A Study of Body Weight and Its Relation with Linear Body Measurements in Piglets Fed Different Feed Formulation

Monica Tissopi1, JP Bordoloi1, J Saharia1, Rajib Kro2

ABSTRACT

The present experiment was carried out to study the body weight and its relation with the linear body measurements of pre-weaned piglets fed with different feed formulation viz., T0 (fed conventional creep feed), T1 (fed 5% milk powder supplemented creep feed), T2 (fed probiotics supplemented creep feed) and T3 (fed creep feed supplemented with 5% milk powder and probiotics). The final body weights at 8th weeks of age were highest in T3 (12.395 ± 0.051 kg) followed by T2 (11.230 ± 0.094), T1 (9.940 ± 0.103) and T0 (8.781 ± 0.073). These findings indicated a positive effect of added supplement in the body weight of pre-weaned piglets. The results showed that the linear body measurements of the piglets maintained a positive correlation with body weight and increased steadily with a significant effect (p <0.001) of treatment on all three traits. Piglets, probiotics.

Keywords: Body weight, Body weight gain, Linear body measurements, Milk powder, Pre-weaned.

Agricultural Science Digest (2019)

INTRODUCTION

Animal husbandry is an indispensable component of agriculture. Since ages animal rearing was carried out side by side with crop cultivation as a basic activity. In the present scenario, there has been a major change in the food consumption scenario with the growing human population adding a burden to produce more food grains and as such meat and meat products consumption is also increasing. Among various livestock species, the pig is a promising species with its higher fecundity, better feed conversion efficiency, early maturity, shorter generation interval and relatively smaller space requirements in housing makes pig rearing as one of the major sources of meat production also making it a lucrative and profitable livestock business in India. As per the 19th Livestock Census–2012, the total pigs in the country is 10.29 million, contributing around 2.01% of the total livestock population ($12.05 million). The domestic production of pork was only 0.45 metric ton and share of pork is around 8% of Country’s total meat production (DARE Report, 2012–2013). The total pigs in the country have decreased by 7.54% over the previous census (i.e., 11.13 million in 18th Livestock Census, 2007). Because of the above situation, the increasing demand for pig, for its meat requires the production of fast-growing pigs as well as management systems that facilitate fast growth.

Growth is a fundamental property of all living organisms and can be defined as the increase in the number of cells and body size over a while. In studies of animal growth, linear body measurements (LBM) such as chest girth, height at withers and body length are used to relate dimensions to an animal’s overall body size. This is because linear dimensions are directly related to bone development, and so any physical growth in LBM is easily noticed. LBM can be taken on many species and are useful in comparing individual animals, breeds of animals, farm performance and even geographical distribution of a species. The need to estimate live weight from simple and more easily measurable variables such as

1Department of Livestock Production and Management, College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati, Assam, India
2Department of Livestock Production and Management, Vanbandhu College of Veterinary Science and Animal Husbandry, Navsari Agricultural University, Gujarat, India

Corresponding Author: JP Bordoloi, Department of Livestock Production and Management, College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati, Assam, India, e-mail: jpbordoloi2016@gmail.com

How to cite this article: Tissopi, M., Bordoloi, J. P., Saharia, J., & Kro, R. (2019). A Study of Body Weight and Its Relation with Linear Body Measurements in Piglets Fed Different Feed Formulation. Agr Sci Diges, 39(2):142-148.

Source of support: Nil
Conflict of interest: None
Submitted: 09/02/2019 Accepted: 11/05/2019

LBM is increasingly being explored in sheep, goats, cattle, and pigs (Birteeb et al., 2015).

The young pigs can grow very fast but, unfortunately, a number of factors including the milk produced by the sows are the major factor limiting piglet growth till weaning (Pluske et al., 2005; Hartmann et al., 1984). While piglets are exposed to many stressors immediately after birth, gastrointestinal problems are among the most severe. Such conditions when encountered can be overcome with effective nutritional management. Thus, in highly prolific sows, providing additional milk sources to suckling piglets will increase the nutrient intake of the piglets and, therefore, improve pre-weaning daily weight gain and weaning weights. Klindt et al. (2003) demonstrated that increasing nutrient availability during lactation is an important determinant of pre-weaning growth rates. Probiotics, sometimes used interchangeably with the term direct fed microbials (DFM), are gaining acceptance as potential alternatives to antibiotics to improve production efficiency (Lee et al., 2010).
Pig keeping is of traditional value in many tribal areas of India, and thus any scientific inputs to enhance the overall performance of the piglets will help in strengthening this traditional practice sustainably. Therefore, the present work was designed to know if the changing body weight of piglets in the successive days of life maintains a relationship with the linear body measurements and if these body growth parameters are influenced by supplementation of probiotics and milk powder.

