The Thai Journal of Veterinary Medicine

Volume 45
Issue 2 *June, 2015*

Article 8

6-1-2015

Genetic Correlations among Average Daily Gain, Backfat Thickness and Sow Longevity in Landrace and Yorkshire Sows

Nuttha Wongsakajornkit

Nalinee Imboonta

Original Article

Genetic Correlations among Average Daily Gain, Backfat Thickness and Sow Longevity in Landrace and Yorkshire Sows

Nuttha Wongsakajornkit Nalinee Imboonta*

Abstract

The present study aimed to estimate heritabilities as well as genetic correlations of sow longevity with average daily gain and backfat thickness. Removed sows included in the current study were 1,706 Landrace sows and 1,159 Yorkshire sows. They were raised in a Thai swine breeding herd and removed in the 2008-2013 period. Sow longevity was defined as the number of days from first farrowing date to removal date. Genetic parameters were estimated by using the Restricted Maximum Likelihood (REML) method with a multiple-trait animal model. On average, the sow longevity, average daily gain and backfat thickness were 633 days, 863 g/day and 11.8 mm, respectively, for the Landrace sows and were 579 days, 805 g/day and 10.7 mm, respectively, for the Yorkshire sows. Heritability estimates for sow longevity, average daily gain and backfat thickness were, respectively, 0.15, 0.31 and 0.57 for the Landrace sows; 0.11, 0.23 and 0.46 for the Yorkshire sows. The sow longevity was found to be unfavorably genetically correlated with the average daily gain and backfat thickness in both Landrace sows (-0.27 and 0.24) and Yorkshire sows (-0.36 and 0.30). Selection for average daily gain and backfat thickness may result in shorter sow longevity. The heritability estimates obtained also indicated that selection for sow longevity would be possible. In spite of the existence of unfavorable associations, it should be pointed out that the relationships are not extremely high, suggesting that selection for these traits simultaneously is likely achievable.

Keywords: average daily gain, backfat thickness, genetic correlation, heritability, sow longevity

Department of Animal Husbandry, Faculty of Veterinary Science, Chulalongkorn University, Pathumwan, Bangkok 10330, Thailand

**Correspondence: ornalinee@hotmail.com*

Introduction

Sow *l*ongevity has effects *on* the efficiency of piglet production. An increase in sow longevity will lead to lower culling rates and lower replacement rates (Koketsu, 2007). These can increase the proportion of sows that have reached their maximum productivity and also reduce the costs of replacement gilts (Hoge and Bates, 2011). Earlier studies reported that sow longevity trait could be measured from several parameters such as number of days from birth, first service or first farrowing to removal, parity number at removal, total number of piglets born alive over a sow's longevity as well as a sow's ability to remain in a herd (López-Serrano et al., 2000; Serenius and Stalder, 2004; Koketsu, 2007; Sobczyńska et al., 2013).

In general, swine selection programs are based on productive traits such as average daily gain and backfat thickness (Tarres et al., 2006) since they are economic important traits. Even though sow longevity is not a productive trait, it can indirectly influence production cost and should be considered in a selection program. Heritability estimates for average daily gain and backfat thickness are moderate and slightly high, ranging from 0.29 to 0.40 and 0.30 to 0.61, respectively (López-Serrano et al., 2000; Serenius and Stalder, 2004; Imboonta et al., 2007b), whereas the range of heritability estimates for sow longevity is low to moderate, i.e. 0.05 to 0.27 (Serenius and Stalder, 2004; Engblom et al., 2009; Sobczyńska et al., 2013). Even with relatively low heritability estimates, genetic variation obtained is sufficient to increase sow longevity by selection (Yazdi et al., 2000).

Genetic correlations between sow longevity and average daily gain in Landrace and Landrace cross Large White sows are negative (-0.06 to -0.32) and those between sow longevity and backfat thickness in Landrace cross Large White sows are positive (0.11 to 0.27) (López-Serrano et al., 2000). These associations indicate that selection for high average daily gain and thin backfat thickness may adversely affect sow longevity. That was in agreement with the finding of Hoge and Bates (2011), who stated that the selection for average daily gain and backfat thickness influenced the sow longevity. On the other hand, Serenius and Stalder (2004) found no significant correlations among average daily gain, backfat thickness and sow longevity. To our knowledge, no genetic parameters of Thai pig population concerning sow longevity have been published before. Thus, the present study aimed to estimate the heritability of sow longevity and genetic correlations among average daily gain, backfat thickness and sow longevity in Landrace and Yorkshire sows raised in Thailand.

