Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
www.entomoljournal.com
JEZS 2020; 8(6): 663-666

Received: 24-09-2020
Accepted: 27-10-2020

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# Rank correlation among temperament scores, body condition scores, and milking behavioral traits in Murrah buffaloes

**PS Pramanik, Praveen Kumar Gupta and SN Giri**

**Abstract**
The present study was conducted on temperament and body condition scores and their relationship with milking behaviour traits in dairy buffaloes at institutional farm. The 32 freshly calved Murrah buffalo cows along with their calves were observed separately for different traits on different days from date 1 to day 130 of lactation. Maximum proportion of buffaloes where docile temperament (T1) followed by restless (TIII) slightly restless (TII) aggressive (T-V) and nervous T-IV) category. Body condition score (BCS-III) was recorded in most of the buffaloes followed by BCS-IV and II and 1. MLT show a fair amount of variability over days, seasons, milkers and parity. T. Score had significant effect on MLT and mostly T-IV had higher mean MLT followed by T-V buffaloes. During initial lactation period BCS-I had slightly higher MLT where as in post peak period, BCS-III head either maximum or near maximum mean MLT followed by BCS-V. Parity calving season, milker and T. score had lesser influence on TMT. BCS-II and III head lower TMT then BCS-1 and V. Parity milking time, T. score and BCS heads significant effect on MY/milking whereas calving season and milker had no significant effect on MY/milking on most of the days studies. Highest yield was obtained in IV parity followed by III, II and 1. In general T1 and V yielded more milk yield per milking then others. It was highest in BCS-V and lowest in BCS 1 on most of the days observed. The effect of parity, T. score and BCS where significant on MFR. Maximum MFR was mostly obtained in the IV parity. Buffaloes of T1 had consistently higher MFR followed by T-II buffaloes and BCS-I had consistently lesser and BCS-III had highest MFR. BCS and T1 where negatively correlated, while BCS was positively and significantly correlated with TMT and MY/milking and MFR but MLT had very low positive correlation with BCS. T1 was significantly negatively correlated with MY/milking and MFR mostly. MLT and MFR was negatively correlated, MLT had low positive correlation with TMT and MY/ milking. MY/milking was positively correlated with MFR.

**Keywords:** Murrah, B.C.S., temperament score, MLT, MY, MFR

## Introduction
The dairy industry believes that contented cows gives more milk, however little scientific reassert has been devoted to the relationship between a cows temperament and milk yield.
Research on body condition score of dairy cows has largely concerned with the impact of BCS at calving on performance in the first half of the subsequent lactation. Considering the need for detailed studies on temperament and BCS of buffalos and the association off these traits with other characters of importance like milking behavioural traits, the present study was undertaken.

## Material and Methods
The present study was carried out on 32 freshly calved Murrah buffalo maintained at the institute. The milking behavioural traits like milk let down time, total milking time, milk yield per milking and average milk flow rate was recorded twice daily till under 130 days of lactation. Temperament score was done as per the technique suggested by Tulloh (1961) [1]. Each buffalo was rated 36 times at morning and evening during the study. The temperament index (TI) was constructed as, TI=No of leg lifts + (2 x No of kicks), Arave and Kilgour (1982) [2]. Body condition score (BCS) of buffalo was performed according to Prasad (1994) [3]. The buffalo comes under TI (docile) 10, T2 (slightly restless) 5, T3 (restless) 8, T4 (nervous) 4 and T5 (aggressive) 5. The no of buffalos following under different categories of BCS where: BCS-I(4), BCS-II(5), BCS-III(11), BCS-4(7) and BCS-5(5). The rank correlation was estimated according to Snedecor and Cochran (1989) [4].

The data on temperament index was transformed by square root transformation for computation of coefficients of correlation between TI and other traits.

