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Effect of Soymilk as Partial Milk Replacer on Haemato-Biochemical Parameters and Faecal Score of Murrah Buffalo Calves

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ABSTRACT

The main goal of this research was to thoroughly assess how replacing part of the milk with Soymilk affects the haematological and biochemical parameters, as well as faecal consistency, in Murrah buffalo calves. The calves were randomly divided into three treatment groups: Treatment 1 received only whole milk, Treatment 2 received a 75:25 ratio of whole milk to Soymilk, and Treatment 3 received a 50:50 ratio of whole milk to Soymilk. During the duration of the experiment, all calves were kept within strict feeding protocols and consistent management practices. Monthly blood samples were aseptically collected to thoroughly evaluate the effectiveness of Soymilk as a partial milk replacer through detailed haematological and serum biochemical analysis. Faecal consistency was observed every 15 days for 90 days to systematically assign faecal scores. The results from the experiment showed no significant variations in a wide range of haematological and serum biochemical parameters in the different treatment groups. Also, the dietary interventions had no considerable impact on the faecal ratings of the young calves, suggesting that incorporating Soymilk did not cause any digestive issues. To sum up, this research strongly proves that Murrah buffalo calves can safely replace up to 50% of whole milk with Soymilk without any negative impact on their health or physical abilities. This discovery highlights the possibility of using Soymilk as a practical and efficient substitute in buffalo calf feeding.

HIGHLIGHTS

- Faecal consistency was observed every 15 days for 90 days to systematically assign faecal scores.
- The dietary interventions had no considerable impact on the faecal ratings of the young calves.

Keywords: Milk replacer, Soymilk, haemato-biochemical parameters, faecal score, faecal consistency

Livestock plays a crucial role in agriculture, with one of its main goals being to maximize profits. Effective management of feeding, housing, health, and other related factors is crucial for the success of livestock farming, according to Ramakant *et al*. (2023). Livestock is crucial for rural communities, serving as a safety net in case of crop failures and offering protection during economic uncertainties. It is appropriately called a "mobile bank" for farmers' income (Channappa *et al*., 2023). India is recognized as the top milk producer in the world, thanks to its large number of animals. Livestock farming has lower production and administration costs and decreased capital requirements when compared to traditional agriculture, making it advantageous (Saurav *et al*., 2023). The growth of the dairy industry greatly strengthens the rural economy by raising the incomes of rural households, especially for small, marginal, and landless farmers (Meena *et al*., 2009). Dairy is a significant factor in the agricultural Gross Domestic Product (GDP) of the country.

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Raising calves with proper economic management is crucial for the success of the dairy industry, as they are the future of the herd (Sorathiya *et al*., 2019). Successful calf raising programs rely on two key components: proper health care and ideal nutrition. The initial three to four months of a calf's existence are crucial for its growth and development, necessitating a milk diet rich in nutrients to aid in tissue growth (Kertz *et al*., 2017). Improved growth performance in the initial stages has long-term developmental effects, leading to enhanced animal well-being and future productivity (Khan *et al*., 2011; Bach, 2012; Van Amburgh and Soberon, 2013). In India, giving whole milk to calves is costly, forcing farmers to sell their milk to support their livelihoods (Shakya *et al*., 2017). Using milk replacers can greatly lower the expenses of raising calves and enhance calf performance. Dairy farmers can benefit economically by selling whole milk thanks to the use of milk replacers (Bridges, 2009). Roy *et al*. (2016) acknowledge milk replacers as excellent sources of liquid nutrition for calves.

Milk replacers commonly include different proteins like soy, wheat gluten, or animal plasma in addition to milk protein. These different proteins may make up anywhere from 10% to 50% of the overall protein in a milk replacer (Sandoval, 2014). Substituting some or all of the milk proteins with these less expensive options may result in economic advantages (Raeth *et al*., 2016).

