Assessing the Behaviour of Sahiwal calves under *Azolla pinnata* feeding *in* early morning hours during cold season

ABSTRACT

The current study was conducted to assess the feeding behaviour of Sahiwal calves under *Azolla pinnata* feeding in early morning hours during cold season. For this experiment, 18 female Sahiwal calves of age group 04 months and 56 kg body weight were taken and divided into three treatment groups. Treatment groups T_1 and T_2 were provided with 15% and 30% protein replacement of concentrate by *Azolla pinnata*while control group was offered feeding as per ICAR, 2013 feeding standards. Feeding behaviour of calves were analysed with the help of instantaneous scan sampling technique and weekly 4 hours of behaviour was recorded (2 hours in a day, twice a week) in early morning hours from 09.00 to 11.00 am. Eating behaviour at 1st month of study was statistically significant in treatment groups T_1 (26.5±0.29) and T_2 group (26.5±0.20) as compared to control group (24.375±0.23) while numerically higher in treatment groups over the whole study period as *Azolla pinnata* has better mineral profiling and protein rich source, rumination time period was higher in T_1 and T_2 group and it might be due to the better resting behaviour in the treatment groups. However, better health status was reported in treatment groups over the control groups. From, this study it may be concluded that *Azolla pinnata* feeding may acts as an alternate protein source by improving the feeding and resting behaviour without affecting the overall performance of calves.

Key words: *Azolla pinnata*, behaviour, calves, morning, Sahiwal

1.INTRODUCTION

India is basically an agrarian nation, having the world's biggest animal population. Animals raising is one of the significant occupations in India that gives milk, excrement and draft power for agriculture. Importance of the domesticated animals can be acknowledged from the way that in spite of the fact that offer of farming division in Indian GDP has tumbled from 37% in 1980-81 to 27 % in 2010-11, the offer of domesticated animals segment in agribusiness expanded from 19 % in 1980-81 to 26.4 % in 2017-2018. It contributes about 8.5- 9.0 % to the nation's GDP[1]. Animal husbandry is an essential part of Indian agriculture that supports more than two-thirds of the rural population's livelihood. Animals are a regular source of cash income for rural households and provide nutrient-high dairy products, draught energy for work and dung as organic source and fuel, hides and skin. According to

20th Livestock Census, Cattle (35.94 %), Buffalo (20.45 %), Sheep (13.87 %), Goat (27.80 %), Pig (1.69%) and others (0.23%) out of the total livestock population. Sahiwal contributes about 3.28% of the total indigenous population (19th Livestock census).Sahiwal is regarded as one of India's finest dairy cattle breed. The breed derives its name from the region of Sahiwal in Pakistan's Punjab district of Montgomery. Green feed and fodder scarcity is considered a major constraint to animal production in India, especially in rural resource-poor areas. The feed deficiency is the most significant disadvantage in livestock production and accounts for almost 50 percent of all Indian animal manufacturing losses. The 65% green fodder and 25% dry food deficiency is anticipated to exasperate indigenous stocks by 2025 [2].India, with the world's second biggest human population with an annual growth rate of 2%, is also responsible for feed and fodder shortages because, against a desirable 12% area of India's entirely cultivable land, only 4% of the area is used in the cultivation of fodder, resulting in a sharp decline in the accessibility of fodder. Feed is the largest expense of animal husbandry and is therefore a main determinant of profitability. As a consequence, livestock rely primarily on crop residues as their primary feed resource in most area of India, which are poor in dietary quality, crude protein and high in fibre. Under these contexts, *Azolla* can function very well as it can be grown at minimum labour costs, using minimum land and producing nutrients of high quality all through the year. *Azolla pinnata* is the most commonly dispersed species in both tropical and temperate regions in India and around the globe. It develops all across the world in ponds, ditches, swamps, hot temperate and tropical areas, and even in lakes and rivers where the water is not turbulent [3].Azolla is protein-rich source that can be used for animal nutrition as a supplier of plant protein and provitamins [4]. Azolla's nutritional value is well recognized, proving that it is a good source of protein, almost all essential amino acids desired for animal nutrition (particularly lysine), and also offers macronutrients such as calcium, magnesium, potassium and vitamins such as vitamin A (beta-carotene precursor) and B_{12}[5]. Azolla can act as a valuable green feed supplement for dairy cattle to improve productivity in terms of development, milk, meat, etc. particularly where the availability of green fodder is limited [6].Till date very scanty literature is available on the effect of *Azolla pinnata* feeding on the behaviour of Sahiwal calves in early morning hours during cold season thus this research work was planned with the following objectives:

