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Performance and Economics of Goat Production in Confinement on Feeding Soya Deoiled Cake and Groundnut Cake-Based Concentrate Mixture

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ABSTRACT

The present study was conducted for 12 weeks at Livestock farm complex, College of Veterinary and Animal Sciences, Udgir in Latur district of Maharashtra state in January–March, 2020 on 12 Osmanabadi goat kids of either sex divided into two groups of 6 kids in each group to study the growth performance, dry matter intake and economics of goat production on feeding soya deoiled cake and groundnut cake-based concentrate mixture. During the experiment, the kids were maintained intensively with same managemental practices. The group I and II were offered concentrate mixture containing soya deoiled cake and groundnut cake, respectively as a protein source. Each kid in the group was supplemented with 200 g of the prepared concentrate mixture day^{-1}. All the kids were offered DHN6 green fodder (70%) ±Hedge Lucerne (30%) *a-dlibitum* and 100 g, 150 g and 200 g of Jowar straw daily kid^{-1} in first four weeks, mid four weeks and last four weeks of the experimental period, respectively. Daily feed intake, weekly body weights were recorded for 12 weeks. It was found that dry matter intake, weekly body weight gain and daily body weight gain was significantly more in kids of group I whereas, no particular trend in dry matter intake (percent BW) was found in between the groups. Net profit kid^{-1} was more in group I (2,129.67) than the group II (₹ 1339.98). It was inferred that the feeding of concentrate mixture with Soya doc as a protein source gives better performance and proved to be economical.

KEYWORDS: Economics, goat kids, groundnut cake, growth, performance, soya doc

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Data Availability Statement: Legal restrictions are imposed on the public sharing of raw data. However, authors have full right to transfer or share the data in raw form upon request subject to either meeting the conditions of the original consents and the original research study. Further, access of data needs to meet whether the user complies with the ethical and legal obligations as data controllers to allow for secondary use of the data outside of the original study.

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1. INTRODUCTION

Due to the low-fat content, goat meat has gained market mainly due to increased demand for healthy foods (Dhaliwal et al., 2022). However, in many regions, the seasonality in the production of roughage and the low quality of pastures hinder the termination and the slaughter of grazing animals at an early age. One of the possible strategies to accelerate the growth of animals is confinement. The goat is an animal that adapts itself readily to almost any climate, especially in the arid region and maintenance with low water (Sarkar et al., 2014, Kaliber et al., 2016 and Berihulay et al., 2019). The goat maintained on a class of fodder on which other animals could not maintained properly and due to that, goat-rearing has become an occupation by a large section of small holders and landless laborers in rural areas (Singh et al., 2000, Anonymous, 2013, Yasmin et al., 2013 and Nehra et al., 2020). Goats provide a dependable source of income to 40% of the rural population below the poverty line in India (Santra et al., 2020). Goat rearing is commonly done by the grazing method (extensive method). In traditional goat farming system, goats are allowed feeding on poor quality feed with almost no supplementary feeding resulting in low growth rate and requires more time to reach market weight (Bhatti, 2013). With very low investments goat rearing can be made into a profitable venture for small and marginal farmers and also contribute in human food security by providing milk and meat (Miller and Lu, 2019, Chauhan et al., 2021).

Groundnut cake contains about 40–45% crude protein and it promotes growth of animals. But, the protein in groundnut cake is deficient in lysine and methionine and having limited amount of tryptophan and threonine (Malik et al., 2017). Among plant protein sources, soybean meal is known for the highest feeding value due to both its high protein content and essential amino acids needed to meet the nutrient requirements of animals. Soybean meal has excellent amino acid profile which makes it suitable to balance most cereal-based diets (Frempong et al., 2019). Kumar et al. (2017)) and Rodrigues et al. (2021) suggested to use concentrate in goat ration to make goat farming more profitable and further reported that diet has an impact on the goat kid growth performance and carcass quality in intensive farming system. However, Singh and Sharma (2019) suggested that the concentrate feeding is utmost important to goat kids for better growth performance. Kushwaha et al. (2016) and Panzuti et al. (2019) suggested that high concentrate supplementation is necessary to improve growth performance by expressing the genetic potential of goats.

