

## Red Purnia cattle – an unexplored indigenous germplasm

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India, being an agrarian economy, have significant contribution from livestock, its products and draught power. The country possesses 160.50 million non-descript cattle among the total population of 185.18 million cattle, which produce 47.8 million MT of milk apart from providing draught animal power (Department of Animal Husbandry Dairying and Fisheries, 2010). There are 30 recognized breeds of cattle in the country that play vital roles in rural economy in their respective breeding tracts. Besides, there are also few more cattle populations in certain regions of the country which confines to particular characteristics and are inhabited in a particular area. They are well recognized as distinct entities by farmers, cattle rearers and localities in the area. Red Purnia is one such cattle, which possesses distinct features, and distributed in certain parts of Bihar. However, no basic scientific work has been conducted so far in the cattle to study the performance of the cattle in the breeding tract. Hence, the present study was conducted on Red Purnia cattle to record the basic details of morphometric characteristics and performance in its breeding tract.

A survey was conducted in 81 villages from 5 blocks of Purnia district, 3 blocks of Araria district and 2 blocks of Katihar district to study the distribution pattern of Red Purnia cattle. A detailed questionnaire was prepared as per breed descriptors of cattle suggested by NBAGR (NBAGR, 2008) to study the morphological characteristics of Red Purnia cattle. From the surveyed area, 20 villages from Dhamdaha, Purnia East, Bhawanipur, Rupauli and Baisi blocks of Purnia district were selected. A total of 875 Red Purnia cattle selected randomly from these villages owned by 176 farm households to study the morphometric traits such as height at withers, body length, chest girth, face length, face width, ear length, horn length, horn circumference and tail length. The body weight of the animals was calculated as per the Shaeffer's formula (Body weight in pound = Length in inches × Girth in inches<sup>2</sup>/300). The calculated body weight was then converted into kilogram for convenience. The production traits such as daily milk yield, peak yield and lactation length and

reproduction parameters such as age at first calving, dry period, calving interval and number of services per conception were studied in the above blocks using questionnaire.

*Description of the breeding tract:* It was observed that Red Purnia cattle are distributed in the entire district of Purnia and adjoining Araria and Katihar districts of Bihar (Fig. 1). The breeding tract of the cattle extended approximately from 25°13' N to 27° 07' N at latitude and from 86° 59' E to 87° 52' E at longitude. The types of soil available in the breeding tract were sandy loam (70.22%) and clay loam (29.78%). Most of the area in the breeding tract experienced severe water-logging condition and the soil was deficient in micronutrients in all the blocks surveyed. The average rainfall in the breeding tract for 31 years from 1980 to 2011 was 1630 mm. The maximum temperature reached up to 48°C during May and the minimum temperature was recorded as low as 2°C during January (Purnia District Magistrate Document, 2012).

### Red Purina breeding tract

*Population of Red Purnia cattle:* The sample frequency



Fig. 1. Breeding tract of Red Purnia cattle. Source: www.india.gov.in

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Figs 2-4. 2.Grey. 3. Red coat Red Purnia cow. 4. Red Purnia young bull.

of Red Purnia cattle with respect to crossbred and other non-descript cattle in the breeding tract ranged from 22% in Bhawanipur block to 46% in Dhamdaha block of Purnia district. The estimated population of Red Purnia cattle based on sample survey was 2.19 lakh. Though the population looked 'normal' in the perspective of conservation, there was a rigorous campaign for artificial breeding of cattle with exotic germplasm going on in the breeding tract, which may pose serious threat to the indigenous germplasm. The herd size of Red Purnia cattle was small with the average of 3.6 and the range was from 1 to 12 in the surveyed area. The survey revealed that 81% of herds possessed at least one cow with one or two calves.

**Housing pattern:** Out of 176 herds surveyed, 111 herds (63%) were provided housing (Fig. 2). Other herds were kept in front of farmer's house or under the shades of the nearby trees. Most of the cattle sheds (94%) in the breeding tract were located very close to farmers house. Bamboos, straws, plastic sheets and mud were commonly used as building materials for making cattle sheds. An average life span of these sheds was 5 years and the sheds were dismantled generally after this period and rebuilt again.

**Feeding:** Among the herds surveyed, 77% were stall-fed and the remaining herds were allowed for community grazing (Fig. 3). For stall-fed cattle, only straws from paddy, wheat and maize, which are locally cultivated by the farmers, were provided. The Red Purnia cattle were not fed with any type of concentrates as a source of additional energy. Even the cultivation of green fodders for animal feeding was not practised in the breeding tract and hence, Red Purnia cattle rarely fed with green fodder.

