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Effect of Effective Microbes (EM) Bokashi Supplementation on Weight Gain Performance of Yearling Bucks of Woito Guji Goat Breeds Fed Natural Hay as Basal Diet

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Abstract
The experiment was conducted in Jinka agricultural research center on-station to determine the effect of different level of effective microbe Bokashi inclusion as supplement on weight gain performance of yearling woito-Guji bucks fed natural grass hay as basal diet. Twenty yearling bucks and with body weight of 13.72 ± 1.74 kg were used in the study. Experimental animals were purchased from local markets namely Qaqo and Benata on two consecutive marketing days and brought to the research center compounded where they stayed in quarantine for two weeks for the purpose of acclimatization. Vaccination and treatment against disease and internal parasite was given for all bucks soon after arrival to quarantine. The experimental design completely randomized block design. Five yearling bucks were randomly assigned to each dietary treatment that consisted of ad libitum local grass hay + no EM-bokashi supplement (T1), and supplementation of effective microbe bokashi at the level of 1% (T2), 3% (T3), and 5% (T4) of total ration as feed basis. Each treatment group has received 200g of wheat bran per day/experimental animal. Highest weight gain was obtained at ($P < 0.05$) with 5% effective microbe bokashi as compared to 3 %, 1% and that of control. However, live weight gain at 1% effective microbe Bokashi inclusion was not significantly different ($P < 0.05$) from that of the control. From the result of this study, it can be concluded that using 5 % EM-bokashi supplementation could bring better body weight gain and resistance to disease and parasites of yearling bucks fed on low protein diet. Hence, increase total profit of the enterprise. But, it can be recommended that this study need to be conducted with broad range of level of effective microbe bokashi supplementation to know the optimum profitable inclusion level of effective microbe Bokashi.
Keywords: - Effective Microbes, Weight gain, low protein diet, Woito Guji breeds

Introduction

Small ruminants serve as investment and insurance due to high fertility, short generation interval and their ability to produce in limited feed resource and their adaptation in harsh environment (Asfaw 1997, Tsedeke 2007). In Ethiopia, smallholder farmers raise sheep and goats as a major source of meat and immediate cash income. Despite their large number and importance their productivity is low due to a number of factors ranging from feed shortage both in quality and quantity and health constraints (Markos 2006, Sisay 2006, Tsedeke 2007 and Getahun 2008). Nutrition plays a major role in the overall productivity, health, and well-being of the sheep flock. The limitations imposed by feeds are particularly serious in areas where there are seasonal shortages, fragile ecologies and potential environmental degradation. A combination of efficient nutrition and sound management practices are thus imperative.

Probiotics or microbial preparations have been increasingly used in livestock productions as feed supplement. Beneficial microorganisms perform essential functions in agricultural systems, but as they are not visible to the naked eye, they are often overlooked. The use of EM to small ruminant is very limited in Ethiopia and in particular in the study area. Non-conventional supplements such as EM could help to cut the current towering price of concentrates, through rumen manipulation and efficient use of available fibrous feed materials. The lactic acid bacteria, in EM-bokashi contribute to the fermentation and breakdown of the tough cellulose and lignin materials in the feed during dry season. Moreover, the report from this study is expected to narrow down the difference and skeptical out looks towards the use of EM as animal feed in the study area, especially to small ruminant. Therefore, this study is designed with following objectives to determine the effect of EM-Bokashi supplement on weight gain performance of yearling bucks fed natural hay as basal diets.

Methodology

Description of Study area

The experiment was conducted at Jinka Agricultural Research Center located at 5º 52' N latitude and 36º 38' E longitude. Jinka is situated in south Ethiopia at 750 kms from Addis Ababa, at an altitude of 1450 m above sea level. The average annual rainfall of the area for the last twelve years is 1294 mm with a range of 994.1 to 1675.8 mm, while the average annual minimum and maximum temperatures were 16.1ºc and 27.6ºc, respectively. The main rainy season extends from March to June interrupted by some dry periods in May.

