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Growth and reproductive performance of Rani breed of pig in various agro-climatic condition of Nagaland

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ABSTRACT

The objective of the present study was to compare the growth and reproductive performance of Rani breed of pig in various agro-climatic condition of Nagaland. The present investigation was conducted at six locations, i.e. Dimapur, ICAR farm and Peren are low hill (300 m) area; Kohima and Wokha are mid hill (1000–1500 m) area and Kiphire district is high hill (2500 m) area. Body weight of male and female pig varied from 67 to 85 kg and 58 to 77 kg at 10 months of age. Body weight at 10 months of age was significantly higher in low hill (Dimapur, Peren and ICAR farm) area compared to high hill area (Kiphire) at all stages in male as well as female pig. Average daily weight gain was significantly higher at ICAR farm compared to other five locations in male and female pig. Age at first estrus and age at first mating was significantly higher at Kiphire. Estrus and mating occurred at significantly shorter age in pig at ICAR farm. There was no variation in gestation length across the different locations. Litter size at birth and litter weight at birth varied from 8 to 9 numbers and 9 to 10 kg. Litter size at weaning was significantly lower at Kiphire. Litter weight at weaning was significantly higher at ICAR farm. Significantly higher weaning to estrus interval was recorded at Kiphire. Pre-weaning mortality was recorded from 7 to 18% and it was highest at Kiphire district followed by Kohima and Peren. There was variation recorded in growth and reproductive performance of Rani breed at different location in Nagaland, however, the performance was better than pure exotic and indigenous breed.

Keywords: Growth Rate, Nagaland, Pig, Rani Breed, Reproductive Performance

Pig rearing is an integral part of tribal farmers in North Eastern India. Pig farming plays a significant role in the livelihoods and socio-cultural practices of the tribal farmers in Nagaland. Pig alone accounts for 55.38% of total livestock population in Nagaland (Kumaresan *et al.* 2007, Singh and Mollier 2016). Per capita consumption of pork at 1.1 kg per month is highest in Nagaland in India (NSSO, GoI 2012). Tribal farmer practice pig farming in traditional way and had developed traditional practices for management, healthcare and breeding (Singh *et al.* 2017, Singh *et al.* 2019a). Every rural household rears two to three pigs in backyard condition. This is a low input low output system in which there is maximum utilization of natural resources available locally (Singh *et al.* 2018). In Nagaland, 75.59% pigs are crossbreed while only 24.41% are indigenous breeds. This is the only state having highest percentage of crossbred pig population owing to high demand of pork and around 50% gap exist between demand and availability. Although the state is first to declare the pig breeding policy in the country, but farmers follow indiscriminate breeding mainly due to unavailability of pure germplasm of any breeds and lack of awareness (Singh *et al.* 2019b). To improve upon the existing system of pig production, Rani breed of pig was introduced in Nagaland under ICAR-Mega Seed Project on Pig (Singh *et al.* 2018). Rani is a cross of Hampshire and Gunghroo breed developed by ICAR-National Research Centre on Pig, Guwahati, India. The breed has been adopted well over the entire North Eastern Region of India due to higher growth rate and high fecundity (Singh *et al.* 2018). However, there is no study regarding growth and reproductive performance of this breed particularly in various agro-climatic condition of Nagaland. Therefore, the present study was done to study the growth and reproductive performance of Rani breed of pig in various agro-climatic condition of Nagaland.

