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STUDY THE EFFECT OF MONENSIN AND ESSENTIAL OILS ON GROWTH PERFORMANCE AND FEED INTAKE IN OSMANABADI GOAT KIDS

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Abstract: The study was conducted with the aim of finding growth promoting effects of monensin and eucalyptus oil in Osmanabadi goats. Feed intake was found more in control followed by eucalyptus oil fed group and monensin fed group. Monensin and eucalyptus oil reduced feed intake. Same observations were noted for the water intake. Water intake was more in control followed by eucalyptus oil and monensin fed groups. Water intake was according to dry matter intake. The body weights were more for monensin fed group followed by eucalyptus oil and control group. It is worth mentioning that morphometric parameters were found more in monensin fed group followed by eucalyptus oil and control group. Lastly conclusion could be drawn that the effect of monensin followed by eucalyptus oil as growth promoter were more evident.

Keywords: Eucalyptus, Feed Intake, Monensin, Osmanabadi, Water Intake.

INTRODUCTION

Antibiotics have been used in animal feed for several years ever since the discovery not only as an anti-microbial agent, but also as a growth-promoting agent and improvement in performance. The meat obtained from antibiotic-fed animals is also of better quality with higher amount of protein and less amount of fat compared to that obtained from animals not supplemented with antibiotics (Hughes and Heritage, 2002). According to a report, out of 13 million kg of antibiotics administered to animals in 2010, the major portion was meant for promoting the growth of the livestock (Spellberg *et al.,* 2013). Monensin is a biologically active compound that has antibacterial and anticoccidial properties. It is used extensively in the livestock industry to control coccidiosis. Monensin is a polyether ionophore produced by Streptomyces cinnamonensis (Santos *et al.,* 2010). Monensin belongs to the ionophore or ion carrier group of antibiotics. The data indicate that monensin in the diets of ruminants may decrease protein degradation in the rumen and may increase feed protein utilization by an average of 3.5 percentage units. Ionophores can reduce CH_4 production by 25% and decrease feed intake by 4% without affecting animal performance. (Tedeschi *et al.,* 2003)

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Essential Oils (EO) are volatile aromatic compounds extracted from whole plants and are secondary metabolites usually made up of terpenoids and phenylpropanoids. Plant EO has antimicrobial properties, which can be effective against undesirable rumen microbes. In addition. The antioxidative activity of aromatic plants and essential oil compounds contributes to the stability and palatability of animal feed and has, moreover, resulted in an improved shelf life and quality of animal products, due to reduced oxidation (Franz *et al.,* 2010). Therefore, recently it has been great interest among nutritionist and rumen microbiologist to exploit EO as natural feed additives to improve rumen fermentation such as volatile fatty acid production, inhibition of methanogenesis, improvement in protein metabolism and efficiency of feed utilization and increasing conjugated linoleic acids in ruminant derived foods. (Patra *et al.,* 2011). The inclusion of essential oils in livestock diets is nowadays becoming a common practice, since dietary supplementation has been proven a simple and convenient strategy to effectively inhibit the oxidative reactions or microbial spoilage at their localized sites. (Swamy *et al.,* 2016).

So far monensin is considered as synthetic chemical entity, on other hand essential oil is natural, easily available and comparatively less toxic if fed in excess so it is essential to conduct comparative study of both compounds in goats for growth performance.

MATERIALS AND METHODS

Location and Environment

The present research work was undertaken on growing Osmanabadi kids at Instructional Livestock Farm Complex (ILFC) and Department of Livestock Production and Management, Mumbai Veterinary College, located at Unit No. 3, Aarey Colony is geographically located at 19.8º N latitude, 72.52º E longitude with a mean sea level (MSL) 3 m. Climate is tropical, wet and dry. The climate is as moderately hot with high level of humidity.

Experimental animals and Groups

A total of 18 Osmanabadi goat kids, aged 2-3 months and of mixed sexes, were selected for the experiment. The animals were randomly divided into three treatment groups, with six animals in each group viz. Control group: 200g concentrate + regular dry and green fodder. T1 group: 200g concentrate + 3mg Monensin along with regular dry and green fodder. T2 group: 200g concentrate + Eucalyptus oil 1g/kid/day initially and 2g/kid/day at the final stage, along with regular dry and green fodder.