**Breeding methods:** Most of the animals were naturally bred with the Red Purnia bulls available in the villages in the breeding tract. Even though the animals were not regularly fed with green fodder and not at all fed with concentrates, the Red Purnia cattle came to estrous regularly and calved once at least in 15 months. This may be unique in Red Purnia cattle as they are very regular in all reproduction characteristics under very low input systems. Recently artificial insemination with exotic germplasm by some non governmental organizations in the breeding tract is fast emerging.

**Diseases and their control:** Majority animals in the breeding tract were vaccinated against foot-and-mouth disease, haemorrhagic septicaemia and blackquarter by the Department of Animal Husbandry. The calves were generally dewormed. The farmers reported no major health care complaints as Red Purnia cattle looked very resistant to major infectious and non-infectious conditions.

**Morphological features:** Red Purnia cattle are small to medium-sized animals with compact body and exist in two different varieties. Firstly, light to dark grey coat colour variety (Fig. 2) in which the cattle possessed grey coat colour uniformly throughout the body and most of them had red tinted hairs in the face. Secondly, the Red colour variety (Fig. 3) possessed red coat colour throughout the body, however, the intensity of red colour varied from animal to animal. The bulls in grey variety (Fig. 4) had dark grey to black colour coat in head, neck and shoulder regions whereas the remaining area of the body was light grey in colour. The proportion of grey variety was higher with 58% and red coat colour variety was 42% among the surveyed population. The horns were small to medium in size, oriented laterally and slightly forward. The forehead was slightly concave. The muzzle, eyelashes and hooves were black in both varieties. The dewlap was small in females but medium in size in males. The hump was also small in females but males had medium-to-large-size humps. The udder was so small and round in shape. The teats were short and tube-shaped. The tail was long and twitch of the tail was black.

#### *Morphometric characteristics*

The morphometric traits at various ages for both sexes of Red Purnia cattle are given in Table 1. Growth was observed till 5 years of age for all morphometric traits, and the rate of growth increased at decreasing rate after 5 years of age. Chest girth was highest in all age groups followed by height at withers and body length, whereas, in adult female Red Purnia cattle, height and body length were almost similar. The height, length and girth of adult Red Purnia cattle found in this study were comparable to the same traits in Khariar cattle of Orissa (Dhal *et al.* 2007), but lower than Gaolao (Patil *et al.* 2005), Red Kandhari (Pundir and Singh 2008) and Khillar (Gokhale



Table 1. Morphometric parameters of Red Purnia cattle at various ages

Traits	< 1 year	1 – 2.5 years	2.5 – 5 years	5 – 7.5 years	> 7.5 years
N					
Male	47	27	23	7	6
Female	63	58	183	224	237
Height at withers (cm)					
Male	75.3±0.54	94.4±0.73	115.2±0.92	125.4±2.42	128.6±2.75
Female	72.4±0.37	87.6±0.43	98.8±0.47	104.8±0.22	107.1±0.26
Body length (cm)					
Male	65.8±0.45	83.4±0.61	105.1±0.68	115.0±1.98	117.2±1.68
Female	62.3±0.46	76.9±0.36	95.4±0.27	101.1±0.37	102.7±0.28
Chest girth (cm)					
Male	87.1±0.28	123.4±0.48	145.4±0.61	150.2±1.12	153.3±1.73
Female	83.7±0.31	104.7±0.35	132.6±0.32	138.9±0.38	140.4±0.30
Face length (cm)					
Male	24.6±0.27	37.4±0.32	42.0±0.55	43.1±0.78	43.7±0.92
Female	23.7±0.18	33.7±0.28	38.4±0.33	40.3±0.29	41.4±0.37
Face width (cm)					
Male	13.4±0.23	15.5±0.34	17.5±0.47	19.2±0.68	19.7±0.73
Female	12.3±0.26	14.0±0.30	15.6±0.34	17.3±0.33	17.6±0.28
Ear length (cm)					
Male	15.4±0.18	17.4±0.26	21.6±0.44	22.4±0.56	22.8±0.63
Female	15.1±0.15	16.4±0.19	18.7±0.30	20.3±0.26	20.5±0.28
Horn length (cm)					
Male	Nil	2.5±0.69	8.3±1.21	15.7±4.8	17.7±6.3
Female	Nil	1.4±0.78	5.7±1.44	12.4±3.2	14.6±5.2
Horn circumference (cm)					
Male	Nil	3.1±0.45	12.4±0.63	14.2±0.76	15.3±0.84
Female	Nil	2.1±0.32	9.7±0.52	11.5±0.30	12.0±0.33
Tail length (cm)					
Male	41.4±0.34	53.3±0.41	60.7±0.43	65.2±0.72	68.4±0.83
Female	40.2±0.24	50.7±0.36	57.1±0.23	60.3±0.38	62.0±0.51

N, Number of observations.

