



Genetic and phenotypic trend for growth performance in Landlly pigs

B C NAHA¹, G K GAUR², B L SAINI³, N R SAHOO⁴ and P BORO⁵

ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh 243 122 India

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Growth is an important trait determining the profitability of swine industry and body weight is one of the good indicators of growth rate. Growth traits are moderately heritable and can be developed through suitable breeding strategies. Implementation of a successful genetic improvement program requires knowledge of accurate genetic parameters (Wilson *et al.* 2010). Estimation of breeding values of males using best linear unbiased prediction (BLUP) procedure is considered to be more advantageous than other procedures (Bae *et al.* 1994). Determining genetic progress achieved by selection program is necessary to evaluate genetic changes, to assess the benefits of selection and to examine feasibility of introducing further adjustments (Euclides Filho *et al.* 1997). The aim of this study was to evaluate the genetic parameters and trend for growth performance in Landlly pigs.

Landlly is a variety of pigs that has been developed at Swine Production Farm, Livestock Production and Management Section, ICAR-Indian Veterinary Research Institute, Izatnagar, UP, India through crossing of Landrace (exotic) with Ghurrah (local) breed under All India Coordinated Research Project on Pig. The inheritance level of Landrace and Ghurrah breed has been maintained at 75% and 25% in Landlly. This centre is situated at an altitude of 564 feet above the mean sea level at 28°N latitude and 79°E longitude. The climate of this place touches both the extremes and relative humidity ranges between 15% and 85%. The piglets were housed in Pakka system. Sufficient space was provided to each individual according to age. Piglets were injected 1 ml iron dextran on 4th and 14th day of birth. Creep ration rich in protein (Protein 21%, Lysine 0.89% and ME 3.36 Mcal/kg) was started from 3rd week onward and was continued up to weaning age (6 weeks of age). Weaned piglets were given ad-lib concentrate,

thereafter. The ration consisted of 20% protein, 0.78% lysine and 3.17 Mcal/kg ME. Female piglets were housed in a group of 5–7 up to the age of 32 weeks. Piglets were vaccinated for foot and mouth disease and swine fever, both.

A total of 2,118 Landlly piglets, born in 5 generations from 2013 to 2017 were recorded for body weight at birth (W0) and at 1 week interval up to 8 week (W1, W2, W3, W4, W5, W6, W7, W8). Each year of birth / farrowing was divided into 3 seasons based on agro-climatic conditions (November to February, season 1; March to June, Season 2; July to October, Season 3). Sires were categorized into 5 groups based on generation number in which their first litter was born. Heritability estimates for body weights were determined using Least Squares and Maximum Likelihood Computer Program (Harvey, 1990) with the following model:

$$Y_{ijklmnop} = \mu + SG_i + S_{ij} + SX_k + G_l + SE_m + Y_n + P_o + b_{ijklmnop} + e_{ijklmnop}$$

where, $Y_{ijklmnop}$, Observation on pth progeny of jth sire belonging to ith sire group; μ , Overall mean; SG_i , Fixed effect of ith sire group (1 to 5); S_{ij} , Random effect of jth sire within ith sire group (1 to 5); SX_k , Fixed effect of kth sex (male & female); G_l , Fixed effect of lth generation (1 to 5); SE_m , Fixed effect of mth season of birth; Y_n , Fixed effect of nth year of birth (1 to 5); P_o , Fixed effect of oth parity of dam (1 to 3); b , Linear regression of observation on age of dam at first farrowing; $e_{ijklmnop}$, Random residual error~NID (0, σ^2_e).

BLUP estimates of the sires were computed using PROC MIXED MODULE of SAS 9.3 using above model. Breeding value of each sire was estimated as twice of sire and sire group solution. Genetic trend for body weights was estimated according to the procedure given by Torres Filho *et al.* (2005) in terms of regression of breeding value of sires on time. Phenotypic trends were estimated as regressions of phenotypic value on time.

Averages, standard errors and standard deviations of different weights in Landlly pigs are shown in Table 1. The results showed that there was a continuous increase in body weight over the age from birth (0.96 kg) to 8 week (12.17 kg). The average value of the weights in this investigation was similar to other crossbreds of Landrace, Large White

Present address: ²Principal Scientist and Head (gyanendrakg@gmail.com), Livestock Production and Management Section; ¹Ph.D. Scholar (binoychanranaha@gmail.com), Division of Animal Genetics; ³Ph.D. Scholar (vetbhsaini30@gmail.com), Division of Animal Genetics; ⁴Senior Scientist (vet.nihar@gmail.com), Division of Animal Genetics; ⁵Ph.D. Scholar (boroprasanta99@gmail.com), LPM Section, ICAR-IVRI, Izatnagar.