Materials and Methods

Data: The animals included in this study were pure-bred Landrace and pure-bred Yorkshire sows from a swine breeding herd located in the east of Thailand. Only data of sows with at least one farrowing record and removed during the period from May 2005 to December 2013 were used in the analyses. The final data set consisted of 9,657 observations of 1,706 Landrace sows and 6,011 observations of 1,159 Yorkshire sows. The pedigree file included 4,738 animals in total, containing 175 sires and 934 dams of Landrace sows together with 149 sires and 615 dams of Yorkshire sows.

The studied traits were sow longevity, average daily gain and backfat thickness. The sow longevity (days) was defined as the number of days from first farrowing date to removal date. Replacement gilts were performance tested from 9 to 22 weeks of age and selected in the studied herd. The gilts were individually weighed at the beginning and the *end* of the performance test. The average daily gain (g/day) was calculated as the difference between the initial and the final body weight divided by the number of days of test period. At the end of the performance test, the gilts were ultrasonically measured for backfat thickness at the 10th rib and 6.5 cm off the midline. All records on sows younger than 300 or older than 600 days at first farrowing were excluded, as judged from the biological and life cycle of sows. Sows with extreme values for the average daily gain (<350 g and >1,300 g) or backfat thickness (<4.5 mm and >25 mm) were treated as missing values. After data editing, 79 records (1.13%) with extreme values for age at first farrowing were excluded. In addition, 7 records (0.02%) and 44 records (0.47%) from sows with extreme values for the average daily gain and backfat thickness, respectively, were treated as missing values.

Statistical analysis: Descriptive statistics were carried out separately for the Landrace and Yorkshire sows. Significance *o*f fixed effects and covariates were tested in univariate models, using generalized least squares. Fixed and covariate effects that were tested are presented in Table 1. Fixed and covariate effects with a significant influence (p<0.05) were included in the final models. Birth month and first farrowing month of the sows were classified into three seasons, i.e. hot (March-June), rainy (July-October) and cool (November-February).

In multiple trait analyses, the following animal model was fitted for all the traits and studied by using REMLF90 program (Misztal, 2001): $y = Xb + Zu + e$, where y is the vector of observations of the three traits considered simultaneously (sow longevity, average daily gain and backfat thickness), X and Z are the incidence matrices for fixed (b) and random animal (u) effects, and e is the vector of residual effects. The random animal effect was assumed to be normally distributed with zero mean and variance $A\sigma^2_a$, where A is the additive genetic relationship matrix between animals and σ^2_a is the additive genetic variance. The random residual effect was assumed to be normally distributed with zero mean and variance $I\sigma^2_e$, where I is the identity matrix and σ^2_e is the error variance.

The model used for sow longevity included a combination of first farrowing year and season as fixed effect as well as age at first mating and total number of piglets born alive over a sow's longevity as covariates together with additive genetic value of animal as random effect. For average daily gain and backfat thickness, the models included a combination of birth year and season as fixed effect and additive genetic value of animal as random effect. In addition, age at beginning of test and final body weight were included

in the model as covariates for average daily gain and backfat thickness, respectively. A significant influence (p<0.05) was retained in the final models. The fixed and covariates effects included in the statistical models for analyses of the studied traits are summarized in Table 1.

Variance components were used to calculate heritabilities of and genetic correlations among the studied traits. Standard errors of heritability estimates were calculated according to the formula given by Lo et al. (1992) and standard errors of genetic correlations were calculated using the method of Falconer and Mackey (1996).

