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CONSTRUCTION OF GROWTH BAND FOR EARLY SELECTION OF INDIGENOUS PIGS IN INDIA

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ABSTRACT

The present study conducted at the Institute Farm of National Research Centre on Pig, Guwahati (Assam) was aimed to assess the pre-weaning growth pattern and construct growth band in 'Ghungroo' and 'Niang Megha' pigs maintained under standard breeding, feeding and management conditions. Piglets of both breeds were maintained under similar management conditions with creep feed costing Rs. 15.76 kg^{-1} amounting to Rs. 46.35 upto weaning age (56 days). The overall mean weight at birth and weaning was 0.96±0.02 and 7.07±0.26 kg, respectively, for 'Ghungroo' pig and 0.64±0.02 and 5.47±0.13 kg, respectively, for 'Niang Megha' pig. The growth curves were linear for all the cases with accuracy of prediction ranging between 97.6 and 99.5%. Breeds of animal showed highly significant difference in body weight for all the weeks. The growth band developed can be used for early selection of animals.

Key words: Body weight, Ghungroo, growth rate, Niang Megha, pigs

INTRODUCTION

Pig is most prolific and fast growing animal mainly reared for meat purpose. The demand for high quality pork and pork-products has recently increased worldwide due to increasing world population and greater consumer expectation. Most of the tribal communities in India particularly in North-Eastern region rear pigs and majority of these are non-descript types although a few well defined indigenous breeds are also available. Of the available local germplasm, 'Ghungroo', an indigenous breed of West Bengal (Accession No. INDIA_PIG_2100_GHOONGROO_09001), and 'Niang Megha' (Accession No. INDIA_PIG_1300_NIANGMEGHA_09002) are important pig genetic resource reared in eastern and north-eastern India. Pre-weaning growth characteristics are the best indicator for early selection of pigs. Heavier pigs at birth and weaning have a competitive advantage and remain heavier throughout their stay in group (Beaulieu *et al.,* 2010). Selections based on growth band at early age can be used as a selection criterion (Jiayang *et al.,* 1999). Though a few studies on growth band development have been conducted in dairy cattle breeds (Singh, 1978; Manoj *et al.*, 2012) and exotic pigs (Gu *et al*., 1992; Kralik *et al*., 1993; Jelen *et al*., 1998; Kušec *et al*., 2008), but no lierature is available for pig breeds in India. The present investigation was aimed to develop pre-weaning growth band in these two pig breeds for later use as a tool for selection.

MATERIALS AND METHODS

The present investigation was carried out on 56 'Ghungroo' and 51 'Niang Megha' pigs of both sexes maintained at the Institute Farm of National Research Centre on Pig (ICAR), Rani, Guwahati, Assam. Piglets of both breeds were maintained under similar management conditions. Piglets were housed with their dam in indoor pens (3.65 m x 3.05 m) with concrete flooring having 6-10 piglets pen^{-1}. Water was available *ad lib* at all times manually with the help of labour. Creep ration (maize - 56.5

parts, wheat bran - 10.0 parts, soybean meal - 12.0 parts, ground nut cake - 19.0 parts, mineral mixture - 2.0 parts and salt - 0.5 parts of 20% CP and 2779 kcal kg^{-1}) were offered to them from 15^{th} day at 20 g $piglet^{-1}$ till weaning. The amount of creep ration was increased @ 20 g $piglet^{-1}$ $week^{-1}$. Thus a piglet was offered 120 g creep ration at the time of weaning at 8 weeks. A piglet consumed 2.94 kg feed till weaning. The existing feed composition costed around Rs. 15.76 kg^{-1}, thus a total of Rs. 46.35 was spent for the development of one piglet up to age at weaning. Body weight of piglets was recorded at weekly interval from birth to weaning. Weekly body weights of male and female piglets from birth to weaning were used to construct selection criteria by preparing growth band and growth curves. The growth curve indicates the graphical representation of average body weight at different stage of life up to weaning. The linear growth function was considered for construction of growth curves as:

$Y = a + b X$; where, '*Y*' was the body weight (kg), '*X*' age (in wk), '*a*' intercept value, and 'b' the estimated regression coefficient.

