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Effect of Sire Line and Creep Feed on Sow and Litter Performance Following a Natural Porcine Reproductive and Respiratory Syndrome Virus Infection

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Summary

A total of 177 gilts and sows (PIC 1050) were used to determine the effects of sire line and creep feed on sow and litter performance during a natural porcine reproductive and respiratory syndrome virus (PRRSV) challenge. Sows were blocked by previous lactation treatment, BW, and parity at breeding and allotted to one of three sire line treatments. Gilts were blocked by breed weight and assigned to one of three sire line treatments. Sire line treatments were Pietrain- or Duroc-based, with sire line A being from a Pietrain sire line and sire lines B and C being from Duroc sires. A common diet was provided during gestation with feed allowance adjusted based on body condition. On d 108 of gestation, sows and gilts were moved into the farrowing facility and provided a common corn-soybean meal-based lactation diet. Litters were cross-fostered within 24 h of farrowing to equalize litter size within sire line treatment. Seven days before weaning, litters were assigned to one of two creep feeding treatments (with or without creep feed) in a randomized complete block design based on sire line treatment. Litters assigned to creep feed received a phase 1 nursery diet until weaning. No significant sire line × creep feed interactions were observed for sow and litter performance throughout the trial. There were minimal effects of creep feeding observed throughout the duration of the study. A difference in sow BW at entry and farrowing was observed ($P < 0.05$), with sows bred to sire line B having increased BW compared with sows bred to other treatments. At weaning, sows bred to sire line B had increased ($P < 0.05$) BW compared with those bred to sire line A, with sows bred to sire line C being intermediate. Sows bred to sire line A tended ($P = 0.097$) to have the greatest BW loss from entry to wean with no mean separation; however, no difference was observed from farrow to wean. A tendency for a difference in ADFI before farrowing was observed ($P = 0.086$), with sows bred to sire line B exhibiting increased feed intake compared with sows bred to other sire line treatments, but there was no mean separation. For lactation length, a significant effect of sire line was observed ($P < 0.05$), with sows bred to sire line B

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having the shortest lactation length compared with the other sire line treatments. No differences were observed in sow ADFI, wean-to-estrus interval, number exhibiting estrus by 9 d after weaning, and pregnancy check at d 35 after weaning. No differences were observed for the percentage of total born alive, stillborn, and mummified, litter size, litter weight, percentage of weaned pigs under 8 lb per litter, litter coefficient of variation, litter ADG, or preweaning mortality. At birth, d 12, and weaning, average piglet BW decreased ($P < 0.05$) in offspring from sire line B compared with other treatments; however, no difference was observed at d 1 after standardization. No difference was observed in piglet ADG from d 12 to wean and d 1 to wean; however, from d 1 to 12, piglet ADG was greater ($P < 0.05$) in litters from sire line C compared with sire line B, with sire line A being intermediate. In conclusion, no interactive effects were observed between sire line and creep feed treatment, and minimal main effects were observed for creep feed throughout the study. Offspring from sire line B had reduced birth and weaning weights compared with other sire line treatments.

Introduction

Average daily gain (ADG), feed efficiency, and carcass composition are heritable traits influenced by high-indexing sires to maximize performance. A perception is that Duroc-based sire lines have a more difficult transition at weaning, with a longer time to start on feed in the early nursery. In a previous study, litters from early maturing sires had increased BW at weaning compared with those from late maturing sires, which later resulted in increased BW at the end of the nursery[3].

Creep feeding strategies are designed to acclimate pigs to solid feed before weaning. Previous research found that pigs characterized as eaters of creep feed had greater feed intake and gain in the nursery compared with non-eaters.[4] In another study, pigs that received creep feed 14 d before weaning had increased BW at weaning.3 However, current research is inconclusive on the preweaning benefits of creep feed to sow or litter performance. No studies have evaluated the combination of offspring sired by different sire lines and creep feeding following natural infection with porcine reproductive and respiratory syndrome virus (PRRSV). Therefore, the objective of this study was to determine the effects of sire line and creep feeding strategy on sow and litter performance during a natural PRRSV infection.

Procedures

The Kansas State University Institutional Animal Care and Use Committee approved the protocol used for this experiment. The study was conducted at the United Animal Health Donald E. Orr farm (Sheridan, IN) with all diets manufactured on-site and fed in meal form. In the middle of October 2025, the research farm experienced a wild-type (1-7-4 L1A.5) PRRSV strain health challenge two months before sows entered the farrowing facility.

[3] Wensley, M. R., J. C. Woodworth, M. D. Tokach, R. D. Goodband, J. M. DeRouchey, and J. T. Gebhardt. 2023. Effect of early vs. late maturing sire line and creep feeding on the stress response, intestinal permeability, and growth performance of nursery and finishing pigs. J. Anim. Sci. 101. doi:10.1093/jas/skad169.