Yadav *et al*. (2018) stated that Soymilk is a white emulsion that closely mimics the appearance and texture of buffalo milk. Obtained from seeds of the soybean plant (Glycine max), Soymilk is a cost-effective source of protein and calories. It shows promise as a replacement for buffalo milk, especially in developing nations, in effectively addressing malnutrition (Mazumder and Begum, 2016). Several research studies have shown that replacing whole milk with Soymilk in calf feeding schedules does not have a negative impact on haematological and biochemical parameters, as all results stayed within the normal range (Yadav, 2016; Shakya *et al*., 2017; Gadzama *et al*., 2018; Fahmida, 2018). In addition, studies have indicated that providing calves with Soymilk does not lead to digestive issues (Ghorbani *et al*., 2007; Yadav, 2016). Hence, the aim of this research is to study the effects of partially replacing whole milk with Soymilk on the haematological and biochemical parameters, along with the faecal scores, of calves.

MATERIALS AND METHODS

The study was carried out at the buffalo farm of the Department of Veterinary Sciences, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, with the approval of the Institutional Animal Ethics Committee (IAEC) vide No.: VCC/IAEC/2022/1624-51 on 10-05-2022. The research lasted for three months.

Animal management and experimental design

For this study, 15 Murrah buffalo calves were selected when they were five days old after the colostrum feeding period. They were divided into three treatment groups randomly, with each group consisting of five calves of similar body weight and sex. The T_1 control group was given only whole milk, whereas the T_2 and T_3 groups were given a mix of whole milk and Soymilk in ratios of 75:25 and 50:50, respectively. The calves were kept in experimental sheds facing east-west with a system of loose housing that allowed for consistent management practices in all treatment groups except for milk feeding. Feeding was given through milk bottles twice a day, around 5 a.m. and 5 p.m. The T_1 group was given whole milk, while the T_2 and T_3 groups were provided with a combination of whole milk and Soymilk in specific proportions. During the experiment, the calves were given a basic diet including dry roughage, green fodder, and a concentrate mixture to ensure they received all necessary nutrients for proper growth, following standard feeding guidelines. Every 15 days, the amount of various feeds was modified to match fluctuations in body weight and guarantee nutritional requirements were satisfied. All experimental calves had unlimited access to fresh water throughout the study.

Preparation of Soymilk

The following steps were undertaken while preparing the soy powder:

Procurement of high-quality soybean seeds by the department and meticulous manual removal of extraneous materials from the seeds.

↓

Analysis of soybean seeds to determine their proximate composition.

↓

Thorough cleaning of soybean seeds using fresh, clean water.

↓

Soaking soybean seeds in water at 4-5 times their weight for 24 hours.

↓

Regular water changes every 12 hours to facilitate leaching of antinutritional factors.

↓

Manual dehulling of soaked soybeans by rubbing between palms after 24 hours.

↓

Soaking and dehulling aimed at reducing antinutritional factors in soybeans.

↓

Overnight drying in a hot air oven at 60°C.

↓

Grinding of dried soybean seeds in a mill and sieving through a 2mm sieve to obtain fine soy powder.

↓

Storage of soy powder in an airtight container for use in Soymilk preparation.

↓

Dissolving 150 grams of soy powder in 1000 ml of lukewarm water to prepare 1 litre of Soymilk.

↓

Vigorous stirring with a stirrer to ensure thorough mixing of soy powder with water.

↓

Straining the mixture through fine muslin cloth.

↓

Incorporating Soymilk into Whole milk as per the designated treatment groups.

Parameters studied

Haemato-biochemical parameters

Blood samples were carefully obtained sterilely through puncturing the jugular vein of all test subjects every month: specifically, on the 30th, 60th, and 90th days of the study. Roughly 10 ml of blood was taken from each animal, with 2 ml being promptly put into EDTA-coated vials for haematological testing, while the rest was placed into sterile plastic tubes without anticoagulant for serum testing. The EDTA-coated vials containing blood samples were examined with an MS45 automatic haematology analyzer. The samples in plastic tubes were tilted to allow clotting before serum analysis. Afterward, the samples with clots were spun at 3200 rpm for a duration of 10 minutes to isolate any red blood cells that were present. The clear, non-haemolyzed sera were collected meticulously into labelled vials. These serum samples were stored in sealed vials at freezing temperatures for later analysis. The saved serum samples were used to assess different serum biochemical parameters with an Erba EM200 fully automated biochemistry analyzer. This thorough procedure guaranteed the trustworthiness and dependability of the haematological and biochemical tests carried out in the study.

