Plant Archives Vol. 26, Supplement 2, 2026 pp.3591-3596 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2026.v26.supplement-2.457

ENHANCING DRY MATTER INTAKE AND WATER CONSUMPTION OF LACTATING NON-DESCRIPT COWS THROUGH SALT AND JAGGERY- ENRICHED SOYBEAN STRAW FEEDING

Priyanka A. Katke[1*], R.R. Shelke[1], S.D. Chavan[1], P.A. Kahate[1], J.P. Deshmukh[2], and S.P. Waghmare[3]
[1]Department of Animal Husbandry and Dairy Science, PGI Dr. PDKV, Akola, Maharashtra, India
[2]Department of Agronomy, Dr. PDKV, Akola, Maharashtra, India
[3]Department of Vet. Clinical Medicine, PGI, VAS, Akola, Maharashtra, India
*Corresponding author E-mail: priyankakatke98@gmail.com
(Date of Receiving : 17-05-2026; Date of Revision : 25-06-2026; Date of Acceptance : 31-07-2026)

ABSTRACT

In the present investigation,120-day feeding trial was conducted to evaluate the effect of salt and jaggery treated soybean straw feeding on dry matter intake (DMI) and water intake of lactating non-descript cows. Twenty cows were randomly allotted to five dietary treatments comprising T_1 (untreated soybean straw), T_2 (2% salt treated soybean straw), T_3 (2% salt + 5% jaggery treated soybean straw), T_4 (2% salt + 7.5% jaggery treated soybean straw) and T_5 (2% salt + 10% jaggery treated soybean straw). All experimental animals were uniformly offered 7 kg green Hybrid Napier fodder and 2.5 kg concentrate mixture per day, while soybean straw was fed according to the respective treatments. Dry matter intake and water intake were recorded weekly for 120 days. In the results of present investigation, the pooled mean DMI (kg/day) was significantly ($P<0.01$) higher in T_5 (9.23), T_4 (9.21) and T_3 (9.20) than in T_2 (8.37) and T_1 (7.28). Likewise, DMI per 100 kg body weight increased significantly from 2.33 in T_1 to 2.87–2.88 in T_3–T_5. Compared with the recommended DMI (2.5% BW), T_3, T_4 and T_5 recorded approximately 15% higher intake, whereas T_1 showed a 6.76% deficit. Average daily water intake also increased significantly ($P<0.01$), ranging from 27.22 kg/day in T_1 to 29.62 kg/day in T_4 and T_5. The findings indicated that treating soybean straw with 2% salt and 7.5–10% jaggery improved feed palatability, resulting in greater dry matter consumption and water intake.

Keywords **:** Soybean straw, Salt, Jaggery, Enrichment, Dry Matter Intake, Water Intake

Introduction

Agricultural is a backbone of Indian economics in which rearing of dairy animal with agriculture is a major farming system in India, it is important and prevalent subsidiary occupation along with agriculture. Feed expenses constitute approximately 70-75% of the total cost involved in livestock production, especially for milch animals. Therefore, adopting effective feeding strategies with an appropriate inclusion of green and nutritious fodder is essential to enhance the profitability of livestock or dairy farming (Modh *et al*., 2024 and Roy *et al*., 2019).

Soybean (*Glycine max* L.) is a native of subtropical centre Asia and is one of the important crop. In America, Brazil and China, the cultivation of soybean was practiced and in some European countries like France, Italy, Germany, Austria and Switzerland.

Soybean occupies an intermediate position between legumes and oil seed and called a miracle "Golden bean" of the 20th century. Soybean is equally important as fodder as well as oil seed crop. The straw is obviously superior in its quality over any other cereal straws. The soybean hay and other green fodder are available for livestock in rainy and winter season. But the soybean straw can be fed throughout the year. The soybean straw consists of stems, leaves, and pods. The average composition of this material includes 35% cellulose, 21% insoluble lignin, 17% hemicelluloses, 11% ash, 1% acid soluble lignin, and remaining constituents such as protein, pectin, and glucuronic

acid substitutes (Cabrera *et al*., 2015; Wan, Zhou, & Li, 2011).

