



Genetic Parameters of Growth and sow Productivity Traits of Large white Yorkshire with Desi and Tamworth with Desi Crossbred Pigs

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Received: 12 October 2013; Accepted: 19 November 2013

ABSTRACT

The present study was conducted to estimate genetic parameters like heritability, genetic and phenotypic correlations among different growth and reproductive traits of LWY x Desi and TMW x Desi maintained at AICRP on Pigs, Livestock Farm, Adhartal, Jabalpur (M.P.). The h^2 estimates for birth weight for LWY and TMW crossbreds has been recorded as 0.011 ± 0.075 and 0.012 ± 0.079 respectively and for weaning weight it has been recorded as 0.271 ± 0.117 and 0.282 ± 0.116 respectively for LWY and TMW crossbreds. The h^2 estimates of body weight at different ages had low to moderate and some where higher at different age. The genetic correlation values at birth were ranged from 0.19 to 0.73 and 0.16 to 0.71 for LWY and TMW crossbreds respectively. The h^2 estimates for maternal traits of LWY and TMW crossbred pigs are within the specified range. Most of the genetic and phenotypic correlations are at higher side with positive direction. Environmental correlations also followed the same trend where most of the values are higher for Large White Yorkshire and Tamworth crossbred Pigs.

Keywords: Crossbreds, environmental correlations, genetic correlation, heritability

In India, the pigs are mostly non-descript type and their production potential including growth rate, feed conversion efficiency, litter size and dressing percentage is quite low as compared to many of the exotic breeds of the world. The breeding and rearing of pigs in India is mainly in the hands of very few people of the weaker section whose economic condition is very poor. Thus, there is a great need to improve the local stock so as to meet the growing animal protein demand of the country. The demands of exotic and crossbred piglets is on an increase as they mature early, grow rapidly and are highly prolific and economic to rear. So, in order to improve the economic traits of indigenous swine herds, cross breeding and upgrading programme with the use of Large White Yorkshire (LWY) and Tamworth (TMW)

have been undertaken under the All India Coordinated Research Project on Pigs (AICRP). The crosses of LWY with Desi and Tamworth with Desi maintained at AICRP on Pigs, Livestock Farm, Adhartal, Jabalpur (M.P.). The knowledge of genetic parameters is required to design genetic improvement programs.

MATERIALS AND METHODS

The present study was conducted on data of Large White Yorkshire (1635) and Tamworth (815) crossbreds maintained at AICRP on Pigs, Livestock Farm, Adhartal, Jabalpur (M.P.), covered over a period of fifteen years (1994-2010) from birth to 8 month of age. The analysis of data for all the traits under study was done by the standard statistical methods (Snedecor and Cochran, 1994). The various genetic parameters like heritability and genetic correlation were estimated by using half sib analysis as described by Backer (1975). The standard error of heritability estimates were calculated by the method as described by Swiger *et al.*, (1964). The standard errors of genetic correlations were determined by the method as described by Robertson (1959). Analysis of variance and covariance on adjusted data was done to estimate the heritability (h^2) and correlation among various traits by using half sib correlation method.

RESULTS AND DISCUSSION

Heritability estimates Growth traits

Heritability estimates for body weights at various age has been presented in Table 1 for Large White Yorkshire (LWY) and Tamworth (TMW) grades from birth to slaughter age. The h^2 estimates body weights were almost near to the standard values. The h^2 estimates after the weaning weights were though on higher side along with a high standard error but such results are expected because the h^2 is highest for structural traits. The high estimates of heritability indicate possibility of improvement in traits through selection. These findings are in close agreement with the reports of Gupta *et al.* (1982), Bardoloi and Sharma (1997), Sudhakar and Gour (2003) and Sharma (2009).

Sow productivity Traits

The h^2 estimates along with standard error for sow productivity traits of LWY and TMW grades are presented in Table 1. The h^2 estimates for maternal traits are within the specified range. The h^2 estimates were low as expected as these are the reproductive traits for both LWY and TMW grades.

Litter size at birth (LSB)

It is the first and most important factor of sow productivity traits as it influences the survival of the newly born piglet and their growth. The h^2 for litter size at birth was estimated to be 0.192 ± 3.896 for LWY grades 0.183 ± 2.215 for TMW grades respectively. These findings are in close agreement with Sukhdeo *et al.* (1979), Gupta *et al.* (1982) and Sharma (2009).