Faecal score

The faecal score was carefully documented every 15 days during the experiment, at intervals of 30, 45, 60, 75, and 90 days. The classification of faecal consistency was done based on a standardized scale: 1 = dry, firm; 2 = soft, well-formed; 3 = similar to pudding; 4 = combination of liquid and solid; and 5 = completely liquid (Bartlett *et al*., 2006). Diarrhoea was identified when the faecal score went over 3, showing notable liquidity and possible digestive issues.

STATISTICAL ANALYSIS

As outlined by Snedecor and Cochran (1994), a one-way analysis of variance (ANOVA) was utilized to compare the average data in the research. The information was processed with software called “SPSS” (version 23). Duncan’s (1955) multiple range tests were used to identify variations in means across different treatments. A threshold

of P<0.05 was established as the level of significance for determining statistical significance.

RESULTS AND DISCUSSION

Haematological parameters

Table 2 shows the effect of Soymilk as partial milk replacer on haematological parameters of Murrah buffalo calves.

After examining the table, it was clear that there were no significant differences in haematological parameters between the calves given whole milk and those given Soymilk as a partial replacer. The results of the current research show that there are no significant differences in blood parameters between the treatment groups, which suggests that feeding Soymilk as a partial milk replacer does not have any harmful effects, even though soybeans contain potentially toxic substances like haemagglutinin and anti-nutrients. In line with our findings, Yadav (2016)

Table 1: Proximate composition (% DM Basis) of feed ingredients fed to experimental buffalo calves (AOAC, 2012)

Ingredients	DM%	CP%	CF%	EE%	Ash%	OM%
Wheat straw	90.00	3.00	35.46	1.02	12.97	87.03
Green fodder	27.43	6.12	23.50	6.50	6.50	93.50
Concentrate	83.95	22.87	5.38	3.71	4.74	95.26
Soybean	91.11	44.32	6.54	22.47	5.85	94.15
Soypowder	90.06	45.40	6.39	22.10	5.97	96.03

Table 2: Effect of Soymilk as partial milk replacer on haematological parameters of Murrah buffalo calves

Days of experiment	Parameters	T_1	T_2	T_3
	Hb (g/dl)	10.72 ± 0.94	10.94 ± 0.73	8.70 ± 0.53
	TEC × 10^6/ µl	9.35 ± 0.71	8.83 ± 0.29	7.81 ± 0.34
	TLC × 10^3/ µl	9.06 ± 2.20	7.72 ± 3.03	5.97 ± 2.42
	Lymphocytes%	64.04 ± 8.92	71.36 ± 11.86	76.68 ± 9.49
	Neutrophils%	31.40 ± 8.40	24.00 ± 10.59	22.54 ± 9.39
30th	Monocytes%	1.44 ± 0.24	1.24 ± 0.07	1.24 ± 0.18
	Eosinophils%	0.40 ± 0.07	0.78 ± 0.17	0.76 ± 0.22
	Basophils %	0.18 ± 0.04	0.26 ± 0.05	0.3 ± 0.05
	MCH (picogram)	11.41 ± 0.4	12.35 ± 0.64	11.09 ± 0.30
	MCHC (g/dl)	27.08 ± 0.76	28.16 ± 0.86	26.52 ± 0.89
	PCV%	38.80 ± 4.7	37.86 ± 1.98	32.04 ± 2.19
	Hb (g/dl)	11.90 ± 2.07	9.70 ± 0.53	9.70 ± 1.46
	TEC × 10^6/ µl	10.69 ± 2.48	8.30 ± 0.34	8.78 ± 0.97
	TLC × 10^3/ µl	12.77 ± 3.04	17.83 ± 0.82	16.01 ± 2.25
	Lymphocytes%	69.20 ± 8.36	61.44 ± 5.1	60.54 ± 3.38
	Neutrophils%	29.52 ± 8.46	35.86 ± 4.68	38.86 ± 4.00
60th	Monocytes%	1.42 ± 0.18	1.52 ± 0.12	1.38 ± 0.22
	Eosinophils%	0.44 ± 0.05	0.83 ± 0.30	0.68 ± 0.30
	Basophils %	0.30 ± 0.07	0.26 ± 0.12	0.42 ± 0.12
	MCH (picogram)	11.34 ± 0.51	11.58 ± 0.36	10.84 ± 0.48
	MCHC (g/dl)	27.92 ± 2.62	30.32 ± 0.80	29.54 ± 0.82
	PCV%	48.54 ± 13.59	31.70 ± 1.40	32.54 ± 3.95

