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Research Article

Journal of Veterinary and Animal Sciences
ISSN (Print): 0971-0701, (Online): 2582-0605
https://doi.org/10.51966/jvas.2026.57.2.271-276

Evaluation of different milk feeding practices on the growth performance of Malabari kids#

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Citation: Varsha, R., Sasidharan, M., Balusami, C., Geetha, N., Thomas, M. & Sahib, L. (2026). Evaluation of different milk feeding practices on the growth performance of Malabari kids.
Journal of Veterinary and Animal Sciences, 57(2),271-276
https://doi.org/10.51966/jvas.2026.57.2.271-276

Received: 30.01.2026 Accepted: 10.04.2026 Published: 30.06.2026

Abstract

A study was conducted in the University Goat and Sheep Farm, Mannuthy for a period of three months in twenty-four selected kids. They were divided randomly into four groups consisting of a control group (C) and three treatment groups (T1, T2, T3). The milk feeding regimens varied in quantity and frequency: Group C received milk at the rate of 1/6th, 1/8th and 1/10th of body weight during 5-30, 31-60 and 61-90 days respectively, fed four times daily. Group T1 received the same quantity as C but was fed thrice daily. Groups T2 and T3 received lower quantities (1/8th, 1/10th and 1/12th of body weight across the same periods) with frequencies of four and three times a day, respectively. All the kids received solid food from day 15. Kids were observed for various parameters such as feed intake, feed conversion ratio, body weight gain and average daily gain. All the observed parameters were significantly higher (P<0.01) in C and T1 than in T2 and T3. It was concluded that Malabari kids fed with milk at the rate of 1/6th, 1/8th and 1/10th during the 1st, 2nd and 3rd months, respectively, showed better growth performance, whereas feeding frequency had no influence on the growth performance of Malabari kids.

Keywords: *Malabari goat kid, milk feeding, quantity, frequency, growth*

Goat farming plays an important role in the livelihoods of small and marginal farmers, particularly in Kerala, where Malabari is one of the most prominent indigenous goat breeds and well known for its better resistance to various diseases, high prolificacy, milk yield, excellent growth rate and adaptability to hot humid conditions (Acharya, 1982). Due to a high metabolic rate, small ruminants need more frequent feeding than large ruminants (Farooq *et al*., 2017). When kids suckle directly from their dam, the exact quantity of milk consumed is difficult to determine, and increased feeding frequency may lead to overfeeding (Singh *et al*., 2017). Among the various milk feeding practices, bottle feeding is considered the most beneficial. One of the primary benefits of bottle feeding is to control and monitor each kid's milk intake regardless of their position in the social hierarchy. Inadequate milk intake or irregular feeding regimens can rapidly result in negative energy balance, leading to compromised immunity, suboptimal weight gain and increased susceptibility to diseases. Offering solid feed throughout the milk feeding phase, even in small quantities, is essential for a gradual

#Part of MVSc thesis submitted to Kerala Veterinary and Animal Sciences University, Pookode, Wayanad, Kerala
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transition from complete dependence on milk to solid nutrition, which helps mitigate the stress associated with nutrient deficiencies, digestive inefficiencies and post-weaning weight loss (Khan *et al*. 2011). Milk feeding is crucial for goat kids because it provides essential nutrients, supports early growth and enhances immune competence. Scientifically established breed-specific milk allowance for Malabari kids was lacking. Hence, the present study was conducted to standardise the milk feeding quantity and frequency and to evaluate the growth performance under different milk feeding regimens.

Materials and methods

Twenty-four Malabari kids of either sex (16 male and eight female) of five days age were selected from the University Sheep and Goat Farm, Mannuthy. Kids were housed in well-ventilated, clean and dry pens up to three months. They were divided into four groups: control (C), treatment 1 (T1), treatment 2 (T2) and treatment 3 (T3), consisting of six animals (4 male and 2 female) each, following in a completely randomised design. The kids were maintained under uniform management conditions throughout the experiment. Kids were permitted to suckle their dam's milk for the first four days after birth. Milk obtained from healthy does was screened for mastitis using the California Mastitis Test (CMT) and then the kids were fed using feeding bottles. The experimental kids were maintained under their respective feeding regimens as described below.