[4] Dos Santos, F. M., G. C. Gottschall, L. K. Alves, and C. A. Garbosa. 2023. Relationship between creep feeding intake and piglets' performance in the nursery phase. An. Acad. Bras. Cienc. 95:2. doi:10.1590/0001-376520232023035.

Breeding and gestation

A total of 177 gilts and sows (Line 1050, PIC, Hendersonville, TN) were used across one breed-to-farrow group from August 2025 to January 2026. At breeding, parity 1+ sows were blocked by previous lactation treatment, BW, and parity, and assigned to be bred to one of three commercially available sire line genetics. Gilts were placed into a gilt development breed room, blocked by breed weight, and assigned to be bred to one of the same sources of sire line semen used for the sows. Sire line treatments were Pietrain- or Duroc-based, with sire line A being from a Pietrain sire line and sire lines B and C being from Duroc sires. In gestation, all females were housed in individual stalls, fed a common gestation diet in meal form, and had their feed allowance adjusted based on sow body condition (Table 1). On approximately d 108 of gestation, all females were moved into the farrowing facility where they were fed a common meal form lactation diet at approximately 6 to 8 lb/d from d 108 of gestation until farrowing.

Lactation

After farrowing, sows had ad libitum access to the common lactation diet until weaning on approximately d 19. A robotic feed system (DryExact Pro; Big Dutchman North America, Holland, MI) was used to record and deliver feed to sows. Sow BW was measured on d 108 of gestation and at weaning. Sow BW after farrowing was calculated using a regression equation developed from previous data (United Animal Health) which was calculated as: Sow body weight post-farrow, lb = 12.91362 + (entry weight, lb × 0.99567) + (parity × 5.91388) – (stillborn × 2.67511) + (mummies × 2.65688) – (litter weight, lb × 1.54809) + (pre-farrow intake, lb × 0.53913). Piglets were cross-fostered within 24 h of birth within sire line treatment to equalize litter size. Piglets were individually weighed at birth, d 1 (standardization), d 12 (start of creep feed), and weaning. Seven days before weaning, litters were assigned to one of two creep feeding treatments (with or without creep feed) in a randomized complete block design based on sire line treatment. For litters assigned to the creep feed treatment, a phase 1 nursery diet with 1.50% SID Lys was fed. The creep feed diet was in meal form and fed using a commercial creep feeder. All instances of piglet mortalities were recorded to determine preweaning mortality. Sows were tracked after weaning to determine the subsequent breeding date, wean-to-estrus interval, and number confirmed pregnant 35 d after weaning.

Statistical analysis

Performance data for the sow portion of the trial were analyzed as a randomized complete block design using the lme4 package of R (Version 4.5.0, R Foundation for Statistical Computing, Vienna, Austria) as a one-way ANOVA for measurements before d 12 in the farrowing facility and a two-way ANOVA for measurements after d 12 in the farrowing facility. Blocking structure accounted for parity, previous lactation treatment, and sow BW for sire line treatment, and sire line treatment served as blocking structure for creep feed treatment. Sow served as the experimental unit. Sire line and creep treatments were included as fixed effects, with replication being included as a random effect. Count data were analyzed using a Poisson distribution using a log link function. Proportion data, including litter born alive, stillborn, born mummified, pigs under 8 lb per litter, sows never in heat, positive subsequent pregnancy check, and preweaning mortality, were analyzed using a binomial distribution using a logit link function. Native piglet measurements were removed from litters with fewer than six born alive. Litters removed included eight from sire A, four from sire B, and eleven from sire C. Native piglet measurements include total born, born alive, born alive weight,

born alive weight coefficient of variation, stillborn, and mummies. Sow measurements affected by native piglet measurements were removed, including sow farrow weight and BW change from farrow to wean. Differences were considered significant at $P < 0.05$ and marginally significant at $0.05 < P < 0.10$.

Results and Discussion

No significant sire line × creep feed interactions were observed for sow and litter performance throughout the trial. The percentage of sows confirmed pregnant at d 35 after weaning decreased ($P = 0.022$), from 98.7% to 93.7%, in sows with litters that received creep feed compared with sows from litters that did not receive creep feed (data not shown). There were no differences in total creep feed consumption, 0.68 lb per litter, between sire line treatments or changes in piglet or litter performance for those offered creep feed compared with those that were not (data not shown).