Table 1 Fixed and covariates effects included in the statistical models for analyses of sow longevity, average daily gain and backfat thickness

Fixed effects	Traits[1]		
	Longevity	ADG	BF
Contemporary groups			
Year × Season of the birth	-	***	***
Year × Season of the first farrowing	***	-	-
Covariate			
Total number of piglets born alive[2]	***	-	-
Age at first mating	*	-	-
Initial performance test age	-	***	-
Initial performance test weight	-	ns	-
Final performance test age	-	-	ns
Final performance test weight	-	-	***

[1]Longevity (days) was estimated by the difference between the date of removal and the date of first farrowing. ADG = average daily gain, BF = backfat thickness

[2]total number of piglets born alive during sow's longevity

ns = not significant (p>0.05), * = significant on the level of p<0.05, *** = significant on the level of p<0.001, - = not considered in the model

Table 2 Number of records (No.), mean, standard deviation (SD), minimum (Min) and maximum (Max) of all traits in Landrace and Yorkshire sows

Traits[1]	Landrace				Yorkshire			
	No.	Mean[2]	SD	Min - Max	No.	Mean[2]	SD	Min - Max
Longevity, days	1,706	633[a]	341	0-1,339	1,159	579[b]	327	0-1,328
ADG, g/day	1,577	863[a]	96	539-1,220	1,094	805[b]	89	505-1,184
BF, mm	595	11.8[a]	3.4	0.5-2.4	505	10.7[b]	2.3	0.5-2.4

[1]Longevity (days) was estimated by the difference between the date of first farrowing and the date of removal. ADG = average daily gain, BF = backfat thickness

[2 a,b] means values within the same row with different superscript letters are significantly (p<0.05) different.

Results

Descriptive statistics: Descriptive statistics for sow longevity, average daily gain and backfat thickness are presented in Table 2. Considering all sows, the average of sows longevity, average daily gain and backfat thickness were 611 ± 337 days, 839 ± 97 g/day and 11.3 ± 3.2 mm, respectively. The Landrace sows lived 54 days longer, gained 58 g/day more weight and had 1.1 mm more backfat thickness compared to the Yorkshire sows (p<0.05). Standard deviations were large for the sow longevity trait.

Heritability: The estimates of heritability for sow longevity, average daily gain and backfat thickness in the Landrace and Yorkshire sows are presented in Table 3. In general, the heritability estimates of sow longevity were low, whereas the heritability estimates of average daily gain and backfat thickness were moderate and slightly high, respectively. However, somewhat higher heritability estimates of all traits were found in the Landrace sows compared to the estimates of the Yorkshire sows.

Genetic correlations: The estimates of genetic correlations of all studied traits are presented in Table 3. Among the studied traits, the genetic correlations were moderate and were quite similar in both breeds. The genetic correlations of sow longevity with average daily gain were moderately negative, while with backfat thickness were moderately positive. The results indicated that the genetic of sow longevity was unfavorably genetically associated with both average daily gain and backfat thickness. Considering the genetic correlation between average daily gain and backfat thickness, moderate negative correlations were found between the breeds. The genetic association between average daily gain and backfat thickness was favorable in only the Landrace sows and it tended to be favorable in the Yorkshire sows since its estimate was not significantly different from zero (-0.18 ± 0.12).

Phenotypic correlations: The estimates of phenotypic correlations of all studied traits are presented in Table 3. In general, the phenotypic correlations were very low and were quite similar between the breeds. In addition, there were no phenotypic associations among the studied traits on account of the phenotypic correlations being close to zero (-0.04 to 0.07) for all traits.

Table 3 Heritabilities (± SE; on the diagonal), genetic correlations (± SE; above the diagonal) and phenotypic correlations (± SE; below the diagonal) of sow longevity, average daily gain and backfat thickness in Landrace and Yorkshire sows

Traits[1]	Longevity	ADG	BF
Landrace			
Longevity	0.15 ± 0.03	-0.27 ± 0.12	0.24 ± 0.10
ADG	-0.02	0.31 ± 0.05	-0.21 ± 0.10
BF	0.07	-0.04	0.57 ± 0.07
Yorkshire			
Longevity	0.11 ± 0.03	-0.36 ± 0.15	0.30 ± 0.13
ADG	0.00	0.23 ± 0.05	-0.18 ± 0.12
BF	0.07	0.06	0.46 ± 0.07

[1]Longevity (days) was estimated by the difference between the date of first farrowing and the date of removal. ADG = average daily gain, BF = backfat thickness

