



ISSN (E): 2277-7695  
ISSN (P): 2349-8242  
NAAS Rating: 5.23  
TPI 2023; 12(5): 4177-4180  
© 2023 TPI

[www.thepharmajournal.com](http://www.thepharmajournal.com)

Received: 24-03-2023

Accepted: 30-04-2023

**SS Shinde**

M.Sc. Agriculture, Department of Animal Husbandry and Dairy Science, College of Agriculture, Latur, Maharashtra, India

**Dr. RA Patil**

Assistant Professor, Department of Animal Husbandry and Dairy Science, College of Agriculture, Latur, Maharashtra, India

**BS Gaikwad**

M.Sc. Agriculture, Department of Animal Husbandry and Dairy Science, College of Agriculture, Latur, Maharashtra, India

**Dr. PV Padghan**

Associate Professor, Department of Animal Husbandry and Dairy Science, College of Agriculture, Latur, Maharashtra, India

**Corresponding Author:**

**SS Shinde**

M.Sc. Agriculture, Department of Animal Husbandry and Dairy Science, College of Agriculture, Latur, Maharashtra, India

## Evaluation of Draftability and physiological response of non-descript bullocks during carting operation

**SS Shinde, Dr. RA Patil, BS Gaikwad and Dr. PV Padghan**

### Abstract

The present study was undertaken with objective to study draft, speed, horse power generated and physiological parameters (respiration rate, pulse rate and body temperature) during carting operation by Non-descript bullocks at different payload. The pairing of bullocks was done at the time of their selection with minimum difference in age, body weight and body measurements. The observation of draft and speed recorded at different payloads of 500 (L<sub>1</sub>), 750 (L<sub>2</sub>) and 1000 kg (L<sub>3</sub>) gunny bags containing 50 to 100 kg sand. The observation of pull exerted by the bullocks in kg were recorded during carting by using digital dynamometer of 200 kg capacity which was joined at central beam of the bullock cart with the help of rope joining the yoke and the base of the cart. In the present study, the overall mean draft generated (kg), speed (km/hr) and horse power (HP) by Non-descript bullock pairs I and II during carting operation were found to be 52.75 and 53.81 kg, 3.56 and 3.62 km/hr and 0.68 and 0.71 HP, respectively for different payloads of 500 (L<sub>1</sub>), 750 (L<sub>2</sub>) and 1000 kg (L<sub>3</sub>). There was a negatively significant ( $p < 0.01$ ) increases in all the three physiological parameters (respiration rate, pulse rate and body temperature) as compared to their pre-work values.

**Keywords:** Draft, horse power, speed, carting, dynamometer, non-descript, payload, physiological parameters

### Introduction

In India the importance of livestock is based on their production of milk and work. Bullocks are the major source of power for cultivating land and carting in rural area. Draught animal play an important role in Indian agriculture and rural transport system. In India most of the people use bullock cart for the transportation of agricultural produce from the farm to respective places. A study was conducted to provide suitable information on draft, speed, horse power generation and physiological parameters during carting by Non-descript bullock found in Latur district at different pay loads. One common bullock cart with 275 kg weight was used on tar road for both the bullock pairs for carting operation.

### Material and Methods

The present study was carried out on tar road. Two healthy pairs of non-descript bullocks almost age (5 to 7 years), body weight and body measurement were select from farmer fields. Pairing of bullocks was done at the time of selection with minimum difference in the age, body weight and body measurements. One common bullock cart was used on tar road for both the bullock pairs. The weight of the cart was 275 kg and the cart man was 65 kg. The observation on draft and speed were recorded at different pay loads of 500 kg (L<sub>1</sub>), 750 kg (L<sub>2</sub>) and 1000 kg (L<sub>3</sub>). The gunny bags containing 50 kg to 100 kg sand were put in the cart for increase or decrease in the payload. The carting operation was performed for 4 consecutive days for each pair during the month of Nov 2017 to April 2018. The working hours of bullocks for research work were from 08.00 am until the fatigue level of animal is reached.