It was observed that supplementation of concentrate mixture @ 1% of the body weight for 120 days improved the body weight gain and ADG of Deccani lambs. Feeding 300 g of concentrate with *adlibitum* green forage had a positive effect on live weight gain, protein conversion rate and FCR of dairy goats (Mahfuz et al., 2018). Costa et al. (2016) reported the inclusion of licuri cake in concentrate decreased DMI and digestibility, reflecting the lower ADG. Whereas, Silva et al. (2015), Banaszkiewicz (2011) and Correia et al. (2016) reported that the groundnut cake is not complete, equal to replace soybean meal in goat feed and young feedlot-finished Nellore bulls, respectively. In contrast, based on the carcass characteristics and quality Silva et al. (2016) suggested that the whole soybean meal in the concentrate of Boer goats can be replaced with groundnut cake. de Oliveira et al. (2016) recommended replacing the soybean meal in concentrate upto 40% by groundnut cake. Hence, the present study was planned to evaluate the effect of supplementation of concentrate mixture containing Soya deoiled cake and groundnut cake as a protein source on the performance of Osmanabadi goat kids in confinement and economics of goat production.

2. MATERIALS AND METHODS

The present study was conducted in January–March, 2020 at Livestock farm complex, College of Veterinary and Animal Sciences, Udgir, Latur, Maharashtra. A 12-week study was conducted on 12 Osmanabadi goat kids of either sex with similar initial body weights and above three months of age. Healthy goat kids free from external and internal parasites were reared under intensive system. The kids were divided into two groups of six kids each. All the kids were offered DHN6 green fodder (hybrid napier grass, Sampoorna) ± hedge Lucerne *a-dlibitum* and 100 g, 150 g and 200 g of jowar straw daily kid^{-1} in first four weeks, mid four weeks and last four weeks of the experimental period, respectively. Two types of concentrate mixture were prepared with soya deoiled cake (Soya doc) and groundnut cake (GNC) as a protein source. Group I and group II kids were provided with 200 g concentrate mixture with soya doc and with groundnut cake, respectively. Diet was isocaloric and iso-nitrogenous. The daily fodder intake, weekly body weights were recorded. Based on the data recorded total dry matter intake, dry matter intake percentage, total live weight gain, daily weight gain was calculated and the data were statistically analyzed by using the Paired T test as per Snedecor and Cochran (1994). The economics of goat production during the trial period was calculated.

3. RESULTS AND DISCUSSION

The chemical composition of concentrate mixture, hedge Lucerne, DHN 6 fodder and jowar straw is tabulated in Table1.

3.1. Dry matter intake

The daily average dry matter intake (DMI) in Osmanabadi goat kids is depicted in Table 2.

Table 1: Chemical composition of concentrate mixtures prepared, green and dry fodder

Sl. No.	Proximate principles percentage	Soya doc-based concentrate mixture	GNC based concentrate mixture	Hedge Lucerne	DH6 fodder	Jowar straw
1.	Dry matter	90.76	90.82	15.87	16.12	89.90
2.	Crude protein	22.37	22.12	19.54	12.81	2.82
3.	Ether extract	3.40	3.50	4.36	5.10	1.65
4.	Total ash	9.85	9.55	5.45	10.6	10.34
5.	NFE	59.83	59.24	50.37	46.01	51.74
6.	Crude fibre	4.55	5.59	20.28	25.48	33.45
7.	Acid insoluble ash	1.6	0.7	-	-	-

Table 2: Dry matter intake in Osmanabadi goat kids fed concentrate mixture with soy doc or groundnut cake

Dry matter	0	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
CSD	383.90 ± 1.81	421.56 ± 1.20	450.72 ± 1.04	495.60 ± 1.56	528.95 ± 1.76	563.66 ± 1.66	598.09 ± 0.73	634.32 ± 1.18	666.75 ± 1.41	700.57 ± 2.01	732.07 ± 1.53	758.97 ± 0.79	784.74 ± 1.07
CGNC	387.49 ± 0.77	395.20 ± 1.39	417.93 ± 1.23	416.66 ± 0.78	440.75 ± 0.64	500.00 ± 1.13	523.40 ± 1.64	548.75 ± 0.97	579.25 ± 0.71	592.07 ± 1.62	641.16 ± 1.09	671.68 ± 1.07	700.07 ± 0.58
p-value	0.17	0.000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Significance	NS	**	**	**	**	**	**	**	**	**	**	**	**

CSD: Concentrate with soya doc; CGNC: Concentrate with GNC

The results showed that DMI was increased as the age of the Osmanabadi goat kids increased. A Significant increase in DMI in kids supplemented with soyadoc-based concentrate mixture as compared to kids supplemented with concentrate mixture with GNC was might be due to comparatively low crude fibre and oil in soya doc based concentrate mixture. Decreased dry matter intake by inclusion of groundnut cake in the ration of goats might be due to its high oil level or energy contents (Silva et al., 2015). The DMI percentage BW is presented in Table 3.