Discussion

In this study, the averages of sow longevity were 633 and 579 days for the Landrace and Yorkshire sows, respectively. These results are in agreement with the averages of sow longevity reported by previous studies. Length of productive life or sow longevity for Swedish Landrace sows reported by Yazdi et al. (2000) is 617 days and that of Australian sows is 615 days (Meszaros et al., 2010). Surprisingly, the average of sow longevity in the finding of Yazdi et al. (2000) was lower than the finding in the current study, even though those sows were raised in a temperate climate country. The difference may partly depend on different data structures. The Swedish data were recruited from 24 herds with more than 50 sows that were born, raised and farrowed in the same herd, whereas our data were recruited from only one herd. There are also somewhat different management among the farms. Furthermore, the extreme values for age at first farrowing were set at lower values than our values (≤250 and ≥480 days vs. ≤300 and ≥600 days). As a result, the average of sow longevity in the study of Yazdi et al. (2000) is slightly lower than the values reported in the current study. For the Yorkshire sows, the average of sow longevity is consistent with the result (602 days) of Tarres et al. (2006) in Switzerland, while it is lower than other studies, e.g. 662 days in USA (Johnson and Nugent, 2008) and 652 days in Poland (Sobczyńska et al., 2013). The differences in the average of sow longevity seem to depend on sow longevity measurement and also sow removal strategies of each studied farm. For example, the study of Johnson and Nugent (2008) defined sow longevity as the age at birth of the last recorded litter of each sow and all sows had the opportunity to produce at least three litters, while Sobczyńska et al. (2013) defined sow longevity as the number of days between the first and last farrowing. Additionally, different housing and management systems in each studied farm have a major impact on sow removal (Sobczyńska et al., 2013).

The heritability estimate for sow longevity in the current study was lower in the Yorkshire sows compared to the Landrace sows. However, the current heritability estimates (0.11 and 0.15) showed sufficient genetic variation, indicating that it is possible to improve sow longevity in both breeds. The heritability estimates for sow longevity obtained in earlier studies ranged from 0.11 to 0.19 for Landrace sows and 0.10 to 0.11 for Yorkshire sows (López-Serrano et al., 2000; Johnson and Nugent, 2003; Sobczyńska et al., 2013) and our results agree well with these values. In general, heritabilities for functional traits such as sow longevity are low (Meszaros et al., 2010), while heritabilities for production (average daily gain and backfat thickness**)** traits are moderate to high (Imboonta et al., 2007a). For the average daily gain in this study, the heritability estimates of the two breeds were moderate. The results are in accord with the findings from earlier studies of either Landrace sows (0.29 to 0.40) or Yorkshire sows (0.25 to 0.41) (López-Serrano et al., 2000; Johnson et al., 2002; Serenius and Stalder, 2004; Imboonta et al., 2007a). In contrast, the heritability estimates for backfat thickness were slightly high in both breeds. The results are similar to those of early studies ranging from 0.41 to 0.61 in Landrace sows and from 0.30 to 0.47 in Yorkshire sows (López-Serrano et al., 2000; Johnson and Nugent, 2003; Serenius and Stalder, 2004; Imboonta et al., 2007b). Indeed, the heritability estimates depend on genetic makeup of breeds and populations studied (Serenius and Stalder, 2004).

The genetic correlation estimates of Landrace and Yorkshire sows found in this study had the same sign and similar magnitudes. The genetic correlations between sow longevity and average daily gain were unfavorable. The results suggest that the selection for high average daily gain may result in decreased sow longevity. The results are also supported by the study of López-Serrano et al. (2000), who found negative genetic correlations (-0.06 to -0.32) between sow longevity and daily gain at approximately 105 kg live weight. Moreover, the study of Sobczyńska et al. (2013)

reported that the sow longevity was weakly negatively correlated with growth rate (-0.11 in Polish Yorkshire sows). Similarly, the findings of Hoge and Bates (2011) showed that gilts with high growth rate at 113 kg of adjusted body weight had an increased risk of removal from herds. Based on previously published findings, gilts with a high average daily gain could lead to high fertility problems (Tholen et al., 1996), high leg conformation problems (Serenius and Stalder, 2004) and short sow longevity (Hoge and Bates , 2011).