Soybean cultivation in India during kharif 2025-2026 area was 123.86 Lakh Ha, production 125.96 lakh tonnes and yield was 1017kg/ha. During 2024-25 area was 129.52 lac ha as against 132.55 lac/ha during 2023-24 and production was 152.68 lakh tonnes in year 2024-25 and 130.62 lakh tonnes in year 2023-24 during kharif season. Yield obtained in year 2024-2025 was 1179 kg /ha and 2023-2024 yield was 985 kg/ha (Source: DA&FW 2026).

In addition to that soybean straw is a leguminous crop and its straw is superior in protein content as compared to cereal crop straws like sorghum straw, wheat straw and rice straw. Hence, soybean crop residue seems to be emerging alternative roughage to sorghum and other cereal straws for animal feeding. But as per the growing habit of soybean all the leaves were shredded at the time of harvesting, only stems and pod kernels were present in the straw, further it contains about 17 per cent lignin, which make straw more hard and course, these affects the intake, palatability, softness of straw and deficit in intake and digestibility affects negatively on health and production of animal (Shelke *et al*., 2024).

Jaggery is appropriate healthy and nutritious foodstuff that serves as the primary sweetener for rural as well as urban residents. It includes approximately 5–15% glucose and fructose, 60–85% sucrose, 0.4% protein, and 0.1g of fat. Proteins, lipids, vitamins (B-complex and folic acid), and minerals (Ca, Fe, P, Mg, K, and trace amounts of Zn, Cu, etc.) all contained at jaggery (Ukey *et al*., 2024).

Therefore, present investigation was planned at Livestock Instructional Farm, Department of AHDS, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, for a period of 120 days were planned and conducted to utilize non-conventional Soybean straw as protein source roughage in the ration of lactating non-descript cows to find out its effect on DMI and water intake.

Material and Methods

A total of twenty early to mid-lactation cows were chosen from the herd according to their stage of lactation, body weight, and milk production. The animals were stratified into five homogeneous groups of four cows each based on comparable average milk yield and body weight. Each group was randomly allotted to one of the five experimental feeding treatments.

Five feeding regimes were formulated for the experimental animals. The cows in treatment T_1 were offered untreated soybean straw along with green fodder and concentrate. Treatment T_2 consisted of 2% salt-treated soybean straw with green fodder and concentrate. In T_3, the animals received soybean straw treated with 2% salt and 5% jaggery, supplemented with green fodder and concentrate. Treatment T_4 comprised soybean straw treated with 2% salt and 7.5% jaggery along with green fodder and concentrate, whereas T_5 consisted of soybean straw treated with 2% salt and 10% jaggery, supplemented with green fodder and concentrate.

A uniform quantity of 7 kg of Jaywant (Hybrid Napier) green fodder was provided daily to all cows irrespective of the treatment. The concentrate mixture (Sugras) was offered according to the body weight and milk production of individual cows, following the recommended thumb rule for feeding lactating dairy animals.

The experimental cows were provided with calculated quantities of feed and fodder according to their respective dietary treatments. Feed intake was recorded weekly throughout the 120-day experimental period to determine the dry matter intake (DMI) of each animal. Dry matter intake was assessed at the beginning of the experiment and subsequently at weekly intervals by measuring the quantity of feed offered and the refusals. Representative feed samples were collected weekly for the estimation of dry matter and proximate composition. The samples were dried, pooled, ground to a uniform particle size, and stored in airtight polythene bags until laboratory analysis.

Water intake of each cow was measured twice a week during the experimental period. Fresh, clean drinking water of known quantity was offered twice daily, in the morning and evening. The amount of water consumed was determined by measuring the quantity of water remaining in the buckets after each feeding, and the difference between the water offered and the residual water was recorded as the daily water intake. Data obtained in the present investigation was statistically analyzed by applying WASP- Web Agri Stat Package 2.0.

