



The Relevance of Pig Breeds from North Eastern India towards Pork Production- A Review

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Abstract: There are five indigenous pig breeds come from North East India, namely Ghungroo, NiangMegha, Doom, Tenyi Vo and Zovawk. Ghungroo breed matures early, produces more litter under organized farm conditions. Rani, Asha and Lumsniang are the Pig varieties released by ICAR by crossing Hampshire with Ghungroo and Niang Megha. It is established that there is wide genetic diversity among the native indigenous breeds. Analysis of cytochrome B gene in Ghungroo and SLC11A1 gene in Doom pigs builds relationship with litter size and natural disease resistance respectively. Organic acid combination and Chayote meal have an influential effect on growth performances in Ghungroo and Zovawk pigs respectively. Skin fold in Ghungroo may sometime plays a predisposing factor for maggot infestation. Artificial Insemination is found to be successful in Ghungroo pig and is propagated to other breeds also. Doom breed is being shown as resistant to piglet diarrhea compared to other breeds.

Keywords: Ghungroo; Niangmegha; Doom; Cytochrome B; Zovawk

Introduction

Pig rearing is an integral part of the farming system of almost all the tribal populations of the North Eastern region of India. In India, 70% of the pig population is reared under traditional small holder, low-input demand driven production system. Over one quarter of the pigs in India (3.8 million) are found in the North-East region, which bears testimony of importance of pig rearing in the livelihood systems of farmers in the region (Zaman *et al.*, 2015). Pork production in India is limited, representing only 9% of the country's animal protein sources. Production is concentrated mainly in the northeastern corner of the country and consists primarily of backyard and informal sector producers for the majority tribal population; livestock keeping – especially pig keeping - is integral to their way of life in the NE Region. There is a growing demand for pork due to increasing per capita income, urbanization and changes in lifestyle and food habits. Much of this demand is met from imports from other states in India and from Myanmar. North East India has much higher pork consumption than the rest of the country. Of these states, Nagaland



has the highest per capita consumption. The tribal population in particular appears to consume more pork on average than other groups. Traders in both Assam and Nagaland reported that the demand for pork was increasing along with prices (DAHD). The indigenous breeds bear unique features such as better heat tolerance, meat quality, early sexual maturity (Karunakaran *et al.*, 2009) and good quality bristles (Mohana *et al.*, 2014) compared with exotic/crossbreds. To give impetus to this nascent yet profitable sector, it results to the “Innovative Pig Development Project for North East (IPDPNE)” being proposed under Sub-Mission of Livestock Development of the National Livestock Mission.

Features	Ghungroo	Niang Megha	Doom	Tenyi Vo	Zovawk
State	West Bengal	Meghalaya	Assam	Nagaland	Mizoram
Origin of name	Anklet in local language	Named after tribe	Named after community	Named after community	Zo means Mizo Vawk means Pig
Colour	Black	Black, star shaped white patches at forehead and hock	Black	Black, white mark on forehead and ventral body	Black
Visible Characteristics	Longtail, upwardly curved snout, bull dog face, large heart shaped ears	Medium tapering snout, long bristle on midline, typically wild look,	Short concave snout, large sized, flat belly, long bristles extend upto thoraco lumber area	Pot bellied, tail with white switch reaching hock, , bright alert eyes, long tapering snour	Erect ears, concave snout, Pot belly, concave top line, long bristles on midline
Use	Pork, Manure	Pork, Bristle, Manure	Lean Pork	Pork, Bristle, Manure	Pork, Manure
Population	184307	127292	3000	60000	39234
NBAGR Accession No	INDIA_PIG_2100_GHOONGROO_09001	INDIA_PIG_1300_NIANGMEGHA_09002	INDIA_PIG_0200_DOOM_09006	INDIA_PIG_1400_TENYIVO_09004	INDIA_PIG_2700_ZOVAWK_09007

(Source: Animal Genetic Resources of India, Agri-IS)

Reproductive Performances

Borah *et al.*, (2011) witnessed 39.75% increase in average litter size, 58.62% increase in average litter weight at birth, 64.92% increase in average litter size at weaning, 82.60% increase in average litter weight at weaning in Ghungroo piglets compared to local pigs in West Garo hills, Meghalaya. The Ghungroo breed matures early, produces more litter under organized farm conditions and Hence it could be promoted further for breeding purpose under low input production system in North Eastern states in India (Patra *et al.*, 2016).

