**Phenotypic characterization and performance evaluation of *Thaokhri* pig of Assam, India**

**Abstract**

Aims: To evaluate the performance of *Thaokhri* pigs of Assam, India

Place and Duration of Study: The study was conducted in Kokrajhar and Gossaigaon, located in the Kokrajhar district of Assam, India, during the period from 2020 to 2022.

Methodology: Nineteen traits were measured in 756 numbers of *Thaokhri* pigs over a period of 2020-2022. The traits considered in the study were A) Morphometric traits at adult age ( 8month) *viz.* chest girth (cm), body length(cm), height at withers(cm) and neck girth; B) Growth traits *viz.* body weight (kg) at birth, weaning (2 months), 8 months and 1 year; C) Reproductive traits (days) *viz.* age at first oestrous, age at first mating, age at first furrowing, furrowing interval; D) Litter traits *viz.* litter size at furrowing (nos.), litter weight at birth (kg) and litter size at weaning (nos.) and E) Carcass traits *viz.* carcass weight (kg), carcass length (cm), dressing percentage (%) and back fat thickness (cm). Statistical analysis of the data generated was done using the software SPSS version 24.

Results: The mean along with standard errors were estimated for various morphometric, growth, reproductive, litter and carcass traits, were found to be 64.40±2.23, 75.40±1.91, 52.90±1.51 and 52.25±2.31cm as chest girth, body length, height at withers, neck girth at adult age; 0.61±1.71, 4.97±1.66, 21.37 ± 2.34 and 34.25± 3.20 kg respectively as body weight at birth, weaning (2 months), 8 months and 1 year; 227.48 ± 3.39, 247.85 ± 2.44, 360.34 ± 5.46 and 195.00±2.15 as Age at first oestrous (days), Age at first mating (days), Age at first furrowing (days) and Furrowing interval (days); 5.19 ± 3.45, 3.26 ± 3.42 and 4.05 ± 1.13 as Litter size at furrowing (nos.), Litter weight at birth (kg) and Litter size at weaning (nos.) and 19.60 ± 3.12, 46.90 ± 2.68, 57.00 ± 1.86 and 1.45 ± 1.21 respectively as carcass weight (kg), carcass length (cm), dressing percentage (%) and back fat thickness (cm).

Conclusion: The present study provides baseline information on morphometric, growth, reproduction , litter and carcass traits of *Thaokhri* pig, an indigenous pig of Assam under native field condition would be of great help in documentation and development of breed descriptors for registration, improvement and conservation of this precious germplasm.

***Key words:*** *Assam,**Indigenous pig,**Morphometric, Performance, Production, Reproduction*

1. **Introduction**

The pig industry plays a crucial role in India's livestock sector, contributing significantly to rural livelihoods, food security and economic growth. India is home to both indigenous and exotic pig breeds, each adapted to different agro-climatic conditions. While indigenous breeds are well-suited to local environments and require minimal inputs, exotic breeds are preferred for their higher productivity. Pigs are domesticated across different regions of India, particularly in the South-Central and North-Eastern regions. Each area has its own locally adapted pig breed, and many households rear one or two pigs annually [1]. It is important to recognize that the industrialization of pig farming is a relatively recent development on a global scale. Certain ethnic communities in the country traditionally rear pigs, particularly black-coloured ones, for festivals and ceremonial occasions [2].

*Thaokhri* pigs (Fig 1) are unique non-descript pig and are primarily found in the north-western region of the northern Brahmaputra valley, particularly in Kokrajhar district, Assam, India, at coordinates 89º 58´12.00´´E and 26º 26´60.00´´N, covering 3,169 square kilometres. Generally, *Bodo* community and occasionally the *Adivasi* community of Assam reared this pig traditionally from time immemorial. They are small, pot-bellied pigs and known for their dwarf size. The name "*Thaokhri,"* derived from *Bodo* language which means spindle used by the local people in sericulture as *Thaokhri* pig body resembles a spindle. It is narrow and tapering towards both end and broader in middle as having a pendulous stomach. They are reared for meat and are also traditionally integral part of *Bodo* community as it is needed compulsory in ritual purposes and after that the meat is utilised in community feast. Due to religious significance, almost every household rear 2-3 numbers of *Thaokhri* pigs. The breed has gained popularity due to its minimal production costs requiring very little expenses in housing, feeding, labour, or transportation. They



**Fig. 1 *Thaokhri* pig**

are maintained exclusively by tethering and feeded with left over of kitchen, vegetables etc. Their ease of management and low cost of production make them an important income source for poor families. However, crossbreeding programs have led to a gradual dilution of the native germplasm, making conservation efforts vital for preserving this unique breed. *Thaokhri* pigs have distinct physical traits, with both sexes sharing a black coat, straight snout, erect small ears and medium to long bristles with coarse hair. The hooves are fully placed, and the adult pig has a concave top line. Reproductively, they have 8 to 10 teats, located in the thoraco-abdominal region.