Feeding trial

In the C and T1 groups, kids were fed milk at the rate of 1/6th of their body weight from 5–30 days, 1/8th from 31–60 days and 1/10th from 61–90 days, with feeding frequencies of four times and three times per day, respectively. In the T2 and T3 treatment groups, kids received milk at the rate of 1/8th of their body weight from day 5–30, 1/10th from day 31–60 and 1/12th from day 61–90, with feeding frequencies of four and three times per day, respectively. All the kids were fed with kid starter (crude protein (CP) - 23.6 %) and Hybrid Napier grass (CP-15.57 %) from 15 days of age.

Analysis of feed

Proximate analysis of kid starter and green fodder was done as per standard procedures (AOAC, 2016). Milk samples were analysed for total solids, protein (AOAC, 2016), fat (IS: 1224.1977) and solids not fat (SNF).

Table 1. Chemical composition of goat milk[1] fed to experimental kids

Components	Per cent
Total solids	12.52 ± 0.65
Crude protein	3.80 ± 0.06
Fat	3.18 ± 0.73
SNF	9.33 ± 0.12

[1]Mean ± SE (n = 6)

Daily feed intake (g)

The kids were fed with a measured quantity of milk, kid starter and green fodder during the study and left over was recorded daily and daily feed intake was calculated.

Growth parameters

All the kids were weighed on the fifth day and thereafter at weekly intervals in the morning before feeding to calculate body weight, total weight gain, feed conversion ratio and average daily gain.

Statistical analysis

The collected data were statistically analysed by one-way ANOVA followed by Duncan's Multiple Range Test using Statistical Product and Service Solutions (SPSS) Version 24.0.

Results and discussion

Chemical composition of feed

The chemical composition of milk given to the experimental kids is presented in Table 1. Chemical composition of kid starter and green fodder are presented in Table 2.

It was observed that the chemical composition of whole milk, kid starter and green fodder used in the present study was similar to the findings reported by Mishra *et al.* (2022) and Sasikala (2018).

Mean daily dry matter intake (g) and feed conversion ratio of Malabari kids

Mean daily dry matter intake and feed conversion ratio of experimental kids were mentioned in Tables 3 and 4 respectively. Dry matter intake (DMI) exhibited a significant treatment effect during the early growth phase. From the first to the sixth week, DMI was significantly

Table 2. Chemical composition[1] of kid starter and green fodder, %

Sl. No.	Parameters	Kid starter	Green fodder
1	Dry matter	91.23 ± 0.03	23.44 ± 0.11
2	Crude protein	23.68 ± 0.02	15.57 ± 0.10
3	Crude fibre	7.36 ± 0.04	30.38 ± 0.02
4	Ether extract	4.42 ± 0.06	1.87 ± 0.13
5	Total ash	9.34 ± 0.05	10.39 ± 0.10
6	Nitrogen free extract	55.19 ± 0.04	41.82 ± 0.35

[1]Mean ± SE (n = 6)

higher (P<0.001) in the C and T1 groups than in T2 and T3, reflecting the influence of providing an optimum quantity of milk in C and T1, which supported better early nutrient intake and stimulated greater voluntary dry matter consumption. In contrast, the restricted milk allowance in T2 and T3 resulted in significantly lower DMI during this period. During the seventh and eighth weeks, differences in DMI among the experimental groups remained statistically significant (P<0.05), indicating a transitional phase in which kids receiving reduced milk (T2 and T3) began to increase their solid feed intake, partially compensating for earlier nutritional restriction (Vickery *et al.* 2023). From the ninth to the twelfth week, no significant differences (P> 0.05) were observed in DMI among the groups. This convergence suggests that kids in T2 and T3 had adapted to the reduced milk allowance by increasing dry matter intake from solid feeds, leading to comparable intake levels across all groups (Lu & Potchoiba, 1988). The study also indicates that feeding frequency had no significant effect on the DMI of Malabari kids, in agreement with the findings of Goonewardene *et al.* (1995) and Jafari *et al.* (2019).