**Materials and Methods**

The experiment was conducted during the period of 1st of October to 15th of December 2017. The feeding trial of the piglets was carried out at the 30-Sow Teaching Unit of the Department of Livestock Production and Management while laboratory analysis of feed and blood samples were done respectively in the Department of Animal Nutrition and Department of Animal Physiology as well as TVCC, College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati, Assam, India. The animal experimental protocol was approved by the Institutional Animal Ethics Committee (IAEC 770/ac/CPCSEA/FVSc/AAU/IAEC/17-18/535) and carried out as per the guidelines of the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), Ministry of Environment, Forest and Climate Change, Government of India.

For the study, seven healthy piglets of uniform size and body weight from each of four Hampshire litters were selected, thus, four treatment groups were formed. Each group of the experimental piglets was randomly assigned to one of the four treatments as shown in Table 1.1.

The piglets together with their mothers were sheltered in conventional farrowing pens till weaning at 8 weeks of age. The floor of the pens was cement concrete and floor area was of $9\,M^2$ with an equal floor area in the outdoor run. All the experimental piglets were raised entirely on their dams’ milk from birth to 7 days of age. From day-8 onward, the piglets of $T_0$, $T_1$, $T_2$, and $T_3$ groups were offered respective experimental feed twice daily as per the feeding schedule up to weaning at 56 days of age. The piglets were separated from their sows daily in the morning and evening for a period of 1–2 hours following suckling and offered feed in the outdoor run and fed to appetite. The piglets were provided clean wholesome water ad libitum round the clock. Other day-to-day routine management tasks like cleaning of pens, disinfection of floors, washing of feeding and water troughs were strictly followed. The formula of the basal conventional farm ration and also compositions of the ration, milk powder, and probiotics used for the piglets are as shown in Tables 1.2 and 1.3, respectively.

The proximate analyses of the feed samples were done as per methods described in AOAC (1990).

The individual body weight of the piglets was weighed using a hanging balance and recorded in kg in the morning before offering feed and water. The first (initial) body weights were recorded on the 1st week of life and then subsequently at weekly interval up to weaning at 56 days of age. The body weight gain of the piglets in a particular week was worked out by subtracting the previous week body weight from the present body weight and recorded in kg.

The body length of the piglets was measured as a straight-line distance from the occipital bone to the base of the tail with a measuring tape and expressed in centimeter (cm).

Height at wither of the piglets was measured as the vertical distance from the top of the scapula bone to the ground parallel to the forelegs and was expressed in centimeter (cm).

**Results and Discussion**

**Body Weight**

The average weekly body weight of the piglets of different treatment groups was presented in Table 2.1. Analysis variance of average body weight (Table 2.2) revealed no significant difference among the initial body weight of the piglets in all the four treatment groups, but the treatment had a significant effect ($p < 0.01$) on average body weight of the piglets in all the subsequent weeks. The final average body weights at 8th week of age were significantly highest ($p < 0.01$) in probiotics cum milk powder group ($T_3$) followed by probiotics ($T_2$), milk powder ($T_1$) and lowest in control group ($T_0$).

The findings indicated a positive effect of added supplement in the body weight of pre-weaned piglets.

**Table 1.1: Group wise feeding treatment of piglets**

| Treatment group | No. of piglet | Average initial body weight (kg) | Experimental feed for the treatment groups |
|-----------------|--------------|----------------------------------|-------------------------------------------|
| T0 (Control)    | 7            | 2.280                            | Conventional farm feed                    |
| T1              | 7            | 2.314                            | Conventional farm feed + 5% supplementation of milk powder (SAGAR BRAND) |
| T2              | 7            | 2.315                            | Conventional farm feed + probiotics (PROBIOSR from VETS PLUS, Inc and CHR. Hansen) as per manufacturer’s recommendation |
| T3              | 7            | 2.300                            | Conventional farm feed + 5% milk powder% probiotics as per manufacturer’s recommendation |
et al. (2015) found significantly higher 14-day and weaning body weights of milk supplemented piglets than the control without supplementation. The findings are also supported by the studies of Venkatachalapathy et al. (2013) who found that concentrate feed mixture supplemented with multispecies probiotics strains showed significantly higher litter weight at weaning than the control fed only concentrate mixture.