### Draft

The observations of pull exerted by bullock in kilogram were recorded during carting operation by using digital dynamometer of 200 kg capacity. The dynamometer was joined at central beam of the bullock cart with the help of rope joining the yoke and the base of the bullock cart so as to record the draft/pull during the carting operation. The draft exerted by the bullocks to pull the cart was depicted on dynamometer in terms of Kg. The observations were recorded for half an hour interval during four hours of operation and such 8 observations average was considered as the average draft required for each carting operation with different

payload for that particular day of experiment.

**Angle of pull**

The angle pull (Cos A) was calculated from the values (in cm) of height measured between ground level and central point of the yoke where yoke was placed and length (base) between forefront of the cart used and perpendicular point of height at ground. From these two values, the angle of pull recorded from those corresponding values of Cos A were reconfirmed in the table of Logarithm (By Hypotenuse Theorem).

The Values of draft corrected for angle of pull (Cos A) were computed according to the method described by Dubey *et al.* (2007) [12] from equation 1 and 2.

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

Where,

X = Base line of implements in cm.

Y= Hypotenuse line of implements in cm.

$$D = P \times \text{Cos A} \text{----- (2)}$$

Where,

D = Draft in Kg.

P = Pull exerted in Kg as recorded by dynamometer.

**Speed (km/hr) of Carting**

The time taken to cover the distance of one point of the road to the other end of the road was recorded with the help of stopwatch. As described earlier the draft and speed of carting operations was recorded consecutively for 4 days and the same is being used for calculating the horse power.

The speed in kilometer per hour was computed by following equation.

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

Where,

S = speed in Km per hour

L = distance moved or travelled in meter

T = time required to cover the distance

3.6 = conversion factor for km/hour

**Horse poer**

The values of the horse power were computed as per Maurya and Devadattam (1982<sup>a</sup>) formula from the following equation.

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

Where,

HP = Horse power

D = Draft developed in kilogram

S = Speed in meter/second

**Physiological Parameters**

The observations physiological parameters like respiration rate (no/min), pulse rate (no/min) and body temperature (°F) were recorded according to the standard clinical procedures

every day before the start of carting operation and immediately after the completion of the work.

**Statistical Analysis**

Completely randomized design was utilized for analysis of data for carting operation. A student “t” test used to test the level of significance of physiological parameter before and after work, recommended by Panse and Sukhatme (1976) [4].

**Results and Discussion**

**1. Draft (Kg), Speed (km/hr) and Horse power (HP) generated during carting**

The Draft (Kg), Speed (km/hr) and Horse power (HP) generated for carting at different payload by Non-descript bullock pair I and II are presented in Table 1.

**1.1 Draft (Kg):** The mean draft generated by pair I and pair II for pay load of 500 (L<sub>1</sub>), 750 (L<sub>2</sub>), and 1000 (L<sub>3</sub>) kg was 42.40, 55.47, 60.39 and 43.38, 56.64, 61.43 kg, respectively with overall mean draft of 52.75±0.22 and 53.81±0.36 kg, respectively for pair I and pair II. It was revealed that there were highly statistically significant differences (p<0.05) for draft generated at different pay loads during carting performance of non-descript bullock of pair I and II was observed. The value of draft generated for three load conditions revealed that as load increases the draft generation also increases. Similar observations were recorded by Atakare (2009) [1] who revealed that highly significant differences (p<0.01) for draft generated at different payloads during carting performance of Deoni bullock. Shelke (2009) [5] also observed similar observation in Red Kandhari bullock for three payloads.

**1.2. Speed (km/hr):** The mean speed of Non-descript bullock pair I and pair II for carting with payload of 500 (L<sub>1</sub>), 750 (L<sub>2</sub>), and 1000 kg (L<sub>3</sub>) was 3.69, 3.55, 3.45 and 3.78, 3.60, 3.50 km/hr, respectively. The overall mean speed developed by bullock pair I and pair II towards carting of various pay load was 3.56±0.005 km/hr and 3.62±0.002 km/hr, respectively. It was found that the speed of carting on tar road generated by non-descript bullocks with different pay load showed highly significant (p<0.05) differences. This may lead to conclusion that the payload was increasing the speed was decreasing. These parameters are inversely proportionate to each other. Similar trend was also observed Yawlikar (2001) [11] observed the carting speed ranging between 3 to 4.5 km/hr for Red kandhari and Deoni bullock pairs at different pay loads. Atakare (2009) [1] observed the average carting speed for 500, 750 and 1000 kg was 3.63 to 3.84 km/hr.