The linear growth function was considered for construction of growth curves. Growth bands were prepared by plotting weekly mean body weights ± double the standard deviation against age as almost 95% of the population comes under this area. The linear regression equations for mean value of different weeks were developed against each sex and overall data for both breeds to develop the prediction equation (Schinckel *et al.*, 1993). The effect of breed and sex of animals on weight were calculated by using least squares analysis (Harvey, 1990). The modified Duncan's multiple range test (Kramer, 1957) was used for comparison of least squares of means.

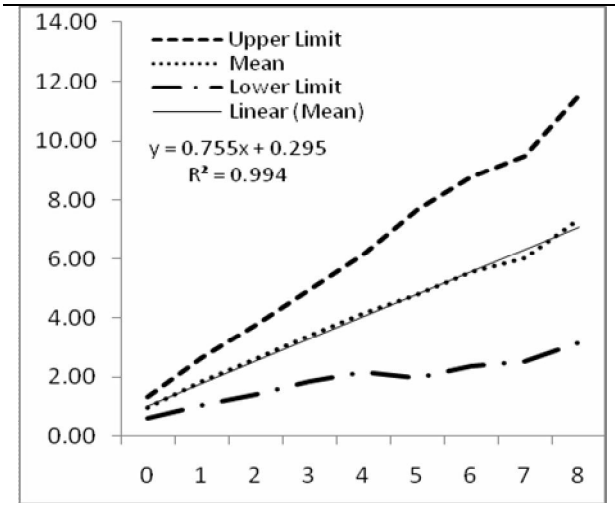
RESULTS AND DISCUSSION

Weekly growth rate in 'Ghungroo' pigs estimated up to 8 weeks age revealed overall mean weight at birth and weaning to be 0.96±0.02 and 7.07±0.26 kg, respectively, whereas the respective values for 'Niang Megha' pig were 0.64±0.02 and 5.47±0.13 kg (Table 1). Pan *et al.* (2005) reported the average

