EVALUATION OF DRAUGHT ABILITY TRAITS OF RED KANDHARI CATTLE

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Abstract: Bullocks are the major source of draught power in Indian villages for performing various agricultural operations. Marathwada region of Maharashtra state has one pride breed of cattle i.e. Red Kandhari. In the present study, two healthy bullock pairs (pair A & B) of 5 to 7 years age, each pair from two different places of study were selected for the present investigation. Three agricultural operations i.e. ploughing, harrowing and sowing were performed by both the pairs of Red Kandhari bullocks for 5 consecutive days between 08.00 am to 12.00 noon during the months of April and May. The overall mean draft generated (Kg) by Red Kandhari bullock pairs A & B during ploughing, harrowing and sowing were 145.65 ± 4.94 and 133.46 ± 9.94, 97.46 ± 4.07 and 97.89 ± 8.06, 88.84 ± 1.44 and 87.88 ± 1.66, respectively. The overall mean speed (Km/hr) exhibited by Red Kandhari bullock pairs A & B during ploughing, harrowing and sowing were 2.53 ± 0.11 and 2.50 ± 0.23, 2.70 ± 0.11 and 3.06 ± 0.24 and 2.61 ± 0.02 and 2.63 ± 0.05, respectively. The overall mean horse power (HP) generated by Red Kandhari bullock pairs A & B during ploughing, harrowing and sowing were 1.36 ± 0.09 and 1.22 ± 0.14, 0.98 ± 0.07 and 1.10 ± 0.07, 0.86 ± 0.06 and 0.85 ± 0.02, respectively. The overall mean Area Covered (m^2/hr) by Red Kandhari bullock pairs A & B during ploughing, harrowing and sowing were 653.10 ± 38.45 and 696.57 ± 28.61, 1284.91 ± 97.76 and 1319.19 ± 70.31, 1388 ± 37.71 and 1442 ± 38.06. It was concluded that the Red Kandhari bullocks are strong, powerful and fastidious in performing draft characters. Similarly, during harrowing and sowing operations the superior performance in all draftability traits led to a conclusion that the Red Kandhari bullocks are excellently good as a draft purpose breed.

Keywords: Draghtability, Harrowing, Ploughing, Red Kandhari, Sowing.

Introduction: The importance of livestock in India is based on their production in terms of milk and draft. The term draught refers to an act of moving load by drawing or force required to pull an implement. Bullocks are the major source of draught power in Indian villages for performing various agricultural operations. India possesses 85 million draught animals consisting of 72 million bullocks, 7.5 million male buffaloes, 3.2 million horses and camel. Marathwada region of Maharashtra state has one pride breed of cattle i.e. Red Kandhari. The females of this breed are low yielders while males are heavier in body size, stout and compact and used for all the agricultural operations. Considering strengths of this breed as draught purpose breed, the present study was undertaken with objective of studying draught, horse power generated for various agricultural operations, the speed of agricultural operations and per hour area covered for various agricultural operations using Red Kandhari bullocks.

Materials and Methods: The present study was undertaken at Red Kandhari Research and Instructional Farm, College of Veterinary and Animal Sciences, MAFSU, Parbhani and Sorghum Research Centre, MAU, Parbhani. Two healthy bullock pairs (pair A & B) of 5 to 7 years age, each pair from two different places of study were selected for the present investigation. In selecting the animals, more emphasis was given on body weight, age and body measurements. The pairing of bullocks was done at the time of their selection with minimum difference in age, body weight and body measurements. All the experimental animals were housed in comfortable animal sheds under hygienic conditions with standard uniform feeding and managemental practices.

Three agricultural operations i.e. ploughing, harrowing and sowing were performed by both the pairs of Red Kandhari bullocks for 5 consecutive days between 08.00 am to 12.00 noon during the months of April and May. The bullock pairs were watered before the start of the experiment and after completion. All the agricultural operations selected for the present study viz. ploughing, harrowing and sowing were performed on black cotton soil. The ploughing, harrowing and sowing operations were performed by *Baliram Desi* plough, blade harrow (*Bakhar*) and three way wooden seedrill respectively.

The observations of pull exerted by bullocks in Kg were recorded during each operation by using digital dynamometer of 200 Kg capacity. The dynamometer was joined at central beam of the implement with the help of rope joining the yoke and the base of the implement so as to record the draft pull during the working of the implement. The draft exerted by the bullocks to pull the implement was depicted on dynamometer in terms of Kg. The observations were recorded every half an hour interval and 8 observations in four hours were considered for average draft required for each operation viz. ploughing, harrowing and sowing for that particular day of experiment.

The values of the draft corrected for angle of pull (Cos A) were computed according to the method described by Dubey *et al.* (2007) from equation 1 and 2.

$$\text{Cos A} = \frac{X}{Y} \text{ ---------- (1)}$$

Where,

X = Base line of the implement in cm

Y = Hypotenuse line of the implement in cm

The draft (D) was calculated by formula

D = P x Cos A ---------- (2)

Where,

D = Draft in Kg

P = Average pull exerted in Kg as recorded by dynamometer.

The speed in Kmph was computed by following equation.

$$S = \frac{L \times 3.6}{T}$$

Where,

S = Speed in Kilometer per Hour

L = Distance moved or travelled in meter.

T = Time required to cover the distance.