	Hb (g/dl)	11.74 ± 0.50	13.04 ± 0.98	10.66 ± 0.51
	TEC × 10^6/ µl	8.76 ± 1.21	9.06 ± 1.41	7.42 ± 0.85
	TLC × 10^3/ µl	14.80 ± 1.66	16.18 ± 2.92	19.18 ± 0.59
	Lymphocytes%	60.62 ± 3.40	62.28 ± 2.77	60.94 ± 5.51
	Neutrophils%	38.46 ± 3.78	33.26 ± 2.46	34.14 ± 4.20
90^{th}	Monocytes%	1.30 ± 0.13	1.96 ± 0.23	1.46 ± 0.26
	Eosinophils%	0.84 ± 0.18	1.46 ± 0.56	1.56 ± 0.38
	Basophils %	0.40 ± 0.10	0.30 ± 0.08	0.26 ± 0.06
	MCH (picogram)	14.58 ± 2.30	15.18 ± 1.56	15.24 ± 2.12
	MCHC (g/dl)	37.18 ± 6.85	36.68 ± 3.30	39.22 ± 5.49
	PCV%	35.16 ± 5.07	36.96 ± 4.86	28.84 ± 3.21
	Hb (g/dl)	11.45 ± 0.37	11.23 ± 0.97	9.69 ± 0.57
	TEC × 10^6/ µl	9.60 ± 0.57	8.73 ± 0.22	8.00 ± 0.40
	TLC × 10^3/ µl	12.21 ± 1.68	13.91 ± 3.13	13.72 ± 3.98
	Lymphocytes%	64.62 ± 2.49	65.03 ± 3.18	66.05 ± 5.31
	Neutrophils%	33.13 ± 2.72	31.04 ± 3.60	31.85 ± 4.85
Overall	Monocytes%	1.39 ± 0.44	1.57 ± 0.21	1.36 ± 0.64
	Eosinophils%	0.56 ± 0.14	1.02 ± 0.22	1.00 ± 0.28
	Basophils %	0.29 ± 0.06	0.27 ± 0.01	0.33 ± 0.05
	MCH (picogram)	12.44 ± 1.07	13.04 ± 1.09	12.39 ± 1.43
	MCHC (g/dl)	30.73 ± 3.24	31.72 ± 2.56	31.76 ± 3.83
	PCV%	40.83 ± 3.99	35.50 ± 1.92	31.14 ± 1.16

Values are means ± standard errors.

also observed that there were no notable variations in haematological parameters (Hb, PCV, and DLC) in buffalo calves given whole milk compared to those given enriched Soymilk. Shakya *et al.* (2017) found similar haemoglobin levels in buffalo calves given whole milk compared to those given a milk replacer containing 20% Soymilk. Gadzama *et al*. (2018) discovered that the haematological parameters of calves were normal regardless of whether they were fed cow milk or Soymilk (up to 75% replacement), with no significant differences. Likewise, Fahmida (2018) recorded comparable haematological values in calves given cow milk compared to those given Soymilk (with up to 50% substitution). In addition, Alam *et al*. (2021) showed no significant variations in Hb, TLC, DLC, and PCV levels between kids given a soy-based milk substitute and those naturally feeding, which is consistent with our research. On the other hand, Sarker *et al*. (2015) found a significant gradual rise ($P<0.05$) in Hb levels in Black Bengal kids who were given higher amounts of Soymilk (25% to 50%) in comparison to those who only received whole milk.