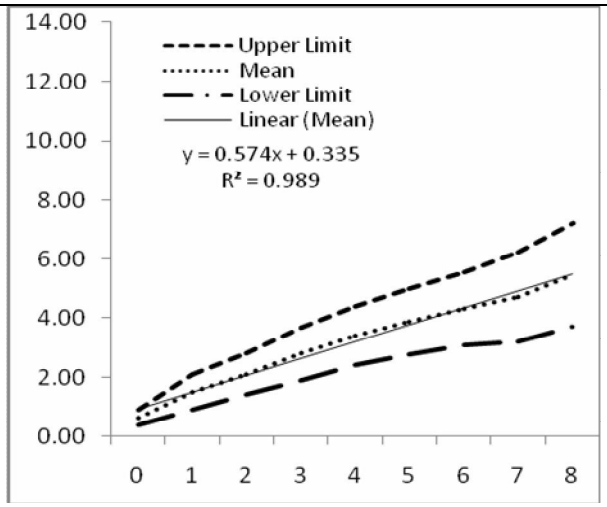
Table 1: Growth performance of pigs

Breed	Ghungroo			Niang Megha		
	Male	Female	Overall	Male	Female	Overall
Weekly body weight (kg)						
At birth	0.97±0.03 (29)	0.94±0.03 (27)	$0.96±0.02^{a}$ (56)	$0.57±0.02^{x}$ (29)	$0.74±0.02^{y}$ (22)	$0.64±0.02^{b}$ (51)
1^{st} wk	1.84±0.07 (29)	1.83±0.07 (27)	$1.84±0.05^{a}$ (56)	$1.38±0.05^{x}$ (29)	$1.65±0.05^{y}$ (22)	$1.50±0.04^{b}$ (51)
2^{nd} wk	2.59±0.11 (29)	2.75±0.11 (27)	$2.67±0.08^{a}$ (56)	$1.96±0.05^{x}$ (29)	$2.32±0.07^{y}$ (22)	$2.12±0.05^{b}$ (51)
3^{rd} wk	3.40±0.14 (29)	3.67±0.14 (27)	$3.53±0.10^{a}$ (56)	$2.58±0.07^{x}$ (29)	$3.11±0.08^{y}$ (22)	$2.81±0.06^{b}$ (51)
4^{th} wk	4.14±0.19 (29)	4.29±0.17 (27)	$4.22±0.13^{a}$ (56)	$3.15±0.07^{x}$ (29)	$3.75±0.09^{y}$ (22)	$3.41±0.07^{b}$ (51)
5^{th} wk	4.81±0.26 (29)	5.25±0.21 (27)	$5.02±0.17^{a}$ (56)	3.76±0.12 (29)	4.05±0.09 (22)	$3.89±0.08^{b}$ (51)
6^{th} wk	5.57±0.30 (29)	5.82±0.24 (27)	$5.69±0.19^{a}$ (56)	4.23±0.13 (29)	4.44±0.09 (22)	$4.32±0.09^{b}$ (51)
7^{th} wk	6.01±0.35 (25)	6.28±0.24 (25)	$6.15±0.21^{a}$ (50)	4.67±0.17 (27)	4.80±0.13 (19)	$4.72±0.11^{b}$ (46)
8^{th} wk	7.34±0.45 (21)	6.83±0.27 (23)	$7.07±0.26^{a}$ (44)	5.39±0.21 (26)	5.59±0.12 (19)	$5.47±0.13^{b}$ (45)
Growth rate (kg)						
0-1 wk	0.87±0.07 (29)	0.89±0.07 (27)	0.88±0.05 (56)	0.81±0.04 (29)	0.92±0.06 (22)	0.86±0.03 (51)
1-2 wk	0.74±0.06 (29)	0.92±0.07 (27)	0.83±0.05 (56)	0.58±0.03 (29)	0.67±0.05 (22)	0.62±0.03 (51)
2-3 wk	0.81±0.05 (29)	0.91±0.07 (27)	0.86±0.04 (56)	0.62±0.04 (29)	0.79±0.10 (22)	0.69±0.05 (51)
3-4 wk	0.75±0.09 (29)	0.63±0.08 (27)	0. 69±0.06(56)	0.57±0.04 (29)	0.64±0.08 (22)	0.60±0.04 (51)
4-5 wk	0.67±0.10 (29)	0.96±0.13 (27)	0.81±0.08 (56)	0.61±0.08 (29)	0.30±0.04 (22)	0.48±0.05 (51)
5-6 wk	0.76±0.06 (29)	0.57±0.10 (27)	0.67±0.06 (56)	0.47±0.04 (29)	0.39±0.05 (22)	0.44±0.03 (51)
6-7 wk	0.33±0.08 (25)	0.55±0.15 (25)	0.44±0.09 (50)	0.47±0.05 (27)	0.38±0.07 (19)	0.44±0.04 (46)
7-8 wk	1.02±0.18 (21)	0.69±0.09 (23)	0.85±0.10 (44)	0.73±0.13 (26)	0.79±0.07 (19)	0.75±0.08 (45)
Overall	5.61±0.38 (29)	5.97±0.22 (27)	5.78±0.23 (56)	4.76±0.18 (29)	4.71±0.13 (22)	4.74±0.12 (51)
Av. daily gain	0.10±0.01	0.11±0.01	$0.11±0.01^{a}$	0.09±0.01	0.09±0.01	$0.09±0.01^{b}$

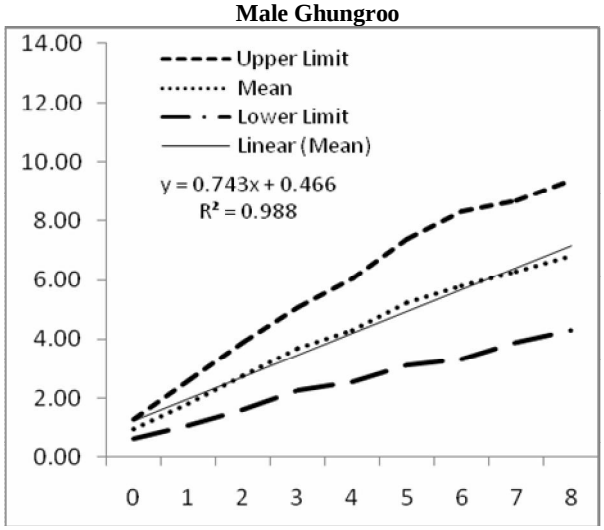
The figures in the parentheses indicate the number of observations. The figures with 'x' and 'y' superscript shows difference between sex and 'a' and 'b' shows difference between breed for the specified age group ($P_{0.01}$)



