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Performance of Pigs as Influenced by Different Housing Systems

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ABSTRACT: A study was conducted to assess and compare the growth performance and carcass characteristics of Large White Yorkshire weaned pigs reared under different housing systems, viz intensive, semi-Intensive and extensive systems. System of housing had significant effect on growth, but degree of response varies and it needs to be assessed for recommendation in the field conditions. Parameters such as body weight, feed intake and feed efficiency were recorded at fortnightly intervals; and carcass traits at 180 days of age. Pigs under different housing systems showed comparable final weight, overall weight gain, and average daily gain and feed intake. Carcass traits such as carcass weight, dressing percentage, carcass length, ham, shoulder, loin eye area, and loin weight were comparable among pigs reared under different housing systems. However, extensively reared pigs had significantly higher feed efficiency (P<0.05), lower back fat thickness (P<0.01) and higher meat percentage (P<0.05) than the pigs reared under semi-intensive and intensive systems of housing. Based on this study, it is recommended that the extensive system of housing found to be improves feed efficiency and meat percentages in pigs.

Keywords: Growth performance, Housing System, Carcass Characteristics, LWY pigs.

INTRODUCTION

Pigs are well adapted to both diversified and intensive agriculture and require comparatively lower investment in housing and equipment, compared to other livestock. Pigs are considered the only litter-bearing animal among meat-producing livestock and they can help to meet the meat demand of the ever-increasing population. Housing for pigs takes away a major sum of non-recurring amount (Joachim, 2002) if proper housing is developed and therefore there is a tendency among pig farmers, especially the weaker section of society, to ignore this aspect of pig production. As a result, the pigs are normally housed in dirty enclosures, which contributes to greater mortality of pigs. The farmers are not aware of the contribution of pig housing to economic returns from the piggery unit. As a consequence of various research and development effects, pig farming is changing from a zero-input enterprise to that of a semi-commercial enterprise. This is mainly due to the realization of its positive qualities such as shorter generation interval, higher growth rate, higher litter size at weaning, the yield of two crops per sow per year and the ability to convert agriculture by-products into the meat (ICAR, 2003). However, in general, pig husbandry remains still primitive in India and the major problems perceived are reduced growth rate and piglet mortality due to poor housing and management practices.

MATERIALS AND METHODS

An experiment was designed to study the effect of three different housing systems on growth performance and carcass characteristics of Large White Yorkshire pigs. Twenty-four Large White Yorkshire piglets weaned at the age of 56 days were randomly selected based on body weight into three treatment groups of eight piglets each. The first group was reared under an Intensive system of housing with concrete floors, the second group was reared under a Semi-Intensive system of housing with concrete floors and the third group was reared under an Extensive system with mud floors. All three groups were given a floor space of 10 sq. ft per piglet as per the ICAR standards. All the treatment groups were fed with a grower ration containing 18 per cent crude protein with a calculated energy value of 2640 kcal. All three treatment groups were maintained under standard management conditions except for the treatments specified. The parameters observed were body weight, body weight gain, feed intake and feed efficiency and the carcass characteristics viz., dressing percentage, carcass length, back fat thickness, loin eye area, ham weight, picnic shoulder, loin weight and meat bone and fat ratio to make a clear recommendation through this study. The statistical analysis of data was carried out as per the methods suggested by Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

Growth performance

Body Weight and Weight Gain. The fortnightly body weight and weight gain of piglets reared under Intensive, Semi-Intensive and Extensive systems of

housing as shown in Tables 1, 2, 4 indicated no significant difference in their growth rate. This was in agreement with the observation of Eriksen and Hermanson (2005); Lyngkhoi *et al*. (2020) who reported that the body weight and daily weight gain of pigs are unaffected by the housing system they are reared. However, pigs reared under the extensive housing system had numerically better weight gain compared to indoor-reared pigs (Table 2). Heyer (2004); Akinlabi *et al*. (2018) have also reported better growth rates in pigs reared outdoors compared to indoors. Contrarily Daza *et al.* (2006) observed a better growth rate in indoor-reared pigs. Morrison *et al*. (2007); Lyngkhoi *et al.* (2020) also observed improvement in overall body weight gain of pigs reared in standard housing with concrete floors.