Serum biochemical parameters

Table 3 provides a comprehensive overview of the serum biochemical parameters of the Murrah buffalo calves in the experiment. During the course of the experiment, the majority of serum biochemical parameters showed no significant variations, with the exception of total protein, phosphorus, and HDL. On the 60^{th} day of the study, total protein levels were notably higher in the T_1 group than in the T_2 group, with a significant difference ($P<0.05$), while no significant variation was noticed between the T_1 and T_3 groups. Additionally, the data showed that phosphorus and HDL levels were significantly elevated ($P<0.05$) in the groups fed with Soymilk (T_2 and T_3) compared to the group fed with whole milk (T_1) by the 90^{th} day of the trial.

Based on the findings mentioned earlier, the higher phosphorus levels seen in the group fed Soymilk can be explained by the naturally high phosphorus levels in soybeans. Our findings are consistent with Roy *et al*. (2012), who discovered that calves fed soy, wheat, and shoti-based milk replacers had plasma glucose and blood

Table 3: Effect of Soymilk as partial milk replacer on serum biochemical parameters of Murrah buffalo calves

Days of experiment	Parameters	T_1	T_2	T_3
30th	Creatinine (mg/dl)	1.07 ± 0.34	0.79 ± 0.20	0.92 ± 0.18
	Glucose(mg/dl)	38.50 ± 5.85	40.86 ± 5.78	43.18 ± 4.42
	Total protein (g/dl)	3.73 ± 0.65	2.66 ± 0.13	3.54 ± 0.53
	Albumin (g/dl)	0.96 ± 0.18	0.66 ± 0.06	0.97 ± 0.20
	Cholesterol (mg/dl)	31.00 ± 5.93	23.80 ± 4.26	33.20 ± 7.37
	Calcium (mg/dl)	8.82 ± 1.27	7.18 ± 0.46	7.66 ± 0.42
	Chloride (mmol/l)	87.84 ± 1.78	80.80 ± 1.77	87.82 ± 3.79
	SGPT (IU/L)	6.72 ± 2.25	6.82 ± 2.77	3.48 ± 1.93
	SGOT (IU/L)	52.02 ± 16.89	36.54 ± 15.17	36.56 ± 17.55
	Alkaline Phosphatase ALP (IU/L)	84.80 ± 20.78	91.40 ± 49.64	54.20 ± 25.71
	Phosphorus (mg/dl)	4.40 ± 0.84	2.98 ± 0.91	3.08 ± 1.07
	UREA (mg/dl)	22.80 ± 5.59	14.56 ± 3.20	16.64 ± 5.44
	HDL (mg/dl)	29.18 ± 7.92	21.42 ± 9.20	21.40 ± 10.39
	LDL (mg/dl)	14.99 ± 5.04	10.02 ± 4.75	10.24 ± 4.42
60th	Creatinine (mg/dl)	1.28 ± 0.03	1.33 ± 0.15	1.38 ± 0.16
	Glucose(mg/dl)	96.34 ± 7.46	85.60 ± 7.16	76.84 ± 11.18
	Total protein (g/dl)	6.64^{b} ± 0.27	5.55^{a} ± 0.28	6.22^{ab} ± 0.23
	Albumin (g/dl)	2.08 ± 0.07	1.79 ± 0.21	2.22 ± 0.30
	Cholesterol (mg/dl)	80.40 ± 7.49	102.80 ± 13.26	100.00 ± 14.30
	Calcium (mg/dl)	11.92 ± 0.27	11.78 ± 0.81	11.62 ± 0.12
	Chloride (mmol/l)	101.56 ± 0.58	94.32 ± 5.26	99.16 ± 1.98
	SGPT (IU/L)	7.82 ± 1.06	12.38 ± 2.74	10.80 ± 2.64
	SGOT (IU/L)	37.80 ± 6.21	57.64 ± 16.03	65.34 ± 25.08
	Alkaline Phosphatase ALP (IU/L)	67.60 ± 9.01	114.60 ± 31.45	118.60 ± 38.31
	Phosphorus (mg/dl)	3.08 ± 0.39	5.22 ± 1.28	4.08 ± 0.73
	UREA (mg/dl)	17.22 ± 2.10	23.46 ± 3.16	18.48 ± 1.72
	HDL (mg/dl)	14.04 ± 3.37	29.18 ± 11.49	24.70 ± 10.81
	LDL (mg/dl)	6.97 ± 1.85	13.98 ± 6.17	10.50 ± 4.32
90th	Creatinine (mg/dl)	1.10 ± 0.26	1.50 ± 0.14	1.36 ± 0.22
	Glucose(mg/dl)	52.54 ± 4.04	67.94 ± 5.10	78.58 ± 12.14
	Total protein (g/dl)	3.81 ± 0.93	5.13 ± 0.22	5.19 ± 0.94
	Albumin (g/dl)	0.81 ± 0.27	1.38 ± 0.13	1.16 ± 0.26
	Cholesterol (mg/dl)	85.60 ± 14.31	108.60 ± 6.38	101.00 ± 13.49
	Calcium (mg/dl)	7.28 ± 1.57	9.36 ± 0.45	9.06 ± 1.42
	Chloride (mmol/l)	56.28 ± 12.64	80.36 ± 1.40	76.10 ± 11.69
	SGPT (IU/L)	15.54 ± 2.23	21.00 ± 2.94	18.04 ± 1.47
	SGOT (IU/L)	72.56 ± 12.55	94.00 ± 5.99	88.54 ± 5.47
	Alkaline Phosphatase ALP (IU/L)	174.80 ± 56.62	197.80 ± 14.68	187.60 ± 55.90
	Phosphorus (mg/dl)	4.98^{a} ± 0.44	6.70^{b} ± 0.48	6.65^{b} ± 0.30
	UREA (mg/dl)	20.14 ± 3.40	24.82 ± 1.99	24.10 ± 1.87
	HDL (mg/dl)	26.12^{a} ± 4.86	40.58^{b} ± 4.13	45.26^{b} ± 3.11
	LDL (mg/dl)	12.49 ± 2.65	20.17 ± 2.42	19.47 ± 1.17