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MATERIALS AND METHODS

The present investigation was conducted at six locations in five districts of Nagaland, viz. Dimapur, Kiphire, Peren, Wokha and Kohima from June 2016 to August 2019. The five districts selected have different agro-climatic condition. The altitude of the study area varied from 280 m at mean sea level to 2500 m at mean sea level. Dimapur and Peren

are low hill (300 m) area; Kohima and Wokha are mid hill (1000–1500 m) area and Kiphire district is high hill (2500 m) area. Piglets of Rani breed were supplied to the farmers from ICAR pig research farm, ICAR Research Complex for NEH Region, Nagaland Centre, Jharnapani, Medziphema. Growth and reproductive performance of 10 sows and 10 boars from each district (total 60 sows and 60 boars) were collected and analysed for the present study. Data regarding the growth and reproductive performance of Rani pigs, required for the experiment were collected from farmers on weekly basis. Data from ICAR pig farm were taken for comparing with the field results. The required data were collected after thorough and proper identification and markings of the animals of the respective farmers of the different locations. Average body weight gain per day was calculated from 2 months of age to 10 months of age. Reproductive performance of sows were recorded in terms of following parameters, i.e. age at first estrus, age at first mating, gestation length, litter size at farrowing, litter weight at farrowing, litter size at weaning, litter weight at weaning, weaning to estrus interval (WEI) and pre-weaning mortality. Data were analysed by one way ANOVA followed by Dunken post hoc test using R 3.6.2 packages for comparing the mean. All data were presented as mean±S.E. The difference of mean values for all data analysed with $P<0.05$ was considered as significant.

RESULTS AND DISCUSSION

Growth rate: Body weight of male pig varied from 67 to 85 kg at 10 months of age at different locations (Table 1). Similarly, in female pig, body weight varied from 58 to 77 kg at 10 months of age at different locations (Table 2). Body weight at 10 months of age in male and female pig was significantly ($P<0.05$) lower in Kiphire district compared to all other locations. Body weight at 10 months of age was significantly ($P<0.05$) higher in low hill (Dimapur, Peren and ICAR farm) area compared to high hill area (Kiphire) at all stages in male as well as female pig. There was variability recorded in body weight in three different locations in low hill area in both male and female

Table 1. Monthly body weight and average body weight (kg) gain of male pig of Rani breed (Mean±S.E.) in different locations in Nagaland

Age in month	Low hill area (200 to 300 m)			Mid hill area (1000 to 1500 m)		High hill area (2500 m)
	Dimapur	ICAR Farm	Peren	Wokha	Kohima	Kiphire
2 M	8.50±0.14^{a}	8.80±0.18^{a}	7.50±0.16^{b}	7.93±0.14^{b}	7.83±0.15^{b}	7.64±0.16^{b}
3 M	13.57±0.23^{b}	17.00±0.36^{a}	14.05±0.20^{b}	14.24±0.43^{b}	14.45±0.17^{b}	13.55±0.23^{b}
4 M	22.85±0.22^{b}	25.59±0.47^{a}	22.10±0.25^{b}	22.66±0.63^{b}	21.74±0.29^{b}	20.18±0.23^{c}
5 M	33.16±0.31^{ab}	33.99±0.59^{a}	32.24±0.30b^{c}	30.86±0.97^{cd}	30.44±0.28^{d}	28.00±0.37^{e}
6 M	43.33±0.19^{a}	44.30±0.56^{a}	41.40±0.32^{b}	40.60±1.16^{bc}	39.53±0.53^{c}	35.75±0.45^{d}
7 M	54.55±0.37^{a}	54.32±0.56^{a}	50.37±0.34^{b}	49.80±1.62^{b}	48.74±0.50^{b}	43.43±0.49^{c}
8 M	65.02±0.50^{a}	64.95±0.59^{a}	59.93±0.52^{b}	59.29±1.39^{b}	57.63±0.67^{b}	51.80±0.67^{c}
9 M	74.50±0.48^{a}	75.06±0.84^{a}	68.12±0.63^{b}	68.56±1.16^{b}	66.67±0.63^{b}	59.64±0.62^{c}
10 M	82.53±0.62^{b}	85.34±1.05^{a}	76.53±0.53^{c}	77.60±1.14^{c}	76.19±0.57^{c}	67.08±0.65^{d}
Average BW (g) gain/day	306.88±2.02^{b}	318.9±4.00^{a}	287.63±2.64^{c}	290.3.±4.75^{c}	284.86±2.06^{c}	247.63±2.79^{d}

Means bearing different superscript in a row differ significantly ($P<0.05$); BW, body weight.