Body weight gain: The average weekly body weight gains (kg) of piglets were presented in Table 2.3. In respect of the final weight gains in the 8th week, both T2 and T3 differed significantly (p<0.01) from T0 and T1 with no significant difference among themselves (Table 2.4). The piglets showed a trend of steady weekly gain from 2nd week onward and were highest in all the treatment groups. The results of average body weight gains (Table 2.3) indicated that it maintained a positive relationship with throughout the period up to 8 weeks age. The present findings are in agreement with the findings of King et al. (1998), who reported that litters given milk supplements grew faster than litters receiving no supplemental milk.

Table 1.2: Ingredients of creep ration

| Name of the ingredients | Parts per hundred |
|-------------------------|-------------------|
| Maize crush             | 50                |
| Wheat bran              | 12                |
| Ground nut cake (de-oiled) | 27            |
| Fish meal               | 8                 |
| Mineral mixture         | 2.5               |
| Salt                    | 0.5               |
| Vitamins (A,D,E,K)      | Added @200 gm/100 kg feed |

Table 1.3: Composition of farm ration, milk powder (Sagar brand) and probiotics (Probios)

| Farm ration (%) | Milk powder (Per 100gm) | Probiotics (Viable lactic acid bacteria/gm) |
|-----------------|-------------------------|-------------------------------------------|
| DM (basal feed) | 95                      | 366                                       |
| DM (left over feed) | 92                | 1.5                                       |
| CP              | 22.1                    | 52                                        |
| EE              | 5.06                    | 35                                        |
| CF              | 4.75                    | 549                                       |
| Total ash       | 7.75                    | 1200                                      |
| NFE             | 60.34                   |                                           |

Table 2.1: Average weekly body weight (kg) of piglets of different treatment groups

| Weeks          | Treatment groups |
|----------------|------------------|
|                | T0               | T1                | T2               | T3               |
| Initial body weight at 1st week of age | 2.280± 0.013 | 2.314± 0.023 | 2.315± 0.006 | 2.300± 0.013 |
| 2nd            | 2.758± 0.037     | 3.104± 0.036     | 3.175± 0.041     | 3.227± 0.057     |
| 3rd            | 3.360± 0.027     | 4.074± 0.041     | 4.229± 0.051     | 4.392± 0.031     |
| 4th            | 4.190± 0.034     | 5.059± 0.035     | 5.475± 0.116     | 5.602± 0.109     |
| 5th            | 5.220± 0.051     | 6.173± 0.111     | 6.745± 0.075     | 6.904± 0.037     |
| 6th            | 6.351± 0.014     | 7.371± 0.111     | 8.465± 0.045     | 8.440± 0.058     |
| 7th            | 7.500± 0.029     | 8.614± 0.103     | 9.425± 0.089     | 10.290± 0.084    |
| 8th            | 8.781± 0.073     | 9.940± 0.103     | 11.230± 0.094    | 12.395± 0.051    |
| Overall        | 5.051± 0.296     | 5.831± 0.340     | 6.382± 0.398     | 6.694± 0.44      |

(p<0.05); treatment means having atleast one common superscript in a row do not differ significantly

Table 2.2: Analysis of variance for weekly body weight of piglets of different groups

| Source            | d.f | SS    | MS    | F value | p value |
|-------------------|-----|-------|-------|---------|---------|
| Treatment         | 3   | 87.124| 29.041| 977.56  | <0.0001 |
| Weeks             | 7   | 1672.163| 238.880| 8040.90  | <0.0001 |
| Treatment* weeks  | 21  | 41.466| 1.975 | 66.47   | <0.0001 |
| Error             | 192 | 5.704 | 0.030 | –       | –       |
A Study of Body Weight and Its Relation with Linear Body Measurements in Piglets Fed Different Feed Formulation

This was due to the corresponding higher body weights of the piglets in the respective treatments and established a positive correlation of body length with body weight change and gain of the piglets. Kharpran (2014) in his research of feeding brewing yeast cake, found no significant difference of body length of piglets in 2nd weeks of age but observed the highly significant difference ($p < 0.01$) from 6th week. On the other hand, the present range of body length of 23.86 ± 0.43 to 25.36 ± 0.34 cm at the 1st week and 40.57 ± 1.65 to 45.86 ± 1.39 cm at 8th week were well comparable with findings of Bordoloi (1974) and Roychoudhury (1978).