3.6 = Conversion factor for Kmph.

The horse power values were computed as per Maurya and Devdattam (1982) formula.

$$HP = \frac{D \times S}{75}$$

Where,

HP = Horse Power

D = Draft developed in Kg

S = Speed in Meter per Second

Results and Discussion: The draft (Kg) generated, speed (Km/hr), Horse Power (HP) and Area covered (m^2/hr) for different agricultural operations viz. ploughing, harrowing and sowing by Red Kandhari bullock pairs A & B are presented in Table 1.

The overall mean draft generated (Kg) during ploughing by Red Kandhari bullock pairs A and B were 145.65 ± 4.94 Kg and 133.47 ± 9.95 Kg, respectively. In the present study, the overall mean draft exerted by both the pairs A & B for first day was significantly higher as compared to subsequent four days of ploughing. These findings are quite higher than the draft generated during ploughing as reported by Yawlikar (2001) for Red Kandhari bullocks (68-80 Kg) and Dubey *et al* (2007) for Non-descript bullocks (60-70 Kg).

The overall mean draft generated during harrowing by Red Kandhari bullock pairs A & B were 97.46 ± 4.07 and 97.89 ± 8.06 Kg, respectively. The similar trend of increased draft generated during first and second day was observed and subsequently reduced up to 5^{th} day.

The overall mean draft generated by Red Kandhari bullock pairs A and B during sowing operation were 88.84 ± 1.44 and 87.88 ± 1.66 Kg respectively. These findings were slightly higher than findings reported by Yawlikar (2001) for Red Kandhari bullocks as 57.85, Deoni 68.5 and Crossbred 70.55 Kg. The slightly higher draft generated in the present study may be due to the soil type (heavy black cotton soil) and season of operation.

The overall mean speed (Km/hr) exhibited by bullock pairs A & B during ploughing operation were 2.53 ± 0.11 and 2.50 ± 0.23, respectively. The mean speed exhibited by pairs A & B during the course of study did not differ significantly from each other. However, both the pairs have shown the decreasing trend in the speed which may be attributed to the same work carried out for five consecutive days resulting into development of fatigue. The similar findings were reported by Yawlikar (2001) in HF x Deoni and Crossbred bullocks.

The overall mean speed (Km/hr) exhibited by bullock pairs A & B during harrowing operation were 2.70 ± 0.11 and 3.06 ± 0.24, respectively. The overall mean speed (Km/hr) exhibited by bullock pairs A & B during sowing operation were 2.61 ± 0.02 and 2.63 ± 0.05, respectively. The overall speed exhibited during harrowing and sowing operations by both the pairs did not differ significantly from each other, however the trend of almost uniform speed during the experimental periods of five days were observed and these findings are in contrast with the findings reported by Yawlikar (2001).

The overall mean Horse Power (HP) generated by Red Kandhari bullock pairs A and B during ploughing, harrowing and sowing operations were 1.36 ± 0.09 and 1.22 ± 0.14, 0.98 ± 0.07 and 1.10 ± 0.07, 0.86 ± 0.06 and 0.85 ± 0.02, respectively. The Horse Power generated during ploughing operation exhibited significant difference between the bullock pairs A & B, however non-significant differences amongst the bullock pairs were observed for harrowing and sowing operation. Similarly, significant differences were observed on day 1^{st} as compared to subsequent days of ploughing, harrowing and sowing operations. These findings are in agreement with Yawlikar (2001) in Red Kandhari, Deoni and Cross bred bullocks and Singh and Upadhya in 1997 in cows and buffaloes.

The overall mean area covered (m^2/hr) by Red Kandhari bullock pairs A and B during ploughing, harrowing and sowing operations were 653.10 ± 38.45 and 696.57 ± 28.61, 1284.91 ± 97.76 and 1319.19 ± 70.31, 1388 ± 37.71 and 1442 ± 38.06, respectively. The non-significant differences were observed between both the pairs as well as during the five days study period for ploughing, harrowing and sowing operations. These findings are in line with the findings reported by Yawlikar (2001) in Red Kandhari, Deoni and Cross bred bullocks for ploughing and sowing operations, however Gafoor (1987) and Rotte *et al* (1987) reported higher area covered for harrowing operation by Red Kandhari and Deoni bullocks.

Table I :- Draftability performance of Red Kandhari bullocks for different agriculture operations

Agriculrural Operations → / Draftability Traits ↓	Ploughing	Harrowing	Sowing
Draft (kg)			
Pair A	145.65 ± 4.94	97.46 ± 4.07	88.84 ± 1.44
Pair B	133.46 ± 9.94	97.89 ± 8.06	87.88 ± 1.66
Speed (Km/hr)			
Pair A	2.53 ± 0.11	2.70 ± 0.11	2.61 ± 0.02
Pair B	2.50 ± 0.23	3.06 ± 0.24	2.63 ± 0.05
Horse Power (HP)			
Pair A	1.36 ± 0.09	0.98 ± 0.07	0.86 ± 0.06
Pair B	1.22 ± 0.14	1.10 ± 0.07	0.85 ± 0.02
Area Covered (m^2/hr)			
Pair A	653.10 ± 38.45	1284.91 ± 97.76	1388 ± 37.71
Pair B	696.57 ± 28.61	1319.19 ± 70.31	1442 ± 38.06

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