There was no particular trend recorded in dry matter intake percentage between two experimental groups during the study period. The maximum dry matter intake percentage was 3.63±0.14% and 3.54±0.11% in kids supplemented with concentrate mixture containing soya doc and GNC, respectively. A Significant difference in dry matter intake percentage was only found on the 7th and 9th week and highly significant difference was recorded during the 3rd and 4th week. Silva et al. (2015) found higher dry matter intake in goats supplemented with concentrate mixture containing soya doc than concentrate mixture containing groundnut cake.

Despite the similarity in the CP content of the two protein sources, the greater fibre and lipid content of the groundnut cake might cause differences in DMI and growth performance (Kumar et al., 2016).

Table 3: Dry Matter intake (percent BW) in Osmanabadi goat kids fed concentrate mixture with soy doc or groundnut cake

Dry Matter percentage	0	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Concentrate with soya doc	3.40± 0.16	3.44± 0.16	3.47± 0.18	3.52± 0.17	3.52± 0.15	3.56± 0.15	3.58± 0.15	3.61± 0.14	3.62± 0.13	3.63± 0.14	3.63± 0.13	3.62± 0.12	3.60± 0.12
Concentrate with GNC	3.43± 0.19	3.34± 0.20	3.30± 0.17	3.12± 0.15	3.14± 0.15	3.36± 0.17	3.37± 0.14	3.38± 0.13	3.42± 0.12	3.36± 0.12	3.50± 0.12	3.52± 0.11	3.54± 0.11
p-value	0.79	0.50	0.18	0.0099	0.0086	0.15	0.07	0.03	0.05	0.01	0.13	0.27	0.42
Significance	NS	NS	NS	**	**	NS	NS	*	NS	*	NS	NS	NS

3.2. Growth performance

The data regarding weekly live body weights in Osmanabadi kids is presented in Table 4.

The non-significant difference in body weight gain in kids of the two groups was found up to the 4th week of study, thereafter, a significant increase was observed in Group1 kids as compared to Group II kids till the last week of experiment. The improved weight gain in goat kids fed concentrate mixture containing soya doc might be due to increased dry matter intake and better amino acid composition of soya doc than groundnut cake (Silva et al., 2015 and Kumar et al., 2016). The daily weight gain in kids in treatment groups was depicted in Table 5.

The daily gain in weight was ranged from 117.14±2.08 to 142.37±15.19 g and 94.29±8.50 to 102.38±3.41 g in kids supplemented with concentrate mixture containing Soya doc and groundnut cake, respectively. The maximum daily weight gain found in the present study was 142.37±15.19 g and 102.38±3.41 g found in kids supplemented with concentrate mixture containing soya doc and groundnut cake, respectively. A Significant difference in daily live weight gain in goat kids was recorded on the 1st and 4th week of study, whereas a highly significant difference in daily live weight gain was recorded on 2nd, 3rd week and from 5th to 12th week of the study period. Better daily weight gain was recorded in kids supplemented with concentrate mixture containing soya doc as a protein source than the

Table 4: Weekly Live Body weights of Osmanabadi Goat kids fed concentrate mixture with soy doc or groundnut cake

Body Weight (Week)	0	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Concentrate with soya doc	11.40 ± 0.54	12.40 ± 0.60	13.18 ± 0.71	14.25 ±0.67	15.17 ±0.72	16.00 ±0.72	16.85 ±0.71	17.70 ± 0.72	18.56 ±0.73	19.41 ±0.74	20.27 ± 0.73	21.11 ± 0.75	21.93 ± 0.74
Concentrate with GNC	11.47 ± 0.60	12.13 ± 0.58	12.81 ± 0.64	13.52 ±0.63	14.20 ±0.66	14.92 ±0.65	15.65 ±0.62	16.35 ± 0.62	17.21 ±0.53	17.74 ±0.62	18.44 ± 0.63	19.16 ± 0.61	19.87 ± 0.62
p-value	0.85	0.56	0.44	0.17	0.10	0.08	0.05	0.03	0.04	0.01	0.01	0.0099	0.0074
Significance	NS	NS	NS	NS	NS	*	*	*	*	*	*	**	**

