 (1990), it was reported that inclusion of 2.5% sucrose in the diet of lactating sows decreased the proportion of sows displaying estrus by d 30 postweaning; however, their finding was not significant and they did not report parity information for the sows studied.

Dietary treatment had no significant effect on litter size at any time during lactation (Table 4). A research center × dietary treatment interaction ($P < 0.05$) was observed for total litter weight at birth and after cross-fostering. This significant interaction continued throughout lactation. By the end of lactation, a 2% improvement in litter weight and daily litter weight gain was noted for sows fed the sucrose/MCP blend at the Southern Research Center. In contrast, sows fed the sucrose/MCP blend at the West Central Research Center weaned litters that were 6% lighter and gained 7% slower than contemporary litters nursing sows fed the control diet. Using litter weight as a gross indicator of the sow's milk production, one could infer a subtle decline in milk production of sows at the West Central Research Center when the diet contained the sucrose/MCP blend at a level of 6%. The slight reduction in litter weight gain combined with the small gains in sow weight during lactation when the sucrose/MCP blend was included in the diet suggests these sows may have redirected absorbed nutrients away from milk production in favor of maternal body tissue. In some situations, this redirection of nutrients may be favorable to subsequent reproductive performance of sows; however, we observed no significant effects of diet on either the postweaning interval to estrus or the proportion of sows displaying estrus at the West Central Research Center.

A different response was apparent at the Southern Research Center. Sows fed the sucrose/MCP-containing diet supported slightly better litter performance compared with their contemporaries fed the control diet. An obvious explanation for this differential response across centers is not apparent. One might attribute this inconsistent response to the large difference in parity of sows at the two research centers. However, both the linear and quadratic parity terms in the statistical model were highly significant, which would suggest that these parity differences were largely accounted for by the covariates.

Table 4. Effect of research center and a sucrose/milk chocolate product (MCP) blend on litter performance (Exp. 1)

	Southern Research Center		West Central Research Center		
Trait	Control	Sucrose/MCP	Control	Sucrose/MCP	SEM
Number of litters	27	27	27	27	—
Lactation length, d	19.6	20.0	22.1	22.4	0.31
Litter size					
Total number born	10.9	11.2	10.5	10.7	0.54
Born alive	10.4	10.5	9.9	9.9	0.50
After cross-foster	10.1	10.1	10.0	10.2	0.16
14 d postpartum[a]	9.6	9.8	9.8	9.5	0.15
Weaning	9.6	9.7	9.8	9.5	0.14
Litter wt., kg					
Total wt. at birth[b]	15.1	17.2	16.7	15.7	0.70
After cross-foster[b]	14.6	15.9	16.1	15.2	0.47
14 d postpartum[b]	40.5	41.4	47.3	44.2	0.90
Weaning[b]	59.2	60.3	65.0	61.2	1.18
Daily litter gain[a]	2.07	2.13	2.34	2.17	0.06

[a]Research center × diet interaction ($P < 0.10$).
[b]Research center × diet interaction ($P < 0.05$).

Experiment 2. Effects of research center and farrowing group were significant for many response variables; however, these effects are not reported or discussed because they are not the focus of this experiment. There were no significant interactions between dietary treatments and research center or dietary treatments and farrowing group, suggesting that the effects of diet were consistent at both research centers and across farrowing groups. The remainder of this discussion will focus on the main effects of dietary treatment on sow performance.

The most important finding in this investigation was the effects of DPS on voluntary feed intake of sows. Dried porcine solubles tended to increase the total amount of feed consumed by sows ($P < 0.10$) through d 9 of lactation and through weaning (Table 5). This observation resulted in a tendency for sows fed increasing dietary concentrations of DPS to exhibit a linear

Table 5. Effect of dried porcine solubles (DPS) on sow performance (Exp. 2)