Experimental animal and housing arrangement

Individual pen was prepared in partition using wooden poles. Similarly feeding drinking troughs were arranged for individual bucks. Twenty (20) yearling bucks of similar age with an average weight of 13.94 ± 1.72 kg were purchased from the local market Qako and Beneta). The bucks were kept in quarantine for fifteen days for acclimatization. Five (5) bucks were assigned for each treatment. Bucks were grouped (blocked) by their weight and assigned for each feed treatment. EM-bokashi of different level was added as a treatment supplementary feed with a recommended feed intake percentage for small ruminants. Data on weight gain in weekly base, observation for disease and parasite case were collected for twelve weeks. Feed troughs were made clean 1-2 hours before the next feeding for every treatment group. The basal feed, local grass hay (with 85 % DM), offered ad libitum for all treatment groups and bucks were watered twice a day. Two hundred gram of wheat bran (as feed basis) was offered as a supplement for all experimental animals under each treatment. Table 1: Animal Arrangement

Block	Category	Initial wt (kg)	Feed treatment group
1	9.5 – 12	9.5	Feed2
		11.5	Feed4
		12	Feed3
		12	Feed1
2	12.5 – 13.4	12.5	Feed2
		13	Feed1
		13	Feed4
		13.4	Feed3
3	13.5 - 14	13.5	Feed 4
		13.5	Feed2
		14	Feed3
		14	Feed1
4	14.2 - 15.1	14.2	Feed1
		14.5	Feed2
		15	Feed4
		15.1	Feed3
5	18.4 – 20.2	15.4	Feed3
		15.8	Feed4
		16	Feed1
		16.5	Feed2

Treatments

Treatment 1 = Control (without EM-Bokashi)
Treatment 2 = 1% EM bokashi
Treatment 3 = 3% EM bokashi and
Treatment 4 = 5% EM Bokashi of expected total feed intake (600 gram) as feed basis.

Economic analysis

Simple partial budget analysis was employed for economic analysis of EM-bokashi supplementation. The price of Bucks and EM-Bokashi were used to determine the economic feasibility. To estimate the total costs

- Initial investment Purchase of bucks
- Costs of feeds, veterinary drugs, labor costs
- Income from sale of bucks
- Net income difference of total income to total cost

Data collection and analysis

Data collected on weight gain were analyzed using SPSS software version 16 with GLM repeated measure ANOVA and means were compared with LSD. Frequency of disease occurrence was analyzed with descriptive statistics.

Results and Discussion

There was a significant difference at ($P < 0.05$) weight gain among bucks fed on the four different level of supplementation. One % EM-Bokashi supplementation was not significantly different from the control. Sheep fed on 5% EM-Bokashi supplementation showed the highest body weight gain as compared to the other three supplementation levels. This increment in body weight gain with increasing amount of EM-Bokashi was similarly reported by other experiments conducted in Debrezeit Agricultural research center (Chernet W., 2012) and in Nepal (Bhola Kumar Dahal, 1997). On top of that Aitana (2006) found that the supplementary feeding of

five goats with 150 g bokashi per animal per day, resulted in a mean individual weight gain of 0.9 kg over seven weeks of the dry season, while the control goats lost 0.3 kg, and that five sheep gained 0,6 kg when given the supplement while the control sheep lost 0.2 kg over the same period. But this study is in contrary to findings of Kazapua (2005), he reported that when ten goats received a daily supplement of about 100 gm bokashi per goat, they lost a mean of 1.8 kg each over 6 weeks of the dry season, while another ten goats lost 4.3 kg after receiving the same quantity of crushed pods of *Acacia erioloba.* This indicates the use of Bokashi has minimal loss, incase when there is weight compared to other feed supplememnts.

Table 2: The effect of EM-Bokashi supplementation on weight gain of yearling bucks fed low protein diet

Means with the different letters in the column are significantly different at 5% level of significance using LSD.

Disease and parasite Occurrence

Feed type	N	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Control	5	15.32^{C}	0.73	13.75	**16.88**
1% Em	5	15.44^{C}	0.73	13.87	**17.00**
3% Em	5	$16.84^{B\,C}$	0.73	15.27	**18.40**
5% em	5	19.30^{A}	0.73	17.73	**20.86**

Two types of disease and parasites both external and internal were diagnosed throughout the experiment but no death occurred. Observation conducted during the experiment revealed that the frequency of occurrence of diseases listed below is very minimum in experimental animals received 5% of EM-bokashi followed by 3% EM-bokashi as supplement (Table 3). The result of this study is in line with findings of (Jaap van Bruchem, 1998) they reported that supplementation of EM-Bokashi improves health condition of animals. Applications of EM were for treating diarrhea, Tjizera (2005) noted that diarrhea cleared up more quickly in goat kids that had been dosed with 10 ml of M-EM diluted in 200 ml water, compared with the control kids.