Table 2. Estimated body weight (kg) of Red Purnia cattle

Age	Male		Female	
	N	Body weight	N	Body weight
< 1 year	47	44.2±0.34	63	38.4±0.35
1 – 2.5 years	27	112.9±0.56	58	74.9± 0.41
2.5 – 5 years	23	198.4±0.68	183	148.8±0.38
5 – 7.5 years	7	232.6±1.25	224	171.2±0.36
> 7.5 years	6	246.2±1.89	237	179.7±0.32

N, Number of observations.

*et al.* 2009) breeds of cattle. However, the same body measurements were higher in Red Purnia cattle than in Vechur (Iype 1996) and Malnad Gidda of Karnataka (Singh *et al.* 2008b).

**Production and reproduction performance:** The body weight of Red Purnia cattle at various ages for males and females as estimated by Shaeffer's formula is given in Table 2. The body weight differed significantly ( $P<0.05$ ) between males and females in all age groups. The body weight of Red Purnia cattle at 1 year and 1 to 2.5 years were comparable

Table 3. Production and reproduction performance of Red Purnia cattle

Traits	N	Mean±S.E.
Daily milk yield (litre)	72	1.78±0.23
Peak yield (litre)	72	2.88±0.31
Lactation length (months)	72	8.13±0.45
Age at first calving (months)	54	41.7±1.78
Dry period (months)	54	6.89±0.36
Calving interval (months)	54	15.0±0.41
No. of services per conception	54	1.31±0.11

N, Number of observations.

to the body weight of Khariar cattle of Orissa (Dhal *et al.* 2007) at the same ages, but higher than that of Malnad Gidda (Singh *et al.* 2008b) and Vechur (Iype 1996) breed of cattle. However, the body weight observed in this study for Red Purnia cattle at the above ages was lesser than the body weight of Red Kandhari breed of cattle (Pundir and Singh 2008).

The production and reproduction characteristics of Red Purnia cattle are furnished in Table 3. It was observed that

Red Purnia cows were low milk yielders but had substantial duration of lactation length. Singh *et al.* (2008b) reported higher daily milk yield and peak yield for Malnad Gidda cattle. However, Red Purnia were superior in age at first calving and calving interval when compared to Malnad Gidda (Singh *et al.* 2008b) and Khillar breed (Gokhale *et al.* 2008). The calving interval of Red Purnia cattle found in this study was lesser in comparison to Hallikar cattle (Singh *et al.* 2008a), but comparable to Red Kandhari (Pundir and Singh 2008). These performances indicated that Red Purnia cattle were superior in reproductive efficiency.

**Utility pattern:** Red Purnia cattle were aggressively used for agricultural operations and pulling loads. On an average, a pair of bullocks worked for  $7.3 \pm 0.12$  h in a day and took  $6.3 \pm 0.28$  h to plough 1 acre of land. Increased mechanization in cultivation of crops reduced the use of Red Purnia cattle in the locality. However, the quantum of dung and urine produced by Red Purnia cattle under low input system forms a part of organic manure and are very essential for fertilizing the lands and protecting them from depletion of soil micronutrients. However, the emergence of artificial insemination in recent times changes the breeding goal and forces the farmers to lean towards higher milk yield.

**Strategy for improvement:** Selective breeding may be the best tool for genetic improvement of Red Purnia cattle. There is considerable variation in the milk production among Red Purnia cows, which could be exploited for further development of Red Purnia cattle to enhance the milk productivity. To make this into reality, it is essential to produce Red Purnia bulls from the elite cows of the same breed. These bulls could be utilized to produce the necessary semen doses for further insemination in Red Purnia cattle. Improvement in the milk yield should be monitored regularly and Red Purnia bulls should further be produced from elite cows in subsequent stages for continuous improvement in milk production without diluting Red Purnia germplasm.

#### SUMMARY

Purnia cattle are small-to medium-size, distributed in Purnia district and adjoining areas of Araria and Katihar districts of Bihar. Red Purnia are not enlisted among the recognized breeds of cattle in India, as there is lack of preliminary information about the cattle. The cattle exist in two different varieties viz. grey and red. The estimated population of Red Purnia is 2.19 lakhs. The herd size was small with the average of 3.6 and 81% of herds possessed at

least 1 cow with 1 or 2 calves. Various morphometric characteristics and body weight of Red Purnia cattle were evaluated on randomly selected 875 animals. Red Purnia cattle are low milk yielders with the average peak yield is  $2.88 \pm 0.31$  litres. These cattle have better reproducing ability with the calving interval of  $15.0 \pm 0.41$  months and  $1.31 \pm 0.11$  number of services/conception. Strategies for genetic improvement of the cattle are discussed.

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