A difference in sow BW at entry and farrowing was observed ($P < 0.05$), with sows bred to sire line B having increased BW compared with sows bred to other treatments (Table 2). At weaning, sows bred to sire line B had increased ($P < 0.05$) BW compared with those bred to sire line A, with sows bred to sire line C being intermediate. There was a tendency ($P = 0.097$) for differences in BW loss from entry to wean, with sows bred to sire line A having the most loss and sows from sire line C the least, but there was no mean separation. A tendency for a difference in ADFI before farrowing was observed ($P = 0.086$), with sows bred to sire line B exhibiting higher feed intake compared with those bred to the other sire line treatments, but there was no mean separation. Sire line did not affect ADFI of sows from farrow-to-wean or pre-farrow-to-wean. For sire line effects, sows bred using sire line B had the shortest ($P < 0.05$) lactation length compared with other treatments. No differences were observed in wean-to-estrus interval, percentage not expressing estrus by 9 d after weaning, or percentage pregnant 35 d after weaning.

No differences were observed for the percentage of total born alive, stillborn, or mummified (Table 3). Litter size, litter weight, percentage of pigs under 8 lb per litter, and litter CV remained similar between treatments throughout the study. At birth, d 12, and weaning, average piglet BW decreased ($P < 0.05$) in offspring from sire line B compared with other treatments; however, no difference was observed at d 1 standardization. Litter ADG remained unaffected between sire line treatments throughout the study. No difference was observed in piglet ADG from d 12 to wean and d 1 to wean; however, from d 1 to 12, piglet ADG was greater ($P < 0.05$) in litters from sire line C compared with those from sire line B, with offspring from sire line A being intermediate. Preweaning mortality was unaffected by sire line treatment throughout the study.

In conclusion, no interactive effects were observed between sire line and creep feed treatment, and minimal main effects were observed for creep feed throughout the study. Offspring from sire line B had reduced birth and weaning weights compared with other sire line treatments.

Acknowledgments

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Table 1. Diet composition (as-fed basis)[1]			
Ingredient, %	Gilt development	Gestation	Lactation
Corn	80.90	80.70	60.57
Soybean meal, 47.7% CP	9.39	15.51	31.32
Choice white grease	---	---	1.00
Soybean hulls	5.96	---	2.50
Calcium carbonate	0.18	0.76	0.58
Monocalcium P, 21.0% P	---	0.23	0.13
Sodium chloride	0.50	---	0.50
Copper chloride	0.02	---	---
L-Lys	0.33	0.15	0.23
DL-Met	0.04	0.08	0.07
L-Thr	0.11	0.07	0.10
L-Trp	0.04	---	---
Tilmicosin phosphate[2]	---	---	0.50
Engage-M[3]	---	0.05	0.05
M-Mobilize[4]	0.08	---	---
Vitamin and trace mineral premix	2.45	2.45	2.45
Total	100	100	100
Calculated analysis			
Standardized ileal digestible (SID) amino acids, %			
Lys	0.68	0.65	1.10
Ile:Lys	54	68	64
Met and Cys:Lys	58	70	53
Thr:Lys	65	70	64
Trp:Lys	20	19	19
Val:Lys	65	78	70
Arg:Lys	86	112	108
Total Lys, %	0.77	0.75	1.24
ME, kcal/lb	1,415	1,429	1,431
SID Lys:ME, g/Mcal	2.18	2.06	3.49
CP, %	11.94	13.08	19.37
Na, %	0.22	0.19	0.20
Ca, %	0.61	0.85	0.85
Available P, %	0.38	0.43	0.43

[1] Gilt development and gestation diets were fed from breeding until d 108 of gestation before transitioning to the common lactation diet until weaning.

[2] Pulmotil, Elanco Animal Health, Greenfield, IN.

[3] Calcium aluminosilicate, United Animal Health, Sheridan, IN.

[4] United Animal Health, Sheridan, IN.

Table 2. Effect of commercial sire line on sow performance during a natural PRRSV challenge[1]

	Sire line[2]				
Item	A	B	C	SEM	*P* =
Count, n	57	62	58	---	---
Parity	2.02	2.22	2.05	0.263	0.688
Sow BW, lb					
Entry	459.0[b]	475.7[a]	454.8[b]	7.52	0.001
Farrow[3,4]	437.4[b]	457.1[a]	432.7[b]	8.76	0.001
Wean	450.0[b]	472.1[a]	457.2[ab]	10.13	0.006
Lactation change (entry to wean)	-9.5	-3.4	0.4	4.43	0.097
Lactation change (farrow to wean)[4]	13.3	16.4	21.8	3.79	0.139
Sow ADFI, lb					
Pre-farrow	5.88	6.03	5.85	0.189	0.086
Farrow to wean	15.81	16.15	16.00	0.409	0.510
Pre-farrow to wean	13.62	13.75	13.79	0.306	0.705
Lactation length, d	19.6[a]	19.2[b]	19.6[a]	0.20	0.018
Wean-to-estrus interval, d	4.31	4.25	4.21	0.067	0.525
Estrus not observed by d 9 after weaning, %	0.00	6.79	0.00	3.164	1.000
Pregnant at d 35, %	97.9	95.1	97.5	4.02	0.481

[1] A total of 177 gilts and sows (Line 1050, PIC, Hendersonville, TN) and litters were used from mating until weaning. The sow farm experienced a natural infection with a 1-7-4 L1A.5 porcine reproductive and respiratory syndrome virus (PRRSV) strain two months before entering the farrowing facility.