The Average Daily Gain of pigs reared under Intensive, Semi-Intensive and Extensive systems of housing are presented in Table 4. In this study, the ADG was comparatively better in the Extensive system than the other system of housing. Honeyman and Harmon (2003); Stern *et al.* (2003); Heyer (2004) are in agreement with the present study that outdoor-reared pigs gain more when compared to indoor-rearing systems. However, Ruff (2017) stated that average daily gain was not affected by varying floor space in his study.

Feed Intake and Efficiency: The housing system did not alter the feed intake in piglets as shown in Tables 3 and 4. However, pigs reared under extensive and semi-intensive housing showed higher feed intake at the 2nd, 4th, and 6th fortnight ($P<0.05$) and highly significant feed intake ($P<0.01$) at the 3rd, 5th and 8th fortnight interval than pigs under intensive housing (Table 3 and 4). Lahrmann *et al.* (2004) recorded more feed intake in outdoor-reared pigs than indoor-reared pigs. The higher feed consumption observed in extensively and Semi-intensively reared pigs could be attributed to increased demand for energy as a result of more outdoor activities. The limited activities in intensively housed pigs could have demanded less energy resulting in lesser-feed consumption. However, Lebert *et al.* (2002); Daza *et al.* (2006) recorded less feed intake in outdoor-reared pigs and more intake in indoor-reared pigs.

The feed efficiency differed significantly among the three systems of housing gas shown in Table 4. Extensively housed pigs showed better feed efficiency than indoor-reared pigs. This was in accordance with the finding of Lahrmann *et al.* (2004). Contrarily, Honeyman and Harmon (2003) reported that indoor-reared pigs have more efficient converters while Landblom *et al*. (2001); Gentry *et al.* (2004) observed that outdoor-reared pigs have better converters of feed.

Carcass Characteristics

Carcass Weight and Carcass Length and Dressing Percentage: Carcass weight, dressing percentage and carcass length of Large White Yorkshire pigs under three different housing systems revealed no significant difference. However, the result showed the carcass parameters are numerically better in the Extensive and Semi-Intensive than in the Intensive system of housing (Table 5). Van der Wal *et al.* (1993) did not observe any significant variation in the carcass traits observed among indoor and outdoor-reared pigs. Similarly, Gentry *et al.* (2004) did not observe any difference in the carcass length among them. However, Akinlabi *et al*. (2018) concluded that crossbred Hampshire pigs being reared on fermented feed and deep litter housing could produce highly graded carcasses and improvement in meat quality. In contrast, Honeyman (2005) noticed higher carcass weight in outdoor-reared pigs while Daza *et al.* (2006) recorded higher carcass weight in indoor-reared pigs. Carolina *et al.* (2003) also noted a better dressing percentage in indoor-reared pigs than in outdoor-reared pigs.

***Back Fat Thickness*:** In the present study, Semi-intensively housed pigs had significantly higher ($P<0.01$) back fat thickness than others (Table 6). Extensively housed pigs had a thinner back fat thickness of 0.95 ± 0.04 inches. It was also observed that the thickness was higher in intensively reared pigs than that in extensively reared pigs. Thinner back fat thickness in outdoor-reared pigs was also recorded by Stern *et al.* (2003); Honeyman (2005); Daza *et al.* (2006). However, higher back fat thickness in outdoor-reared pigs is reported by Bee *et al.* (2004). The lesser back fat thickness in outdoor-reared pigs could be attributed to a greater energy expenditure through higher physical activity, therefore leaving less excess energy available for fat deposition. The amount of energy requirement for maintenance of body temperature and motor activity might not be present to the same degree in intensively reared pigs asin extensively reared pigs (Warriess *et al.*, 1983).