1. **Materials and Methods**

**2.1 Source of Data and Data Collection:** The data was collected from the breeding tract of *Thaokhri* pig which is available only in Kokrajhar and Gossaigaon areas of Kokrajhar district of Assam, India. Data were collected by personal visits and providing questionaries to the farmers.

**2.2 Traits studied:** Morphometric traits at adult age (cm) i.e. 8months age *viz.* chest girth , body length, height at withers and neck girth; Growth traits *viz.* body weight (kg) at birth , weaning (2month), 8 months and 1 year;; reproductive traits *viz.*, age at first oestrous (days), age at first mating (days) in female, age at first furrowing (days), furrowing interval (days); litter traits *viz.* litter size at furrowing (nos.), litter weight at birth (kg) and litter size at weaning (nos.) and carcass traits *viz.* carcass weight (kg), carcass length (cm), dressing percentage (%) and back fat thickness (cm).

* 1. **Recording procedure of traits:**

**TABLE 1. Studied Traits and Methods of Measurement**

|  |  |
| --- | --- |
| **Traits** | **Method of Measurement** |
| **Body length** | The body length was measured as a straight-line distance from the occipital bone to the base of the tail. It was recorded in centimetre. |
| **Height at withers** | It was measured as the vertical distance from the top of the scapula bone to the ground parallel to the fore legs and recorded in centimetre. |
| **Heart girth/chest girth** | Measured as the circumference of the chest behind the elbow joint by placing the measuring tape and was recorded in cm. |
| **Body weight** | Body weight of the animals at different were recorded by measuring their weight in kilograms at respective ages by using weighing balance |
| **Age at first oestrus** | The total nos. of actual days from date of birth to date of coming to first heat. |
| **Age at first mating** | The total nos. of actual days from date of birth to the date of first mating |
| **Age at first farrowing** | Calculated as actual days from date of birth to the date of first farrowing. |
| **Farrowing interval** | The days between two consecutive farrowing. |
| **Litters size at birth** | It is recorded as total nos. of piglets both alive for each individual female in a farrowing. |
| **Litter size at weaning** | It is recorded as the total nos. of live piglets weaned per litter |
| **Litter weight at birth** | It is the total birth weight of all the piglets from alive to a dam and recorded in Kg. |
| **Carcass weight** | The weight of the carcass was measured in Kg by using a balance. |
| **Carcass length** | The carcass was first split into two equal halves by cutting from belly to sternum on the ventral side and cutting the vertebral column longitudinally on the dorsal side. The carcass length was then measured as a straight-line distance from the anterior edge of the first rib to the front edge of the aitch bone (symphysis pubis). The measurements were taken for each half of the carcass separately and average value was recorded (cm) as the carcass length. It was measured with a measuring tape. |
| **Dressing percentage** | The dressing percentage was recorded as a ratio of the dressed carcass weight (without head) to live weight and expressed in percentage. |
| **Back fat thickness** | The thickness of back fat was measured on the half carcass at 3 points viz. 1st rib, last rib and last lumber vertebra. The measurements were recorded in centimetre by use of a scale. The mean value of the three measurements is recorded. |

**2.4 Sample size :** Data on different traits were collected from 756 numbers of *Thaokhri* pigs over a period of 2020-2022

**2.5 Statistical Analysis:** Descriptive statistics, including the mean and standard error, were computed for each trait using SPSS Statistics, version 24 [3]. The dataset was first examined for any missing or outlying values to ensure accuracy in the analysis. For each trait, the mean was calculated to determine the central tendency of the data, and the standard error (S.E.) was computed to assess the variability of the mean estimate.