Results and Discussion

Table 1: Average weekly dry matter intake (kg/day/cow) over experimental period on different treatments

Weeks	Week wise mean values of treatments					Pooled mean
	T_1	T_2	T_3	T_4	T_5	
Week-1	7.14	7.25	7.25	7.24	7.26	**7.22**^{a}
Week-2	7.16	8.20	8.18	8.18	8.19	**7.98**^{b}
Week-3	7.18	8.21	8.20	8.19	8.21	**8.00**^{b}
Week-4	7.20	8.23	8.39	8.38	8.39	**8.12**^{c}
Week-5	7.22	8.25	8.57	8.56	8.58	**8.23**^{d}

Week-6	7.23	8.27	8.75	8.75	8.76	**8.35^{e}**
Week-7	7.25	8.29	8.94	8.93	8.95	**8.47^{f}**
Week-8	7.27	8.31	9.12	9.11	9.13	**8.59^{g}**
Week-9	7.29	8.33	9.30	9.30	9.31	**8.70^{h}**
Week-10	7.38	8.45	10.13	10.12	10.14	**9.24^{i}**
Week-11	7.39	8.73	10.18	10.20	10.23	**9.34^{j}**
Week-12	7.39	9.00	10.19	10.29	10.32	**9.44^{k}**
Week-13	7.40	9.28	10.14	10.36	10.36	**9.50^{l}**
Week-14	7.36	8.40	10.04	10.03	10.05	**9.17^{m}**
Week-15	7.34	8.38	9.86	9.85	9.86	**9.06^{n}**
Week-16	7.32	8.36	9.67	9.66	9.68	**8.94^{o}**
Week-17	7.31	8.34	9.49	9.48	9.50	**8.82^{p}**
Pooled mean	**7.28^{c}**	**8.37^{b}**	**9.20^{a}**	**9.21^{a}**	**9.23^{a}**	

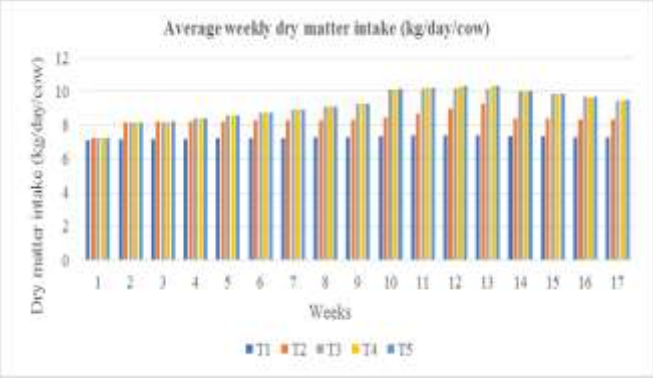

Fig. 1: Average weekly dry matter intake (kg/day/cow) over experimental period on different treatments

Average weekly dry matter intake (kg/day/cow) over experimental period on different treatments is given in Table 1 and depicted in figure 1. The average weekly dry matter intake (DMI) of lactating cows increased gradually during the experimental period in all treatments, with the highest intake observed between Weeks 10 and 13, followed by a slight decline towards the end of the trial. The pooled mean DMI was significantly ($P<0.05$) higher in T_5 (9.23 kg/day), T_4 (9.21 kg/day), and T_3 (9.20 kg/day) than in T_2 (8.37 kg/day) and T_1 (7.28 kg/day). The results indicate that feeding salt- and jaggery-treated soybean straw improved dry matter intake compared to untreated soybean straw, while T_3, T_4, and T_5 performed similarly.