Table 2. Monthly body weight and average body weight (kg) gain of female pig of Rani breed (Mean±S.E.) in different locations in Nagaland

Age in month	Low hill area (200 to 300 m)			Mid hill area (1000 to 1500 m)		High hill area (2500 m)
	Dimapur	ICAR Farm	Peren	Wokha	Kohima	Kiphire
2 M	6.75±0.11^{c}	7.21±0.11^{ab}	6.89±0.09^{bc}	7.30±0.09^{a}	7.03±0.13^{ab}	7.12±0.15^{ab}
3 M	13.07±0.23^{b}	13.81±0.20^{a}	12.78±0.10^{bc}	13.28±0.38^{ab}	13.04±0.21^{b}	12.32±0.12^{c}
4 M	21.37±0.44^{ab}	21.15±0.27^{ab}	20.50±0.18^{bc}	22.26±0.61^{a}	20.03±0.25^{c}	18.80±0.29^{d}
5 M	29.98±0.37^{a}	30.63±0.36^{a}	28.32±0.29^{b}	28.26±1.14^{b}	28.03±0.30^{b}	26.68±0.41^{c}
6 M	39.27±0.49^{a}	40.13±0.54^{a}	35.64±0.42^{b}	38.30±1.10^{b}	35.50±0.40^{b}	32.31±0.52^{c}
7 M	48.33±0.53^{ab}	49.94±0.59^{a}	42.95±0.56^{c}	46.90±1.34^{b}	43.03±0.60^{c}	39.06±0.47^{d}
8 M	57.66±0.56^{ab}	59.76±0.48^{a}	50.75±0.70^{c}	55.99±1.40^{b}	50.91±0.75^{c}	45.59±0.55^{d}
9 M	66.27±0.55^{b}	69.14±0.62^{a}	58.19±0.67^{c}	64.76±1.06^{b}	58.97±0.64^{c}	52.07±0.52^{d}
10 M	74.07±0.68^{b}	77.97±0.41^{a}	65.89±0.74^{c}	73.25±1.21^{b}	65.67±0.68^{c}	58.91±0.32^{d}
Average BW (g) gain/day	281.25±2.82^{b}	294.83±2.04^{a}	245.80±2.99^{c}	274.70±4.92^{b}	244.30±2.76^{c}	215.77±1.55^{d}

Means bearing different superscript in a row differ significantly ($P<0.05$); BW, Body weight.

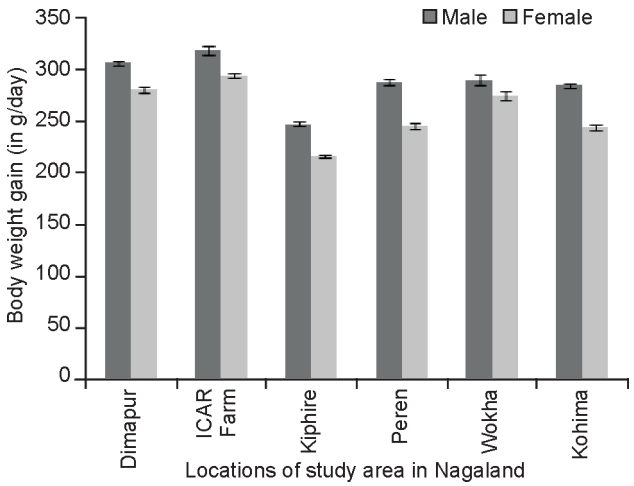

Fig. 1. Average body weight (g) gain per day in male and female pigs of Rani breed (Mean±SE) in different districts of Nagaland.