### Heart Girth

The average weekly values of heart girth (cm) of different treatments were presented in Table 2.5, and it was an increasing trend throughout the experimental period. Analysis of variance (Table 2.6) showed highly significant ($p < 0.01$) effect of treatment on this parameter. The overall values of T1, T2, and T3 were not significantly different among themselves, but they all were significantly higher than the T0 value. This was due to the corresponding higher body weights of the piglets in the respective treatments and established a positive correlation of heart girth with the body weight of the piglets. Kharpran (2014) in his research of feeding brewing yeast cake, found no significant difference of heart girth of piglets in 2nd weeks of age but observed the highly significant difference ($p < 0.01$) from 6th week in 3% and 4% brewing yeast cake supplemented piglets. The present range of 23.93 ± 0.38 to 25.44 ± 0.81 cm at the 1st week and 37.29 ± 1.32 to 43.93 ± 1.03 cm at 8th week were well comparable with findings of Bordoloi (1974) and Roychoudhury (1978).

### Linear Body Measurements

#### Body Length

The average weekly values of body length (cm) of different treatments were presented in Table 2.5. The finding indicated that the average weekly body length of piglets in all the groups was increased throughout the experimental period and had significant difference (as shown in Table 2.6) among the treatment means in 2nd, 7th and 8th weeks. The average weekly body length in group T0 was significantly ($p < 0.01$) lower than both T2 and T3 while T1 differed significantly only from T3 and there was no significant difference between T2 and T3. However, on an overall basis, the body length was highest in T3 and gradually reduced in T2, T1, and T0 group. This was due to the corresponding higher body weights of the piglets in the respective treatments and established a positive correlation of body length with body weight change and gain of the piglets. Kharpran (2014) in his research of feeding brewing yeast cake, found no significant difference of body length of piglets in 2nd weeks of age but observed the highly significant difference ($p < 0.01$) from 6th week. On the other hand, the present range of body length of 23.86 ± 0.43 to 25.36 ± 0.34 cm at the 1st week and 40.57 ± 1.65 to 45.86 ± 1.39 cm at 8th week were well comparable with findings of Bordoloi (1974) and Roychoudhury (1978).

### Table 2.3: Average weekly body weight gain (kg) of piglets in different treatment groups

| Weeks | T0     | T1     | T2     | T3     |
|-------|--------|--------|--------|--------|
| 2nd   | 0.508c ± 0.008 | 0.790b ± 0.030 | 0.860ab ± 0.033 | 0.927a ± 0.022 |
| 3rd   | 0.602c ± 0.007 | 0.970b ± 0.049 | 1.050b ± 0.032 | 1.165a ± 0.017 |
| 4th   | 0.816d ± 0.013 | 0.985c ± 0.026 | 1.075b ± 0.028 | 1.210a ± 0.029 |
| 5th   | 1.030d ± 0.017 | 1.100c ± 0.031 | 1.250b ± 0.025 | 1.302a ± 0.014 |
| 6th   | 1.157b ± 0.075 | 1.212b ± 0.028 | 1.270b ± 0.030 | 1.535a ± 0.027 |
| 7th   | 1.150b ± 0.035 | 1.243b ± 0.013 | 1.720b ± 0.049 | 1.850a ± 0.032 |
| 8th   | 1.280c ± 0.033 | 1.330c ± 0.045 | 1.805b ± 0.053 | 2.105a ± 0.045 |
| Overall | 0.935d ± 0.042 | 1.090c ± 0.028 | 1.290b ± 0.049 | 1.442a ± 0.056 |

Treatment means having at least one common superscript in a row do not differ significantly

### Table 2.4: Analysis of variance for weekly body weight gain (kg) of piglets of different treatment groups

| Source          | d.f | SS   | MS   | F value | p value |
|-----------------|-----|------|------|---------|---------|
| Treatment       | 3   | 7.289| 2.430| 308.14  | <0.0001 |
| Weeks           | 6   | 15.626| 2.604| 330.30  | <0.0001 |
| Treatment*Weeks | 18  | 1.966| 0.109| 13.86   | <0.0001 |
| Error           | 168 | 1.325| 0.008| –       | –       |