1. To study the effect of *Azolla pinnata* feeding on the feeding behaviour of Sahiwal calves
2. To investigate the effect of *Azolla pinnata* feeding on the incidence of health disorders

2. MATERIALS AND METHODS

Eighteen growing Sahiwal female calves with averageinitial body weight of 56±0.68 Kg were used in thisstudy. The calves were randomly assigned to three experimentalgroups (6 calves per group). The animals were kept in individual pens in a well ventilated room over a concrete floor. The animals were properly vaccinated and dewormed before the start of experiments. The experiment was conducted for 90 days (13 weeks) from 1 Nov 2018 to 29 Jan. 2019. Adaptation period of 2 weeks on the regular diet was done; it was followed by the experimental period of 13 weeks (90 days) from during which the groups were feed with the three different treatments.Treatment group (T_1 and $T_{2)}$was feed by replacing the 15 % , 30% protein content of the concentrate with the *Azolla pinnata* andcontrol group Tc was fed as per ICAR feeding standard (2013). The diets formulated were iso-nitrogenous and iso-caloric in all the groups and all the animals were fed individually. Concentrate mixture mixed with Azolla was provided at 9.00 AM and roughage mixed with wheat straw was offered at 11.00 AM and this was feed thrice a day. Mineral supplement and water was offered ad libitum throughout the research. Feed left by the animals were weighed every morning. Behaviour of female Sahiwalcalves was assessed in the early morning hours from 09.00 to 11.00 am by using Sony handy-cam twice a week for whole study period immediatelyafterprovidingconcentrate mixture mixed with *Azolla pinnata*. Each treatment group was offered with separate feed alley and one feed alley was used for 6 calves. Behaviour was analysed by instantaneous scan sampling technique for the above mentioned time period i.e. 4 hrs/week (Total 13*4= 52 hrs). Data were analysed with the help of SPSS software version 16.

3. RESULTS AND DISCUSSION

Feeding behaviour of Sahiwal calves under *Azolla pinnata* feeding at 1st, 2nd and 3rd month of experiment is depicted below in table 1, 2, 3 andin the figure 1, 2 and 3 respectively.

3.1 Feeding behaviour in different months

Eating behaviour at 1st month of study was statistically significant in treatment groups T_1 (26.5±0.29) and T_2 group (26.5±0.20) as compared to control group (24.375±0.23) while numerically higher in treatment groups over the study period as *Azolla pinnata* has better mineral profiling and protein rich source and yet so far no work has been done related to our study. But, some researchers had done work on different feeding regimens and our results are in agreement with the results obtained by(Boga *et al*., 2009, Forbes 1995, Fraser and Broom 1990, Arthington *et al*., 1997, Mogenson*et al*., 1997, Mousaie*et al*., 2014 and Yari *et al*., 2014)[7, 8, 9, 10, 11, 12, and 13].Rumination time period was higher in T_1 and T_2 group in the whole experiment period and it might be due to the better resting behaviour in the treatment

groups. Our, results are in contradictory to the results obtained by (Yari *et al.*, 2018, Moonsieand Mowate 1993)[14 and 15]. Thus, higher resting time period was observed in *Azolla pinnata* treatment groups and calves spent more time in resting and lesser standing duration as calves prefers to eat concentrate mixture mixed with *Azolla pinnata*. However, the overall average eating, rumination and resting behaviour were better and numerically higher in treatment groups while lower standing behaviour was observed in treatment groups.

Table 1: Feeding behaviour of Sahiwal calves under *Azolla pinnata* feeding at 1st month of experiment

Parameters	Tc	T1	T2
Eating	24.37^{a}±0.23	26.50^{b}±0.29	26.50^{b}±0.20
Rumination	30.62±0.21	31.37±0.37	32.00±0.13
Resting	27.37±0.27	28.12±0.31	28.12±0.12
Standing	32.12±0.24	29.00±0.40	29.87±0.17
Miscellaneous	5.52±0.00	5.01±0.32	3.51±0.32

(Mean with different superscripts in a row differ significantly $p < 0.05$)