Unfavorable genetic correlations were obtained between sow longevity and backfat thickness. The results suggest that the selection for low backfat thickness may result in decreased sow longevity. Similar results were obtained by López-Serrano et al. (2000), who found positive genetic correlations (0.11 to 0.27) between sow longevity and backfat thickness at approximately 105 kg live weight. Furthermore, Sobczyńska et al. (2013) reported that sow longevity was weakly positively (0.16) correlated with backfat thickness adjusted to 110 kg body weight of Polish Landrace sows. The findings of Hoge and Bates (2011) showed that gilts with thin backfat thickness at 113 kg of adjusted body weight had an increased risk of removal from herds. In contrast, there were no significant effects of average daily gain and backfat thickness on sow longevity in Swedish Landrace sows (Yazdi et al., 2000). The average daily gain in the study of Yazdi et al. (2000) was measured from birth until approximately 24 weeks of age and backfat thickness was measured at approximately 24 weeks of age, whereas the average daily gain in the current study was measured from 9 to 22 weeks of age and backfat thickness was measured at approximately 22 weeks of age. In older age, sows increase backfat deposition, resulting in decreased variation of sows' backfat thickness since there are enough time for all the sows to reach their mature physiology. This is confirmed by the standard deviation of backfat thickness, i.e. 11.5 ± 2.1 mm in Swedish sows vs. 11.8 ± 3.4 and 10.7 ± 2.3 in the Thai sows used in this study. These difference together with different genetic backgrounds between the two populations may influence the different genetic correlations somehow.

According to the current results, favorable genetic correlations between average daily gain and backfat thickness were found. However, only the Landrace sows showed a significant favorable genetic correlation, suggesting that the selection for increased average daily gain results in decreased backfat thickness in Landrace sows. These favorable associations are in agreement with earlier studies. Dube et al. (2013) reported that the genetic correlation between average daily gain during the test period from 27 kg to 86 kg of live weight and backfat thickness was -0.26. Additionally, Kim et al. (2004) reported that the days to 90 kg of Duroc, Landrace and Large White pigs were negatively correlated with the backfat thickness measured at 3 different sites. On the other hand, unfavorable genetic correlations were reported by Serenius and Stalder (2004). They reported positive genetic correlations between daily gain and backfat thickness at approximately 100 kg live weight in Finnish Landrace and Finnish Large White gilts (0.32 and 0.39, respectively).

The difference in the estimated genetic correlations seems to depend on the population studied and the effects were used to create the models (Yazdi et al., 2000; Serenius and Stalder, 2004). In addition, the difference in results depends on the difference in measurement such as the age, weight, and site of measurement. For the average daily gain measurement, Yazdi et al. (2000) measured the average daily gain from birth until approximately 170 days of age, while Serenius and Stalder (2004) measured the average daily gain from birth to approximately 100 kg of live weight. For backfat thickness measurement, Serenius and Stalder (2004) measured backfat thickness at approximately 100 kg of live weight at 3 different sites (left side, right side and back). In the study of Kim et al. (2004), backfat thickness was measured at approximately 90 kg of live weight and it was the average of three backfat thickness measurements (shoulder, mid-back and lion).

In conclusion, genetic parameter estimates for all studied traits of Thai pig population in this study were similar to those obtained in other pig populations which were raised under subtropical and temperate areas. Additionally, the results of this study confirm that sow longevity is lowly heritable traits; however, sufficient genetic variation exists for selection to increase sow longevity. In contrast, average daily gain and backfat thickness are moderately to highly heritable traits. The unfavourable genetic correlations of sow longevity with average daily gain and backfat thickness indicate that the selection for high average daily gain and low backfat thickness may result in decreased sow longevity.

Acknowledgements

This study was supported by the 90th Year Chulalongkorn Scholarship, Ratchadaphiseksomphot Endowment Fund. The authors would like to thank Assist. Prof. Chatree Khatiworavage, Department of Animal Husbandry, Faculty of Veterinary Science, Chulalongkorn University, Thailand for valuable assistance with the REML estimation.

References

Chen P, Baas TJ, Mabry JW, Dekkers JCM and Koehler KJ 2002. Genetic parameters and trends for lean growth rate and its components in U.S. Yorkshire, Duroc, Hampshire, and Landrace pigs. J Anim Sci. 80(8): 2062-2070.

Dube B, Mulugeta SD and Dzama K 2013. Genetic relationship between growth and carcass traits in Large White pigs. S Afr J Anim Sci. 43(4): 482-492.