**Birth weight of calves and other traits**

The rank correlation among birth weight of calves and other traits have been presented in table 1. There was no association between birth weights of calves and temperament score of their dams. However temperament indices of dam where mostly negatively correlated with birth weight of their calves though they were non significant. Body condition score of buffaloes had significant positive association with birth weight of their calves. Among the correlation with milking behavioural traits, the birth weight of calf had significant positive correlation with their dams milk yield per milking. However, it had no significant positive association with MLT, TMT and MFR in most of the days under observation.

In practical buffalo husbandry, calves are allowed to suckle their dam for let-down of milk. The present study examined a potential natural sucking behaviour of Buffalo calves in relation to their dam's temperament, body condition score and milking behavioural traits. It was observed that the body condition of dam at calving and birth weight of calf were highly positively correlated, however birth weight of calf was negatively associated with temperament index of dam. This was also corroborated by the negative association between body condition and temperament index of dam. Among milking behavioural traits milk yield per milking and average milk flow rate where highly positively correlated with birth weight of calf though total milking time and milk let down time were weekly associated with calf's birth weight.

**Table 1:** Rank correlation among birth weights of calf's with temperament and body condition score during different days of lactation

| Traits/Days | | 1 | 2 | 3 | 4 | 5 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TS | M | .oo | .oo | .oo | .oo | .oo | .oo | .oo | .oo | .oo | .oo | .oo | .oo | .oo | .oo | .oo | .oo | .oo | .oo |
| | E | 0 | .oo | .oo | .oo | .oo | .oo | .oo | .oo | .oo | .oo | .oo | .oo | .oo | .oo | .oo | .oo | .oo | .oo |
| BCS | M | .57** | .57** | .57** | .57** | .57** | .57** | .57** | .57** | .57** | .54** | .54** | .54** | .54** | .54** | .54** | .54** | .54** | .54** |
| | E | 0.57 | 0.57 | 0.57 | 0.57 | 0.57 | 0.57 | 0.57 | 0.57 | 0.57 | 0.54 | 0.54 | 0.54 | 0.54 | 0.54 | 0.54 | 0.54 | 0.54 | 0.54 |
| TI | M | -0.21 | -0.12 | 0.07 | -0.11 | -0.07 | 0.01 | -0.12 | 0.06 | -0.21 | -0.02 | -0.24 | -0.11 | -0.09 | 0.1 | -0.03 | -0.21 | 0.14 | 0.16 |
| | E | -0.18 | -0.13 | -0.01 | -0.13 | -0.2 | -0.05 | -0.31 | -0.03 | -0.23 | 0.01 | -0.09 | -0.29 | 0.12 | -0.26 | .00 | -0.15 | -0.04 | 0.34 |
| MLT | M | -0.06 | 0.15 | -0.09 | -0.02 | 0.12 | -0.11 | 0.13 | 0.33 | 0.17 | 0.18 | 0.2 | 0.03 | 0.17 | 0.1 | 0.05 | 0.04 | 0.1 | -0.05 |
| | E | -0.06 | 0.21 | 0.1 | 0.06 | 0.27 | 0.02 | 0.05 | -0.02 | 0.13 | 0.24 | 0.26 | 0.23 | 0.23 | 0.2 | 0.03 | 0.11 | 0.18 | 0.06 |
| TMT | M | .39* | 0.12 | 0.28 | 0.15 | 0.22 | .46** | 0.16 | 0.15 | -0.03 | 0.15 | -0.04 | 0.13 | 0.14 | 0.2 | 0.29 | 0.04 | 0.26 | 0.01 |
| | E | 0.06 | 0.19 | 0.07 | 0.31 | 0.3 | .36* | 0.13 | 0.25 | 0.18 | .39* | 0 | 0.34 | 0.23 | 0.08 | 0.13 | 0.23 | 0.23 | 0.28 |
| MY | M | .54** | .42* | .42* | .38* | .49** | .53** | 0.34 | 0.25 | 0.19 | 0.23 | 0.25 | .43* | .37* | .41* | 0.32 | .47** | .51** | 0.31 |
| | E | .45** | .49** | .39* | .64** | .42* | .38* | 0.23 | 0.32 | 0.23 | 0.27 | 0.16 | .36* | .37* | 0.28 | 0.33 | .37* | .40* | .50** |
| MFR | M | .40* | .35* | 0.25 | 0.34 | .41* | 0.25 | 0.25 | 0.22 | 0.19 | 0.22 | .36* | .38* | 0.34 | 0.28 | 0.24 | .45* | .42* | .41* |
| | E | .44* | 0.26 | 0.23 | .42* | .50** | 0.09 | 0.23 | 0.12 | 0.09 | -0.03 | 0.25 | -0.01 | 0.12 | 0.3 | .35* | 0.12 | 0.1 | 0.15 |

