

Characteristics of lifetime pre-weaning production traits in Landrace and Yorkshire sows under tropical conditions



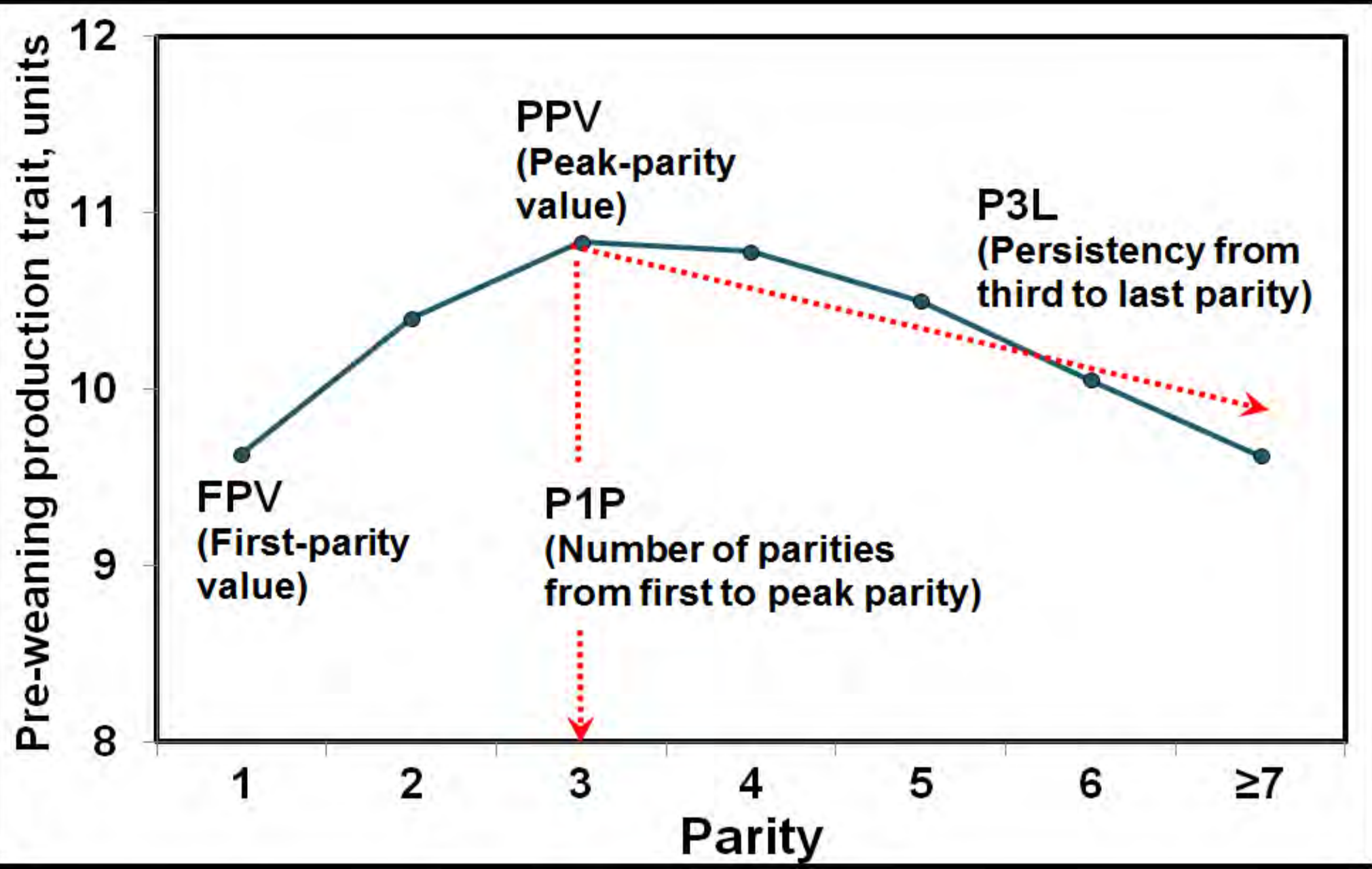
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SUMMARY