Table 5: Daily Weight Gain of Osmanabadi goat kids fed concentrate mixture with soy doc or groundnut cake

Body Weight (Daily)	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Concentrate with Soya doc	142.37 ± 15.19	129.05 ±17.009	153.33 ±8.92	130.48 ±9.89	119.05 ± 4.40	120.95 ± 1.41	122.38 ±4.01	121.90 ±3.51	123.81 ±4.10	122.86 ±1.32	120.48 ±2.67	117.14 ±2.08
Concentrate with GNC	94.29 ±8.50	97.62 ±16.88	101.43 ±2.50	97.62 ±9.50	102.38 ± 3.10	101.43 ± 7.90	100.24 ±1.40	99.21 ±0.63	99.31 ±0.88	100.00 ±3.10	102.38 ±3.41	101.45 ±2.17
p-value	0.04	0.06	0.0020	0.01	0.0001	0.055	0.006	0.0013	0.0021	0.0025	0.02	0.001
Significance	*	**	**	*	**	**	**	**	**	**	**	**

concentrate mixture containing groundnut cake. The more live body weight and daily gain in body weight was high in kids supplemented with concentrate mixture containing soya doc. This might be due to better amino acid make of Soya doc and increased dry matter intake in kids supplemented with concentrate mixture with soya doc (Kumar et al., 2017). Gatenby (1995) in sheep and Kumar et al. (2017) in pigs recorded the highest weight gain and ADG fed soybean meal and this might be due to positive N, Ca and phosphorus balance and more nutrient digestibility in sheep and pigs fed soybean meal..

3.3. FCR in goat kids

The Table 6 depicts the data regarding FCR in goat kids. The data in Table 6 indicated that the FCR in goat kids supplemented with concentrate mixture containing soya doc and groundnut cake was ranged from 3.14±0.33 to 6.71±0.11 and 4.12±0.10 to 6.92±0.14, respectively. A non-significant difference was recorded in the FCR in the goat kids supplemented with concentrate mixture containing soya doc and groundnut cake in Ist, IInd, VIth,VIIth, VIIIth, IXth, Xth, XIth and XIIth week, highly significant difference was found during IIIrd and IVth week of study whereas, significant difference was recorded in Vth week of study. In this study, no particular trend was found concern to FCR. No influence on FCR on replacing the soybean meal with peanut cake in crossbred goat kids and broilers

Table 6: FCR of Osmanabadi goat kids fed concentrate mixture with soy doc or groundnut cake

FCR (Weekly)	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Group I	3.14 ±0.33	5.17 ±1.25	3.28 ±0.18	4.17 ±0.30	4.73 ±0.18	4.95 ±0.06	5.21 ±0.16	5.49 ±0.15	5.80 ±0.21	5.96 ±0.06	6.32 ±0.13	6.71 ±0.11
GroupII	4.36 ±0.38	5.68 ±1.80	4.12 ±0.10	4.74 ±0.48	4.91 ±0.15	5.18 ±0.37	5.47 ±0.09	5.45 ±0.62	5.92 ±0.06	6.55 ±0.24	6.60 ±0.20	6.92 ±0.14
p-value	0.05	0.73	0.0081	0.27	0.0172	0.57	0.22	0.95	0.66	0.08	0.42	0.23
Significance	NS	NS	**	**	*	NS	NS	NS	NS	NS	NS	NS

was reported by Silva et al. (2015) and Frempong et al. (2019), respectively

3.4. Cost of feeding and income

Table 7 presents the data regarding cost of feeding of goat and income. Total feeding cost for kids supplemented with concentrate mixture containing soya doc and groundnut cake was ₹ 1029.33 and ₹ 1183.02, respectively, whereas total calculated income after sailing of kids in these two groups @ ₹ 300 kg^{-1} live body weight in kids was ₹ 3159 and ₹ 2523, respectively. Calculated net profit was ₹ 2129.67 and ₹ 1339.98 kid^{-1} in the treatment groups supplemented with concentrate mixture containing soya doc and groundnut cake, respectively. Total net profit was found more in kids supplemented with concentrate mixture containing soya doc. Reduced cost of feeding and increased net profit on inclusion of soybean meal in the broiler ration was reported by Frempong et al. (2019).