*$P$<0.05, **$P$<0.01; N=3 **2 for each trait under each day

**Temperament score**

Temperament score had significantly ($P$<0.01) positive correlation with temperament index table 2, however, it was lowly associated with body condition score. Milk let down time was also weekly correlated with temperament score in initial five days of milking but this relationship changed and was significantly correlated (positively) with temperament score on most of the subsequent days. Total milking time was also positively but non significantly associated with temperament score on most of the days. Milk yield per milking and M F R where mostly negatively correlated (non significant) with temperament score.

The buffaloes of higher degrees of temperament score had higher temperament indices and had higher milk let down time but lower milk yield per milking and average milk flow rate indicating poor milking characteristics of high temperament score buffaloes.

**Table 2:** Rank correlation among temperament score of buffaloes with body condition score during different days of lactation

| Traits/Days | | 1 | 2 | 3 | 4 | 5 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BCS | M | .06 | .06 | .06 | .06 | .06 | .06 | .06 | .06 | .06 | .03 | .03 | .03 | .03 | .03 | .03 | .03 | .03 | .03 |
| | E | .06 | .06 | .06 | .06 | .06 | .06 | .06 | .06 | .06 | .03 | .03 | .03 | -.02 | .03 | .03 | .03 | .03 | .03 |
| TI | M | .66** | .66** | .57** | .60** | .67** | .54** | .58** | .45** | .57** | .55** | .43* | .62** | .44* | .52** | .69** | .36* | .52** | .52** |
| | E | .55** | .70** | .71** | .60** | .50** | .67** | .62** | .43* | .59** | .68** | .58** | .38* | .53** | .76** | .64** | .39* | .46** | .36* |
| MLT | M | .00 | -.03 | -.06 | -.16 | .06 | .36* | .26 | .44** | .48** | .33 | .33 | .40* | .42* | .51** | .55** | .57** | .50** | .51** |
| | E | .01 | -.09 | -.22 | -.05 | .17 | .15 | .32 | .53** | .52** | .42** | .30 | .34 | .25 | .33 | .49** | .54** | .50** | .53** |
| TMT | M | .09 | .03 | .35* | .33 | .41* | .11 | .40* | .22 | .16 | -.10 | .02 | -.10 | -.16 | .01 | -.09 | -.09 | -.08 | .10 |
| | E | -.01 | .20 | .19 | .16 | .42* | .22 | .20 | .09 | .21 | .00 | -.04 | -.04 | .12 | .20 | .07 | .22 | .31 | .13 |
| MY | M | .02 | -.11 | .13 | .12 | .07 | -.08 | -.08 | -.05 | -.08 | -.15 | -.13 | -.18 | -.23 | -.35* | -.24 | -.33 | -.22 | -.26 |
| | E | -.02 | .01 | .02 | .05 | .11 | .08 | .08 | .05 | -.05 | -.11 | -.12 | -.15 | -.18 | -.04 | -.16 | -.18 | -.12 | .00 |
| MFR | M | -.08 | -.12 | -.14 | -.22 | -.24 | -.27 | -.36* | -.26 | -.17 | -.03 | -.16 | -.14 | -.15 | -.29 | -.08 | -.23 | -.20 | -.22 |
| | E | -.01 | -.13 | -.14 | -.06 | -.27 | -.24 | -.18 | -.14 | -.23 | -.09 | -.06 | -.03 | -.29 | -.30 | -.33 | -.31 | -.35 | -.05 |