Feed and water intake Measurement

The daily feed intake for each kid was measured by offering a weighed amount of feed and fodder three times a day. Leftover feed was collected each morning to calculate the daily feed intake. Similarly, the daily water intake was recorded by providing each kid with a measured amount of water, and any leftover water was collected and measured each morning to determine the daily water consumption.

Weekly Body Weight

Each goat was weighed at the start of the experiment to establish baseline body weight. Following this, the goats were weighed weekly to monitor changes in body weight throughout the 90-day experiment.

Morphometric Parameters

Growth parameters, including body length, height at withers, heart girth, and paunch girth, were recorded weekly during the 90-day period. These parameters were used to assess the growth and development of the kids. Body Length (cm): Measured from the shoulder to the pin bone. Heart Girth (cm): Circumference of the chest, just behind the forelegs. Height at Withers (cm): Distance from the ground to the withers. Paunch Girth (cm): Circumference around the abdomen at the stomach, just before the hind legs.

RESULTS AND DISCUSSION

Weekly feed and water intake

The average weekly daily dry matter intake (DMI) of Osmanabadi kids during the study was presented in Table 1. The analysis revealed no statistically significant difference ($p \geq 0.05$) in DMI among the experimental groups. However, numerically, the Control group exhibited the highest DMI, followed by T2 and T1 respectively.

The findings of this study align with previous research by Soodeen-Karamath et al. (1999) and Huston et al. (1990), who reported that monensin supplementation in goats and lambs did not significantly impact feed intake. Similarly, O'Kelly et al. (1992) observed no significant reduction in feed intake in steers supplemented with monensin sodium. In the T2 group, the observed dry matter intake (DMI) is consistent with the findings of Sallam et al. (2009), who investigated the effects of eucalyptus oil supplementation in sheep and reported similar feed intake levels across different treatments. The lack of significant differences in DMI among treatments suggests that both Monensin and Eucalyptus oil at the tested inclusion rates do not adversely affect feed intake. However, the numerically lower DMI in T1 and T2 groups

compared to the Control may indicate subtle influences, such as palatability or metabolic effects, warranting further investigation.

Water Intake during the Study

The average weekly water intake in Osmanabadi kids was measured across all three experimental groups and the data was summarized in Table 2. The results were statistically analyzed and found non-significant ($P \geq 0.05$), indicating that there was no substantial difference in water intake between the three groups. However, the Control group consistently showed higher water intake compared to both T1 and T2 groups. The reduced water intake in the T1 and T2 groups could be attributed to the lower dry matter intake (DMI) observed in these groups, as water intake is often directly related to feed intake. As Monensin and Eucalyptus oil both resulted in slightly lower DMI, this might explain the corresponding decrease in water consumption. These findings are consistent with the research by Rogers et al. (1982), who reported that Monensin supplementation in steers led to reduced water intake, possibly due to altered feed intake or metabolic changes.

Weekly weight gain

The average weekly body weight of Osmanabadi kids was presented in Table 3. T1 group had the highest average weekly body weight, followed by the T2 group, and then the Control group, the differences were found to be statistically non-significant ($P \geq 0.05$), suggesting that the treatments did not have a significant impact on body weight gain. The results are in line with previous studies, such as Mousa et al. (1994), Huston et al. (1990), and Ilan et al. (1981), who found that Monensin supplementation improved growth performance in goats and lambs. Studies by Lei et al. (2018), Williams et al. (2018), and Soltan et al. (2009) found similar body weight improvements when essential oils like eucalyptus oil were fed to animals.

Weekly morphometric parameters

The study investigated the weekly morphometric parameters of Osmanabadi kids (lambs), assessing the effects of different treatments on body growth. The parameters measured included body length, heart girth, punch girth, and height at the withers and summarised of the results for each parameter in Table 4. In all morphometric parameters, treatment groups showed greater growth than the control group, but no statistically significant differences were observed ($P > 0.05$) in any parameter. These findings align with the studies of Moseley et al. (1977) and Froehlich et al. (2017), suggesting that Monensin and Eucalyptus Oil may enhance growth, but the effect was not statistically significant compared to the control.