Overall	Creatinine (mg/dl)	1.15 ± 0.07	1.21 ± 0.21	1.22 ± 0.15
	Glucose(mg/dl)	62.46 ± 17.42	64.80 ± 13.01	66.20 ± 11.52
	Total protein (g/dl)	4.73 ± 0.96	4.45 ± 0.90	4.98 ± 0.78
	Albumin (g/dl)	1.28 ± 0.40	1.28 ± 0.33	1.45 ± 0.39
	Cholesterol (mg/dl)	65.67 ± 17.40	78.40 ± 27.35	78.07 ± 22.43
	Calcium (mg/dl)	9.34 ± 1.36	9.44 ± 1.33	9.45 ± 1.16
	Chloride (mmol/l)	81.89 ± 13.40	85.16 ± 4.58	87.69 ± 6.66
	SGPT (IU/L)	10.03 ± 2.77	13.40 ± 4.12	10.77 ± 4.20
	SGOT (IU/L)	54.13 ± 10.09	62.73 ± 16.78	63.48 ± 15.03
	Alkaline Phosphatase ALP (IU/L)	109.07 ± 33.24	134.60 ± 32.30	120.13 ± 38.52
	Phosphorus (mg/dl)	4.15 ± 0.56	5.00 ± 2.15	4.60 ± 1.06
	UREA (mg/dl)	20.05 ± 1.61	20.95 ± 3.22	19.74 ± 2.24
	HDL (mg/dl)	23.11 ± 4.62	30.39 ± 5.56	30.45 ± 7.46
	LDL (mg/dl)	11.48 ± 2.37	14.72 ± 2.95	13.40 ± 3.03

Values are means ± standard errors.