*$P$<0.05, **$P$<0.01; N=3**2 for each trait under each day

**Body condition score (BCS)**

The body condition score of lactating buffalo and its temperament index (TI) was negatively correlated on most of the days, though correlation was not significant in all the days under investigation table 3. There correlation of body condition score with milking behavioural traits where found to be positive and it was significant ($P$<0.01) with milk yield per milking on almost all the days under study.

The relationship between temperament index and milk let down time was positive and non significant on most of the days. Similarly total making time was also positively correlated with TI on most of the study days. However, milk yield per milking and average milk flow rate where obviously negatively associated with temperament index table 4.13.

**Table 3:** Rank correlation among body condition score of buffaloes with temperament indices during different days of lactation

| Traits/Days | | 1 | 2 | 3 | 4 | 5 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TI | M | -0.27 | -0.19 | -0.22 | -0.17 | -0.05 | 0.04 | -0.05 | -0.12 | -0.1 | -0.14 | -0 | -0.06 | -0.22 | 0.12 | -0.03 | -0 | 0.14 | 0.32 |
| | E | -0.22 | -0.23 | 0.11 | -0.22 | 0 | -0.12 | -0.09 | -0.18 | -0.1 | -0.01 | 0.07 | -0.18 | 0.09 | -0.11 | 0.01 | -0.1 | 0.17 | 0.34 |
| MLT | M | 0.05 | 0.22 | 0.19 | 0.1 | 0.22 | 0.03 | 0.11 | 0.27 | 0.28 | .36* | .35* | 0.16 | 0.3 | 0.1 | 0.25 | 0.16 | 0.14 | 0.08 |
| | E | -0.02 | 0.19 | 0.08 | 0.13 | 0.24 | 0.11 | 0.1 | 0.02 | 0.3 | 0.26 | 0.33 | 0.21 | 0.28 | 0.22 | 0.21 | 0.2 | 0.2 | 0.13 |
| TMT | M | 0.11 | 0.18 | 0.1 | 0.16 | 0.26 | .49** | 0.29 | 0.24 | 0.22 | 0.31 | 0.28 | 0.27 | .47** | 0.32 | .47** | 0.23 | 0.33 | 0.21 |
| | E | 0.19 | 0.31 | 0.18 | .44** | .37* | .54** | 0.29 | 0.29 | .42* | .40* | 0.22 | .40* | .54** | .37* | 0.31 | 0.2 | 0.23 | 0.24 |
| MY | M | 0.27 | .37* | .45** | .40* | .52** | .63** | .55** | .50** | .43* | .47** | .42* | .52** | .49** | .50** | .47** | 0.34 | .46** | 0.34 |
| | E | .48** | .49** | .36* | .59** | .49** | .49** | .53** | .50** | .37* | .47** | .40* | .49** | .49** | .59** | .51** | .41* | .46** | .52** |
| MFR | M | 0.3 | 0.15 | .36* | 0.28 | 0.28 | 0.32 | .36* | .40* | 0.22 | 0.08 | 0.34 | 0.32 | 0.16 | 0.33 | 0.14 | 0.28 | .35* | 0.26 |
| | E | 0.24 | 0.14 | 0.27 | 0.19 | 0.25 | 0.04 | .35* | 0.23 | 0.01 | 0.16 | 0.23 | 0.07 | -0.1 | 0.29 | .38* | 0.19 | 0.2 | 0.23 |

*$P$<0.05, **$P$<0.01; N=3**2 for each trait under each day

**Milk let down time (MLT)**

During most of the days under study milk let down time was positively associated with total milking time, milk yield per milking and average milk flow rate.