Yorkshire and Hampshire breeds (Ajayi and Akinokun, 2013; Devendran *et al.* 2014; Mondal and Kumar, 2015).

Heritability estimates of different body weights are also given in Table 1. The heritability of body weight was low (0.112 to 0.129) at birth and 8 weeks, medium (0.156 to 0.290) at 3 and 32 week and high (0.313 to 0.851) at other ages. High heritability estimate for body weight at post weaning stage and low at pre weaning stage could be due to existence of substantial amount of variance provided by dam during pre weaning stage and variation in number of observations during post weaning stage. The medium and high heritability estimate of body weight at most of the ages indicated the possibility of effective individual selection program for the overall genetic improvement in herd.

Genotypic and phenotypic trend in different weights are shown in Table 2. Genetic trend in present investigation was 0.001 kg for birth weight, 0.016 kg for weight at 2 week, 0.041 kg for weight at 4 week, 0.026 kg for weight at 6 week and 0.012 kg for weight at 8 week. The body weight at 4 week received the highest genetic improvement of 41 g/year (0.66% of mean). The results revealed that selection for body weight has been effective at this herd for attaining genetic improvement. The magnitude of selection is however very low resulting to non-significant genetic trend. Bejar *et al.* (1993) reported the genetic trends for weaning weight as small and consistent with positive selection differentials and low selection intensity. The genetic trend was also estimated by Gaur *et al.* (1997) and

Chimonyo *et al.* (2006) in Landrace and Mukota pigs. Their estimates were however higher as compared to present investigation. Gaur *et al.* (1997) noticed genetic change of 1.492 kg in body weight at 16 week and Chimonyo *et al.* (2006) showed genetic gain of 0.11 kg in body weight at birth.

Positive and significant phenotypic trend was observed for body weight at birth (0.26 kg), 2 (0.90 kg), 4 (1.71 kg), 6 (2.52 kg) and 8 (3.36 kg) week. The highest rate of phenotypic trend (27.60% annual) was noticed for body weight at 8 week. The results revealed that growth performance of Landlily pigs is improving in desired direction at this herd. The phenotypic trend in this investigation was however better than that reported by Gaur *et al.* (1997) in Landrace crossbreds wherein they observed phenotypic change from 0.021 to 0.301 kg in body weight at 1 to 8 week.

SUMMARY

This investigation aimed to evaluate the genetic parameters and trend for growth performance in Landlily pigs. Records of 2,118 piglets, born in 5 generations from 2013 to 2017 were analyzed for body weight at birth and subsequently at 1 week interval up to 8 week. There was a steady increase in body weight over the age from birth (0.96 kg) to 8 week (12.17 kg). The heritability estimate was low (0.112 to 0.129) for body weight at birth and 8 weeks, medium (0.156 to 0.290) for weight at 3 and 32 week and high (0.313 to 0.851) for other weights. Genetic trend was low and ranged from 0.001 (birth weight) to 0.041 kg (weight at 4 week). Phenotypic trend was positive, significant and higher than genetic trend (0.26 kg at birth to 3.36 kg at 8 week). The results showed that growth performance of Landlily pigs at this herd is improving in desired direction.

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Table 1. Average, standard deviation and heritability estimate of body weights in Landlily pigs

Trait	Number of observation	Average (kg)	Standard deviation (kg)	Heritability estimate
W0	2118	0.96 ± 0.01	0.19	0.112±0.001
W1	1932	2.11± 0.01	0.56	0.313±0.005
W2	1792	3.39 ±0.02	0.93	0.315±0.005
W3	1590	4.85 ±0.04	1.24	0.290±0.005
W4	1476	6.20 ±0.04	1.48	0.518±0.011
W5	1439	7.60 ±0.05	1.74	0.593±0.013
W6	1329	9.04 ±0.06	1.75	0.567±0.013
W7	1232	10.38 ±0.07	1.78	0.461±0.011
W8	1150	12.17 ±0.16	5.49	0.129±0.003

Table 2. Genotypic and phenotypic trend in body weights in Landlily pigs

Trait	Phenotypic trend		Genotypic trend	
	Regression coefficient	Standard error	Regression coefficient	Standard error
W0	0.25912**	0.00257	0.00136	0.00146
W2	0.90236**	0.00964	0.01559	0.01094
W4	1.70659**	0.01917	0.04112	0.02518
W6	2.52165**	0.02871	0.02650	0.03746
W8	3.36017**	0.05432	0.01151	0.02539

**Significant P < 0.01.

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