Table 7: Cost of feeding and income after sale of kid fed concentrate mixture with soya doc or groundnut cake

Sl. No.	Particulars	Group I	Group II
1.	Average cost of feeding Jowar straw	12.6 kg×₹ 5=₹ 63.0	12.6 kg×₹ 5=₹ 63.0
2.	Average cost of feeding green fodder (Dashrath+DHN6)	193.31 kg×₹ 3=₹ 579.93	273 kg×₹ 3-= ₹ 519.00
3.	Cost of concentrate mixture	16.8 kg×₹ 25.34=₹ 386.4	16.8 kg×₹ 29.82=501.02
4.	Total feed cost	₹ 1029.33	₹ 1183.02
5.	Average total live body weight gain	10.53 kg	8.41 kg
6.	Cost kg-1 live weight gain	₹ 97.75	₹ 140.67
7.	Income after sale @ ₹ 300 kg^{-1} live weight	₹ 3159	₹ 2523
8.	Net profit Kid-1	₹ 2,129.67	₹ 1339.98

1US$=₹ 74.53 (March, 2020)

4. CONCLUSION

Supplementation of concentrate mixture containing soyadoc at 32% level in concentrate mixture with routine feeding of Osmanabadi goat kids in confinement improved dry matter intake, gave better weight gain in kids . This was proved to be economical by reducing the cost of production kg^{-1} live body weight gain as compared to groundnut cake. Inclusion of soya doc in concentrate mixture of goat ration had no positive effect on FCR compared to groundnut cake.

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6. REFERENCES

Anonymous, 2013. Economic Survey of Pakistan. Economic Advisor's Wing, Finance Division, Government of Pakistan, Islamabad. Available at https://www.finance.gov.pk/survey_1314.html.

Banaszkiewicz, T., 2011. Nutritional value of soybean meal. In: El-Shemy, H. (Ed.), Soybean and Nutrition. IntechOpen. Available athttps://www.intechopen.com/books/soybean-and-nutrition/nutritional-value-of-soybean-meal.

Berihulay, H., Abied, A., He, X., Jiang, L., Ma, Y., 2019. Adaptation mechanisms of small ruminants to environmental heat stress. Animals 9(3), 75.

Bhatti, A., 2013. Feeding behavior, voluntary intake and digestibility of various summer fodders in sheep and goats. Pakistan Journal of Zoology 45(1), 53–58.

Chauhan, I., Menna R.K., Gautam, S., Kharayat, N.S., Jana, C., Sankar, M., 2021. Growth and reproduction performances of chaugarkha goat of Kumaonregion of Uttarakhand. International Journal of Bio-resource and Stress Management 12(3), 205–210.

Correia, B.R., de Carvalho, G.G., Oliveira, R.L., Pires, A.J., Ribeiro, O.L., Silva, R.R., Leao, A.G., Oliveira, P.A., 2016. Intake, digestibility, performance, and nitrogen metabolism of feedlot-finished young bulls () fed diets containing peanut cake. Journal of Animal Science 94(11), 4720–4727.

Costa, J.B., Oliveira, R.L., Silva, T.M., Ribeiro, R.D., Silva, A.M., Leao, A.G., Bezerra, L.R., Rocha, T.C., 2016. Intake, digestibility, nitrogen balance, performance, and carcass yield of lambs fed licuri cake. Journal of Animal Science 94(7), 2973–2980.

de Oliveira, P.A., Oliveira, R.L., Jaeger, S.M., de Paula Leite, M.C., Bagaldo, A.R., Bezerra, L.R., Correia, B.R., de Santana Filho, N.B., 2016. Intake and digestibility, rumen fermentation, and concentrations of metabolites in steers fed with peanut cake. Tropical Animal Health and Production 48(2), 403–409.

Dhaliwal, A.D.S., Kasrija, R., Singh, P., Jadoun, Y.S., 2022. A collating study for health and management practices followed by stall fed and extensive rearing goat farmers of Punjab.InternationalJournal of Bio-resource and Stress Management 13(1), 605–612.

Frempong, N.S., Thomas, N.N., Nortey, C., Paulk, Charles, R.S., 2019. Evaluating the Effect of replacing fish meal in broiler diets with either Soybean meal or poultry by-product Meal on Broiler Performance and total feed cost per kilogram of gain. Journal of Applied Poultry Research 28(4), 912–918.

Gatenby, R.M., 1995. Sheep. In: The Tropical Agriculturist (2nd Edn.) Macmillan Publisher, 6–25.

Kaliber, M., Koluman, N., Silankone, N., 2016. Physiological and behavioral basis for the successful adaptation of goats to severe water restriction under hot environmental conditions. Animal 10(1), 82–88.