Milk intake was significantly higher (p<0.001) in the C (56.20 L/kid) and T1 (55.34 L/kid) groups compared to T2 (40.94 L/kid) and T3 (40.49 L/kid)Total dry matter intake from milk was significantly (p<0.01) higher in C (7.04 ± 0.27) and T1 (6.93 ± 0.14) groups compared to T2 (5.13 ± 0.23) and T3 (5.07 ± 0.29), reflecting the optimum milk allowance in the former groups. Total DMI was significantly higher in C and T1 than in T2 and T3 (P<0.01), despite *ad libitum* access to kid starter and green fodder, suggesting that milk allowance directly influences overall feed intake, as milk constitutes the primary source of dry matter in young ruminants (NRC, 2007). A better feed conversion ratio (FCR) was observed in C and T1 groups than in T2 and T3 (P<0.01). The FCR recorded in the present study was lower than the value of 3.14±0.14 reported by Shalinee *et al*. (2024) in milk-fed Malabari kids, indicating that variations in milk feeding plays significant role in determining feed conversion ratio. Similar FCR of 1.73 in Malabari kids fed with doe milk was reported by Sasikala (2018). Milk proteins provide amino acids essential for growth and digestion, influence nutrient assimilation and growth factors in milk play a role in the development of organs (Tome & Debabbi, 1998).

Body weight (kg) of experimental kids

Mean body weight of Malabari kids is represented in Table 5. Mean initial body weights did not differ

Table 3. Mean daily dry matter intake of Malabari kids (g)

Week	C	T1	T2	T3	P value
1	50.75^{a}± 1.58	49.68^{a} ± 2.11	38.60^{b} ± 1.79	38.06^{b} ±1.84	0.001**
2	58.97^{a} ± 2.39	58.78^{a} ± 1.65	41.48^{b} ± 2.35	43.07^{b} ± 2.77	0.001**
3	65.71^{a} ± 3.02	65.04^{a} ± 1.37	45.41^{b} ± 2.14	46.95^{b} ± 2.87	0.001**
4	76.63^{a} ± 3.88	76.60^{a} ± 1.99	54.16^{b} ± 2.25	55.81^{b} ± 3.2	0.001**
5	92.43^{a} ± 2.76	92.94^{a} ± 0.98	79.01^{b} ± 2.79	79.60^{b} ± 2.92	0.001**
6	115.48^{a}± 2.11	115.7^{a} ± 2.10	87.15^{b} ±1.08	87^{b} ± 1.33	0.001**
7	143.40^{a} ± 5.58	142.89^{a} ± 2.78	128.13^{b}± 3.65	128.42^{b}± 4.05	0.017*
8	172.89^{a} ± 5.29	171.24^{a} ± 7.48	151.11^{b}± 5.64	147.74^{b}± 6.10	0.014*
9	167.29 ± 5.78	165.75 ± 5.69	157.66± 5.10	155.28± 4.28	0.311^{ns}
10	188.45 ± 7.32	188.10 ± 3.49	177.47± 3.41	178.78 ± 7.2	0.383^{ns}
11	220.11 ± 5.14	217.26 ± 3.47	203.68± 4.28	203.03± 3.52	0.311^{ns}
12	271.47 ± 7.14	268.96 ± 4.27	256.24 ±6.36	257.03 ±3.42	0.383^{ns}

[1]Mean ± SE (n = 6)

ns–Non significant (P>0.05)

[a-b]Mean of different treatment having different alphabets as superscripts within a row differ significantly (*- P<0.05), (**- P<0.01).