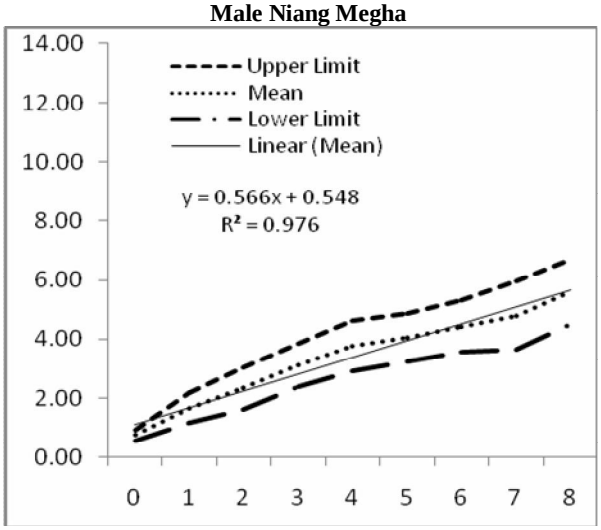
Male Ghungroo



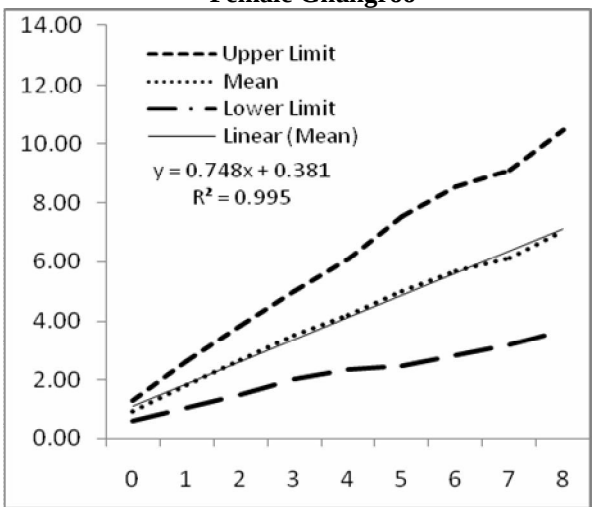
Male Niang Megha



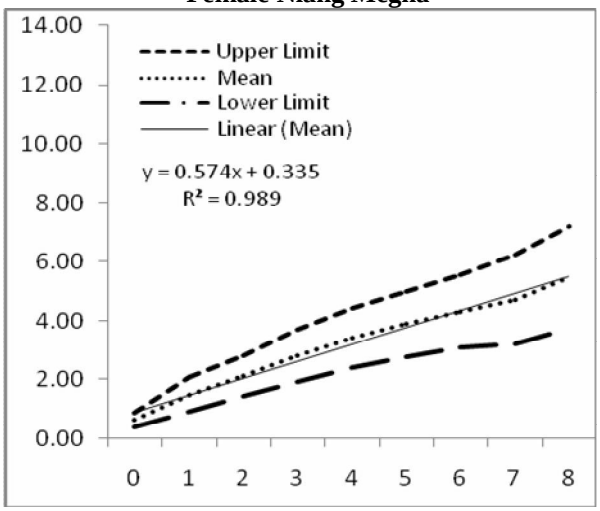
Female Ghungroo



Female Niang Megha



Overall Ghungroo pig (irrespective of sex)



Overall Niang Megha pig (irrespective of sex)

In prediction equations 'X' and 'Y' represents weeks and body weight, respectively
'X' and 'Y' axis of the growth bands represents weeks and body weight, respectively

Fig. 1: Growth band and their graphical comparison in Ghungroo and Niang Megha pigs

body weight at birth in 'Ghungroo' pigs as 1.08±0.22 kg, reared under field condition. Similarly, Kumaresan *et al.* (2009) reported the mean weight at birth of 'Niang Megha' breed as 0.485±0.23 kg and mean weight at weaning as 4.97±0.21 kg. The weights in different weeks and sex were highly significant in all the age groups. In 'Ghungroo' pigs, there was no significant difference for growth rate between sexes in all the age groups. In 'Niang Megha' pigs, male animals showed highly significant ($p<0.01$) difference upto 4^{th} week age for growth rate. There was higher body weight gain in male animals (after 4^{th} week age) than in their female counterparts. This may be attributed to the release of male hormones by males causing differential growth rates in males and females after one month of age (Kralik *et al.*, 1999).