	Level of dietary DPS, %				
Item	0	1.5	3.0	SEM[a]	Statistical effect
Number of sows	36	42	41		
Parity	4.19	4.67	4.36	—	—
Lactation length, d	20.6	20.7	20.7	0.30	—
Total feed intake, kg					
d 0 to 9	47.5	52.0	49.0	1.64	Linear, $P < 0.10$
	(5.3)[b]	(5.8)	(5.4)		
d 10 to 18	60.2	64.9	63.1	1.91	—
	(6.7)	(7.2)	(7.0)		
d 0 to weaning	125.4	136.2	129.5	3.82	Linear, $P < 0.10$
ADFI, kg/d as-fed	6.03	6.53	6.30	0.17	Linear, $P < 0.10$
Sow weight, kg[c]					
d 109 of gestation	267.6	263.0	260.8	5.16	—
Farrowing	246.1	246.4	243.8	5.13	—
d 9	246.7	248.1	245.4	4.93	—
d 18	246.4	252.8	246.5	4.76	—
Weaning	243.2	248.0	243.7	4.78	—
Sow backfat depth, mm					
Farrowing	15.1	15.5	17.1	0.69	—
Weaning	14.4	15.1	16.0	0.58	—
Days to estrus	4.67	4.59	4.32	0.16	—
Sows in estrus by d 15 postweaning, %	94	95	97	—	—

[a]$SEM = \sqrt{(MSE/harmonic\ mean\ number\ of\ observations)}$.
[b]ADFI (kg/d as-fed) for the period.
[c]Number of observations were 21, 23, and 22 for 0, 1.5, and 3.0% DPS, respectively.

Table 6. Effect of dried porcine solubles (DPS) on litter performance (Exp. 2)

	Level of dietary DPS, %				
Item	0	1.5	3.0	SEM[a]	Statistical effect
Number of litters	36	42	41	—	
Pigs per litter					
Total born	10.9	10.7	10.3	0.55	—
Born live	9.4	9.8	9.3	0.46	—
After cross-foster	10.5	9.9	9.8	0.18	Linear, $P < 0.05$
d 9	9.3	9.5	9.4	0.10	—
d18	9.2	9.3	9.1	0.10	—
Weaning	9.2	9.3	9.0	0.12	—
Litter weight, kg:					
After cross-foster	16.1	16.0	16.3	0.42	—
d 9	31.4	30.2	30.2	0.73	—
d 18	53.5	52.5	52.0	1.31	—
Weaning	61.1	59.9	58.2	1.54	—

[a]SEM = $\sqrt{(\text{MSE/harmonic mean number of observations})}$.

increase ($P < 0.10$) in average daily feed intake over the entire lactation. Lindemann et al. (1998) reported a similar improvement in voluntary feed intake of nursery pigs fed up to 6% DPS. Koehler et al. (1998) observed marginal improvements in daily feed intake and gain of nursery pigs fed 2.5% DPS, which were enhanced by the addition of 4% spray-dried porcine plasma. Others (Bregendahl et al., 1998; DeRouchey et al., 2000) found no effect of dietary DPS on feed intake of nursery pigs, but Zimmerman et al. (1997) consistently observed increased feed intake of nursery pigs previously fed DPS. The greatest numerical increase in the feed intake of sows in the present study resulted from 1.5% dietary DPS. As DPS addition increased to 3.0%, voluntary feed intake declined but still exceeded that of sows offered the control diet.

We observed no significant effect of DPS on body weight or backfat depth of sows, interval from weaning to expression of estrus, or the proportion of sows that expressed estrus by d 15 after weaning. The slight increase (0.5 kg) in average daily feed intake had no positive influence on sow body condition or postweaning performance. Data presented in Table 5 for sow body weight represents only females at the West Central Research Center. An undetected malfunction of the scale at the Southern Research Center generated spurious data that were deleted from the analysis of sow body weights across dietary treatments.

Similar to sow body weight and backfat depth, dietary DPS did not have any significant effects on litter size or litter weight throughout lactation (Table 6). Litter size after cross-fostering was different across dietary treatments. This result represents a chance occurrence that we do not attribute to a biological effect of DPS. Consequently, we used litter size after transfer (in addition to parity) as a covariate for analysis of all subsequent litter size and weight data. Since dietary treatments were not imposed until after farrowing, we did not expect any effects of DPS on initial litter size. Apparently, DPS had no effect on milk production of sows because we observed no differences in litter weight at any time during lactation. Daily litter weight gain was 2.15, 2.10, and 2.00 kg for sows assigned to 0, 1.5, and 3.0% DPS diets, respectively.

Implications

The inclusion of 4% sucrose and 2% milk chocolate product in corn-soybean meal–based lactation diets did not seem to enhance voluntary feed intake of lactating sows, nor did it improve growth performance of nursing piglets. Dried porcine solubles included in corn-soybean meal diets at 1.5% tended to increase the feed intake of lactating sows.

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