Table 4. Data on dry matter intake and feed conversion ratio of Malabari kids

Parameters	Control	T1	T2	T3	P value
Total milk intake per kid (L)	56.20^{a} ± 2.14	55.34^{a} ± 1.08	40.94^{b} ± 1.82	40.49^{b} ± 2.31	<0.001**
Total dry matter intake from milk per kid (kg)	7.04^{a} ± 0.27	6.93^{a} ± 0.14	5.13^{b} ± 0.23	5.07^{b} ± 0.29	<0.001**
Total dry matter intake per kid (kg)	11.7^{a} ± 0.33	11.61^{a} ± 0.17	10.39^{b} ± 0.25	10.4^{b} ± 0.29	0.002**
Total weight gain (kg)	7.72^{a} ± 0.40	7.35^{a} ± 0.39	6.25^{b} ± 0.29	5.92^{b} ± 0.23	0.003**
Feed conversion ratio (kg feed /kg body weight gain)	1.527^{a} ± 0.047	1.599^{a} ± 0.08	1.764^{b} ± 0.058	1.762^{b} ± 0.026	0.044*

[1]Mean ± SE (n = 6); ns –Non significant (P>0.05)

[a-b]Mean of different treatments having different alphabets as superscripts within a row differ significantly (**- P<0.01).

significantly among the groups ($p > 0.05$). Body weights remained statistically comparable across treatments up to the eighth week. From the ninth week onwards, significant differences emerged between treatment groups. Mean body weight was significantly higher in groups C and T1 than in T2 and T3 during weeks 9 to 12. The results indicate that the quantity of milk offered had a significant influence on body weight, while milk feeding frequency had no influence on the body weight of Malabari kids. Similar findings were reported by Jongman *et al*. (2020) and Kehoe *et al*. (2007). Conversely, Singh *et al. (*2017) reported that enhancing the quantity of milk offered from 1/10th to 1/8th and 1/6th of their body weight did not significantly impact the body weight of Beetal kids.

Total weight gain and average daily gain of Malabari kids

Total weight gain and average daily gain (ADG) of Malabari kids were presented in Table 6. Total body weight gain was higher in C and T1, whereas T2 and T3 (reduced milk-fed groups) showed significantly lower gains ($p < 0.01$) which was in accordance with Abbas *et al.* (2017).

Mean daily gain was 92 g in C and 88 g in T1, which were significantly superior ($p < 0.01$) to 74 g in T2 and 70 g in T3. In Beetal kids, ADG ranged between 64 to 81 g/day raised under different milk feeding practices (Singh *et al.,* 2017). Similarly, Malabari kids exhibited an ADG of 90 g during the pre-weaning period and 60.2 g during post weaning (Thomas *et al.,* 2019). The study indicates that ADG was significantly influenced by the quantity of milk offered, whereas frequency had no effect on ADG, and it was in accordance with Jafari *et al*. (2019), Abouheif *et al*. (2010) and Kehoe *et al*. (2007).

C and T1 groups, which received an optimum quantity of milk, benefited from an adequate nutrient supply that supported higher total weight gain and average daily gain which was in accordance with Xiao *et al.* (2025).

Overall findings of the study revealed that growth performance was significantly influenced by the quantity of milk rather than frequency. It was in accordance with Jafari *et al*. (2021), total nutrient intake and energy balance are stronger determinants of growth than the pattern of feeding frequency as long as overall nutrient supply is adequate. The kids which received the optimum quantity of milk showed better growth performance than restricted groups, and this aligns with Conneely *et al.* (2014) and Jongman *et al*. (2020). In young kids, milk bypasses the rumen and is digested enzymatically in the abomasum; nutrient