Table 1: Heritability estimates along with standard errors for growth and sow productivity traits in LWY with desi and TMW with desi crossbred pigs

Traits	Heritability \pm S.E.	
	LWY grades	TMW grades
Birth weight	0.011 \pm 0.075	0.012 \pm 0.079
Body weight at 1 month	0.486 \pm 0.129	0.496 \pm 0.122
Body weight at 2 month	0.271 \pm 0.117	0.282 \pm 0.116
Body weight at 3 month	0.324 \pm 0.125	0.319 \pm 0.121
Body weight at 4 month	0.582 \pm 0.142	0.591 \pm 0.139
Body weight at 5 month	0.675 \pm 0.138	0.687 \pm 0.143
Body weight at 6 month	0.718 \pm 0.139	0.691 \pm 0.152
Body weight at 7 month	0.641 \pm 0.143	0.637 \pm 0.141
Body weight at 8 month	0.569 \pm 0.129	0.581 \pm 0.137
Litter size at Birth (LSW)	0.192 \pm 3.896	0.183 \pm 2.215
Litter Size at Weaning (LSW)	0.103 \pm 4.105	0.101 \pm 4.132
Litter Weight at Birth (LWB)	0.581 \pm 4.134	0.578 \pm 5.524
Litter Weight at Weaning (LWW)	0.372 \pm 4.235	0.362 \pm 4.284

Table 2: Genetic, phenotypic & environmental correlation for sow productivity traits for Large White Yorkshire crossbred pigs.

$r_p(r_E)r_G$	LSB	LSW	LWB	LWW
LSB	1	0.848(0.859)	0.941(.999)	0.821(0.884)
LSW	0.821	1	0.811(0.958)	0.938(0.989)
LWB	0.913	0.846	1	0.847(0.862)
LWW	0.648	0.849	0.862	1

r_G : Genetic correlation (below diagonal value), r_p : phenotypic correlation (above diagonal value), r_E : Environmental correlation (above diagonal value in parentheses)

Table 3: Genetic, phenotypic & environmental correlation for sow productivity traits for Tamworth crossbred pigs.

$r_p(r_E)r_G$	LSB	LSW	LWB	LWW
LSB	1	0.776(0.823)	0.821(0.896)	0.745(0.827)
LSW	0.768	1	0.761(0.838)	0.817(0.985)
LWB	0.876	0.625	1	0.764(0.786)
LWW	0.595	0.628	0.798	1

r_G : Genetic correlation (below diagonal value), r_p : phenotypic correlation (above diagonal value), r_E : Environmental correlation (above diagonal value in parentheses)

Litter size at weaning (LSW)

The h^2 for litter size at weaning was estimated to be 0.103- \pm 4.105 for LWY crossbreds and 0.101 \pm 4.132 TMW crossbreds respectively. The low heritability estimates may also be due to small sample size and also there is possibility of

sampling error that could not be avoided. The present findings are in close agreement with the previous works of Gupta *et al.* (1982) and Sharma (2009).

Litter weight at birth (LWB)

It is also a non avoidable parameter in swine husbandry which is usually dependent on litter size at birth. So, higher would be the litter size at birth, more will be the Litter weight at birth. The h^2 for litter weight at birth of LWY and TMW crossbreds estimated to be 0.581 ± 4.134 and 0.578 ± 5.524 respectively. Heritability having a higher value which could be due to small sample size and the sampling error. These findings are in conformity with the findings of Gupta *et al.* (1982), Jogi *et al.* (1992) and Sharma (2009).

Litter Weight at Weaning (LWW)

The h^2 estimates for maternal traits are within the specified range. The h^2 estimates of litter weight at weaning were due to the results of mothering ability of sow i.e. how the sows nourishes the piglets and the availability of milk for the piglets. These reports are in accordance with the findings of Gupta *et al.* (1982), Jogi *et al.* (1992) and Sharma (2009).

The Heritability estimates of growth traits in Large White Yorkshire and Tamworth crossbred Pigs had higher range, which indicates that individual selection can be practiced for selection of animals for future breeding. The low heritability estimates for reproductive traits indicates that these traits can be improved by improving managemental conditions.

Genetic, Phenotypic and Environmental Correlation

For Body Weight (from Birth to 8th months of age)

The genetic and phenotypic correlations are at higher side with positive direction. Growth was linear; therefore such types of correlations are expected. Environmental correlations also followed the same trend where some values are higher with positive direction. Environmental correlations also followed the same trend where some values are higher but with a negative direction. The genetic correlation values at birth, at weaning were ranged from 0.19 to 0.73, 0.37 to 0.69 and 0.16 to 0.71, 0.40 to 0.71 for LWY and TMW crossbreds respectively. The present findings are in agreement by the work of Sharma (2009).

For sow productivity traits

The Genetic, Phenotypic & Environmental Correlation for sow productivity traits are presented in Table 2 and 3 of LWY and TMW grades respectively. Most of the genetic and phenotypic correlations are at higher side with positive direction. Environmental correlations also followed the same trend where most of the values are higher for Large White Yorkshire and Tamworth crossbred Pigs. The similar findings have been reported by Sharma (2009).

Most of the genetic and phenotypic correlations are at higher side with positive direction. Environmental correlations also followed the same trend where most of the values are higher for Large White Yorkshire and Tamworth crossbred Pigs.

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