Sow lifetime pre-weaning production is economically important for commercial swine operations. Knowledge of the characteristics of pre-weaning production (PWP) traits from the first to the last parity of sows would help improve production efficiency. *Thus, the aim of this study was to investigate the characteristics of lifetime PWP traits in Landrace (L) and Yorkshire (Y) sows raised in an open-house system in Thailand.* The PWP traits were number of piglets born alive (NBA), number of piglets weaned (NPW), average weight of piglets at birth (ABW), and average weight of piglets at weaning (AWW). The dataset contained 8,765 records of NBA, NPW, ABW, and AWW from 1,377 sows (1,059 L and 318 Y) farrowed from 2001 to 2011 in a commercial swine population. The characteristics of each PWP trait were first-parity value (FPV), peak-parity value (PPV), number of parities from first parity to peak parity (P1P), and persistency from third to last parity (regression coefficient; P3L). The FPP, PPP, NFP, and P3L for NBA, NPW, ABW, and AWW were analyzed using a linear model that considered year-season at first farrowing, genetic group (L and Y), and age at first farrowing as fixed effects, and residual as a random effect. Year-season at first farrowing affected ($P < 0.05$) the four PWP characteristics for all traits, except for FPV for AWW, PPV for NPW, and P3L for NBA and AWW. *Sows that farrowed at older ages in the first parity had higher PWP values for all traits ($P < 0.05$), but had lower peak-parity production values for AWW ($P = 0.047$) and lower number of parities from first to peak production for NBA ($P = 0.009$) and NPW ($P = 0.01$) than sows that farrowed at younger ages in their first parity. Genetic group only influenced ($P < 0.01$) FPV and PPV for NBA and P3L for AWW. Landrace sows had higher numbers of piglets at birth in their first and peak parities, and higher persistency of production from third to last parity than Y sows.*



INTRODUCTION

Sow lifetime pre-weaning production is important to increase the profitability of commercial swine operations. Lifetime pre-weaning production (PWP) traits include number of piglets born alive (NBA), number of piglets weaned (NPW), average weight of piglets at birth (ABW), and average weight of piglets at weaning (AWW). Sow values for these four traits first tend to increase and then to decrease across parities as sows grow older (Hoving et al., 2011). Consequently, each one of these PWP can be characterized in terms of their first-parity value (FPV), peak-parity value (PPV), number of parities from first parity to peak parity (P1P), and persistency from third to last parity (regression coefficient; P3L). Sows that begin their productive life at a higher level are expected to reach a higher peak level, and to have a higher persistency of production. Thus, values of these four characteristics (FPV, PPV, P1P, and P3L) for each trait (NBA, NPW, ABW, and AWW) could be used for genetic evaluation and selection to increase production efficiency and profitability of swine operations. *Thus, the objective of this study was to investigate the characteristics of four lifetime pre-weaning production traits using four quantitative characteristics in Landrace (L) and Yorkshire (Y) sows raised in an open-house system in Thailand.*

MATERIALS AND METHODS

Data, Animals and Traits: The dataset contained a total 8,765 phenotypic records of lifetime pre-weaning production traits from 1,059 Landrace (L) and 318 Yorkshire (Y) sows from a commercial swine farm in the Northern part of Thailand. Records were from sows that farrowed from 2001 to 2011. The lifetime pre-weaning production (PWP) traits were lifetime number of piglets born alive (NBA), number of piglet weaned (NPW), average weight of piglets at birth (ABW), and average weight of piglets of weaning (AWW). The characteristics of PWP were first-parity value (FPV), peak-parity value (PPV), number of parities from first parity to peak parity (P1P), and persistency from third to last parity (regression coefficient; P3L). Only sows with production records from at least parities 1 to 4 and more were used in this research.