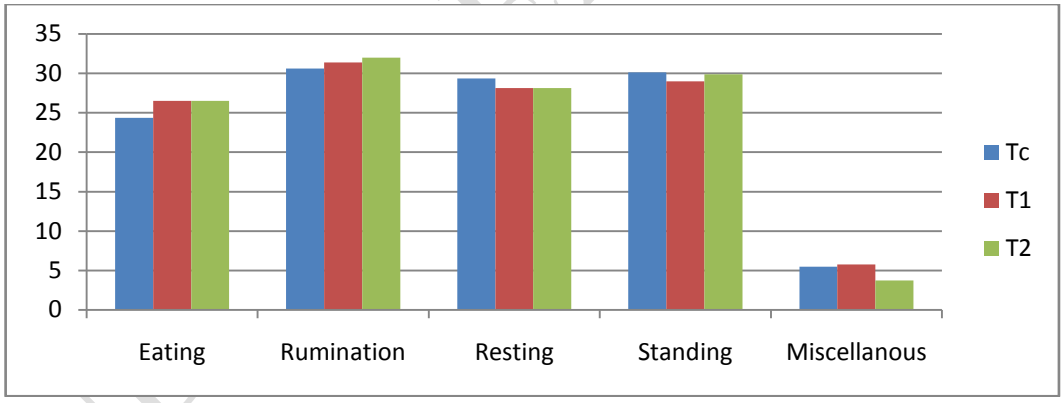

Figure 1: Feeding behaviour of Sahiwal calves under *Azolla pinnata* feeding at 1st month of experiment (X Axis-Different feeding behaviour parameters and Y Axis-Time duration)

Table 2: Feeding behaviour of Sahiwal calves under *Azolla pinnata* feeding at 2nd month of experiment

Parameters	Tc	T1	T2
Eating	26.25±0.47	25.75±0.62	28.00±0.73
Rumination	28.75±0.43	31.25±0.69	29.57±0.75
Resting	27.50±0.28	28.25±0.14	27.62±0.37

Standing	28.50±0.23	30.25±0.17	29.87±0.51
Miscellaneous	9.00±0.32	4.50±0.54	4.94±0.20

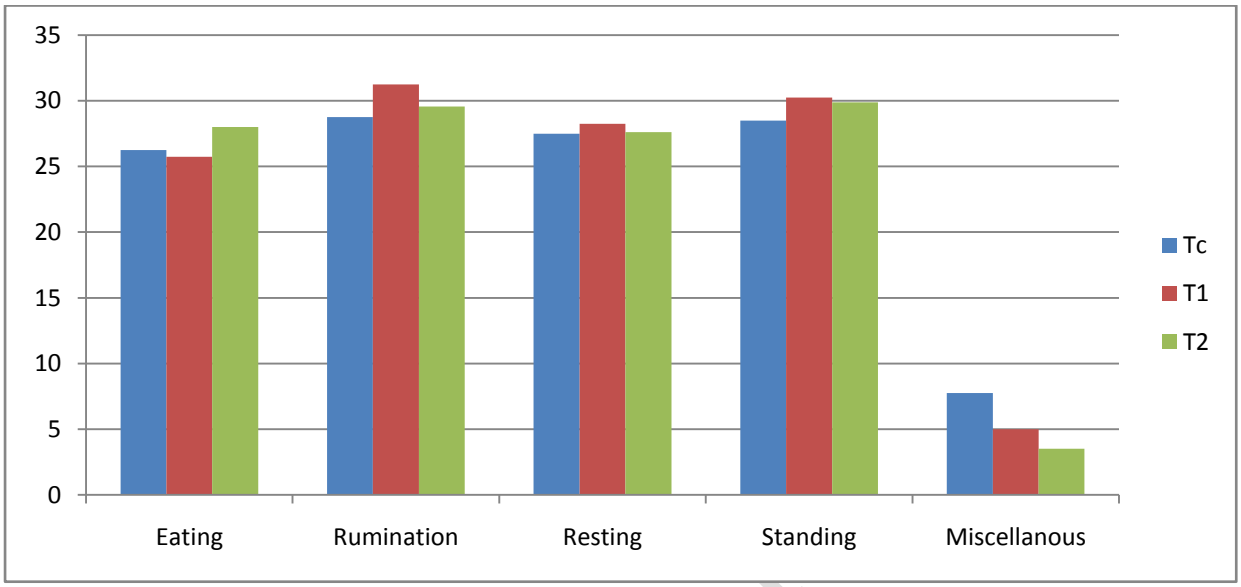

Figure 2: Feeding behaviour of Sahiwal calves under *Azolla pinnata* feeding at 1st month of experiment (X Axis-Different feeding behaviour parameters and Y Axis-Time duration)

Table 3: Feeding behaviour of Sahiwal calves under *Azolla pinnata* feeding at 3rd month of experiment