**Table 4:** Rank correlation among temperament indices with other milking behavioural traits during different days of lactation

| Traits/Days | | 1 | 2 | 3 | 4 | 5 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MLT | M | -0 | -0 | -0 | -0.1 | 0.14 | 0.02 | -0 | 0.06 | .36* | -0 | 0.06 | 0.12 | 0.22 | 0.2 | .48** | 0.05 | 0.26 | 0.22 |
| | E | 0.14 | -0.2 | -30 | -0 | -0.1 | -0.18 | 0.11 | 0.2 | -0 | 0.18 | -0.1 | 0.14 | 0.07 | 0.12 | 0.33 | 0.24 | 0.23 | .37* |
| TMT | M | 0.12 | 0.12 | 0.32 | 0.05 | 0.22 | 0.05 | 0.09 | -0.1 | 0.16 | 0.19 | 0.25 | -0.1 | -0.2 | -0.2 | -0.06 | -0.1 | 0.07 | -0.1 |
| | E | 0.05 | 0.06 | 0.26 | 0.01 | 0.12 | 0.2 | 0.11 | -0.1 | 0.06 | -0.1 | -0.1 | 0.14 | -0 | 0.12 | 0.05 | -0.1 | 0.05 | 0.05 |
| MY | M | -0.2 | -0.3 | -0.1 | -0.3 | -0.1 | -0.16 | -0.3 | -0.1 | -0.1 | -0.1 | -0.1 | -0.2 | -.36* | -0.1 | -0.27 | -0.3 | -0.1 | -0.1 |
| | E | -0.3 | -0.3 | -0.2 | -0.1 | -0.1 | -0.2 | -0.1 | -0.2 | -.35* | -0.2 | -0.3 | -0.1 | -0.2 | -0.2 | -.43* | -0.3 | -0 | 0.03 |
| MFR | M | -.39* | -0.3 | -0.3 | -.44* | -0.2 | -.43* | -0.3 | -0.2 | -0.2 | -.37* | -.37* | -0 | -0.2 | 0.18 | -0.18 | -0.3 | -0.2 | 0.01 |
| | E | -0.2 | -.36* | -.43* | -0.2 | -0.3 | -51** | -0.3 | -0.1 | -.39* | -0.1 | -0.1 | 0.14 | -0.2 | -0.3 | -.55** | -0.1 | 0 | -0.1 |

*$P$<0.05, **$P$<0.01; N=3**2 for each trait under each day

**Total milking time (TMT)**

The positive significant ($P$<0.01) association between total milking time and milk yield per milking was observed. However, average milk flow rate was negatively associated with TMT.

**Table 5:** Rank correlation among milk let down time with other milking behavioural traits during different days of lactation

| Traits/Days | | 1 | 2 | 3 | 4 | 5 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TMT | M | -0.3 | 0.01 | -.37* | -0.2 | 0.1 | 0.1 | 0.04 | 0.15 | 0.31 | 0.19 | 0.34 | 0.33 | 0.03 | -0 | -0 | -.35* | 0.18 | 0.14 |
| | E | -0.1 | 0.13 | -0.2 | -0.2 | 0.1 | 0 | 0.2 | 0.22 | .41* | .46** | 0.28 | 0.28 | .39* | 0.33 | 0.32 | .36* | 0.24 | 0.18 |
| MY | M | -0.3 | -0 | -0.1 | 0.01 | 0.1 | 0.1 | 0.33 | 0.15 | .40* | .41* | 0.28 | 0.16 | 0.12 | -0.1 | -0.1 | -0.2 | -0 | 0.05 |
| | E | -0.3 | -0.1 | 0.01 | -0 | 0.1 | 0.3 | 0.27 | .37* | 0.23 | 0.25 | 0.37 | 0.1 | .56** | 0 | 0 | -0.1 | 0.1 | 0 |
| MFR | M | -0.1 | 0.05 | 0.15 | 0.27 | 0.2 | 0.1 | 0.21 | -0 | 0.16 | .38* | -0 | -0.2 | 0.17 | -0.1 | -0.1 | 0.04 | -0.2 | -0 |
| | E | -0.1 | 0.06 | 0.16 | 0.17 | 0.1 | 0.2 | -0.1 | 0.14 | -0.2 | -0.22 | 0.08 | -0.2 | 0.04 | -0.3 | -0.3 | -.38* | -0.2 | -0.2 |