Climate, Nutrition and Management: Seasons were winter (November to February), summer (March to June) and rainy (July to October). All gilts and sows were kept in individual pen and raised in an opened-house system. The temperature was controlled with the help of mist fans and drippers, which were activated when the ambient temperature was over 33°C. Breeding sows were fed 2.5 kg of feed/d (16% of crude protein and 3,200 to 3,500 kcal/kg of energy; 2 feeding times). Lactating sows were fed 5 to 6 kg feed/d (18% crude protein, 4,060 kcal/kg energy; 4 feeding times). Phenotypic growth and reproduction records of individual animals were used to select replacement gilts. Estrus detection of gilts and sows was done twice a day (morning and evening) by boar exposure. Gilts and sows were inseminated twice, first at the onset of estrus and 12 hours after the first service. Pregnant gilts and sows were moved to individual farrowing pens approximately 7 days before farrowing time. All gilts and sows gave birth naturally and without any assistance.

Statistical Analysis: The model included year-season of first farrowing, genetic group (L and Y), and age at first farrowing as fixed effects and residual as a random effect. The least squares means for all traits were estimated and differences compared using Bonferroni t-tests.



RESULTS AND DISCUSSION

Mean phenotypic values were 9.63 (SD = 3.38) piglets for NBA, 8.07 (SD = 2.87) piglets for NPW, 1.58 (SD = 0.24) kg for ABW, and 6.43 (SD = 1.93) kg for AWW. Year-season at first farrowing affected ($P < 0.05$) the four PWP characteristics (FPV, PPV, P1P, and P3L) for all traits, except for FPV for AWW, PPV for NPW, and P3L for NBA and AWW. The range of least squares means (LSM) for FPV was 7.90 to 10.26 piglets for NBA, 6.79 to 9.39 piglets for NPW, 1.45 to 1.71 kg for ABW, and 5.66 to 7.39 kg for AWW. The LSM of PPV ranged from 12.02 to 14.57 piglets for NBA, 10.65 to 12.26 piglets for NPW, 1.82 to 2.05 kg for ABW, 8.39 to 9.99 kg for AWW. The range LSM of P1P was 2.48 to 4.00 parity for NBA, 2.30 to 3.56 parity for NPW, 2.84 to 5.64 parity for ABW, and 2.33 to 5.76 parity for AWW. Lastly, the LSM for P3L ranged from -1.16 to 0.63 piglets for NBA, -1.64 to 0.17 piglets for NPW, -0.08 to 0.07 for ABW, and -0.68 to 0.81 for AWW.

The regression coefficients of NBA, NPW, ABW, and AWW on age at first farrowing are presented in Table 1. Age at first farrowing of sows affected FPV for all traits ($P < 0.05$), PPV for AWW ($P = 0.047$), and P1P for NBA ($P = 0.009$) and NPW ($P = 0.01$). These regression coefficients indicated that sows that had their first parity at older ages had higher PWP values for all traits ($P < 0.05$), but had lower peak-parity production values for AWW ($P = 0.047$) and lower number of parities from first to peak parity for NBA ($P = 0.009$) and NPW ($P = 0.01$) than sows with first parities at younger ages. However, gilts that farrow at an early age would need to be intensively managed and fed with high quality feedstuff to guarantee that they will have appropriate body weight and puberty (Segura-Correa et al., 2011).