Table 2: Average weekly dry matter intake (kg/day/cow per 100 kg body weight) over experimental period on different treatments

Weeks	Week wise mean values of treatments					Pooled mean
	T_1	T_2	T_3	T_4	T_5	
Week-1	2.28	2.34	2.35	2.32	2.30	2.32^{a}
Week-2	2.28	2.59	2.57	2.58	2.57	2.52^{b}
Week-3	2.29	2.59	2.57	2.58	2.58	2.52^{b}
Week-4	2.29	2.60	2.63	2.63	2.63	2.56^{c}
Week-5	2.32	2.60	2.68	2.69	2.69	2.60^{d}
Week-6	2.33	2.61	2.74	2.75	2.75	2.64^{e}
Week-7	2.30	2.61	2.80	2.80	2.80	2.66^{e}
Week-8	2.35	2.61	2.85	2.85	2.86	2.71^{f}
Week-9	2.35	2.62	2.91	2.91	2.91	2.74^{f}
Week-10	2.36	2.65	3.15	3.13	3.16	2.89^{g}
Week-11	2.36	2.73	3.19	3.15	3.19	2.93^{h}
Week-12	2.35	2.82	3.20	3.17	3.12	2.94^{h}
Week-13	2.35	2.88	3.09	3.11	3.06	2.90^{gh}
Week-14	2.36	2.63	3.13	3.12	3.13	2.88^{g}
Week-15	2.35	2.63	3.07	3.07	3.08	2.84^{i}
Week-16	2.35	2.63	3.02	3.02	3.02	2.81^{i}
Week-17	2.35	2.62	2.96	2.97	2.97	2.78^{j}
Pooled mean	2.33^{c}	2.63^{b}	2.88^{a}	2.88^{a}	2.87^{a}	

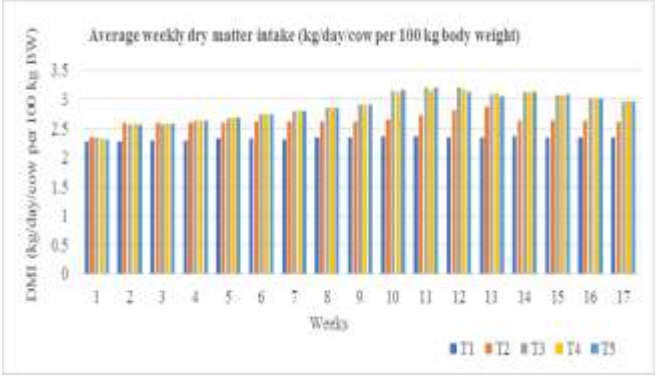

Fig. 2 : Average weekly dry matter intake (kg/day/cow per 100 kg body weight) over experimental period on different treatments

Average weekly dry matter intake (kg/day/cow per 100 kg body weight) over experimental period on different treatments expressed in Table 2 and depicted in figure 2. The dry matter intake (DMI) per 100 kg body weight increased gradually in all treatment groups during the experimental period, reaching its highest level around Weeks 10–12, and then declined slightly towards the end of the trial. The pooled mean DMI per 100 kg body weight was significantly ($P<0.05$) higher in T_3 (2.88), T_4 (2.88), and T_5 (2.87) compared to T_2 (2.63) and T_1 (2.33). These results indicate that feeding salt- and jaggery-treated soybean straw improved dry matter intake relative to body weight, while no significant difference was observed among T_3, T_4, and T_5.

Table 3 : Effect of feeding treatments on dry matter intake of lactating cows

Treatments	BW (kg)	DMI (Kg)	DM requirement (kg) (2.5 kg % BW)	Per cent (Excess/ deficit) intake	DMI /100 kg BW
T_1	312.41	7.28	7.81	-6.76	2.33
T_2	317.61	8.37	7.94	5.36	2.63
T_3	319.56	9.2	7.99	15.1	2.88
T_4	320.28	9.21	8.01	15.02	2.88
T_5	321.05	9.23	8.03	14.97	2.87