*$P$<0.05, **$P$<0.01; N=3**2 for each trait under each day

**Milk yield per milking (MY)**

The association between milk yield per milking and average milk flow rate was highly significant ($P$< 0.01) positively in most of the days under study.

**Table 6:** Rank correlation among total milking time with other milking behavioural traits during different days of lactation

| Traits/Days | | 1 | 2 | 3 | 4 | 5 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MY | M | .59** | .48* | .60** | .57** | .56** | .77** | .39* | .63** | .65** | .66** | .67** | .64** | .73** | .53** | .50** | .47** | .58** | 0.22 |
| | E | .36** | .38* | .51** | .62** | .62** | .57** | .58** | .71** | .60** | .71** | .64** | .57** | .54** | .42* | .55** | .47** | .40* | .49* |
| MFR | M | 0.03 | -0.26 | -0.22 | -0.25 | -0.2 | -0.17 | -.37* | -0.11 | -.36* | -0.32 | -0.16 | -.38* | -0.02 | -0.21 | -0.22 | -0.15 | 0.03 | -.41* |
| | E | -0.27 | -.50** | -.50** | -0.31 | -0.28 | -.53** | -0.3 | -.39* | -.51** | -..34 | -.35* | -.41* | -.47** | -0.32 | -0.14 | -.56** | -.56** | -37* |

*$P$<0.05, **$P$<0.01; N=3**2 for each trait under each day

**Average milk flow rate (MFR)**

The average milk flow rate of buffalo was positively correlated with its calf activities at the suckling time.

**Table 7:** Rank correlation among milk yield per milking with average milk flow rate during different days of lactation

| Traits/Days | | 1 | 2 | 3 | 4 | 5 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MFR | M | .76** | .62** | .54** | .55** | .57** | .44* | .62** | .64** | .39* | .40* | .54** | .38* | .63** | .65** | .67** | .75** | .79** | .72** |
| | E | .69** | .49** | .38* | .50** | .46** | 0.3 | .48** | 0.3 | 0.3 | 0.3 | .44* | .40* | .38* | .63** | .68** | .40* | .46** | .56** |

*$P$<0.05, **$P$<0.01; N=3**2 for each trait under each day

## Results & discussion

Body condition score (BCS) were negatively correlated with temperament indices (TI) indicating that buffaloes with good body condition show less kicking and less lifting during milking time. BCS was positively and significantly correlated with TMT, MY/ milking and MFR but low positive correlation was observed between BCS and MLT. These indicated that buffaloes with good BCS would in general better milking behavioural traits. Low positive correlation was observed between T1 with MLT and TMT, however TI was significantly and negatively correlated with MY/milking and MFR on most of the days under study indicating difficulty in handling of animals high in temperament during milking. MLT had Low positive correlation with TMT and MY/milking whereas it was negatively correlated with MFR. The buffaloes which had more let down time, had also more milking time because of low milk flow rate. However due to more milking time there yield was comparatively more. TMT was highly positively correlated with MFR. MY/milking was positively correlated with average milk flow rate.

It was observed that birth weight of calf was highly positively correlated with BCS of its dam at calving but negatively correlated with TI of dam. Among milking behavioural traits, MY/milking and MFR where highly positively correlated with birth weight of calf; however TMT and MLT where weekly associated with calf's birth weight.

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