Table 5. Mean body weight (kg) of Malabari kids

Weeks	C	T1	T2	T3	P value
Initial (day 5)	2.43 ± 0.08	2.38 ± 0.10	2.47 ± 0.11	2.43 ± 0.12	0.953 ^{ns}
1	2.82 ± 0.11	2.82 ± 0.08	2.80 ± 0.00	2.77 ± 0.16	0.985 ^{ns}
2	3.15 ± 0.15	3.12 ± 0.07	2.90 ± 0.14	3.00 ± 0.18	0.581 ^{ns}
3	3.57 ± 0.17	3.55 ± 0.10	3.30 ± 0.13	3.38 ± 0.19	0.553 ^{ns}
4	4.08 ± 0.19	4.17 ± 0.07	3.90 ± 0.19	3.90 ± 0.24	0.66 ^{ns}
5	4.57 ± 0.23	4.58 ± 0.11	4.45 ± 0.23	4.33 ± 0.28	0.844 ^{ns}
6	5.23 ± 0.27	5.20 ± 0.11	4.97 ± 0.23	4.82 ± 0.34	0.608 ^{ns}
7	6.09 ± 0.26	5.92 ± 0.19	5.48 ± 0.26	5.23 ± 0.28	0.088 ^{ns}
8	6.83 ± 0.28	6.56 ± 0.26	6.09 ± 0.29	5.82 ± 0.40	0.052 ^{ns}
9	7.73^{a}± 0.25	7.43 ^{a} ± 0.24	6.77^{b}± 0.36	6.48^{b} ±0.34	0.045*
10	8.58^{a}± 0.26	8.22 ^{a} ± 0.31	7.37 ^{b} ± 0.31	7.06 ^{b} ±0.38	0.011*
11	9.39^{a} ±0.33	9.00 ^{a} ± 0.30	8.05 ^{b} ± 0.32	7.73 ^{b} ±0.30	0.005**
12	10.15^{a}± 0.45	9.73 ^{a} ±0.38	8.72 ^{b} ± 0.36	8.35^{b} ±0.31	0.01*

[1]Mean ± SE (n = 6); ns –Non significant (P>0.05)

$^{a-b}$Mean of different treatments having different alphabets as superscripts within a row differ significantly (*- P<0.05), (**- P<0.01) .

Table 6. Mean body weight, total weight gain and average daily gain of Malabari kids (kg)

Parameters	C	T1	T2	T3	P value
Initial body weight (day 5)	2.43 ± 0.08	2.38 ± 0.10	2.47 ± 0.11	2.43 ± 0.12	0.953 ^{ns}
Final body weight (kg)	10.15^{a} ± 0.45	9.73^{a} ± 0.38	8.72^{b} ± 0.36	8.35^{b} ± 0.31	0.01*
Total weight gain (kg)	7.72^{a} ± 0.40	7.35^{a} ± 0.39	6.25^{b} ± 0.29	5.92^{b} ± 0.23	0.003**
Mean daily gain (kg)	0.092^{a} ± 0.005	0.088^{a} ± 0.005	0.074^{b} ± 0.003	0.070^{b} ± 0.003	0.003**

[1]Mean ± SE (n = 6); ns –Non significant (P>0.05)

$^{a-b}$Mean of different treatments having different alphabets as superscripts within a row differ significantly (*- P<0.05), (**- P<0.01).

absorption depends largely on total daily milk intake rather than meal frequency. Consequently, when total milk allowance is constant, altering feeding frequency does not substantially influence growth performance in goat kids (Abdelsattar *et al*., 2023; Vickery *et al*., 2023). Studies have indicated that decreasing milk feeding frequency has minimal effects on feed intake and growth performance in calves (Welk *et al*., 2023; Revilla-Ruiz *et al*., 2024).

Conclusion

Total DMI, body weight and ADG were significantly higher and improved FCR in groups fed with milk at the rate of 1/6th, 1/8th and 1/10th during the 1st, 2nd and 3rd months, respectively, in Malabari kids. The frequency of milk feeding (3 times and four times a day) did not significantly affect the growth performance of Malabari kids.

