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Effect of Tillage Implements on Physiological Responses of Camel

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Abstract: Performance of five improved camel drawn implements namely MB plough, disc harrow, five-tyned cultivator, blade harrow and bund former were evaluated on farmers field in sandy soil. Draft requirement of tested implements was found to be within the draft capacity of the camel. Effect of these implements on physiological responses of camels was also observed. The pulse rate, respiration rate, and rectal temperature increased with the duration of work and speed of camels was reduced in the similar conditions.

Key words: Camel, draft, pulse rate, respiration rate, rectal temperature, speed.

Rajasthan has maximum number of camels and accounts for about 60% of the total 0.753 million camel population of India (Singh and Verma, 1987). A large number of camel in Thar desert of Rajasthan is used for draft purposes mainly for ploughing and harrowing the field, and for transportation. Camels are well suited to work in dry and hot environment of desert eco-system where they are able to pull heavier loads than other draft animals. Optimum draft of 18% of body weight of camel can be achieved with associated increase of 14 to 16 beats/min in pulse rate (PR), 5 to 6 breaths/min in respiration rate (RR) and 1.5 to 1.8°C in rectal temperature (RT) (Anonymous, 1990). At this draft the camel did not show any sign of fatigue even after 4 hrs of operation on tarmacadam road. The use of camel for draft is quite suitable economically and socially, especially for farmers who own only small holdings and farming labor is available where needed. In semi-arid and arid zones of Rajasthan most of the farmers use traditional, animal drawn implements. Tomar and Agrawal (1988) and Laddha (2000) have reported that the draft requirement of indigenous plough, Tota plough, Heera plough, two-tyned cultivator and three-tyned cultivator was about 43 kgf, 42 kgf, 46 kgf, 45 kgf, and 59 kgf, respectively, in sandy soil at moisture content of 10.7 to 11.8%. Thus the camel power is underutilized. This gap may be filled, up to some extent, by using improved matching camel drawn implements.

Although the camel has been used as a draft animal for a very long time in the Thar desert of Rajasthan, no documented information is available on the draftability and physiological responses of camel under field conditions. The physiological responses such as PR, RR, RT in field conditions during the tillage operations provide suitable data for assessment of work capacity of camel. This information is also essential for proper task design and in order to avoid accumulation of work stress in animal (Pathak, 1985). A draught animal

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can be compared with a motor-battery system in which the rating determines the power; the battery determines the work capacity or energy output of the system. Here physiological responses of camel with different tillage implements in actual field conditions during the different periods of the day have been studied.

Materials and Methods

Three camels of 6, 7 and 9 years age and weighing about 640, 620, and 635 kg, respectively, were selected for conducting the study in sandy soil (92.5%, sand, 2.08% silt, 5.36% clay) on farmer's field in Bikaner district. Five improved camel drawn implements namely mould board plough, disc harrow, five-tyned cultivator, blade harrow and bund former were selected. Each implement was evaluated for three days in the field to avoid chances of error. A standard procedure was adopted to measure the performance parameters of implements such as pull, width and depth of furrow, etc.

The camels were operated according to work rest cycle (Anonymous, 1990). The working schedule followed was 3-hour work, 2-hour rest, 3-hour work. Physiological parameters RR, PR, and RT were recorded at hourly interval. The speed of operation was average of five readings taken in an hour. Physiological parameters were also recorded during the rest for observing the recovery of these parameters. Environmental conditions such as ambient temperature, wind velocity, relative humidity and sunshine were recorded daily.

The respiration rate of camel was measured by counting the number of hot gushes exhaled per minute blowing against the back of the palm kept near the nostrils of the camel. The pulse rate was measured by placing the second finger on the coccygeal artery under the tail of the camel and counting number of beats per minute. Rectal temperature was measured by digital thermometer.

Results and Discussion

Tillage implements were operated in the field at moisture content of 10.8 to 11.5%. The average maximum temperature and RH were 42.1°C and 35%, respectively. The draft requirement of implements is shown in Fig. 1 and variations in physiological responses of camel with these implements are depicted in Figs. 2 and 3.

The draft requirement of cultivator was maximum (84.88 kgf) followed by M.B. plough (83.1 kgf). Bund former required minimum draft (17.9 kgf) amongst the tested implements. The draft requirement of tested implements was in the range of 3 to 14% of the body weight of the camel, which is well within the optimum draft capacity of camel (16 to 18% of body weight).

The pulse rate of camel increased with duration of work (Fig. 2). The increase in pulse rate was higher (30 to 39%) with MB plough, disc harrow, and five-tyne cultivator during the first three hours, whereas this increase was 14 to 21% with the bund former and blade harrow. This may be due to the higher draft requirement of MB plough, five-tyne cultivator and disc harrow, which was about 14% of the body weight. The draft requirement of blade harrow and bund former was about 3 to 7% of the body weight of the camel which is comparatively very low and change in pulse rate may be due to only continuous