The overall weight gained from birth to weaning (8^{th} weeks age) was 5.78±0.23 and 4.74±0.12 kg, respectively, for 'Ghungroo' and 'Niang Megha' breeds. The average pre-weaning daily gain (ADG) in pigs was 0.11±0.01 and 0.09±0.01 kg., respectively, for 'Ghungroo' and 'Niang Megha' breeds. Breeds showed highly significant variation for ADG. Growth bands were prepared by plotting weekly mean body weights and standard deviation (mean ± 2SD) against age for different sexes and cumulative data for each breed. The growth curves were linear for all the cases with accuracy of prediction ranging between 97.6 and 99.5% (Fig. 1). Further, the growth bands were narrow at birth, but widened with age for both male and female piglets of both breeds. The widening of growth band during later stage was due to higher variance in body weight with increase in age (Kušec *et al*., 2008). The increase in variance with age could be due to greater effect of environment causing larger individual differences in body weight with advancement of age.

The animals with lower and higher body weights can be screened by using growth bands. Thus growth band serves as a useful aid in making efficient and early decision for proper management and selection of piglets at different ages. The growth curve fitting and construction of growth bands can be used effectively for selection of 'Ghungroo' and 'Niang Megha' piglets at early age, besides selecting the animals on the basis of their performance during the later stages of life.

REFERENCES

Beaulieu, A.D., Aalhus, J. L., Williams, N. H. and Patience, J. H. 2010. Impact of piglet birth weight, birth order, and litter size on subsequent growth performance, carcass quality, muscle composition, and eating quality of pork. *Journal of Animal Science*, **88**: 2767-2778.

Gu, Y., Schinckel, A.P. and Martin, T.G. 1992. Growth, development, and carcass composition in five genotypes of swine. *Journal of Animal Science*, **70**: 1719-1729.

Harvey, W.R. 1990. *User's Guide for LSMLMW PC-2 version Mixed Model Least-squares Likelihood Computer Programme*. Mimeograph Columbus, Ohio, USA.

Jelen, T. 1998. *Research on Growth of Pigs of Different Genotypes*. M.Sc. thesis, University J.J. Strossmayer, Osijek.

Jiayang S., Jonathan R. and Julian, J.F. 1999. Confidence bands for growth and response curves. *Statistica Sinica*, **9***:* 679-698.

Kralik, G., Jelen, T., Scitovski, R. and Kusec, G. 1999. Analysis of phenotypic expression and growth of gilts using asymmetric S-function. *Feedstuffs*, **41**: 159-165.

Kralik, G., Scitovski, R. and Sencic, D. 1993. Application of asymmetric S-function for analysis of the growth of boars. *Stocarstvo*, **47**: 425-433.

Kramer, C.Y. 1957. Extension of multiple range tests to group correlated adjusted means. *Biometrics*, **13**: 13-18

Kumaresan, A., Bujarbaruah, K.M., Pathak, K.A., Das, A. and Bardoloi, R.K. 2009. Integrated resource-driven pig production systems in a mountainous area of Northeast India: Production practices and pig performance. *Tropical Animal Health and Production*, **41**: 1187-1196.

Kušec, G., Djurkin, I., Kralik, G., Baulain, U. and Kallweit, E. 2008. Allometric vs. dynamic models in the investigation of pig growth. *Studeni - prosinac*, **10**: 459-464.

Manoj, M., Gandhi, R.S., Raja, T.V., Verma, A., Singh, A. and Sachdeva, G.K. 2012. Growth rates and growth curve in Sahiwal cattle. *Indian Journal of Dairy Science*, **65**: 354-355.

Pan S., Misra S.K. and Kundu M.S. 2005. Ghoongroo pig: A new found animal genetic resource of sub-Himalayan West Bengal, India *Animal Genetic Resource Information.* FAO. **37:** 91-96.

Schinckel A.P., Ferrell J., Einstein M.E., Pearce S.A. and R.D. 1993. Boyd. Analysis of pig growth from birth to six days of age. 1993. *Swine Research Report, Purdue University*,57-67.

Singh, D. 1978. *Growth Band of Brown Swiss Crossbred Cattle – Karnal*. M.Sc. thesis. NDRI, Karnal, Haryana, India.