This was due to the corresponding higher body weights of the piglets in the respective treatments and established a positive correlation of body length with body weight change and gain of the piglets. Kharpran (2014) in his research of feeding brewing yeast cake, found no significant difference of body length of piglets in 2nd weeks of age but observed the highly significant difference ($p < 0.01$) from 6th week. On the other hand, the present range of body length of 23.86 ± 0.43 to 25.36 ± 0.34 cm at the 1st week and 40.57 ± 1.65 to 45.86 ± 1.39 cm at 8th week were well comparable with findings of Bordoloi (1974) and Roychoudhury (1978).
A Study of Body Weight and Its Relation with Linear Body Measurements in Piglets Fed Different Feed Formulation

### Table 2.5: Average weekly body length (cm), heart girth (cm) and height at wither (cm) of piglets of different treatment groups

| Weeks | Groups | BL | HG | HW |
|-------|--------|----|----|----|
| 1st   | T0     | 23.86 ± 0.43 | 23.93 ± 0.38 | 8.43 ± 0.20 |
|       | T1     | 25.24 ± 0.72  | 25.04 ± 0.90  | 18.80 ± 0.30 |
|       | T2     | 25.30 ± 1.15  | 25.43 ± 0.30  | 18.93 ± 0.41 |
|       | T3     | 5.36 ± 0.34   | 25.44 ± 0.81  | 19.01 ± 0.46 |
| 2nd   | BL     | 27.14 b ± 0.55 | 27.07 b ± 0.65 | 18.79 b ± 0.26 |
|       | HG     | 27.43 b ± 0.25 | 27.71 b ± 0.26 | 19.79 b ± 0.32 |
|       | HW     | 29.21ab ± 1.21 | 28.86 ab ± 1.32 | 19.86 ab ± 0.86 |
| 3rd   | BL     | 29.07 ± 0.62  | 29.79 ± 0.60  | 20.36 ± 0.51 |
|       | HG     | 30.57 ± 1.11  | 31.36 ± 0.94  | 21.50 ± 0.62 |
|       | HW     | 31.86 ± 0.98  | 31.50 ± 1.27  | 22.00 ± 0.85 |
| 4th   | BL     | 32.21 ± 0.69  | 32.07 ± 0.68  | 22.36 ± 0.63 |
|       | HG     | 33.29 ± 1.14  | 33.21 ± 0.89  | 22.86 ± 0.57 |
|       | HW     | 33.57 ± 0.88  | 33.71 ± 1.19  | 23.71 ± 0.54 |
| 5th   | BL     | 34.50 ± 1.02  | 34.86 ± 0.37  | 24.43 ± 0.43 |
|       | HG     | 35.43 ± 0.53  | 35.14 ± 0.70  | 25.00 ± 0.76 |
|       | HW     | 36.21 ± 0.93  | 36.00 ± 1.03  | 25.07 ± 0.83 |
| 6th   | BL     | 35.57 ± 0.61  | 35.66 ± 1.29  | 25.71 ± 0.57 |
|       | HG     | 36.79 ± 1.01  | 37.71 ± 1.38  | 26.76 ± 0.72 |
|       | HW     | 38.21 ± 1.42  | 38.71 ± 1.11  | 27.43 ± 0.78 |
| 7th   | BL     | 37.29 b ± 1.51 | 36.79b ± 1.35 | 26.71b ± 1.24 |
|       | HG     | 38.71 ab ± 0.99 | 37.71b ± 1.01 | 27.21b ± 0.59 |
|       | HW     | 40.43ab ± 1.91 | 39.57ab ± 1.46 | 27.86b ± 0.71 |
| 8th   | BL     | 40.57 b ± 1.65 | 39.29 ± 1.32  | 27.00 b ± 1.23 |
|       | HG     | 40.64 b ± 1.31 | 39.14bc ± 1.06 | 28.64 b ± 0.61 |
|       | HW     | 45.21a ± 1.24 | 42.00b ± 1.286 | 31.86 ± 0.58 |
| Overall | BL | 32.68b ± 0.77 | 34.02b ± 0.59 | 23.21b ± 0.53 |
|       | HG     | 35.00b ± 0.96 | 34.47b ± 0.75  | 24.49a ± 0.63 |
|       | HW     | 35.41 ± 0.87 | 34.82a ± 0.90 | 24.53 ± 0.50 |
|       |        | 34.86 ± 1.39 | 43.82a ± 0.68 |

*(p < 0.05)*

Treatment means having at least one common superscripts in a row do not differ significantly.