***Loin Eye Area and Ham, Loin and Picnic Shoulder Percentages*:** There was no significant difference in the loin eye area and ham, loin and picnic shoulder percentages (Table 6) among pigs reared under the three different housing systems. Gentry *et al.* (2004) also noted no difference in loin percentage between indoor and outdoor-reared pigs. Bee *et al.* (2004) recorded higher ham and shoulder percentages in outdoor-reared pigs than indoor-reared pigs. Honeyman (2005); Daza *et al.* (2006) noted higher loin and ham percentages in indoor-reared pigs than the outdoor-reared pigs.

***Meat, Fat and Bone Percentages*:** A significant ($P<0.01$) difference in the meat and fat percentage was observed in the pigs reared under different housing systems. The meat percentage is significantly higher in the extensive housing system followed by semi-intensive and intensive housing systems. This report was in agreement with Strudsholm and Hermansen (2005). Olsson *et al.* (2003) also found that conventionally raised pigs had higher lean meat than organically (outdoor) raised pigs. The higher meat percentage and lower fat percentage in extensively reared pigs as compared to the pigs of the other two systems of rearing could be attributed to the greater amount of physical activities in the outdoor reared pigs (Warriss *et al.*, 1983).

Table 1: Fortnight body weight (kg) in Large White Yorkshire piglets reared under three different housing systems (n=8).

Fortnight interval	Intensive system	Semi-Intensive system	Extensive system	'F' value
0	12.08 ±1.29	12.06 ±1.22	12.08 ±1.14	0.001 ^{NS}
1	15.12 ±1.67	16.43 ± 1.86	16.47 ±1.61	0.200 ^{NS}
2	20.62 ±2.34	21.17±2.53	20.83 ±2.01	0.014 ^{NS}
3	25.56 ±2.79	25.87 ±2.57	26.80 ±2.25	0.063 ^{NS}
4	31.22 ±2.95	32.43 ± 3.54	32.60 ± 2.46	0.063 ^{NS}
5	37.56 ±3.10	36.83 ±3.69	38.98 ±3.51	0.108 ^{NS}
6	43.16 ±3.29	42.46 ±3.81	45.92 ± 3.47	0.286 ^{NS}
7	49.41 ± 3.72	48.58 ±4.10	51.55 ±3.52	0.102 ^{NS}
8	54.17 ±3.81	53.65 ±4.04	57.55 ±3.37	0.313 ^{NS}

Table 2: Fortnight weight gain (kg) in Large White Yorkshire piglets reared under three different housing systems (n=8).

Fortnight interval	Intensive system	Semi-intensive system	Extensive system	'F' value
1	3.03±10.54	4.37±10.66	4.38±10.51	1.783 ^{NS}
2	5.50±10.82	4.73±10.75	4.36±10.51	0.671 ^{NS}
3	4.93±10.68	4.70±10.41	5.96±10.65	1.272 ^{NS}
4	5.66±10.36	6.56±1 1.02	5.80 ±10.47	0.499 ^{NS}
5	6.33± 11.38	4.40±10.35	6.381±1.17	1.123 ^{NS}
6	5.66±10.37	5.62±10.37	6.93± 11.00	1.356 ^{NS}
7	6.25±10.76	6.12±10.40	5.62 ±10.39	0.363 ^{NS}
8	4.76 ±1 0.77	5.06±10.33	6.00 ±10.73	1.004 ^{NS}

Table 3: Fortnight feed intake (kg) in Large White Yorkshire piglets reared under three different housing systems (n=8).