pig. In case of female pig, body weight at 10 months of age was significantly (P<0.05) higher in Wokha district compared to Kohima district in high hill area. Average body weight gain (ADG) per day varied from 247 to 318 g in male and 215 to 294 g in female pig in different locations (Fig.1). Average body weight gain per day was significantly (P<0.05) higher at ICAR farm compared to other five locations in male and female pig. Among low hill area location (Dimapur, Peren and ICAR farm), higher average body weight gain was recorded at ICAR farm compared to other two locations. In low hill area, significantly (P<0.05) higher average body weight gain per day in both male as well as female pig was recorded at ICAR farm followed by Dimapur and Peren. In high hill area locations (Wokha and Kohima), average body weight gain per day in female pig was significantly (P<0.05) higher in Wokha district compared to Kohima district. Also, average daily weight gain was significantly (P<0.05) higher in male in comparison to female at all the location (Fig. 1). Lower growth rate at Kiphire could be due to harsh climatic condition, lack of availability of balanced feed, feeding with low energy and high fiber diet and non availability of health care service on time as the district is remotely located on Indo-Myanmar border. Although, there was variation in body weight in Rani breed at different location at different stages, however, it was higher than the growth rate of pure Hampshire and Large White Yorkshire in the NEH region as reported by Kumaresan *et al.* (2006) and Pal *et al.* (2004). This could be due to crossbreeding as Rani breed has 50% Gunghroo blood which makes this breed better adaptable to the Indian conditions. Sharma *et al.* (2005) also recorded lower body weight in pure Hampshire breed. Zeliang *et al.* (2016) reported similar findings for crossbred pig in Nagaland. Murugan *et al.* (2009) recorded higher body weight at 10 months of age in Duroc crossbred pig. Ranjan *et al.* (2003) recorded lower body weight at 10 months of age in Tamworth crossbred pig. Average daily weight gain (ADG) was recorded from 204 to 317 g in crossbred pig in Meghalaya (Gupta *et al.* 2009). Murugan *et al.* (2009) recorded 390 g average daily weight gain in Duroc crossbred pig. Sharma *et al.* (2005) recorded 422 g of ADG in Hampshire breed. Kumaresan *et al.* (2006) recorded 170 to 184 g of ADG in Hampshire and Large White Yorkshire pig. Ranjan *et al.* (2003) recorded 222 g of ADG in Tamworth crossbred pig. Pal *et al.* (2004) reported lower ADG in Hampshire × Khasi crossbred pig.

Reproductive performance: Occurrence of first estrus in Rani pig varied from 262 day to 308 days across different

Table 3. Reproductive performance of Rani breed of pig (Mean±S.E.) in in different locations in Nagaland

Reproductive parameter	Low hill area (200 to 300 m)			Mid hill area (1000 to 1500 m)		High hill area (2500 m)
	Dimapur	ICAR Farm	Peren	Wokha	Kohima	Kiphire
Age at first estrus (days)	291.9±5.08^{b}	262±3.48^{c}	296±5.66a^{b}	276.4±5.44^{c}	299.5±6.12^{ab}	308.7±5.71^{a}
Age at first mating (days)	314.8±5.23^{b}	284.4±3.40^{c}	316.9±5.92^{b}	292.7±4.97^{c}	319.6±6.15^{ab}	332±5.62^{a}
Gestation length (days)	114±0.42^{a}	114.5±0.30^{a}	114.5±0.40^{a}	114±1.08^{a}	114.7±0.53^{a}	114.4±0.40^{a}
Litter size at birth (nos.)	9.7±0.42^{a}	9.5±0.50^{a}	9.2±0.48^{a}	9.6±1.18^{a}	9.0±0.80^{a}	8.4±0.30^{a}
Litter weight at birth (kg)	9.80±0.34^{a}	10.18±0.33^{a}	10.11±0.36^{a}	9.77±0.98^{a}	10.18±0.64^{a}	9.31±0.26^{a}
Litter size at weaning (nos.)	8.2±0.20^{ab}	8.5±0.30^{ab}	7.7±0.21^{abc}	8.7±0.91^{a}	7.3±0.33^{bc}	6.8±0.20^{c}
Litter weight at weaning (kg)	60.26±1.09^{a}	63.34±1.39^{a}	57.84±0.94^{ab}	63.40±6.54^{a}	54.81±2.10^{ab}	49.51±1.23^{b}
Weaning to estrus interval (days)	24.8^{b}	10.0^{c}	28.5^{b}	22.12^{b}	24.6^{b}	40.30^{a}
Pre weaning mortality (%)	14.62	10.41	14.71	7.76	15.98	17.99