Kumar, H., Kumar, B., Singh, S.K., 2017. Effect of replacing fish meal and groundnut cake by doc soya on weight gain, digestibility and blood biochemical profiles in growing pigs. Indian Journal of Animal Research 51(4), 722–725.

Kushwaha, T., Tripathi, M.K., Tripathi, P., Sharma, D.K., Chaudhary, U.B., Rajkumar, V., 2016. Effect of varying levels of concentrate feeding on growth performance, Carcass Traits, blood parameters and gastrointestinal nematodes in goat kids. Animal Nutrition and Feed Technology 16(1), 25–36.

Mahfuz, S.U., Islam, M.S.D., Chowdhury, M.R., Islam, S., Hasan, M.K., Uddin, M.N., 2018. Influence of concentrate supplementation on production and reproduction performance of female black Bengal goat. Indian Journal of Animal Research 52(5), 735–739.

Malik, T.A., Thakur, S.S., Mahesh, M.S., Yogi, R.K., 2017. Replacing groundnut cake with gluten meals of rice and maize in diets for growing Sahiwal cattle. Asian Australasian Journal of Animal Science 30(10), 1410–1415.

McDonald, P., Edwards, R.A., Greenhalgh, J.F.D., 1995. Animal Nutrition (7th Edn.). Longman, London, UK, 468.

Miller, B.A., Lu, C.D., 2019. Current status of global dairy goat production: An overview. Asian-Australas Journal of Animal Science 32(8), 1219–1232.

Nehra, H.L., Uddin, A., Bhateshwar, V., 2020. A study on growth performance of weaned kids of Sirohi goat fed with different levels of concentrates. Journal of Animal Research 10(2), 247–251.

Panzuti, C., Duvaux-Ponter, C., Bruckmaier, R., Dessauge, F., 2019. Effect of feeding level during the prepubertal phase on mammary gland development in female goat kids. Journal of Dairy Research 89(3), 267–271.

Rodrigues, T.C.G.C., Santos, S.A., Cirne, L.G.A., dos S., Pina, D., Alba, H.D.R., de Araujo, M.L.G.M.L., Silva, W.P., Nascimento, C.O., Rodrigues, C.S., de Carvalho, G.G.P., 2021. Palm kernel cake in high-concentrate diets improves animal performance without affecting the meat quality of goat kids. Animal Production Science 62(1), 78–89.

Santra, B., Goswami, A., Dhara, K., Biswas, S., 2020. Adoption index of women goat farmers in various aspirational districts of NitiAyog in West Bengal, India. International Journal of Bio-resource and Stress Management 11(6), 578–584.

Sarkar, S., Padaria, R.N., Vijayaragavan, K., Pathak, H., Bhowmik, A., Kumar, P., Jha, G.K., 2014. Constructing a knowledge test to measure the knowledge level of farmers about climate change in arid ecosystem of India. International Journal of Bio-resource and Stress Management 5(4), 530–535.

Silva, T.M., de Medeiros, A.N., Oliveira, R.L., Neto, S.G., Ribeiro, M.D., Bagaldo, A.R., Ribeiro, O.L., 2015. Peanut cake as a substitute for soybean meal in the diet of goats.Journal of Animal Science 93(6), 2998–3005.

Silva, T.M., de Medeiros, A.N., Oliveira, R.L., Gonzaga Neto, S., Queiroga, R., Ribeiro, R.D., Leao, A.G., Bezerra, L.R., 2016. Carcass traits and meat quality of crossbred Boer goats fed peanut cake as a substitute for soybean meal. Journal of Animal Science 94(7), 2992–3002.

Singh, D.K., Kumar, S., Singh, N.S., Singh, C.S.P., 2000. Genetic and non-genetic factors affecting pre-weaning

relative growth rate (RGR) in black Bengal and its half-bred kids. The Indian Journal of Animal Sciences 72(2), 161–164.

Singh, T., Sharma, M., 2019. Feeding of concentrate and green fodder at an early age and its effects on growth rate in goat kids. Journal of Krishi Vigyan 8(1), 133–136.

Snedecor, G.W., Cochran, W.G., 1994. Statistical Methods (8thEdn.). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, India.

Yasmin, F., Miyan, M.A.H., Chowdhury, S.M.Z.H., 2013. Pricing: A management technology for goat meat market in Bangladesh using simultaneous equation model. International Journal of Bio-resource and Stress Management 4(3), 435–443.