Fortnight interval	Intensive system	Semi-intensive system	Extensive System	'F' value
1	13.57 ±0.79	15.27 ±0.87	15.21 ±0.30	1.874 ^{NS}
2	21.30^{b}± 0.31	22.82^{a}±0.27	22.75^{a} ± 0.48	5.518*
3	23.00^{b} ± 0.36	23.71^{ab}±0.18	24.85^{a}±0.28	10.750**
4	25.92^{b}±0.20	26.92^{a}±0.27	26.71^{ab}±0.28	4.179*
5	31.78^{a}±0.57	25.00^{b}± 1.32	30.71^{ab}±0.26	18.455**
6	30.00^{c}±0.56	31.42b^{c}± 0.99	34.42^{a} ± 0.23	11.208*
7	34.71 ± 1.16	33.85 ±0.87	31.42 ±0.56	3.550 ^{NS}
8	29.00^{bc}±0.85	28.57^{c}±0.67	33.71^{a}±0.94	17.823**

NS – Non-significant, * - Significant (P<0.05), ** - Significant (P<0.01); Values bearing different superscripts in columns differ significantly.

Table 4: Growth performance of Large White Yorkshire piglets under different housing systems(n=8).

Parameters	Intensive housing system	Semi-intensive housing system	Extensive housing system	F value
Overall weight gain (kg)	42.08 ±13.41	41.58± 12.93	45.46 ±12.38	0.517^{NS}
Average daily gain (kg)	0.35 ± 0.03	0.35 ± 0.03	0.38 ± 0.02	0.53 ^{NS}
Average daily feed intake (kg)	1.62 ±0.14	1.62±10.12	1.67±10.17	0.049 ^{NS}
Feed efficiency ratio	4.5^{a} ±0.01	4.4^{a} ±0.15	4.12^{b}±0.32	4.25*

NS – Non-significant, * - Significant (P<0.05) ; Values bearing different superscripts in columns differ significantly

Table 5: Carcass characteristics of Large White Yorkshire piglets under different housing systems (n=8).

Carcass characteristics	Intensive housing system	Semi-intensive housing system	Extensive housing system	F value
Carcass Weight (kg)	32.63 ± 14.15	35.75 ± 11.9	34.93 ±13.33	0.396 ^{NS}
Dressing Percentage	59.97 ± 1.99	63.40 ± 1.18	60.57 ± 1.64	2.002 ^{NS}
Carcass Length (cm)	69.00 ±1.376	69.62 ±1.668	71.25 ±1.340	0.623 ^{NS}
Loin Eye Area (cm^{2})	22.62 ±0.59	22.75 ± 0.07	23.88 ± 1.04	0.863 ^{NS}
Back Fat Thickness (Inches)	1.01^{b} ± 0.04	1.24^{a} ± 0.07	0.95^{b} ± 0.05	7.282**
Ham (%)	25.43 ± 0.82	26.76 ± 1.02	25.07 ± 1.89	0.467 ^{NS}
Loin (%)	23.43 ± 1.08	24.61 ± 1.02	24.05 ± 0.88	0.337 ^{NS}
Picnic Shoulder (%)	16.74 ± 1.34	18.93 ± 0.30	18.43 ± 0.80	1.612 ^{NS}
Meat (%)	51.87^{b} ± 1.20	51.44^{b} ± 0.81	55.99^{a} ± 1.36	4.777*
Fat (%)	26.54^{b} ± 1.25	25.120^{a} ± 0.47	26.24^{b} ± 0.56	4.390*
Bone (%)	20.17 ±1.74	18.09 ± 0.64	19.59 ± 0.07	0.797 ^{NS}

NS – Non-significant, *- Significant (P<0.05), ** - Significant (P<0.01); Values bearing different superscripts in columns differ significantly.

CONCLUSIONS

Piglets were reared under three different housing systems *viz.*, intensive, semi-intensive and extensive systems. The growth and carcass characteristics of the pigs under different housing systems were compared. Extensively housed pigs had better feed efficiency with less back fat thickness and higher meat percentage than intensively and semi-intensively housing pigs.

FUTURE SCOPE

Since the study was conducted under organised farming conditions, the effect under field conditions is to be explored before making suitable recommendations.

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Conflict of Interest. None.

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