**Table 1:** Carting performance of Non-descript bullocks at different pay loads

Payload	L <sub>1</sub> (500 kg)	L <sub>2</sub> (750 kg)	L <sub>3</sub> (1000 kg)	Mean ± SE
<b>Draftability Trait</b>				
<b>Draft(kg)</b>				
Pair I	42.40 <sup>c</sup>	55.47 <sup>b</sup>	60.39 <sup>a</sup>	52.75±0.22
Pair II	43.38 <sup>c</sup>	56.64 <sup>b</sup>	61.43 <sup>a</sup>	53.81±0.36
<b>Speed (km/hr)</b>				
Pair I	3.69 <sup>a</sup>	3.55 <sup>b</sup>	3.45 <sup>c</sup>	3.56±0.05
Pair II	3.78 <sup>a</sup>	3.60 <sup>b</sup>	3.50 <sup>c</sup>	3.62±0.05
<b>Horse Power (HP)</b>				
Pair I	0.57 <sup>c</sup>	0.72 <sup>b</sup>	0.76 <sup>a</sup>	0.68±0.03
Pair II	0.60 <sup>c</sup>	0.75 <sup>b</sup>	0.79 <sup>a</sup>	0.71±0.04

Similar superscripts do not differ significantly (p<0.05) from each other within a column

**1.3. Horse power (HP):** The overall mean horse power (HP) generated during carting by Non-descript bullock pair I was 0.57, 0.72 and 0.76 for 500 ( $L_1$ ), 750 ( $L_2$ ), and 1000 ( $L_3$ ) kg payload for 4 consecutive days, respectively with the overall mean horse power for different payload was  $0.68 \pm 0.003$ . Similarly, the overall mean horse power generated by Non-descript bullock pair II was 0.60, 0.75 and 0.71 (HP) for 500 ( $L_1$ ), 750 ( $L_2$ ), and 1000 ( $L_3$ ) kg payload for 4 consecutive days, respectively with a overall mean for different payload as  $0.71 \pm 0.004$  HP. The analysis of variance for horse power generated at different payloads during carting by non-descript bullock pair I and II has revealed highly significant ( $p < 0.05$ ) differences in the horse power for different payloads. The horse power generated during carting operation by non-descript bullock pair I and II (0.68 and 0.71) evidently prove the gradual increase in HP. The result was in line with findings of Yawlikar (2001)<sup>[11]</sup> who reported that horse power generated during carting for different pay loads as 0.65 to 0.75 for Red Kandhari and 0.70 to 0.98 for Deoni bullocks. Atakare (2009)<sup>[1]</sup> also reported that the 0.74 to 0.78 HP for 500, 750 and 1000 kg for Deoni bullocks.

The overall observations of Carting performance by non-descript bullock pairs produced in the present investigation by showing a draft generation of 52.75 to 53.81 kg with a speed of 3.56 to 3.62 km/hr and horse power generation of 0.68 to 0.71 for carting for 500, ( $L_1$ ), 750 ( $L_2$ ), and 1000 kg ( $L_3$ ) pay load.

From the present investigation it may be concluded that the Non-descript bullocks required lower horse power generation for carting the different pay load as compare to Red Kandhari, Deoni and Haryana bullock pairs. Hence, Non-descript bullock pairs are moderately suited for the carting performance.

## 2. Physiological Parameters of Non-descript Bullocks during carting operation

The physiological parameters like respiration rate, pulse rate and body temperature of each non-descript bullocks were recorded before start and immediately after completion of carting operation. It was necessary to noted the changes take place in these parameters due to the impact of draft/horse power generated by the bullock after completion of the work.

### 2.1 Respiration rate of non-descript bullocks before and after carting operation

The overall mean respiration rate (No/min) of each non-descript bullocks were recorded before and after for carting are presented in Table 2.