Mean values with different superscripts in a row differ significantly (P<0.05).

urea nitrogen (BUN) values that were statistically similar to those of calves fed a traditional whole milk-based diet. In the same way, Shukla (2014) found that calves fed whole milk and a milk replacer with soybean meal and soy seeds showed no significant variations in serum total protein, serum calcium, and serum phosphorus levels. Huang *et al*. (2015) found no significant variations in BUN and serum total protein levels in calves given soy protein concentrate compared to calves only receiving whole milk. In line with our results, Gadzama *et al.* (2018) determined that all serum biochemical levels stayed within normal limits, with no notable distinctions noted between cow milk-fed and Soymilk-fed groups (with up to 75% substitution). In her 2018 study, Fahmida also found no significant difference in serum biochemical levels (plasma protein, plasma glucose, BUN, serum calcium, and serum phosphorus) between calves fed cow milk or Soymilk (up to 50% substitution).

On the other hand, Senevirathne *et al*. (2017) found that calves fed a pelleted microbially enhanced soy protein-based milk replacer had higher BUN and plasma glucose levels than calves fed pelleted soybean-based and conventional milk replacers.

Fecal score

Table 4 shows the average faecal scores in the Murrah buffalo calves from the experiment after replacing some whole milk with soymilk. The findings show that there were no significant differences (P>0.05) between the treatment groups during the experiment.

Table 4: Faecal score of Murrah buffalo calves under different treatment groups

Days of experiment	Treatments		
	T_1	T_2	T_3
15th	2.40 ± 0.24	2.20 ± 0.20	2.60 ± 0.40
30th	2.00 ± 0.32	2.00 ± 0.32	1.80 ± 0.37
45th	2.60 ± 0.81	2.00 ± 0.00	1.40 ± 0.24
60th	2.00 ± 0.45	2.20 ± 0.37	2.60 ± 0.68
75th	1.80 ± 0.37	1.20 ± 0.20	1.80 ± 0.37
90th	1.60 ± 0.24	1.80 ± 0.37	2.00 ± 0.32
Overall	2.07 ± 0.15	1.90 ± 0.15	2.03 ± 0.20

The examination of the faecal score values from the calves showed that the faecal score remained unchanged regardless of whether they were fed Whole milk or Soymilk during the study. These results indicate that adding Soymilk to the diet of the calves did not cause any digestive issues. Our findings are consistent with prior research; a study by Campos *et al*. (1982) showed that replacing 50% of milk protein with soy protein had no impact on faecal scores in calves when compared to a control group. Likewise, Silva *et al*. (1986) found no notable differences in faecal scores when substituting milk protein with as

much as 66% soybean protein. According to our research, Donovan *et al*. (2002), Quigley *et al*. (2006), and Lee *et al*. (2008) produced similar results indicating no significant variations in faecal scores between calves given different milk replacers and those given whole milk. Ghorbani and colleagues (2007) also found that there was no difference in faecal scores when calves were given Soymilk as a replacement for up to 50% of whole milk. Furthermore, Yadav (2016) determined that fortified Soymilk did not have a major influence on faecal scores, indicating that Soymilk supplementation has limited effects on digestive health. These combined results emphasize the consistency of faecal scores in calves given Soymilk as a supplement, indicating its promise as a suitable alternative to traditional milk replacers with no negative impact on digestive health.

CONCLUSION

According to the findings of this research, it is clear that replacing up to 50% of Whole milk with Soymilk did not harm the haemato-biochemical parameters in Murrah buffalo calves. Moreover, there were no digestive issues among the calves as a result of this partial replacement. These results highlight the potential for Soymilk to be a safe and viable option as a partial substitute for milk in calf diets. Soymilk provides a hopeful substitute for Whole milk by promoting haemato-biochemical balance and aiding in digestive health. This finding agrees with previous research that emphasizes the suitability of Soymilk in calf feeding, without impacting their health and growth outcomes. In conclusion, the research provides useful information on improving calf feeding approaches, showing that Soymilk can be a successful replacer for Whole milk without adverse effects on health or digestion in Murrah buffalo calves.

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