Means bearing different superscript in a row differ significantly (P<0.05).

locations in Nagaland (Table 3). Similarly, age at first mating varied from 284 to 332 days. Age at first estrus and age at first mating was significantly (P<0.05) higher at Kiphire than other locations. Estrus and mating occurred at significantly (P<0.05) shorter age in pig at ICAR farm. This is in line with the results of growth rate at Kiphire, as slower growing animal will attain puberty later than their counterpart. Kumaresan *et al.* (2007) reported higher age at first estrus and age at first mating in pure Hampshire and pore large White Yorkshire. Whereas, age at first fertile service was recorded earlier in crossbred and Gunghroo pig (Gokuldas *et al.* 2015, Zeliang *et al.* 2016) compared to pure Hampshire. There was no variation recorded in gestation length across the different locations. Similar observation was recorded by earlier studies (Gokuldas *et al.* 2015, Zeliang *et al.* 2016) in different breeds. Litter size at birth and litter weight at birth varied from 8 to 9 and 9 to 10 kg. There was significant difference in litter size at birth and litter weight at birth in different locations. Litter size at weaning varied from 6 to 8 and was significantly (P<0.05) lower at Kiphire district. Litter weight at weaning was recorded from 54 to 63 kg and it was recorded significantly (P<0.05) higher at ICAR farm. Litter weight at weaning was lowest at Kiphire district. This may be due to the effect of harsh climatic condition of the region on growth performance of piglets. Similar findings were reported by Kumaresan *et al.* (2007), Gokuldas *et al.* (2015) and Zeliang *et al.* (2016). Weaning to estrus interval is an important reproductive parameter for measuring the reproductive efficiency in pig. It varied from 10 to 40 days in different location. Significantly higher (P<0.05) weaning to estrus interval at Kiphire may be due to lack of balance feeding to mother and poor body condition of mother after farrowing. Gokuldas *et al.* (2015) recorded higher farrowing index in crossbred pig compared to pure exotic or indigenous pigs which is in concurrence with the findings of the present study. Pre-weaning mortality was recorded from 7 to 18% and it was highest at Kiphire district followed by Kohima and Peren. Severe cold at higher elevation may be the reason for higher mortality in newborn piglets as their homeostasis mechanism is not well developed. Kumaresan *et al.* (2009) also reported higher mortality in pig in NEH region where as Gokuldas *et al.* (2015) reported 3 to 16% pre weaning mortality in different breed in institutional farm and reported higher mortality during winter season. There was variation recorded in reproductive performance of Rani breed at different location in Nagaland and it performed best in intensive rearing at ICAR research farm in terms of growth rate, average body weight gain per day and reproductive performance. However, the performance of Rani breed at mid hills and high hills was still better than pure exotic and indigenous breed as reported by different workers in NEH region.

Pork is the staple diet of tribal people of NEH region; however, there exist a wide gap between demand and availability of the pork. This is mainly due to low productivity of indigenous or non-descriptive germplasm. The present study demonstrated the growth and reproductive performance of Rani breed of pig in different agro-climatic condition of Nagaland. The breed is well adapted across the different agro-climatic condition of Nagaland. The growth and reproductive performance is better than pure exotic or indigenous breed and has capacity to farrow two times in a year. Therefore, Rani breed of pig can be propagated in different agro-climatic condition of Nagaland varying from low hills to high hills for better productivity and profitability. However, precaution must be exercised in breeding tract of indigenous germplasm.

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