CONCLUSION

Monensin supplementation resulted in the highest body weight gain, followed by eucalyptus oil and the control group, suggesting its superior growth-promoting effect. However, differences among the groups were statistically non-significant. Morphometric parameters, including body length, height at withers, heart girth, and paunch girth, were also highest in the monensin group, followed by eucalyptus oil and control, further supporting the growth benefits of these supplements. Dry matter intake (DMI) and water intake were highest in the control group, followed by eucalyptus oil and monensin groups. Both supplements reduced feed and water intake without compromising growth, indicating improved feed efficiency. Monensin likely improved feed protein utilization and energy metabolism, while eucalyptus oil exhibited antimicrobial properties, enhancing rumen fermentation and metabolic efficiency.

References

[1] Franz, C., Baser, K. H. C., & Windisch, W. (2010). Essential oils and aromatic plants in animal feeding–a European perspective. A review. *Flavour and Fragrance Journal*, **25**(5), 327-340

[2] Froehlich, K. A., Abdelsalam, K. W., Chase, C., Koppien-Fox, J., & Casper, D. P. (2017). Evaluation of essential oils and prebiotics for newborn dairy calves. *Journal of animal science*, **95**(8), 3772-3782.

[3] Hughes, P., and Heritage, J. (2002). Antibiotic growth-promoters. *Feed Tech* 6.8, 20–22.

[4] Huston, J. E., Engdahl, B. S., & Calhoun, M. C. (1990). Effects of supplemental feed with or without ionophores on lambs and Angora kid goats on rangeland. *Journal of animal science*, **68**(12), 3980-3986.

[5] Ilan, D., Ben-Asher, A., Holzer, Z., Nitsan, Z., Nir, I., & Levy, D. (1981). Effect of monensin supplementation on growth, feed digestibility and utilization in young calves. *Animal Science*, **32**(2), 125-131.

[6] Lei, Z., Zhang, K., Li, C., Wu, J., Davis, D., Casper, D., ... & Wang, J. (2018). Dietary supplementation with Essential-oils-cobalt for improving growth performance, meat quality and skin cell capacity of goats. *Scientific reports*, **8**(1), 1-12.

[7] Moseley, W.M., McCartor, M.M., & Randel, R. D. (1977). Effects of monensin on growth and reproductive performance of beef heifers. *Journal of Animal Science*, **45**(5), 961-968.

[8] Mousa, H.M. (1994). Ruminal and blood characteristics of Nubian goats dosed with the growth promoter monensin. *Acta Veterinaria Brno*, **63**(1), 13-17.

[9] OKelly, J. C., & Spiers, W. G. (1992). Effect of monensin on methane and heat productions

of steers fed lucerne hay either ad libitum or at the rate of 250 g/hour. *Australian Journal of Agricultural Research*, **43**(8), 1789-1793.

[10] Patra, A.K. (2011). Effects of essential oils on rumen fermentation, microbial ecology and ruminant production. *Asian J. Anim. Vet. Adv*, 6, 416-428.

[11] Rogers, J.A., & Davis, C.L. (1982). Rumen volatile fatty acid production and nutrient utilization in steers fed a diet supplemented with sodium bicarbonate and monensin. *Journal of Dairy Science*, **65**(6), 944-952.

[12] Sallam, S.M.A., Nasser, M.E.A., Abdalla, A.L., & Araujo, R. C. (2009). *Methane production by sheep consuming diets with different levels of eucalyptus essential oil* (No. IAEA-CN--174).

[13] Santos, G.T., da Silva-Kazama. D.C. and Kazam, R., (2010). Scientific progress in ruminant production in the 1st decade of the XXI century. Revista Brasileira de Zootecnia, 39, 478–490.

[14] Spellberg, B., Bartlett, J.G., & Gilbert, D.N. (2013). The future of antibiotics and resistance. *New England Journal of Medicine*, **368**(4), 299-302.

[15] Soodeen-Karamath, S., & Youssef, F.G. (1999). Effect of monensin, avoparcin and grass supplementation on utilization of urea-treated rice straw by sheep and goats. *Small Ruminant Research*, **33**(3), 201-211.

[16] Soltan, M.A.E., Shewita, R.S., & Al-Sultan, S.I. (2009). Influence of essential oils supplementation on digestion, rumen fermentation, rumen microbial populations and productive performance of dairy cows. *Asian J Anim Sci*, 3, 1-12.