### Table 2.6: Analysis of variance for weekly body length (cm), heart girth (cm) and height at wither (cm) of piglets of different treatment groups

| Parameters | Source | d.f | SS | MS | F value | p value |
|-----------|--------|-----|----|----|---------|---------|
| BL        | Treatment | 3   | 295.192 | 98.397 | 11.01 | <.0001 |
|           | Weeks   | 7   | 6186.246 | 883.749 | 98.92 | <.0001 |
|           | Error   | 213 | 1903.022 | 8.934 | – | – |
| HW        | Treatment | 3   | 253.557 | 84.519 | 10.62 | <.0001 |
|           | Weeks   | 7   | 4793.258 | 684.751 | 86.01 | <.0001 |
|           | Error   | 213 | 1695.845 | 7.962 | – | – |
| BG        | Treatment | 3   | 129.085 | 43.028 | 8.82 | <.0001 |
|           | Weeks   | 7   | 3243.515 | 463.359 | 94.96 | <.0001 |
|           | Error   | 213 | 1039.341 | 4.878 | – | – |
• **Height at wither**: The average weekly height at wither of piglets in all the groups (Table 2.5) were in increasing trend throughout the experimental period. Analysis of variance (Table 2.6) revealed a significant effect of treatment on this trait in 2nd, 7th and 8th week of age. The overall values of $T_0$, $T_1$, and $T_2$ were not significantly different among themselves, but they all were significantly higher ($p < 0.01$) than the $T_3$ value. This was due to the corresponding higher body weights of the piglets in the respective treatments and indicated a positive correlation of height at wither with the body weight of the piglets. Kharpran (2014) in his research of feeding brewing yeast cake, found no significant difference of height at wither of piglets in 2nd weeks of age but observed the highly significant difference ($p < 0.01$) at 7th and 8th week in piglets fed 3% and 4% brewing yeast cake supplemented ration. Also, the range of 18.43 ± 0.20 to 19.01 ± 0.46 and 27.00 ± 1.23 to 32.21 ± 1.25 cm height at wither at first and 8th week were well comparable with findings of Bordoloi (1974) and Roychoudhury (1978).

### Estimating the Relation of Body Weight with Linear Body Measurement

The correlation coefficient of body weight with the linear body measurement in the different treatments of $T_0$, $T_1$, $T_2$, and $T_3$ are shown in Table 2.7. Analysis of the data revealed a highly significant correlation ($p < 0.01$) of these traits with the body weight of the piglets in all the treatment groups. The high correlations of the traits indicate that LBM (body length, chest girth, and height at withers) have strong relationships with one another and that body length, heart girth, and height at wither increased with a corresponding increase in body weight of the piglets in different weeks. The present findings were in good agreement with findings of Birteeb et al. (2015) who reported correlation coefficient of body weight with body length as 0.862 and 0.854; with heart girth as 0.963 and 0.903 and with height at wither as 0.867 and 0.809 in piglets at 5 and 10 weeks of age and all correlation values were highly significant. Machebe et al. (2010) and Kharpran (2014) observed a similar correlation of body weight with body length, heart girth, and height at wither.

### Table 2.7: Correlation coefficient of body weight with linear body measurements of piglets of different treatment groups