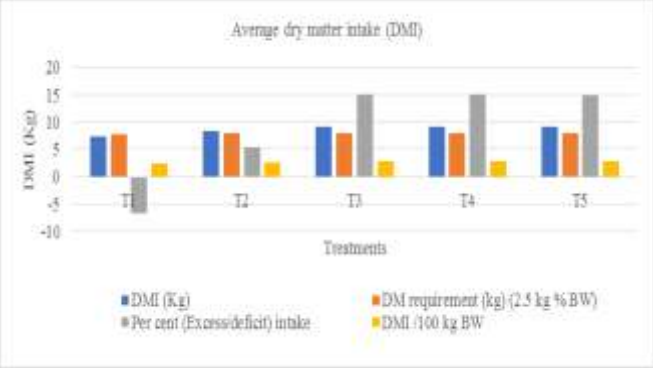

Fig. 3 : Effect of feeding treatments on dry matter intake of lactating cows

Table 3. presents the average dry matter intake (DMI) of lactating cows under different dietary treatments in comparison with the recommended feeding standard of 2.5% of body weight and depicted in Fig.3. The average body weight of experimental cows ranged from 312.41 to 321.05 kg, with only minor variation among treatment groups, indicating that the animals were comparable at the start of the experiment. The average daily DMI increased progressively from 7.28 kg in T_1 (untreated soybean straw) to 9.23 kg in T_5 (2% salt + 10% jaggery-treated soybean straw). Cows receiving 2% salt-treated soybean straw (T_2) consumed 8.37 kg DMI/day, whereas those fed 2% salt + 5% jaggery (T_3) and 2% salt + 7.5% jaggery (T_4) consumed 9.20 and 9.21 kg/day, respectively. The highest DMI was recorded in T_5 (9.23 kg/day), although the difference between T_3, T_4, and T_5 was marginal. These results indicate that the inclusion of salt and jaggery improved the palatability and voluntary intake of soybean straw, leading to greater dry matter consumption compared with untreated straw.

Based on the feeding standard of 2.5% of body weight, the estimated DMI requirement varied from 7.81 to 8.03 kg/day across treatments. Cows in the control group (T_1) consumed 6.76% less dry matter than the recommended requirement, indicating that untreated soybean straw could not adequately support the desired intake. In contrast, cows in T_2 exceeded the requirement by 5.36%, while those in T_3, T_4, and T_5 exceeded the requirement by 15.10%, 15.02%, and 14.97%, respectively. The greater-than-required intake in the treated groups demonstrates that salt and jaggery treatment markedly enhanced feed acceptability and encouraged voluntary feed consumption. Dry matter intake expressed per 100 kg body weight further supported these findings.

The DMI/100 kg body weight increased from 2.33 kg in T_1 to 2.63 kg in T_2, and further to 2.88, 2.88, and 2.87 kg in T_3, T_4, and T_5, respectively. The values obtained in T_3 to T_5 were substantially higher than the conventional recommendation of 2.5 kg/100 kg body weight, confirming that treated soybean straw was consumed more readily than untreated straw. The nearly identical DMI/100 kg body weight observed in T_3, T_4, and T_5 also suggests that increasing the jaggery level beyond 5% produced only a marginal improvement in dry matter intake.

Similar results were also reported by Mudgal *et al*. (2010) who observed no negative effect on the dry matter intake of SBS. Khare *et al*. (2018) also observed similar effect and Dibragede *et al*. (2024) reported that feeding of 2 per cent salt treated soybean straw increases DMI in the gir cows heifers. Shelke, *et al*. (2018) also reported that soybean straw treated with 2 per cent urea improves softness, palatability and DMI intake in the lactating cows.