The overall mean respiration rate before and after carting operation recorded for non-descript bullock was 20.99 and 36.58 for I-A, 21.66 and 37.21 for I-B, 22.24 and 39.18 for II-A and 21.49 and 38.54 for bullock II-B (per minute), respectively. The respiration rate before and after carting operation was negatively significant ( $p < 0.01$ ) for bullock No. I-A, I-B, II-A and II-B as revealed by "Student t-test" (Table 2).

Similar findings were also reported by Shelke (2009)<sup>[5]</sup> observed that the increasing in respiration rate during carting operations in Red Kandhari bullocks. Patil (2007)<sup>[3]</sup> for

Khillar bullock have also reported the respiration rate before and after for various operations which ranged between 22.29 to 52.47 beat/min for carting operation. In the present study the respiration rates recorded before carting operations ranged between 20 to 22 per minute whereas after operations it ranged between 37 to 39 per minute. The increase in respiration rate before and after work was due to increased rate of metabolism to provide adequate energy to the working muscles.

### 2.2 Pulse rate of non-descript bullocks before and after carting operation

The overall mean pulse rate (No/min) of each non-descript bullocks was recorded before and after carting are presented in Table 2.

The overall mean pulse rate of bullock before and after carting operation was 48.32 and 68.49 for I-A, 49.66 and 69.74 for I-B, 51.41 and 70.58 for II-A, 49.99 and 68.91 (per/min) for II-B bullocks respectively. The pulse rate before and after the Carting operation differ negatively significantly for all the bullock No. I-A, I-B, II-A and II-B as revealed by the "Student t-test".(Table 2).

Similar findings were also reported by Yawlikar (2001)<sup>[11]</sup> the increased pulse rate before and after carting operations for Red Kandhari, Deoni and Crossbred bullocks. Patil (2007)<sup>[3]</sup> observed pulse rate beats/min for Khillar as 57 to 78.81 before and after for carting operations. In the present investigation the pulse rates recorded before carting operation ranged between 48 to 51 per minute whereas after operation it ranged between 68 to 70 per minute. The increase in pulse rate represents a rise in cardiac activities to fulfill the increased demand of oxygen during work.

### 2.3 Body temperature of non-descript bullocks before and after carting operation

The overall mean body temperature ( $^{\circ}$ F) of individual non-descript bullocks recorded before and after carting are presented in Table 2.

The overall mean body temperature of non-descript bullock before and after carting operation was 100.03 and 102.01 for I-A, 100.20 and 102.18 for I-B, 100.27 and 102.31 for II-A, and 100.12, and 102.22  $^{\circ}$ F for II-B bullocks, respectively. The Body temperature before and after the carting operation differ negatively significant ( $p < 0.01$ ) for all the bullock No. I-A, I-B, II-A and II-B as revealed by the "Student t-test".(Table 2).

The increase in the body temperature of non-descript bullocks after completion of the carting operation observed in the present investigation are compare with result reported by Yawlikar (2001)<sup>[11]</sup> for Red Kandhari Deoni and HF x Crossbred. Atakare (2009)<sup>[1]</sup> for Deoni and Shelke (2009)<sup>[5]</sup> for Red Kandhari observed the increase in body temperature during carting operation.

In the present study it is observed that there was uniform increasing in the body temperature for carting operation. The increase in body temperature before and after work might be due to increased heat stress on account of increased lactic acid production by the muscles and its removal by oxidative process (Yadav 2001)<sup>[9]</sup>.

**Table 2:** Physiological Parameter of Non-descript Bullocks Before and After Carting Operations

Bullocks	Mean		“t” value
	Before	After	
<b>Respiration rate (no/min)</b>			
I-A	20.99	36.58	-62.26**
I-B	21.66	37.21	-48.57**
II-A	22.24	39.18	-64.60**
II-B	21.49	38.54	-116.05**
<b>Pulse rate (no/min)</b>			
I-A	48.32	68.49	-121**
I-B	49.66	69.74	-79.80**
II-A	51.41	70.58	-66.50**
II-B	49.99	68.91	-55.24**
<b>Body temperature (°F)</b>			
I-A	100.03	102.01	-20.99**
I-B	100.20	102.18	-15.77**
II-A	100.27	102.31	-22.72**
II-B	100.12	102.22	-22.64**

(\*\* $p < 0.01$ )

In the present study the overall mean for percent increase of respiration rate by non-descript bullock pair I was 73.03 percent for carting operation, respectively. Whereas bullock pair II overall mean for percent increases of respiration rate for carting operation was 77.74 percent, respectively.