[2] Sows were bred to three different commercial sire lines.

[3] For 23 sows with born alive < 6, native piglet measurements were removed. Sows removed include 8 from sire A, 4 from sire B, and 11 from sire C. Native piglet measurements include total born, born alive, born alive weight, born alive weight coefficient of variation, stillborn, and mummies. Sow measurements affected by native piglet measurements were removed, including sow farrow weight and body weight change from farrow to wean.

[4] Body weight post-farrow was modeled utilizing the equations developed by United Animal Health. Sow body weight post-farrow, lb = 12.91362 + (entry weight, lb × 0.99567) + (parity × 5.91388) – (stillborn × 2.67511) + (mummies × 2.65688) – (litter weight, lb × 1.54809) + (pre-farrow intake, lb × 0.53913).

Table 3. Effect of commercial sire line on litter performance during a natural PRRSV challenge[1]

	Sire line[2]				
Item	A	B	C	SEM	*P* =
Count, n[3]	57	62	58	---	---
Wean age, d	19.6[a]	19.2[b]	19.6[a]	0.20	0.018
Litter characteristics					
Total born, n	16.6	17.0	16.2	0.57	0.628
Born alive, %	80.15	82.46	82.78	1.757	0.331
Stillborn, %	10.25	8.88	8.02	1.214	0.276
Mummified, %	7.82	6.94	7.44	1.450	0.749
Litter size, n					
Native (d 0)	13.2	13.9	13.2	0.54	0.615
Post-standardization (d 1)	11.2	11.7	11.2	0.44	0.563
Start creep feed (d 12)	10.5	10.9	10.6	0.42	0.757
Wean	10.5	10.8	10.6	0.44	0.822
Litter weight, lb					
Native (d 0)	37.7	37.3	37.1	1.53	0.951
Post-standardization (d 1)	32.4	32.7	32.0	0.79	0.737
Start creep feed (d 12)	96.4	94.5	98.7	2.28	0.221
Wean	149.2	148.0	151.7	3.38	0.557
Pigs under 8 lb at wean per litter, %	1.49	1.68	0.60	0.561	0.138
Mean piglet BW, lb					
Native (d 0)	2.87	2.69	2.85	0.064	0.045
Post-standardization (d 1)	2.91	2.80	2.87	0.059	0.389
Start creep feed (d 12)	9.16[a]	8.64[b]	9.27[a]	0.157	0.001
Wean	14.26[a]	13.64[b]	14.29[a]	0.210	0.012
Litter weight CV, %					
Native (d 0)	20.57	20.97	19.12	0.954	0.280
Post-standardization (d 1)	17.27	17.26	17.45	0.703	0.973
Start creep feed (d 12)	16.97	17.25	16.18	0.708	0.511
Wean	15.90	16.30	14.97	0.676	0.354
Litter ADG, lb/d					
d 1 to d 12	5.35	5.39	5.61	0.150	0.214
d 12 to wean	7.55	7.66	7.57	0.215	0.842
d 1 to wean	6.00	6.04	6.13	0.164	0.724
Piglet ADG, lb/d					
d 1 to d 12	0.52[ab]	0.51[b]	0.54[a]	0.009	0.024
d 12 to wean	0.73	0.72	0.72	0.015	0.526
d 1 to wean	0.58	0.57	0.59	0.010	0.175
Preweaning mortality, %					
Birth to d 1	7.04	7.06	7.29	1.167	0.980
d 1 to wean	5.26	6.12	4.35	0.974	0.341
Birth to wean	13.10	13.54	12.09	1.472	0.707

[1] A total of 177 gilts and sows (Line 1050, PIC, Hendersonville, TN) and litters were used from mating until weaning. Litters were cross-fostered within sire line treatment to equalize litter size up to 24 h after farrowing. The sow farm experienced a natural infection with a 1-7-4 L1A.5 porcine reproductive and respiratory syndrome virus (PRRSV) strain two months before entering the farrowing facility.

[2] Sows were bred to three different commercial sire lines.

[3] For 23 sows with born alive < 6, native piglet measurements were removed. Sows removed include 8 from sire A, 4 from sire B, and 11 from sire C. Native piglet measurements include total born, born alive, born alive weight, born alive weight CV, stillborn, and mummies. Sow measurements affected by native piglet measurements were removed, including sow farrow weight and body weight change from farrow to wean.