Engblom L, Lundeheim N, Schneider Mdel P, Dalin AM and Andersson K 2009. Genetics of crossbred sow longevity. Animal. 3(6): 783-790.

Falconer DS and Mackey TFC 1996. Introduction of quantitative genetics. 4th ed. England: Longman Group Limited.

Hoge MD and Bates RO 2011. Developmental factors that influence sow longevity. J Anim Sci. 89(4): 1238-1245.

Imboonta N, Rydhmer L and Tumwasorn S 2007a. Genetic parameters and trends for production

and reproduction traits in Thai Landrace sows. Livest Sci. 111(1–2): 70-79.

Imboonta N, Rydhmer L and Tumwasorn S 2007b. Genetic parameters for reproduction and production traits of Landrace sows in Thailand. J Anim Sci. 85(1): 53-59.

Johnson ZB, Chewning JJ and Nugent RA, 3rd 2002. Estimates of heritability for body length and relationship to other performance traits for four breeds of swine. Ark Anim Sci Dept Report, AAES Res. Series 522: 116-119.

Johnson ZB and Nugent RA, 3rd 2003. Heritability of body length and measures of body density and their relationship to backfat thickness and loin muscle area in swine. J Anim Sci. 81(8): 1943-1949.

Johnson ZB and Nugent RA, 3rd 2008. Estimates of heritability for lifetime productivity traits and longevity in four breeds of swine. Ark Anim Sci Dept Report, AAES Res. Ser. 563: 119–121.

Kim JI, Sohn YG, Jung JH and Park YI 2004. Genetic parameter estimates for backfat thickness at three different sites and growth rate in swine. Asian-Aust J Anim Sci. 17(3): 305-308.

Koketsu Y 2007. Longevity and efficiency associated with age structures of female pigs and herd management in commercial breeding herds. J Anim Sci. 85(4): 1086-1091.

Lo LL, McLaren DG, McKeith FK, Fernando RL and Novakofski J 1992. Genetic analyses of growth, real-time ultrasound, carcass, and pork quality traits in Duroc and Landrace pigs: II. Heritabilities and correlations. J Anim Sci. 70(8): 2387-2396.

López-Serrano M, Reinsch N, Looft H and Kalm E 2000. Genetic correlations of growth, backfat thickness and exterior with stayability in Large white and Landrace sows. Livest Prod Sci. 64(2–3): 121-131.

Meszaros G, Palos J, Ducrocq V and Solkner J 2010. Heritability of longevity in Large White and Landrace sows using continuous time and grouped data models. Genet Sel Evol. 42: 1-13.

Misztal I 2001. "REMLF90 Manual." [Online]. Available: http://nce.ads.uga.edu/~ignacy/newprograms.html. Accessed January 28, 2014.

Serenius T and Stalder KJ 2004. Genetics of length of productive life and lifetime prolificacy in the Finnish Landrace and Large White pig populations. J Anim Sci. 82(11): 3111-3117.

Sobczyńska M, Blicharski T and Tyra M 2013. Relationships between longevity, lifetime productivity, carcass traits and conformation in Polish maternal pig breeds. J Anim Breed Genet. 130(5): 361-371.

Tarres J, Bidanel JP, Hofer A and Ducrocq V 2006. Analysis of longevity and exterior traits on Large White sows in Switzerland. J Anim Sci. 84(11): 2914-2924.

Tholen E, Bunter K, Hermesch S and Graser H 1996. The genetic foundation of fitness and reproduction traits in Australian pig populations. 2. Relationships between weaning to conception interval, farrowing interval, stayability, and other common reproduction and production traits. Australian Journal of Agricultural Research. 47(8): 1275-1290.

Yazdi MH, Rydhmer L, Ringmar-Cederberg E, Lundeheim N and Johansson K 2000. Genetic study of longevity in Swedish Landrace sows. Livest Prod Sci. 63(3): 255-264.