Table 1. Regression coefficients of lifetime pre-weaning production traits on age at first farrowing

Characteristic of PWP trait	Pre-weaning production trait	Regression Coefficients of age at first farrowing (days)	P value
FPV	NBA	0.0059 ± 0.0024	0.015
	NPW	0.0044 ± 0.0020	0.034
	ABW	0.0005 ± 0.0002	0.005
	AWW	0.0031 ± 0.0016	0.045
PPV	NBA	-0.0009 ± 0.0014	0.512
	NPW	-0.0003 ± 0.0008	0.743
	ABW	0.0002 ± 0.0002	0.263
P1P	NBA	-0.0031 ± 0.0012	0.009
	NPW	-0.0030 ± 0.0012	0.010
	ABW	0.0007 ± 0.0012	0.599
	AWW	0.0014 ± 0.0014	0.305
P3L	NBA	-0.0004 ± 0.0015	0.796
	NPW	0.0004 ± 0.0015	0.811
	ABW	0.0001 ± 0.0001	0.208
	AWW	-0.0010 ± 0.0009	0.267

Sow genetic group only influenced ($P < 0.01$) FPV and PPV for NBA and P3L for AWW. Landrace sows were better than Y sows for NBA (FPV and PPV) and AWW (P3L). The L sows had higher FPV (9.77 ± 0.13 vs. 8.81 ± 0.22 piglets), higher PPV (13.61 ± 0.07 vs. 13.21 ± 0.13 piglets), and higher P3L (0.08 ± 0.15 vs. -0.20 ± 0.08) for NBA than Y sows. The superiority of L over Y for NBA in study was similar to reports from Tantasuparuk et al. (2000) who studied reproductive performance of L and Y (8.9 ± 0.07 vs. 8.4 ± 0.09 piglets; $P < 0.001$) in three purebred pig herds in Thailand, and Tummarak et al. (2001) who utilized Swedish pig data. In this population, L sows were used to produce replacements and dams for crossbreeding between L and Y, whereas Y sows were used to produce replacements and sires for crossbreeding between L and Y. The superiority of L sows for lifetime NBA and AWW here supported the current mating system in this population. Considering breed differences obtained here, a subsequent analysis to determine additive genetic variances, covariances, heritabilities, and genetic correlations as well as predicted additive genetic values for the characteristics (FPV, PPV, P1P, and P3L) of the traits (NBA, NPW, ABW, and AWW) studied here is warranted. Utilization of these lifetime production traits for genetic evaluation, selection of sires and dams, and mating strategies in this and other swine operations would help increase the speed of their genetic progress and efficiency of production in Thailand.

FINAL REMARKS

- Year-season at first farrowing affected FPV, PPV, P1P, and P3L for all lifetime pre-weaning production traits, except for FPV for AWW, PPV for NPW, and P3L for NBA and AWW.
- Sows with older ages at first farrowing had higher first-parity values for all traits, lower peak-parity values for AWW, and lower number of parities from first to peak parity for NBA and NPW.
- Landrace sows had higher first-parity and peak-parity values for NBA and higher persistency values for AWW than Yorkshire sows.