**3. Results and discussion**

The average along with standard errors of the traits under study are given in Table no. 2

|  |  |  |
| --- | --- | --- |
| **Traits** | **Average ± S.E.** | **Total number of populations (N)** |
| 1. Morphometric trait ( adult age i.e. 8months ) | | |
| i) Chest-girth (cm) | 64.40± 2.23 | 123 |
| ii) Body length (cm) | 75.40± 1.91 | 123 |
| iii) Height at withers (cm) | 52.90± 1.51 | 123 |
| iv) Neck girth (cm) | 52.25± 2.31 | 123 |
| 1. Growth trait |  |  |
| i) Birth weight | 0.612 ± 1.71 | 38 |
| ii) Weaning weight (2 months) | 4.970 ± 1.66 | 298 |
| iii) Body weight at 8 months | 21.369 ± 2.34 | 168 |
| iv) Body weight at 1 year | 34.250 ± 3.26 | 148 |
| 1. Reproductive traits |  |  |
| i) Age at first oestrus(days) | 227.85 ± 3.39 | 130 |
| ii) Age at first mating (days) | 247.85 ± 2.89 | 117 |
| iii) Age at first furrowing (days) | 360.34 ± 5.36 | 105 |
| iv) Furrowing interval (days) | 195.00 ± 2.15 | 99 |
| 1. Litter traits |  |  |
| i) Litter size at furrowing | 5.19 ± 3.45 | 98 |
| ii) Litter weight at birth (kg) | 3.26 ± 3.42 | 98 |
| iii) Litter size at weaning | 4.05 ± 1.13 | 84 |
| 1. Carcass traits | | |
| i) Carcass weight (kg) | 19.60 ± 3.20 | 18 |
| ii) Carcass length (cm) | 46.90 ± 2.55 | 18 |
| iii) Dressing percentage (%) | 57.00 ± 1.94 | 18 |
| iv) Back Fat thickness (cm) | 1.25 ± 2.53 | 18 |

**Table no 2. Mean along with standard error (S.E.) of morphometric, growth, reproductive, litter and carcass traits in *Thaokhri* pigs**

**3.1 Body Measurements**: The study assessed various body measurements such as chest girth, body length, height at withers and neck girth inadult *Thaokhri* pigs. The results revealed 64.4±2.23, 75.4±1.91, 52.9±1.51 and 52.25±2.31cm as chest girth, body length, height at wither, neck girth. A higher average heart girth (77.31+0.27cm) and lower body length and height at withers (66.41+0.17 and 44.7+0.20 cm) at adult age in Indigenous pigs of Assam [5]. Similarly, higher chest girth (73.23±3.15) and lower body length (61.02±3.13cm) and height at withers (51.88±4.67cm) was recorded in adult desi pigs of Bareilly [6]. A higher chest girth (84.49±4.84cm) and height at withers (58.41±1.69 cm) and lower body length (64.80±2.13cm) was reported for indigenous pigs of Tamil Nadu [7]. Higher value for chest girth (82.99±0.42cm), body length (80.22±0.40cm), height at withers (64.55±0.35cm) and neck girth (68.62±0.39cm) were estimated in Doom pig of Assam [8].

**3.2 Body Weight:** The body weight at birth, weaning (2month), 8 months and 1 year were found to be 0.61±1.71, 4.97±1.66, 21.37 ± 2.34 and 34.25± 3.20 kg, respectively. A comparable birth weight was reported by [17] in Niang Megha (0.64 ± 0.02 kg in), [19] in Naing Megha pigs (0.64±0.02kg) and [11] in doom pig (0.66±0.05 kg). However, higher birth weight was seen by [20] in Ghungroo pigs reared under field conditions (1.08±0.22 kg), [11] in Mizoram non-descript local pig (0.86 ± 0.08 kg); [16] in Ghungroo pig (0.96±0.02 kg) and [9] in local pig of Dima Hasao district of Assam (0.53± 0.07 kg). Contrastingly, a lower birth weight observed in Khasi Local (0.485 ± 0.23) and Sikkim local pig (0.49±0.31kg) by [12; 13].

The weaning weight as reported by [12] in Khasi Local pigs (4.97 ± 0.21kg) and [11] in Mizoram local pigs (4.87±0.28 kg) are in agreement with the present finding. However, A higher weaning weight reported by [16] in 7.08±0.25 kg in Ghungroo pig and 5.47±0.13 kg in Niang-Megha [14]. A much higher mean weight at birth and weaning of Ghungroo Pig as 0.96±0.02 and 7.07±0.26 kg and higher weaning weight in Niang Megha pigs (5.47±0.13 kg) [19] and [13] in Sikkim local pigs (4.90±0.33 kg). In a local pig of Dima Hasao district of Assam, hilly terrain region in North Eastern state of India the body weight (kg) was observed as 5.07a ± 0.53 months [9].

A similar body weight of Dima Hasao district of Assam reported the body weight at 8 months (32.45 ±1.4kg) in local pig [9]. Contrastingly, higher body weight at 8 months and 1 year age reported by [8] in Doom pig of Assam (40.48±3.83 and 64.23±3.39) and [4] in Niang Megha as 28.75± 0.76 kg in 8 months of age.