บทคัดย่อ

สหสัมพันธ์ทางพันธุกรรมระหว่างอัตราการเจริญเติบโต ความหนาไขมันสันหลัง และอายุการใช้งานของแม่สุกรในแม่สุกรพันธุ์แลนด์เรซและพันธุ์ยอร์คเชียร์

ณัฏฐา วงศาขจรกิจ นลินี อิ่มบุญตา*

การศึกษาครั้งนี้มีวัตถุประสงค์เพื่อประเมินค่าอัตราพันธุกรรมและค่าสหสัมพันธ์ทางพันธุกรรมระหว่างอายุการใช้งานแม่สุกรกับอัตราการเจริญเติบโตและความหนาไขมันสันหลังของแม่สุกร ข้อมูลแม่สุกรคัดทิ้งที่ใช้ในการศึกษาครั้งนี้เป็นข้อมูลของแม่สุกรพันธุ์แลนด์เรซ 1,706 ตัวและแม่สุกรพันธุ์ยอร์คเชียร์ 1,159 ตัวที่เลี้ยงโดยฟาร์มสุกรพ่อแม่พันธุ์แห่งหนึ่งของประเทศไทยและถูกคัดทิ้งในช่วงระหว่างปีพ.ศ. 2551-2556 อายุการใช้งานแม่สุกรวัดได้จากจำนวนวันที่นับตั้งแต่วันที่แม่สุกรคลอดลูกครั้งแรกจนถึงวันที่แม่สุกรถูกคัดทิ้งจากฟาร์ม ทำการประเมินค่าพารามิเตอร์ทางพันธุกรรมโดยใช้แบบหุ่นของตัวสัตว์และการวิเคราะห์หลายลักษณะพร้อมกันด้วยวิธี Restricted Maximum Likelihood (REML) การศึกษาพบว่า อายุการใช้งาน อัตราการเจริญเติบโต และความหนาไขมันสันหลัง สำหรับแม่สุกรพันธุ์แลนด์เรซ มีค่าเท่ากับ 633 วัน 863 กรัม/วัน และ 11.8 มิลลิเมตร ตามลำดับ สำหรับแม่สุกรพันธุ์ยอร์คเชียร์ มีค่าเท่ากับ 579 วัน 805 กรัม/วัน และ 10.7 มิลลิเมตร ตามลำดับ ค่าอัตราพันธุกรรมของอายุการใช้งานแม่สุกร อัตราการเจริญเติบโต และความหนาไขมันสันหลังมีค่าเท่ากับ 0.15, 0.31 และ 0.57 ในแม่สุกรพันธุ์แลนด์เรซ และ 0.11, 0.23 และ 0.46 ในแม่สุกรพันธุ์ยอร์คเชียร์ ตามลำดับ สหสัมพันธ์ทางพันธุกรรมระหว่างอายุการใช้งานแม่สุกรกับอัตราการเจริญเติบโตและความหนาไขมันสันหลัง พบว่ามีความสัมพันธ์แบบไม่พึงประสงค์ทั้งในแม่สุกรพันธุ์แลนด์เรซ (-0.27 และ 0.24) และแม่สุกรพันธุ์ยอร์คเชียร์ (-0.36 และ 0.30) แสดงว่าการคัดเลือกลักษณะอัตราการเจริญเติบโตและความหนาไขมันสันหลังอาจจะส่งผลให้อายุการใช้งานแม่สุกรสั้นลง ค่าอัตราพันธุกรรมของอายุการใช้งานแม่สุกรที่ได้จากการศึกษานี้ชี้ให้เห็นว่าการคัดเลือกเพื่อปรับปรุงอายุการใช้งานแม่สุกรให้นานขึ้นสามารถเป็นไปได้ ถึงแม้จะพบว่ามีความสัมพันธ์แบบไม่พึงประสงค์ระหว่างลักษณะทั้งสามก็ตามแต่ขนาดความสัมพันธ์ไม่สูงมากนัก บ่งชี้ว่าการคัดเลือกเพื่อปรับปรุงลักษณะทั้งสามไปพร้อมๆกันยังมีความเป็นไปได้

คำสำคัญ: อัตราการเจริญเติบโต ความหนาไขมันสันหลัง สหสัมพันธ์ทางพันธุกรรม อัตราพันธุกรรม อายุการใช้งานของแม่สุกร

ภาควิชาสัตวบาล คณะสัตวแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย ปทุมวัน กรุงเทพฯ 10330

***ผู้รับผิดชอบบทความ** E-mail: ornalinee@hotmail.com*