Table 4 : Average weekly water intake (kg/day/cow) over experimental period on different treatments

Weeks	Week wise mean values of treatments					Pooled mean
	T_1	T_2	T_3	T_4	T_5	
Week-1	27.02	28.16	28.78	29.27	29.14	28.47^{a}
Week-2	27.10	28.18	28.83	29.31	29.31	28.55^{a}
Week-3	27.09	28.20	28.89	29.35	29.36	28.58^{a}
Week-4	27.17	28.21	28.94	29.39	29.40	28.62^{b}
Week-5	27.13	28.23	29.27	29.44	29.45	28.71^{c}
Week-6	27.11	28.24	29.32	29.49	29.50	28.73^{c}
Week-7	27.20	28.26	29.36	29.54	29.55	28.78^{d}
Week-8	27.18	28.28	29.41	29.59	29.60	28.81^{d}
Week-9	27.24	28.29	29.43	29.63	29.63	28.85^{e}
Week-10	27.20	28.31	29.47	29.68	29.68	28.87^{e}
Week-11	27.31	28.32	29.49	29.72	29.72	28.91^{f}
Week-12	27.22	28.34	29.57	29.73	29.73	28.92^{f}
Week-13	27.30	28.35	29.65	29.79	29.79	28.98^{g}
Week-14	27.30	28.37	29.68	29.83	29.83	29.00^{g}
Week-15	27.37	28.39	29.91	29.87	29.87	29.08^{h}
Week-16	27.33	28.41	29.93	29.93	29.93	29.10^{h}
Week-17	27.48	28.46	29.93	29.98	30.03	29.18^{i}
Pooled mean	27.22^{c}	28.29^{b}	29.40^{a}	29.62^{a}	29.62^{a}	

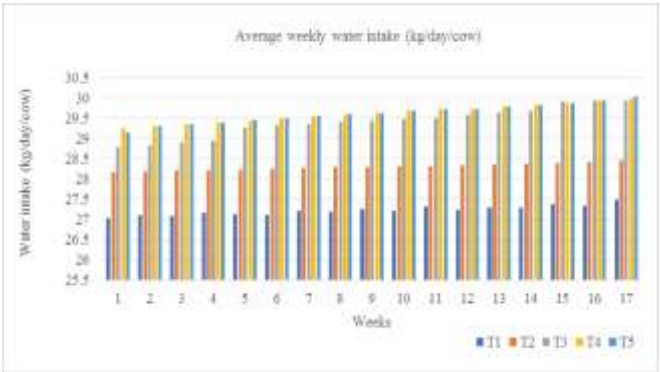

Fig. 4 : Average weekly water intake (kg/day/cow) over experimental period on different treatments

Average weekly water intake (kg/day/cow) over experimental period on different treatments are express in table 4 and depicted in figure 4. The average weekly water intake of lactating cows increased gradually throughout the experimental period in all treatments. The pooled mean water intake was significantly ($P<0.05$) higher in T_4 (29.62 kg/day) and T_5 (29.62 kg/day), which were at par with T_3 (29.40 kg/day), while T_2 (28.29 kg/day) was significantly higher than T_1 (27.22 kg/day). These results indicate that feeding salt- and jaggery-treated soybean straw increased water intake compared to untreated soybean straw.

Table 5 : Daily water intake of experimental cows under various treatments

Treatment	Average body weight (kg)	Water intake /day /cow (L)	Water intake/day /100 kg BW (L)	Water : DM ratio*
T_1	312.41	27.22	8.71	3.74
T_2	317.61	28.29	8.91	3.38
T_3	319.56	29.40	9.20	3.20
T_4	320.28	29.62	9.25	3.22
T_5	321.05	29.62	9.23	3.21
F-test	–	Significant	Significant	–
SE(m) ±	–	0.073	0.024	–
CD (P<0.05)	–	0.205	0.064	–
CD (P<0.01)	–	0.273	0.085	–
CV (%)	–	0.823	–	–