Reproductive Performances of Indigenous North Eastern Pigs

Parameters	Ghungroo	Niang Megha	Doom	References
Age at puberty	190.38± 4.38 days	210.5± 2.42 days		Sahoo <i>et al.</i> , (2012)
Age at first service	9.3±0.43 months	10.96±1.09 months		Gokuldas <i>et al.</i> , (2015)
Age at first farrowing	13.1±0.65 months	14.76±0.32 months	368±1.537 days	Gokuldas <i>et al.</i> , 2015 and Khargharia <i>et al.</i> , 2014



Farrowing interval	169± 4.88 days	207.05± 8.16 days	213.533±0.396 days	Sahoo <i>et al.</i> , 2012 and Khargharia <i>et al.</i> , 2014
Farrowing index	1.72	1.71		Gokuldas <i>et al.</i> , (2015)
Farrowing rate	80.95%	83.42%		Gokuldas <i>et al.</i> , 2015
Gestation Period	113.8±0.16 days	111.848±0.136 days	112.044±0.295 days	Gokuldas <i>et al.</i> , 2015 and Khargharia <i>et al.</i> , (2014)
Generation Interval	393.25±5.01 days	443.12±3.05 days		Gokuldas <i>et al.</i> , (2015) and Sahoo <i>et al.</i> , (2012)

Productive Performances

The pre weaning growth rate in case of Ghungroo crossbreds is slightly lower than the Hampshire and Duroc because of their large litter size (Kaushik *et al.*, 2016).

Parameters	Ghungroo	Niang Megha	Doom	References
Pig weight at birth (Kg)	0.96±0.02	0.64 ± 0.02		Nath <i>et al.</i> , (2013) and Kumaresan <i>et al.</i> , (2007)
Pig Wight at weaning(Kg)	7.08±0.25	5.47±0.13		Nath <i>et al.</i> , (2013) and Kumaresan <i>et al.</i> , (2007)
Litter Size at birth	10.02± 0.35	6.5± 0.21	6.250±0.237	Sahoo <i>et al.</i> , (2012) Khargharia <i>et al.</i> , 2014
Litter Size at weaning	8.2± 0.23	5.63± 0.42	5.025 ± 0.21	Sahoo <i>et al.</i> , (2012) Khargharia <i>et al.</i> , 2014
Litter weight at birth (Kg)	9.5± 0.23	4.23 ± 0.29		Nath <i>et al.</i> , (2013), Kumaresan <i>et al.</i> , (2007) and Sahoo <i>et al.</i> , (2012)
Litter weight at weaning (Kg)	49.67± 2.15	28.46± 2.25		Nath <i>et al.</i> , (2013), Kumaresan <i>et al.</i> , (2007) and Sahoo <i>et al.</i> , (2012)

Development of pig varieties

“Rani”, the crossbred pig variety has been developed by ICAR-NCR on Pig by crossing Hampshire (exotic breed) with Ghungroo (indigenous breed) to have 50% inheritance of both the breeds. Duroc, another exotic germplasm, was crossed with “Rani” to develop “Asha” cross to have 25% Ghungroo, 25% Hampshire and 50% Duroc inheritance. Lumsniang is a new pig variety released by ICAR RC NEH Region, Umiam, Meghalaya. It has 25% genetic inheritance of Niang Megha and 75% genetic inheritance of Hampshire.



Genetic Characteristics and Diversity

Assessment of genetic diversity in indigenous animals is an important and essential task for animal genetic improvement studies as well as conservation decision-making. The genetic diversity and population structure of all indigenous swine breeds from North Eastern region of India using microsatellite markers is studied by Zaman *et al.*, (2013) and Zaman *et al.*, (2014).

Parameter	Ghungroo	Niang Megha	Doom	Zovawk
No. of Microsatellite Markers	21	21	22	22
No. of alleles observed	103	82	120	122
Frequency distribution of alleles	0.0179 to 0.9615	0.0303 to 0.9333	0.02 to 0.6667	0.0200 to 0.9783
Heterozygosity value	0.55±0.356	0.545±0.279	0.62±0.287	0.46±0.252
Polymorphic information content (PIC) value	0.54±0.22	0.1227 to 0.7281	0.63±0.143	0.54±0.22
Shannon's information index	1.16	1.00	1.36	-
within-population inbreeding estimate (FIS)	0.0919	0.0311	0.089	0.1526

Variants of cytochrome B gene affects on reproductive traits namely litter size at first, second and third farrowing, piglet mortality, age at first farrowing and farrowing interval of Ghungroo pig (Pradhan *et al.*, 2018). The cytogenetic study in Niang Megha reveals that chromosomes are sub-metacentric, metacentric and telocentric for chromosomes 1-7, 8-12 and 13-18 respectively (Sahoo *et al.*, 2013). The Follicle stimulating hormone beta polypeptide (FSH β) gene has been investigated as a candidate gene for litter size because of its role in maturation of small and medium follicles into ovulating large follicles. PCR based short interspersed nuclear elements (SINE) detection method and PCR-RFLP is carried out to identify the polymorphism in FSH β gene. Higher frequencies of SINE $-/-$ and SINE $+/-$ genotypes were observed in Ghungroo pigs as compared to Niang Megha and Nagaland local pigs (Magotra *et al.*, 2015).