Acknowledgements

The authors thank the Dean, College of Veterinary and Animal Sciences, Mannuthy, Professor and Head, University Goat and Sheep farm, Mannuthy, for providing the facilities necessary to conduct the study.

Conflicts of interest

The authors declare that they have no conflict of interest.

References

Abbas, W., Bhatti, S. A., Khan, M. S., Saeed, N., Warriach, H. M., Wynn, P., & McGill, D. (2017). Effect of weaning age and milk feeding volume on growth performance of Nili-Ravi buffalo calves. *Italian Journal of Animal Science, 16*(3), 490-499. https://doi.org/10.1080/1828051X.2017.1291282

Abdelsattar, M. M., Zhao, W., Saleem, A. M., Kholif, A. E., Vargas-Bello-Perez, E., & Zhang, N. (2023). Physical, metabolic and microbial rumen development in goat kids: A review on the challenges and strategies of early weaning. *Animals, 13*(15), 2420. https://doi.org/10.3390/ani13152420

Abouheif, M. A., Al-Saiady, M. Y., Makkawi, A. A., Ibrahim, H. A., & Kraidees, M. S. (2010). Effect of either once or twice daily feeding of pelleted high-concentrate diet on performance and digestion in growing lambs. *Journal of Animal and Veterinary Advances, 9*(5), 925–931. https://doi.org/10.36478/javaa.2010.925.931

Acharya, R. M. (1982). *Sheep and goat breeds of India*. Food and Agriculture Organization of the United Nations.

Conneely, M., Berry, D. P., Murphy, J. P., Lorenz, I., Doherty, M. L., & Kennedy, E. (2014). Effects of milk feeding volume and frequency on body weight and health of dairy heifer calves. *Livestock Science, 161*, 90–94. https://doi.org/10.1016/j.livsci.2013.12.022

Farooq, M. Z., Abdullah, M., Ahmad, N., & Sattar, S. (2017). Effect of feeding frequency on dry matter intake, weight gain, feed conversion efficiency and its relation with body measurements in Lohi lambs. *Pakistan Journal of Agricultural Sciences*, *54*(3), 689–692.

Goonewardene, L. A., ZoBell, D. R., & Engstrom, D. F. (1995). Feeding frequency and its effects on feedlot performance in steers. *Canadian Journal of Animal Science, 75*(2), 255–257. https://doi.org/10.4141/cjas95-037

Jafari, A., Azarfar, A., Alugongo, G. M., Ghorbani, G. R., Mirzaei, M., Fadayifar, A., Omidi-Mirzaei, H., Cao, Z., Drackley, J. K., & HossieniG. M. (2021). Milk feeding quantity and feeding frequency: effects on growth performance, rumen fermentation and blood metabolites of Holstein dairy calves. *Italian Journal of Animal Science, 20*(1), 336-351. https://doi.org/10.1080/1828051X.2021.1884504

Jafari, S., Ghorbani, G. R., Khorvash, M., & Mirzaei, M. (2019). Effect of milk allowance and feeding frequency on growth performance, dry matter intake and health of dairy goat kids. *Small Ruminant Research, 174*, 48–55.

Jongman, E. C., Conley, M. J., Borg, S., Butler, K. L., & Fisher, A. D. (2020). The effect of milk quantity and feeding frequency on calf growth and behaviour. *Animal Production Science, 60*, 944-952. https://doi.org/10.1071/AN19049

Kehoe, S. I., Dechow, C. D., & Heinrichs, A. J. (2007). Effects of weaning age and milk feeding frequency on dairy calf growth, health and rumen parameters. *Livestock Science, 110*(3), 267-272. https://doi.org/10.1016/j.livsci.2006.11.007

Khan, M. A., Weary, D. M., & von Keyserlingk, M. A. G. (2011). Invited review: Effects of milk ration on solid feed intake, weaning and performance in dairy heifers. *Journal of Dairy Science*, *94*, 1071–1081. https://doi.org/10.3168/jds.2010-3733

Lu, C. D., & Potchoiba, M. J. (1988). Milk feeding and weaning of goat kids-A review. *Small Ruminant Research, 1*, 105-112. https://doi.org/10.1016/0921-4488(88)90025-9

Mishra, S., Sonawane, M., Lohar, P., & Sonawane, S. (2022). Comparative study on nutritive properties

and composition of milk of Sangamneri Goat, Nimari Cow and Surti Buffalo. *IOSR Journal of Agriculture and Veterinary Science, 15*(1), 17–30.