**3.3 Reproductive Traits:** The reproductive traits of *Thaokhri* pigs were evaluated to assess their breeding efficiency and productivity. The findings provide important observation into the breed’s reproductive potential, which can guide selection and management strategies for improved production. The present study revealed 227.48 ± 3.39, 247.85 ± 2.44, 360.34 ± 5.46 and 195.00±2.15 as age at first oestrous (days), age at first mating in female (days), age at first furrowing (days) and furrowing interval (days).

The age at sexual maturity in female Naga local pigs found to be 248.12±34.2 days which align with present report [14]. The age of first farrowing was reported as 12.11±2.51 months in non-descript local pig of Mizoram by [11], was found to be corroborated with the present finding. A similar age at puberty/maturity was observed by [10] in Ghungroo pig (7.8±0.41 months) and [9] in local pig of Dima Hasao district of Assam (7.51±0.14month). Also, [4] observed a similar age at sexual maturity (213.19±2.86 days) and age at first farrowing (362.67±2.95 days) in Niang Megha pig. Slightly lower age at first heat (202.40±2.20days), age at first fertile service (225.65±5.63days), age at first farrowing (340.56±6.11 days) and a higher Inter farrowing interval (215.63±7.25 days) was observed in Doom pig [8]. However, the age at first farrowing reported by [15] on village pig in Sri Lanka (9.50 ± 2.61 months) was found to be quite lower than the present report. A lower age at first heat was reported by [23] in Bangladeshi sow (6 months), [16] in Ghungroo and Niang Megha pigs (190.38± 4.38 days and 210.5± 2.42 days), respectively. Contrastingly, a higher age at puberty was reported by [14] in female Naga local pigs (248.12±34.2 days) and [10] in Niang Megha pigs (9.85±1.08 months). The age at first fertile service as 235±5.21 days and 241.3±2.25 days in Ghungroo pig and Niang Megha pigs which were higher than the present report [16]. A higher age at first conception (8.73±2.67 months), age at first farrowing (12.5±1.65 months) and farrowing interval (7.55±2.40 months) was observed in local pig of Dima Hasao district of Assam [9]. A higher age of first farrowing was reported by [14] in Naga local pig (12.67±5.51 months). A similar farrowing interval was reported by [12] in Khasi local pig (194.52 ± 9.47 days), [13] in Sikkim local pig (196.27±8.37 days) and [21] in native pigs in Bangladesh (6.09 ±0.02 months). However, higher farrowing interval as compared to *Thaokhri* pig reported by [17] in Niang Megha pigs (207.05± 8.16 days), [14] in Naga local pig was 304.90±103.20 days, [18] in Doom pig and Niang Megha (213.533±0.396 days and 206.121±0.785 days). Contrastingly, [11] in non-descript pig of Mizoram (8.23 ±0.20 months), [22] reported lower farrowing interval in Mali pig of Tripura (178.5±0.9 days), [15] in Sri Lankan local pig 8.91±2.49 months, [16] in Ghungroo (169± 4.88 days), [10] in Ghungroo and Niang Megha pig (7.2±0.19 months 7.18±0.3 months). The variation in age of sexual maturity might be due to various reasons like differences in their level of nutrition, adverse social environment, non-uniform body weight, different season of the year, breed differences, disease or parasitic infestation and other managemental practices adopted [14]. Rearing system and managemental conditions associated with it greatly influence age of first farrowing.

Thereby, the reproductive performance of *Thaokhri* pigs highlights their moderate fertility, consistent farrowing intervals and acceptable litter sizes. These findings emphasize the breed’s potential for sustainable pig farming, though further genetic selection and improvedmanagement practices could enhance reproductive efficiency. Strategies such as optimized nutrition, controlled breeding programs and selection for superior reproductive traits can further improve productivity and economic viability in *Thaokhri* pig farming.

**3.4 Litter traits :** The present study revealed litter size at furrowing, litter weight at birth (kg) and litter size at weaning as 5.19 ± 3.45 nos., 3.26 ± 3.42 kg and 4.05 ± 1.13 nos., respectively. A comparable litter size at weaning observed by [9] in Nagaland local pigs (4.33+0.53), [8] reported a similar litter size at birth (5.92±0.62 nos.), litter weight at birth (3.90±0.32 kg), litter size at weaning (4.90±0.33 nos.). Litter size at birth and weaning (5.80±0.42 and 4.57a±0.48) in Niang-Megha pig was observed [4] corroborated with the present result. However, a higher litter size at birth was reported by [11] in non-descript local pigs (7.40±0.40), [16; 17] in Ghungroo and Niang-Megha pig (10.02± 0.35 and 6.5± 0.21), [18] in Dome and Niang-Megha pig (6.250±0.237 and 6.080±0.219). Higher litter size at birth observed by [10] in Ghungroo (8.7±0.25) and Niang Megha (6.34±0.26) and [9] in Nagaland local pigs (6.18+0.18). Contrastingly, a lower litter size of 4.3±0.45 numbers at birth reported by [13] in Sikkim local pig.