The solute carrier family 11 member A1 (*SLC11A1*), also known as natural resistance-associated macrophage protein 1 (*NRAMP1*), is a divalent transition metal (iron and manganese) transporter involved in iron metabolism and host resistance to certain pathogens. The sequencing and phylogenetic analysis of the *SLC11A1* gene of Doom pigs could be used for genetic selection with disease-resistance varieties and up gradation of indigenous germplasm of domestic livestock (Devi *et al.*, 2017)

Analysis of MTRNR1 gene reveals distinct clustering of native Indian pigs with Chinese pigs over European pigs. The Nei's unbiased genetic identity estimates indicates less genetic distance (0.2909) between Niang Megha and Tenyi Vo pigs than the both individually with Ghugroo breed (Sahoo *et al.*, 2016).



Skin fold in Ghungroo

Patra *et al* (2014) studied skin fold formation in Ghungroo and interpreted that the most predominant site for skin fold formation is forehead and flank region followed by back and ham and also emphasized the skin folding at forehead region predisposes the maggot wound formation which affects the gross productivity of this breed.

Thermal stress

Thermal stress has a significant adverse effect on commercial swine production. Animals may adapt to stress conditions by an alteration in the expression of stress-related genes such as heat shock proteins (HSPs) and monocarboxylate transporters (MCTs). Possible involvement of these genes reduces the deleterious effect of thermal stress, thus maintaining cellular integrity and homeostasis in pigs (Parkunan *et al*, 2015).

Carcass Characteristics of Ghungroo

Khan *et al* (2010) reported that Carcass Weight, Dressing Percentage, Chilled Carcass Weight, Loin Eye Area, Back Fat Thickness, Carcass Length, shoulder weight, ham weight and loin weight of carcass increase with increase in slaughter weight in case of Ghungroo pigs.

Thomas *et al* (2017) obtained following results by conducting experiments on Ghungroo x Hampshire x Duroc fattener pigs

Meat: bone ratio= 2.95

Fat: lean ratio= 0.17

Carcass length =61.5 cm – 93 cm

Loin eye area= 1.30 in² – 5.50 in².

Nutrition

Traditionally, the pigs are fed locally available rice bear waste, rice bran, local grass, herbs, colocasia etc. The growing ghungroo piglets and its crossbreds fed with locally made rice bear waste up to 25% of the total dry matter shows increased growth rate and feed conversion efficiency in north eastern part of India (Haldar *et al.*, 2017). Organic acid combination results into better gain in weight and FER in Ghungroo piglets than antibiotic supplementation (Dutta *et al.*, 2015). Chayote meal could safely replace the standard grower ration up to 40% in the diet of growing Zovawk pigs without causing any adverse effects on growth and nutrient utilization (Lalthansanga and Samanta, 2015).

Artificial Insemination

Both organized and un-organized small holder pig farmers suffer due to non-availability of quality germplasm in their vicinity. Indiscriminate use of limited number of breeding male available in the region leads to decline in reproductive performance and overall productivity of the farm. Artificial insemination (AI) technique bring immense opportunities in overcoming the deficiency of breeding boar and could promote in establishment of small holder breeding unit for meeting the demand of quality pig germplasm. Ghungroo was first artificially inseminated with Hampshire boar semen in Nagaland by ICAR Research Complex for NEH Region, Nagaland Centre (Morung Express, January 15, 2014). Patra *et al.*, (2014) obtained following findings while conducting artificial insemination on Ghungroo pigs in Nagaland.



Parameters	Value
Volume(ml)	164.84 ± 7.37
Motility	80.7
Concentration (millions/ml)	259.28 ± 21.88
Total sperm per ejaculates (billion)	48.96
Conception rate	91.0
Service per conception	1.11
Litter size	8.80

Hematological Profile of Doom Pigs

The hematology of Doom and Zovawk was analyzed to understand their normal physiology (Nath *et al.*, 2017; Mayengbam *et al.*, 2014).

Parameters	Doom	Zovawk
RBC X 10 ⁶ /μl	8.171±0.104	11.25± 0.69
WBCx10 ³ /μl	15.760±0.863	17.68± 0.84
Hb gm %	18.966±1.984	15.15± 0.70
Hemocrit (%)	46.658± 4.882	57.89± 1.52
MCV(fL)	57.251± 6.980	63.56± 1.47
MCH (pg)	23.273±5.092	19.10± 0.53
MCHC (%)	40.850±3.175	30.05± 4.30

Piglet diarrhoea

Piglet diarrhoea caused by beta2 toxin producing *Clostridium perfringens* is a serious problem to piggeries throughout the world. The newly recognized Doom breed of Assam, India can survive under poor rearing condition and is generally found to be resistant to Beta2 toxin (Hussain *et al.*, 2017).

Gastrointestinal habitat

The gastrointestinal (GI) habitat of ruminant and non-ruminant animals sustains a vast ensemble of microbes that are capable of utilizing lignocellulosic plant biomass. After screening and enzymatic quantification of eighty-one obtained bacterial isolates, *Serratia rubidaea* strain DBT4 and *Aneurinibacillus aneurinilyticus* strain DBT87 were revealed as the most potent strains, showing both cellulase and xylanase production in Zovawk pigs (Asem *et al.*, 2017).

Conclusion

So many works conducted in indigenous pigs suggest that conservation of local descript pigs should be necessary as they show unavoidable features which place them in elite groups of exotic.



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