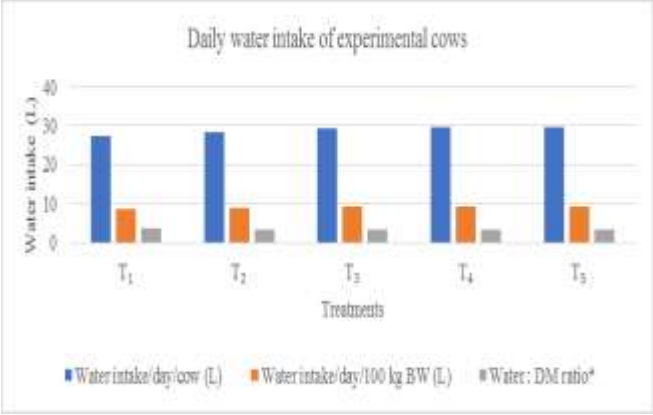

Fig. 5 : Daily water intake of experimental cows under various treatments

The average daily water intake of lactating cows under different dietary treatments, along with water intake expressed per 100 kg body weight and the water: dry matter (DM) intake ratio expressed Table 5 and depicted in Figure 5. Water intake is an important indicator of feed consumption, metabolic activity, and the productive performance of dairy cows. It is closely associated with dry matter intake, milk yield, ambient temperature, and dietary composition.

The average daily water intake increased progressively with the inclusion of salt- and jaggery-treated soybean straw in the ration. Cows in the control group (T_1), which received untreated soybean straw, consumed the least amount of water (27.22 L/day). Water intake increased to 28.29 L/day in cows fed 2% salt-treated soybean straw (T_2) and further increased to 29.40 L/day in T_3 receiving 2% salt + 5% jaggery-treated soybean straw. The highest water intake (29.62 L/day) was recorded in both T_4 (2% salt + 7.5% jaggery-treated soybean straw) and T_5 (2% salt + 10% jaggery-treated soybean straw). Statistical analysis revealed that the treatment effect on water intake was significant ($P<0.05$), indicating that the dietary treatments influenced the voluntary water consumption of lactating cows.

Water intake expressed on the basis of 100 kg body weight also followed a similar trend. The lowest value (8.71 L/100 kg body weight) was observed in the control group (T_1), while the highest value (9.25 L/100 kg body weight) was recorded in T_4, followed closely by T_5 (9.23 L) and T_3 (9.20 L). The increase in water intake per unit body weight in the treated groups indicates that cows consuming treated soybean straw had greater physiological demand for water, mainly due to their higher dry matter intake and improved nutrient utilization. The significant treatment effect further confirms that feeding treated soybean straw enhanced water consumption beyond the influence of body weight alone.

The Water: DM ratio ranged from 3.20 to 3.74 L of water per kilogram of dry matter intake. The highest ratio (3.74) was observed in the control group (T_1), whereas the lowest ratio (3.20) was recorded in T_3. Although cows receiving treated diets consumed more total water, they also exhibited substantially higher dry matter intake, resulting in a comparatively lower water requirement per unit of dry matter consumed. The similar ratios observed in T_3, T_4, and T_5 indicate that increasing the jaggery level beyond 5% did not markedly alter the relationship between water intake and dry matter intake.

The statistical parameters showed a standard error [SE(m)] of 0.073 L/day and a critical difference (CD) at 5% probability of 0.205 L/day, indicating that differences in water intake greater than 0.205 L/day among treatments were statistically significant. The coefficient of variation (CV) of 0.823% reflects very low experimental variability and demonstrates excellent uniformity among the experimental animals and high precision of the recorded observations.

Overall, the results indicate that feeding 2% salt-treated soybean straw supplemented with jaggery increased voluntary water intake in lactating cows. The higher water consumption observed in T_3, T_4, and T_5 can be attributed to increased dry matter intake, improved palatability of the treated soybean straw, enhanced ruminal fermentation, and the greater metabolic demand associated with improved nutrient intake. The plateau in water intake between T_4 and T_5 suggests that increasing the jaggery level beyond 7.5% offered little additional benefit in stimulating water consumption, indicating that the response had reached its practical maximum. These findings demonstrate that salt and jaggery treatment of soybean straw not only improved feed intake but also supported the increased water consumption required to maintain normal rumen function and productive performance in lactating cows.