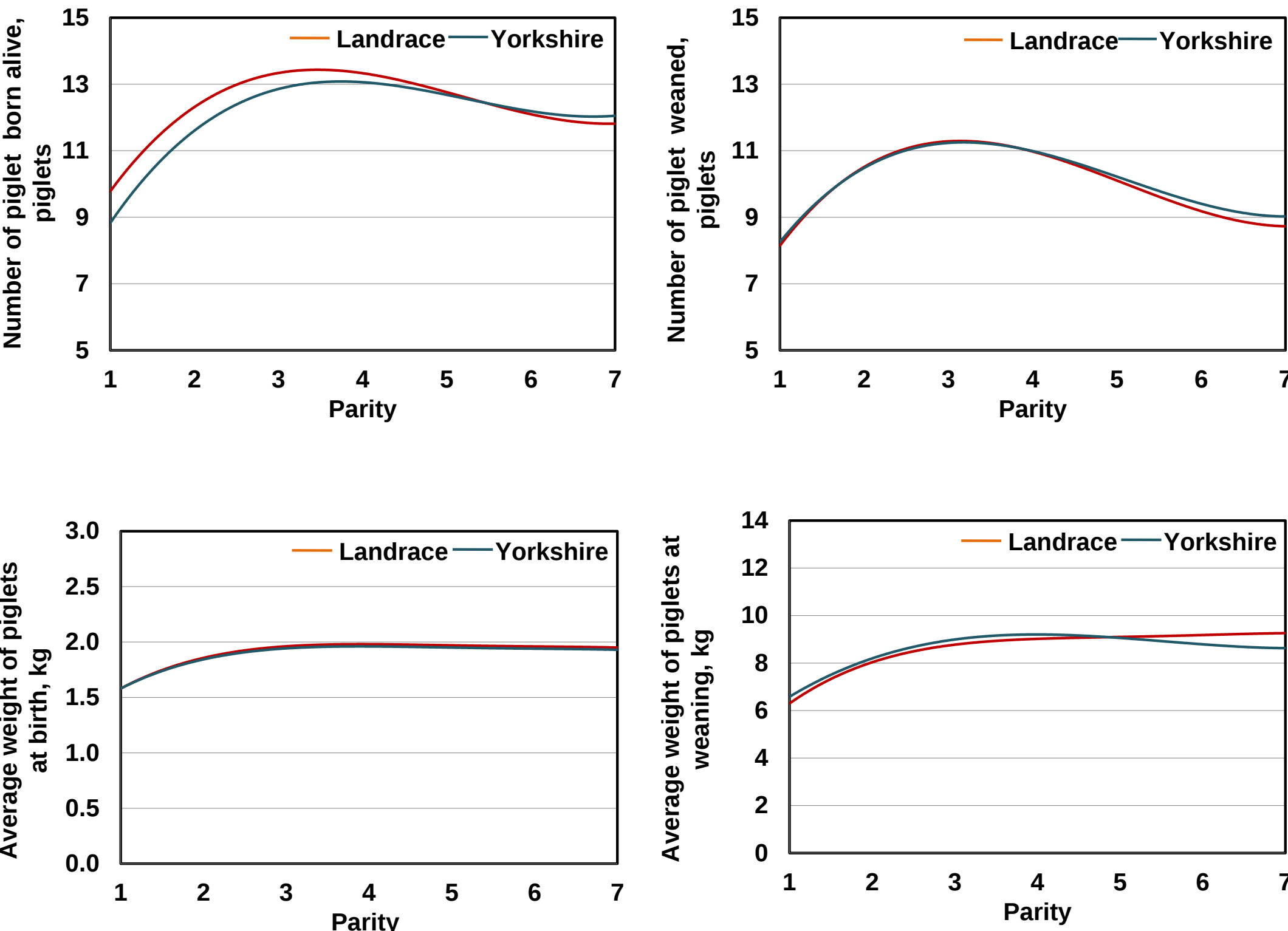


Table 2. Least squares means and standard errors for lifetime pre-weaning production traits by genetic group

Characteristic of PWP trait	Pre-weaning production trait	Landrace	Yorkshire
FPV	NBA	9.77 ± 0.13 ^a	8.81 ± 0.22 ^b
	NPW	8.12 ± 0.11	8.23 ± 0.18
	ABW	1.58 ± 0.01	1.58 ± 0.02
PPV	NBA	13.61 ± 0.07 ^a	13.21 ± 0.13 ^b
	NPW	11.45 ± 0.04	11.41 ± 0.07
	ABW	1.98 ± 0.01	1.96 ± 0.02
P1P	NBA	3.29 ± 0.06	3.26 ± 0.11
	NPW	3.11 ± 0.06	3.01 ± 0.10
	ABW	3.82 ± 0.06	3.98 ± 0.11
P3L	NBA	-0.46 ± 0.08	-0.30 ± 0.13
	NPW	-0.69 ± 0.08	-0.61 ± 0.13
	ABW	-0.01 ± 0.01	-0.01 ± 0.01
	AWW	0.08 ± 0.05 ^a	-0.20 ± 0.08 ^b

^{a, b} Least squares means within the same row with different superscripts differ ($P < 0.01$)

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