| Treatment | Week | 1     | 2     | 3     | 4     | 5     | 6     | 7     | 8     | Overall |
|-----------|------|-------|-------|-------|-------|-------|-------|-------|-------|---------|
| $T_0$     | BL   | 0.909*| 0.767*| 0.981**| 0.661 | 0.864*| 0.821*| 0.952**| 0.956**| 0.898** |
| $p$ value | 0.005| 0.044 | 0     | 0.106 | 0.012 | 0.024 | 0.001 | 0.001 | 0      |
| HG        | 0.924**| 0.834*| 0.971**| 0.558 | 0.965*| 0.984**| 0.944**| 0.881*| 0.857**|
| $p$ value | 0.003| 0.02  | 0     | 0.193 | 0     | 0     | 0.001 | 0.009 | 0      |
| HW        | 0.834*| 0.931**| 0.951**| 0.462 | 0.961**| 0.960**| 0.922**| 0.979**| 0.863**|
| $p$ value | 0.02 | 0.002 | 0.001 | 0.296 | 0.001 | 0.001 | 0.003 | 0      | 0      |
| $T_1$     | BL   | 0.867*| 0.748 | 0.924**| 0.884**| 0.896**| 0.974**| 0.968**| 0.888**| 0.886**|
| $p$ value | 0.012| 0.053 | 0.003 | 0.008 | 0.006 | 0     | 0     | 0.008 | 0      |
| HG        | 0.950**| 0.705 | 0.939**| 0.994**| 0.868*| 0.932**| 0.897**| 0.894**| 0.863**|
| $p$ value | 0.001| 0.077 | 0.002 | 0     | 0.111 | 0.002 | 0.006 | 0.007 | 0      |
| HW        | 0.856*| 0.848*| 0.847*| 0.910**| 0.843*| 0.919**| 0.883**| 0.856*| 0.917**|
| $p$ value | 0.014| 0.016 | 0.016 | 0.004 | 0.017 | 0.003 | 0.008 | 0.014 | 0      |
| $T_2$     | BL   | 0.762*| 0.961**| 0.974**| 0.816*| 0.774*| 0.938**| 0.937**| 0.916**| 0.885**|
| $p$ value | 0.047| 0.001 | 0     | 0.025 | 0.041 | 0.002 | 0.002 | 0.004 | 0      |
| HG        | 0.790*| 0.938**| 0.903**| 0.865*| 0.686 | 0.931**| 0.953**| 0.996**| 0.880**|
| $p$ value | 0.035| 0.002 | 0.005 | 0.012 | 0.089 | 0.002 | 0.001 | 0      | 0      |
| HW        | 0.784*| 0.881**| 0.871*| 0.810*| 0.973**| 0.926**| 0.953**| 0.966**| 0.931**|
| $p$ value | 0.037| 0.009 | 0.011 | 0.027 | 0     | 0.003 | 0.001 | 0      | 0      |
| $T_3$     | BL   | 0.963**| 0.977**| 0.909**| 0.952**| 0.955**| 0.935**| 0.697 | 0.946*| 0.922**|
| $p$ value | 0.0  | 0     | 0.005 | 0.001 | 0.001 | 0.002 | 0.002 | 0.082 | 0.001 | 0      |
| HG        | 0.818*| 0.981**| 0.840*| 0.926**| 0.926**| 0.896**| 0.705 | 0.927**| 0.917**|
| $p$ value | 0.025| 0     | 0.018 | 0.003 | 0.003 | 0.006 | 0.077 | 0.003 | 0      |
| HW        | 0.926**| 0.892**| 0.933**| 0.924**| 0.855*| 0.919**| 0.872*| 0.942**| 0.892**|
| $p$ value | 0.003| 0.007 | 0.002 | 0.003 | 0.014 | 0.003 | 0.011 | 0.002 | 0      |
**Conclusion**

In any livestock farming proposition, the body weight of the animals in different ages was always the most important criterion that affected their productive and reproductive performances. This even held more significant in a meat production entity like pig farming for pork production. The study found that piglets fed with probiotics and milk powder combine (T₃) showed better body growth with increasing body weight and weight gain followed by piglets group fed with probiotics (T₂) and milk powder (T₁) as compared to the control basal fed group (T₀). Linear body measurements like body length, heart girth, and height at wither of the piglets increased proportionately with the rate of body growth in the treatment order as above and showed a high correlation with body weight. Thus, the weight of piglets can be predicted with high accuracy using linear body measurements. In the end, it can be concluded that feeding of suitable probiotics is always beneficial while simultaneous enrichment of the feed with a nutritious supplement like milk powder is even better for the piglets to attain maximum weight at weaning and might affect their post-weaning growth performance.

**References**

18th Livestock Census, (2007). All India report based on quick tabulation plan. Government of India, Ministry of Agriculture, Department of animal husbandry, dairying and fisheries, Krishi Bhavan, New Delhi, pp. 13.

19th Livestock Census, (2012). All India report. Government of India, Ministry of Agriculture, Department of animal husbandry, dairying and fisheries, Krishi Bhavan, New Delhi, pp. 12.