The overall mean for percent increase of pulse rate by non-descript bullock pair I was 41.08 percent for carting operation. Whereas bullock pair II overall mean for percent increases of pulse rate for carting operation was 37.56 percent. The overall mean for percent increase of body temperature by non-descript bullock pair I was 1.97 percent for carting operation. Whereas bullock pair II overall mean for percent increases of body temperature for carting operation was 2.06 percent. It is observed the percent increase in physiological parameter of non-descript bullocks for different agricultural operations are quite higher than the Vinoo (2010) reported the overall means for percent increase in RR, PR and RT were 55.84, 22.76 and 1.71 respectively in carting. Singh (2013) reported there was a significant increase in all the three physiological parameter as compared to their pre-work values.

### Conclusion

The present study indicated draught generated of 52.75 to 53.81 kg with a speed of 3.56 to 3.62 km/hr and the horse power generated of 0.68 to 0.71 HP during carting by non-descript bullock for different pay load of 500 to 1000 kg. The overall picture of physiological parameter in terms of respiration rate, pulse rate and body temperature of non-descript bullocks when exposed to carting operation with different loads has resulted into a moderate alteration increase in these parameters. Which gives to concrete conclusion that the non-descript bullock pairs are well suited for carting performance with normal pay load transportation and medium speed.

### References

1. Atakare SP. Evaluation of Draught Ability Traits of Deoni Cattle. M.V.Sc. Thesis Submitted to MAFSU, Nagpur (M.S.); c2009.
2. Maurya NL, Devdattam DSK. Response of Some Physiological Parameters of Crossbred Bullocks to Different Draft and Ambient Conditions. Indian J Dairy Sci. 1982<sup>a</sup>;35(1):18-25.
3. Patil SR. Studies on Draft ability in Khillar cattle, Ph.D.

4. Thesis submitted to MPKV, Rahuri, (M.S.); c2007.
4. Panse VG, Sukhatme PC. Statistical Methods for Agricultural Research. Indian Council of Agricultural Research, New Delhi; c1976. p. 137-151.
5. Shelke HS. Evaluation of Draught Ability Traits of Red Kandhari Cattle. M.V. Sc. Thesis submitted to MAFSU, Nagpur, (M.S.); c2009.
6. Siddiqui MF, Shelke HS, Kharwadkar MD, Ingale VS. Evaluation of Draught Ability Traits of Red Kandhari Cattle. Life Sciences International Research Journal, 2017, 4.
7. Singh B. Study on the Draughtability of Crossbred Bullocks and Their Physiological, Haematological Changes during Work Performance. International Journal of Agril. Sciences & Veterinary Medicine, 2013, 1.
8. Vinoo R. Estimation of Draught Ability of Ongole Bullocks by Different Methods, Tamilnadu. J Veterinary and Animal Sciences. 2010;6(1):24-30.
9. Yadav AS, Dhaka SS, Kumar B. Effect of Working on Physiological, Biochemical and Haematological Parameters in Haryana Bullocks. Asian-Aust. J Animal Sciences. 2001;14:1067-1072.
10. Yawalikar PV. Comparative Studies of Draftability Power of Indigenous and Crossbred Bullocks. Ph.D. Thesis Submitted to Marathwada Agril. Uni, Parbhani, (M.S.), 2001.
11. Yawlikar PV, Karanjkar LM, Patil RA. Comparative Studies on the Work Performance of Indigenous and Crossbred Bullocks during Ploughing. Draught Animal News. 2003;(39):24-27.
12. Dubey JP, Schares G, Ortega-Mora L. Epidemiology and control of neosporosis and Neospora caninum. Clinical microbiology reviews. 2007 Apr;20(2):323-267.