Similar finding observed by Sonone *et al*. (2018) the incorporation of soybean straw in the ration of the calves did not influence the feed intake and also noticed that level of soybean straw had effect on the water consumption of calves and Dibragede *et al*. (2024) adding salt-treated soybean straw increased the water intake to some extent.

Conclusion

The inclusion of salt and jaggery-treated soybean straw improved dry matter intake and water intake of lactating cows compared with untreated soybean straw. The treated groups, particularly T_3, T_4, and T_5, showed higher dry matter consumption, adequate fulfilment of nutritional requirements, and increased water intake. These improvements indicate that salt and jaggery treatment enhanced the palatability and acceptability of soybean straw, resulting in better feed utilization and supporting the productive performance of lactating cows.

References

Cabrera, E., Munoz, M. J., Martin, R., Caro, I., Curbelo, C. and Diaz, A. B. (2015). Comparison of industrially viable pretreatments to enhance soybean straw biodegradability. *Bioresource Technology*, **194**, 1–6.

Department of Agriculture and Farmers Welfare (DA&FW), Ministry of Agriculture & Farmers Welfare. (2024). *[Title of report/document not provided]*.

Dibragede, H., Chavan, S. D., Singh, N., Lashkare, S. V., Awasthi, A. and Kumar, V. (2024). Comparing the impact of jowar straw and soybean straw on growth performance in Gir heifers. *Journal of Animal Research*, **14**(3), 215–221.

Jangam, A. K. and Thali, P. (2004). *WASP: Web Agri Stat Package 2.0*. ICAR Research Complex for Goa, Ela, Old Goa, India.

Khare, A., Baghel, P. S. and Nayak, S. (2018). Effect of feeding green maize along with soybean straw over nutrient digestibility and milk yield of the crossbred lactating cows. *International Journal of Veterinary Sciences and Animal Husbandry*, **3**(3), 66–69.

Modh, M. B., Patel, K., Patel, H. K. and Mor, V. B. (2024). Nitrogen and cutting management in Bajra Napier hybrid. *Forage Research*, **50**(3), 233–239.

Mudgal, V., Baghel, R. P. S. and Srivastava, S. (2010). Effect of feeding soybean straw on intake and milk production of lactating crossbred cows. *Journal of Horticulture Letters*, **1**(1), 06–07.

Roy, A. K., Agrawal, R. K., Bhardwaj, N. R., Mishra, A. K. and Mahanta, S. K. (2019). *Revisiting national forage demand and availability scenario: Indian fodder scenario Redefining state-wise status*. ICAR-AICRP on Forage Crops and Utilization, Jhansi, India, 1–21.

Shelke, R. R., Chavan, S. D. and Kahate, P. A. (2018). Effect of feeding or urea-ammoniated soybean straw on dry matter intake, yield and quality of cow milk. *Indian Journal of Animal Sciences*, **88**(6), 727–730.

Shelke, R. R., Chavan, S. D., Kahate, P. A., Bidwe, K.U., Shegokar, S. R. and Nage, S. P. (2024). Effect of salt-treated soybean straw feeding on performance of lactating cows. *PKV Research Journal*, **48**(2).

Sonone, N. R., Tanpure, M. U., Dahatonde, K. N. and Chavan, S. D. (2018). Effect of feeding soybean (*Glycine max*) straw on feed and water intake of crossbred calves. *Journal of Pharmacognosy and Phytochemistry*, **7**(6), 938–940.

Ukey, P. D., Ingale, V. M., Wategaonkar, S. B., Park, J. P., Pillai, P. K., Ghatge, J. S., Patil, S. B. and Khot, J. A. (2024). Jaggery making reforms, value addition and preservation: A comprehensive review. *International Journal of Advanced Biochemistry Research*, **8**(1), 692–701.

Wan, C., Zhou, Y. and Li, Y. (2011). Liquid hot water and alkaline pretreatment of soybean straw for improving cellulose digestibility. *Bioresource Technology*, **102**(10), 6254–6259.