Abe, F., Ishibashi, N. and Shimamura, S. (1995). Effect of administration of bifido bacteria and lactic acid bacteria to newborn calves and piglets. Journal of Dairy Science, 78(12): 2838-2846.

AOAC, (1990). Official methods of analysis (15th edition) Williams S. (ed). Association of Official Analytical Chemists, Washington, D.C., 1990, 152-164

Birteeb, P. T., Tetteh, I.O. and Salifu, A. R. S. (2015). Growth Performance and Weight Estimation of Large White Piglets Weaned at Different Ages. Research & Reviews: Journal of Veterinary Science and Technology, 4(3):15-23.

Bordoloi, T. (1974). Studies on relationship between linear body measurements and growth to evolve prediction equation on body weight in pigs. M.V.Sc. Thesis, Agra University, Agra.

DARE, (2014). Department of Agricultural Research and Education, Ministry of Agriculture, Government of India, New Delhi-110001.

Hartmann, P.E., McCauley, I., Goonneratne, A.D. and Whitely, J.L. (1984). Inadequacies of Sow Lactation: Survival of the Fittest. In: M. Peaker, R.G. Vernon and C.H. Knight (Eds.), pathological strategies in lactation. Academic Press, London, pp. 301-326.

Kharpran, S. (2014). Performance of pre-weaned Hampshire piglets fed with dietary supplementation of dried brewing yeast.

A Thesis submitted to the Assam Agricultural University, Guwahati-781022.

King, R.H., Boyce, J.M. and Dunshea, F.R. (1998). Effect of supplemental nutrients on the growth performance of sucking pigs. Aust. J. Agric. Res., 49(5): 883-887.

Klindt, J. (2003). Influence of litter size and creep feeding on preweaning gain and influence of preweaning growth on growth to slaughter in barrows. J. Anim. Sci., 81:2434-2439.

Lahetinen, T., Rinttila, T., Koort, J. M. K., Kant, R., Levonen, K., Viljanen, M. J., Bjorkroth, J. and Palva, A. (2015). Effects of a multispecies Lactobacillus formation as a feeding supplement on the performance and immune function of piglets.. Livestock Science, 180: 164-171.

Lee, K.W., Lillehoj, H.S. and Siragusa, G.R. (2010). Direct-fed microbials and their impact on the intestinal microflora and immune system of chickens. Journal Poultry Science, 47:106-114.

Machebe, N. S. and Ezekwe, A. G. (2010). Predicting body weight of growing-finishing gilt raised in the tropics using linear body measurements. Asian J. Exp. Biol. Sci., 1(1): 162-165.

Novotni-Danko, G., Balogh, P., Huzsvai, L. and Gyori, Z. (2015). Effect of feeding liquid milk supplement on litter performances and on sow back-fat thickness change during the suckling period. Archives of Animal Breeding, 58(1): 229-235.

Puske, J. R., Payne, H. G., Williams, I. H. and Mullan, B. P. (2005). Early feeding for lifetime performance of pigs. Recent advances in animal nutrition in Australia, 15:171-181.

Pollmann, D. S., Danielson, D. M. and Peo, E. R. (1980). Effect of Lactobacillus Acidophilus on Starter Pigs Fed a Diet Supplemented with Lactose 1. Journal of Animal Science, 51(3):638-644.

Rava, S. (1991). Effect of skim milk feeding and early weaning on the growth performance of Hampshire pigs. M.V.Sc Thesis, Assam Agricultural University, Guwahati, Assam.

Roychoudhury, R. (1978). Studies on pre-weaning growth and its effect on subsequent body weight gains in Landrace pigs. M.V.Sc. Thesis, Assam Agricultural University, Guwahati, Assam.

Shim, S. B., Verstegen, M.W.A., Kim, I.H., Kwon, O.S. and Verdonk, J.M.A.J. (2005). Effects of feeding antibiotic-free creep feed supplemented with oligofructose, probiotics or symbiotics to suckling piglets increases the preweaning weight gain and composition of intestinal microbiota. Archives of Animal Nutrition, 59(6): 419-427.

Venkatachalapathy, R.T., Gopalakrishnan, S. P. and Usha, A.P. (2013). Effect of Probiotics Supplementation on the Performance of Preweaned Piglets. In: Probiotics in Sustainable Food Production: Current Status and Future Prospects “Probiotics in Food Production”, Ramanathan, A. and Senthivel, T. (Eds.), 2: 281.