Parameters	Tc	T1	T2
Eating	28.00±0.40	27.37±0.23	26.00±0.20
Rumination	29.50±0.36	30.12±0.21	30.00±0.17
Resting	27.50±0.20	28.62±0.55	28.90±0.33
Standing	32.02±0.18	29.87±0.57	30.62±0.31
Miscellaneous	2.98±0.32	4.02±0.23	4.48±0.32

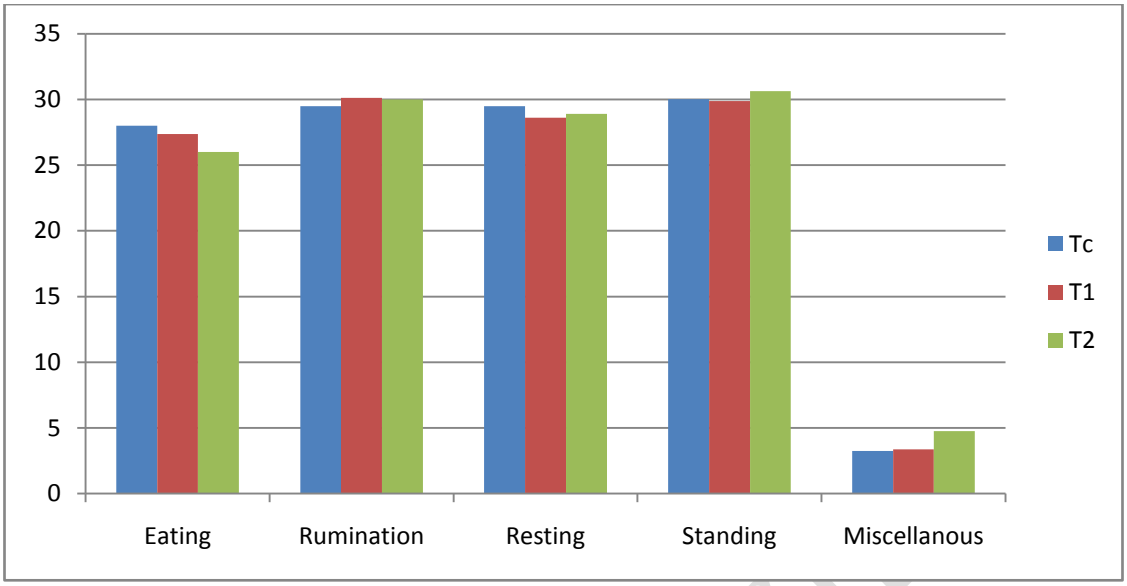

Figure 3: Feeding behaviour of Sahiwal calves under *Azolla pinnata* feeding at 1st month of experiment(X Axis-Different feeding behaviour parameters and Y Axis-Time duration)

Table 4: Average Feeding behaviour of Sahiwal calves under *Azolla pinnata* feeding in the whole trial period

Parameters	Tc	T_1	T_2
Eating	26.20±1.04	26.54±0.46	26.83±0.60
Rumination	29.62±0.54	30.91±0.39	30.52±0.74
Resting	28.19±0.64	28.33±0.15	28.21±0.37
Standing	29.55±0.52	28.70±0.37	28.12±0.25
Miscellaneous	6.44±1.29	5.52±0.70	6.32±0.38

3.2 Health incidence

The number of health disorders reported in the study in terms of Diarrhoea, Pneumonia, parasitic infestation and mortality are depicted in the table 5. The number of diarrhoeal cases in all the groups was similar and it might be duethe reason that *Azolla pinnata* feeding has higher moisture content and low dry matter. While, no case of pneumonia was reported in treatment groups and 1 case was reported in control group however, 3 cases of parasitic infestation reported in control group and 1, 2 cases were reported in T_1 and T_2 respectively due to *Azolla pinnata* feeding which is rich source of Antioxidants, better mineral profiling

and acts as good immunomodulator. Our results of health incidence were in agreement to the results obtained by (Wijayasinghe*et al*., 1984)[17].

Table 5: Health incidence *Azolla pinnata*(Numbers) reported during the study period

Parameters	Tc	T_1	T_2
Diarrhoea	1	1	1
Pneumonia	1	0	0
Parasitic infestation	3	1	2
Mortality	0	0	0

4. CONCLUSION

From, this study it may be concluded that *Azolla pinnata* feeding may acts as an alternate protein source by improving the feeding and resting behaviour without affecting the overall performance of calves.

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