Litter weight at birth similar to *Thaokhri* pig was observed by [13] as 3.00±0.45 kg (non-descript Sikkim local pig). But, a higher litter weight at birth as compared to present report observed by [11] and [16] as 6.40±1.43 kg, and 9.5± 0.23 kg in Ghungroo pig. Nutritional aspect before farrowing has significant effect on litter weight at birth.

Since, the desi pigs are mostly reared under scavenging system, they encounter adverse environmental conditions and this has tremendous impact on litter size. Factors like type of pigs, management practices, mortality rate and prevalent of climatic condition affects the litter size at weaning [14].

**3.4 Carcass Characteristics**: The carcass characteristics of *Thaokhri* pigs were assessed in castrated males slaughtered between 10 to 12 months of age. The findings provide key understanding into the breed’s meat yield, dressing percentage and back fat thickness, which are crucial for evaluating their commercial potential. The carcass weight (kg), carcass length (cm), dressing percentage (%) and back fat thickness (cm) in the present study are19.60 ± 3.12, 46.90 ± 2.68, 57.00 ± 1.86 and 1.45 ± 1.21, respectively. Comparable carcass length (49.69±0.38 cm) and dressing percentage (58.85± 0.24 %) and higher backfat thickness(1.75±0.03cm) and lower carcass weight(14.03±0.20 kg) were recorded in indigenous pigs of Assam[24]. The carcass length in Doom pigs of Assam (48 cm) which is in good agreement to present finding [8]. [9] observed a higher carcass weight (31.83 ± 0.12 kg), dressing percentage (72.41±0.57%), and back fat thickness (3.03±0.06 cm) in local pigs of Dima Hasao district of Assam. Also, higher carcass weight, dressing percentage and back fat thickness (42 kg, 77.54% and 28 mm) observed in Doom pigs of Assam by [8].

Carcass weight indicates moderate carcass yield, which aligns with the growth performance observed in this indigenous breed. The relatively uniform carcass weight across the sampled population suggests consistency in growth and meat production under similar rearing conditions. The observed carcass length suggests that *Thaokhri* pigs possess a well-structured body conformation suitable for meat production. The dressing yield falls within the expected range for indigenous pig breeds and suggests efficient carcass recovery, making *Thaokhri* pigs a viable option for meat production. The dressing percentage is influenced by factors such as body composition, fat deposition and management practices. The back fat thickness, a key indicator of meat quality and carcass composition, averaged 1.40 ± 2.53 cm, ranging from 1.00 to 1.75 cm. The moderate fat deposition suggests that *Thaokhri* pigs maintain a lean carcass, which may be advantageous for consumers preferring leaner pork. However, optimal fat cover is essential for meat flavour, tenderness and juiciness, indicating that further selection and nutritional strategies could enhance carcass quality.

Hence, the study highlights the potential of *Thaokhri* pigs for meat production, with desirable carcass traits such as moderate weight, good dressing percentage and lean meat characteristics. These findings can aid in developing breeding and management strategies aimed at improving meat yield and quality in this indigenous pig breed.

**4. Conclusion**

*Thaokhri* is a unique germplasm belonging to Assam, India. They are reared only in Kokrajhar district of Assam. The study generated baseline information on the production appraisal of this non-descript germplasm which is strongly attached to the traditional culture of rural people. Baseline information and phenotypic characterization of this germplasm can be utilised as breed descriptor for registration of this animal, development of strategies for improvement and conservation of this germplasm**.**

**ACKNOWLEDGEMENTS**

The authors sincerely acknowledge the help and support received from the pig farmers of Kokrajhar district of Assam and ICAR-AICRP on Pig, Directorate of Research (Veterinary), Assam Agricultural University, Khanapara, Guwahati-781022, Assam.

**COMPETING INTERESTS**

Author has declared that no competing interests exist.

**AUTHORS’ CONTRIBUTIONS**

1.Dhireswar Kalita: Conceptualization and methodology, 2.Nipu Deka : Investigation and Data curation, 3.Nilotpal Das: Survey work and data collection, 4.Olympica Sarma : Statistical analysisand 5.Arundhati Phookan: Manuscript preparation

**COMPETING INTERESTS DISCLAIMER:**

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

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