[17] Swamy, M. K., Akhtar, M.S., & Sinniah, U.R. (2016). Antimicrobial properties of plant essential oils against human pathogens and their mode of action: an updated review. *Evidence-Based Complementary and Alternative Medicine*, 2016.

[18] Tedeschi, L.O., Fox, D.G., & Tylutki, T.P. (2003). Potential environmental benefits of ionophores in ruminant diets. *Journal of environmental quality*, **32**(5), 1591-1602.

[19] Williams, P., Cifuentes, X., Velasco, V., Campos, J., Bórquez, F., & Allende, R. (2018). Can dietary dried oregano improve the digestible nutrient intake of growing goats? *Chilean Journal of Agricultural & Animal Sciences, ex Agro-Ciencia*, **34**(1).

Table 1: Dry Matter Intake (gm)

Weeks	**DMI (gm)**		
	Control	**T1**	**T2**
1	288.17 ± 2.02	263.33 ± 1.61	274.00 ± 1.67
2	312.17 ± 1.17	286.33 ± 1.63	298.67 ± 2.17
3	322.00 ± 1.24	294.67 ± 1.71	311.50 ± 2.01
4	340.50 ± 1.41	307.67 ± 1.05	321.83 ± 0.60
5	345.00 ± 1.46	315.00 ± 1.15	328.83 ± 1.14
6	351.00 ± 1.46	321.00 ± 1.15	335.00 ± 1.29
7	370.83 ± 1.49	330.50 ± 0.76	356.83 ± 0.95
8	373.50 ± 1.34	334.33 ± 0.71	360.17 ± 0.95
9	383.00 ± 1.06	351.17 ± 1.54	372.83 ± 0.87
10	395.50 ± 0.99	368.83 ± 0.87	383.83 ± 1.85
11	412.67 ± 1.09	386.67 ± 1.02	404.50 ± 0.85
12	434.67 ± 1.31	402.33 ± 0.67	421.17 ± 1.08
13	453.00 ± 2.76	414.83 ± 1.56	429.33 ± 1.54
Mean ± SE	367.85 ± 1.45	336.67 ± 1.19	353.73 ± 1.31

Table 2: Water Intake (L)

Weeks	**Water intake (L)**		
	Control	**T1**	**T2**
1	0.29 ± 0.016	0.66 ± 0.007	0.66 ± 0.012
2	0.55 ± 0.002	0.25 ± 0.015	0.26 ± 0.012
3	0.95 ± 0.006	0.34 ± 0.011	0.54 ± 0.006
4	1.04 ± 0.005	0.54 ± 0.003	0.64 ± 0.008
5	1.27 ± 0.002	0.56 ± 0.010	0.83 ± 0.004
6	1.75 ± 0.005	0.75 ± 0.003	1.07 ± 0.011
7	2.03 ± 0.006	0.84 ± 0.008	1.24 ± 0.021
8	2.54 ± 0.008	0.96 ± 0.007	1.04 ± 0.003
9	2.82 ± 0.002	1.03 ± 0.004	1.85 ± 0.031
10	3.18 ± 0.034	1.33 ± 0.010	2.05 ± 0.006
11	3.52 ± 0.023	1.51 ± 0.042	2.34 ± 0.017
12	3.76 ± 0.026	1.71 ± 0.021	2.50 ± 0.029
13	3.87 ± 0.037	1.78 ± 0.031	2.72 ± 0.032
Mean ± SE	2.47 ± 0.042	1.03 ± 0.019	1.33 ± 0.028

Table 3: Average Weight Gain (g)

Weeks	**Weight gain (g)**		
	Control	**T1**	**T2)**
1	3.60 ± 0.074	3.48 ± 0.050	3.61 ± 0.063
2	4.26 ± 0.007	4.83 ± 0.006	4.38 ± 0.020
3	5.40 ± 0.022	6.37 ± 0.028	5.50 ± 0.022
4	6.03 ± 0.035	7.03 ± 0.007	6.36 ± 0.157
5	6.77 ± 0.099	8.58 ± 0.029	6.65 ± 0.037
6	7.40 ± 0.021	10.50 ± 0.027	7.04 ± 0.006
7	8.49 ± 0.022	11.56 ± 0.032	8.31 ± 0.023
8	9.19 ± 0.032	12.80 ± 0.023	9.87 ± 0.040
9	9.60 ± 0.017	13.25 ± 0.021	10.60 ± 0.015
10	10.51 ± 0.023	14.24 ± 0.008	11.75 ± 0.092
11	11.32 ± 0.018	14.27 ± 0.038	13.20 ± 0.029
12	12.19 ± 0.164	15.53 ± 0.008	13.89 ± 0.028
13	13.47 ± 0.037	16.24 ± 0.011	14.36 ± 0.046
Mean ± SE	8.97 ± 0.013	12.45 ± 0.023	9.93 ± 0.029