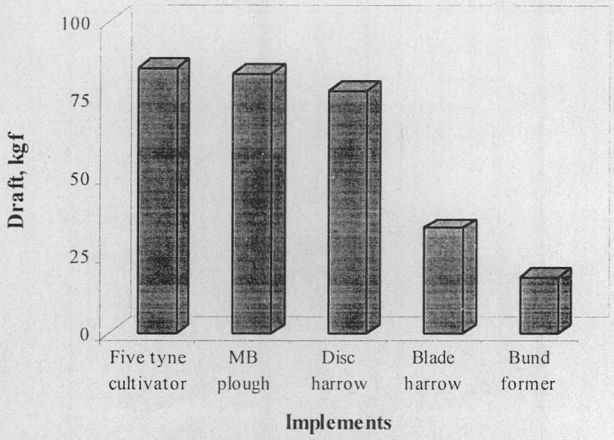

Fig. 1. Draft requirement of tested implements.

walking of the camel. It was also observed that the maximum and minimum variation in pulse rate was almost same before and after rest. Trend of pulse rate during first hour of operation after rest support that the two-hour rest period given to camel is sufficient for comfortable operation.

The respiration rate increased with increase in duration of work with all implements (Fig. 2). The highest respiration

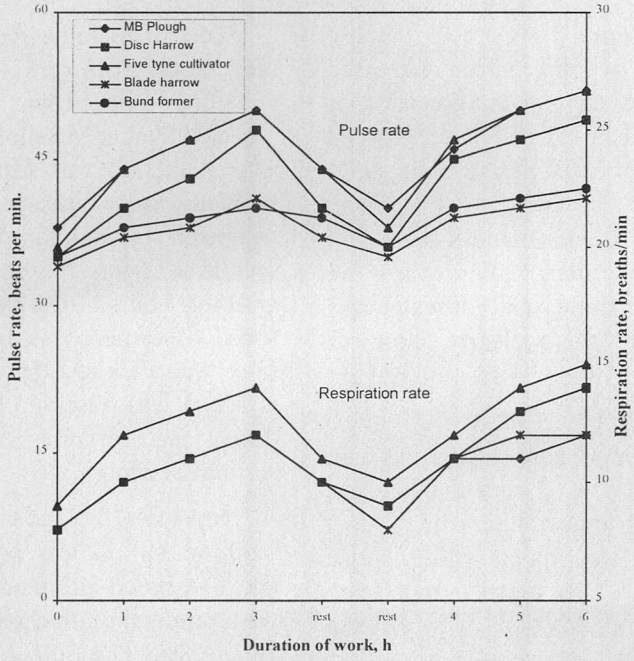

Fig. 2. Variation in pulse and respiration rates with duration of work.

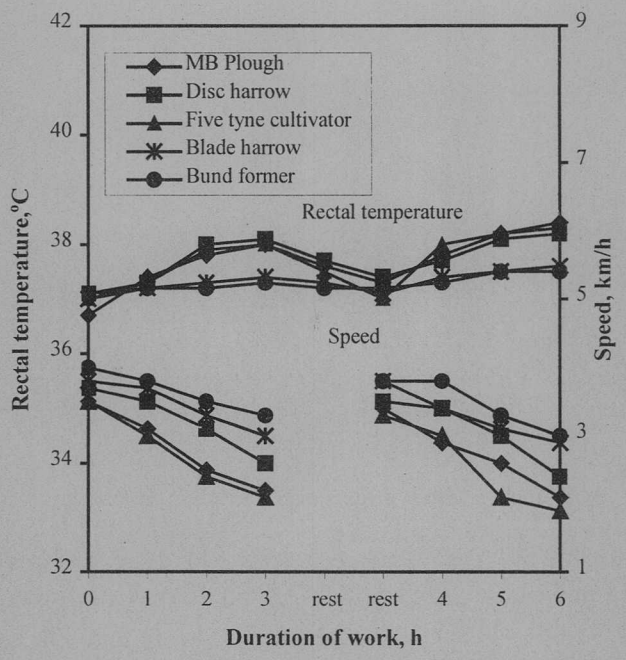

Fig. 3. Variations in rectal temperature and speed of operation with duration of work.

rate (15 breaths min^{-1}) was with the use of cultivator. The respiration rate increased steeply by 25 to 62% from the start of the operation and lasted till camel worked for 3 hrs. During the rest period this rapidly declined. Fig. 2 also indicates that trend of variation in RR with blade harrow and bund former was similar, while it was more with MB plough, five-tyned cultivator and disc harrow. The trend clearly indicates the direct effect of higher draft requirement of latter implements.

The rectal temperature increased with duration of work (Fig. 3) but the increase Increase in rectal temperature while camel worked was very slow as compared to rise in RR and PR. The rectal temperature increased with the duration of work and stabilized after two hours.

Speed of operation reduced gradually with the duration of work (Fig. 3). Maximum reduction in speed was observed with five-tyned cultivator, MB plough and disc harrow. This reduction was less and almost same for blade harrow and bund former. Reduction in speed was similar during the first and second sessions. It was also observed that with two hours of rest period the operational speed of camels was increased during the first hour after rest. However, a sharp drop in speed was observed with all implements during the last hour of work during the second session.

It may be concluded that draft requirement of MB plough, disc harrow and five-tyned cultivator was found within the optimum draft capacity of camel, i.e., 14 to 18%. The draft requirement of bund

former and blade harrow was very low, further modifications are required to utilize the available camel power more efficiently. The pulse rate, RR and RT increased and the speed of operation decreased with duration of work.

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