National Research Council. (2007). *Nutrient requirements of small ruminants: Sheep, goats, cervids, and New World camelids*. National Academies Press. https://www.nationalacademies.org/publications/11654

Revilla-Ruiz, A., Carulla, P., Fernández Novo, A., de Mercado, E., Pérez Navarro, A., Patron-Collantes, R., Sebastián, F., Pérez Garnelo, S. S., Gonzalez Martín, J. V., Estelles, F., Villagra, A., & Astiz, S. (2024). Effect of milk-feeding frequency and calcium gluconate supplementation on growth, health, and reproductive and metabolic features of Holstein heifers at a rearing farm. *Animals, 14*(9), 1336. https://doi.org/10.3390/ani14091336

Sasikala, N. (2018). *Comparison of different milk replacers on growth performance of Malabari kids*. (M.V.Sc thesis, Kerala Veterinary and Animal Sciences University). Krishikosh. https://krishikosh.egranth.ac.in/server/api/core/bitstreams/8084b5b6-b585-4625-9753-d096c72aa752/content

Shalinee, G. V., George, S. K., Ally, K., Shyama, K., Purushothaman, S., & Bindu, K. A. (2024). Impact of dairy-based starter rations on growth performance, feed efficiency and profitability in raising Malabari goat kids. *International Journal of Veterinary Science and Animal Husbandry*, *9*(6), 229–233. https://doi.org/10.22271/veterinary.2024.v9.i6d.1876

Singh, G., Malik, D. S., Kaswan, S., & Saini, A. L. (2017). Effect of milk feeding management on performance of Beetal kids under stall-fed conditions. *Indian Journal of Animal Production Management*, *33*, 15–20. https://epubs.icar.org.in/index.php/IJAPM/article/view/79296

Thomas, S., Anil, K. S., Suraj, P. T., Sasidharan, M., & Venkatachalapathy, R. T. (2019). Study on non-genetic factors affecting morphometry of Malabari goats in farmers flocks in Kozhikode district. *Journal of Veterinary and Animal Sciences*, *50*(2), 129–132. https://doi.org/10.51966/jvas.2019.50.2.129-132

Tome, D., & Debabbi, H. (1998). Physiological effects of milk protein components. *International Dairy Journal, 8*(5–6), 383–392. https://doi.org/10.1016/S0958-6946(98)00061-2

Vickery, H. M., Neal, R. A., Stergiadis, S., & Meagher, R. K. (2023). Gradually weaning goat kids may improve weight gains while reducing weaning stress and increasing creep feed intakes. *Frontiers in Veterinary Science, 10,* 1200849. https://doi.org/10.3389/fvets.2023.1200849

Welk, A., Otten, N. D., & Jensen, M. B. (2023). Invited review: The effect of milk feeding practices on dairy calf behavior, health and performance—A systematic review. *Journal of Dairy Science, 106*(9), 5853–5879. https://doi.org/10.3168/jds.2022-22900

Xiao, J., Ma, H., Tian, J., Lu, G., Wei, X., Peng, Y., Hu, R., Peng, Q., Wang, L., Xue, B., & Wang, Z. (2025). Effects of increased milk allowance through within-study comparisons on dairy calf growth and future performance. *Journal of Dairy Science*, *108*(10), 10812–10836. https://doi.org/10.3168/jds.2025-26555. ■