Table 4: Presentation of average weekly morphometric parameters

Weeks	Average Weekly Morphometric Parameters											
	AWBL			AWHG			AWPG			AWHW		
	C	T1	T2	C	T1	T2	C	T1	T2	C	T1	T2
1	21.43±0.28	21.88±0.33	21.61±0.23	26.66±0.30	26.26±0.33	26.73±0.38	26.66±0.30	26.26±0.33	26.73±0.38	29.58±0.20	30.43±0.25	29.8±0.35
2	21.86±0.22	22.8±0.20	22.15±0.15	26.91±0.24	27.2±0.17	27.13±0.30	26.91±0.24	27.2±0.17	27.13±0.30	29.86±0.25	31.76±0.23	30.7±0.18
3	22.33±0.16	23.58±0.21	23.06±0.08	27.33±0.20	29.15±0.13	27.86±0.20	27.33±0.20	29.15±0.13	27.86±0.20	30.33±0.09	32.36±0.18	31.11±0.14
4	22.81±0.16	24.48±0.13	23.55±0.07	27.91±0.18	30.35±0.24	28.86±0.12	27.91±0.18	30.35±0.24	28.86±0.12	30.96±0.09	33.28±0.10	31.93±0.14
5	23.43±0.18	25.38±0.20	24.4±0.07	28.58±0.18	30.95±0.16	29.85±0.12	28.58±0.18	30.95±0.16	29.85±0.12	31.83±0.14	34.68±0.25	32.86±0.09
6	24.21±0.21	26.35±0.13	25.53±0.09	29.41±0.21	32.03±0.15	30.91±0.17	29.41±0.21	32.03±0.15	30.91±0.17	32.8±0.17	36.41±0.22	33.91±0.14
7	25.4±0.14	27.75±0.11	26.68±0.14	30.35±0.25	33.11±0.17	31.93±0.18	30.35±0.25	33.11±0.17	31.93±0.18	34.03±0.19	37.88±0.20	35.13±0.10
8	26.75±0.22	28.98±0.11	28.05±0.15	31.65±0.20	34.4±0.16	33.06±0.21	31.65±0.20	34.4±0.16	33.06±0.21	35.01±0.28	39.1±0.26	36.35±0.08
9	28.13±0.18	31±0.10	29.73±0.15	32.9±0.18	35.81±0.15	34.8±0.16	32.9±0.18	35.81±0.15	34.8±0.16	36.28±0.30	40.9±0.26	38.1±0.15
10	29.48±0.24	32.73±0.14	31.16±0.18	34.16±0.19	37.4±0.09	35.61±0.26	34.16±0.19	37.4±0.09	35.61±0.26	37.95±0.27	43.03±0.24	40.63±0.29
11	31.71±0.35	34.8±0.13	33.15±0.09	36.51±0.29	39.93±0.22	37.58±0.23	36.51±0.29	39.93±0.22	37.58±0.23	40.21±0.24	45.15±0.22	42.66±0.22
12	33.8±0.34	36.86±0.14	35.41±0.10	38.71±0.20	41.98±0.19	40.06±0.14	38.71±0.20	41.98±0.19	40.06±0.14	42.04±0.27	47.26±0.20	44.68±0.16
13	35.91±0.37	39.01±0.14	37.46±0.08	40.78±0.17	44.06±0.18	42.21±0.14	40.78±0.17	44.06±0.18	42.21±0.14	44.41±0.31	49.03±0.16	46.85±0.22
Mean ± SE	26.71±0.23	28.89±0.16	27.84±0.12	31.68±0.21	34.04±0.18	32.81±0.20	31.68±0.21	34.04±0.18	32.81±0.20	35.02±0.22	38.55±0.21	36.51±0.17

#Control- Unexposed group, #Group T_1- Monensin, #Group T_2- Eucalyptus oil