Similarly, the current study revealed that the frequency of occurrence of parasites was minimum in experimental animals received EM-bokashi at 5 and 3% level. This study is in line with reports of , Kapalanga (2006) found a mean of 11 ticks per goat, compared with 37 ticks per control goat and 21 ticks per goat treated weekly with old engine oil, Nanyeni (2005), he noted that cattle were tick-free, four weeks after being sprayed weekly with EM diluted 10 times, while there was a low mean tick load of 35 ticks per control cow; also that flies were reduced from a mean of 39.5 flies per control cow to 12.5 flies per sprayed cow. Haikali (2006) found a gradual reduction in tick loads on cattle sprayed weekly with EM5 diluted with an equal amount of water, from a mean of 20 ticks to 8 ticks per cow at the end of seven weeks, while the mean tick load on the control cows rose from 20 to 22 ticks per cow over the same period.

Table 3: Frequency of disease occurrence on experimental animal under each treatment

Description	Level of EM-Bokashi supplementation			
	0% EM-Bokashi	1% EM-Bokashi	3% EM-Bokashi	5% EM-Bokashi
Frequency CPPR	3.00	3.00	1.00	0.00
Frequency of pneumonia	2.00	1.00	.00	0.00
Frequency of external parasites	2.00	2.00	100	0.00
Frequency of internal parasites	2.00	1.00	.00	0.00

Economic Analysis

Profitability was calculated using Cost Benefit Ratio (CBR). In this economic analysis animal, purchase, labor cost, Em-Bokashi purchase, purchase of drugs and wheat bran were considered as initial cost and final income was obtained from sell of bucks as indicated (table 4). Drug cost for treatment 4 was not considered because the bucks were not susceptible for diseases and parasite case. Pertaining to labor cost five birr increment in case of EM-Bokashi supplement is due to additional work load for feeding and measuring EM-bokashi during experiment.

Table 4: Economic analysis

Description	**Treatment**			
	T1 (Control)	**T2 (1% EM)**	**T3 (3% EM)**	**T4 (5% EM)**
Initial wt	13.84	13.33	13.98	13.76
Final wt	15.6	15.44	17.84	19.3
Cost of Bokashi	0	10.72	32.32	53.70
Wheat bran	40	40	40	40
Drug cost	20	15	10	0
Animal purchase cost	420	420	430	428
Labor cost	30	305	35	35
Total cost (A)	510	510.72	547.32	556.7
Animal selling price (B)	550	576	634	690
Income (B-A)	**40**	**66.28**	**86.68**	**129.3**

Conclusion

EM- Bokashi supplemented at 5% of total diet (daily dry matter intake) resulted in highest weight gain and profit. Supplementing this amount can be financially affordable for small scale farmers. Therefore, though more level of supplementation (up to 10%) can result in better growth (Bhola Kumar Dahal, 1997), farmers can use this level as they might have low finance availability to purchase Effective microbes.

In this experiment, both weight gain and profitability were increased as level of supplementation increases. It is expected that these two parameters (weight gain and profitability) might start to decrease at one point when level of supplementation increases. Hence, it is recommended to conduct similar experiment with more number of levels of Bokashi supplementation.

Disease and parasite occurrence frequency and duration couldn't was not supported by laboratory analysis rather simply by physical observation.

In the study district pastoralists allow small ruminants to graze/browse freely under normal condition without confinement. Hence, supplementing animals with EM-bokashi under free grazing/browsing condition may improve body weight rather than confining.

Reference

AITANA, S., (2006). Supplementing goats and sheep with EM-bokashi in Omusati Region. R*eport submitted for Bachelor of Technology Research Project*, Polytechnic of Namibia, Windhoek, Namibia.

Asfaw W (1997). Country report: Ethiopia, Proceedings of a Seminar on Livestock Development Policies in Eastern and Southern Africa 28th July–1st August 1997, Mbabany, Organized by CTA, OAU/IBAR, The Ministry of Agriculture, Cooperative, Swaziland.

Bhola Kumar Dahal, (1997). Effective Microorganizms (EM) for Animal Production. Institute of Agriculture and Animal Science. Rampur Campus, Chitwan, Nepal.

Chernet Woyimo Woju (2012), *Impact of effective microorganisms™ (EM™) on nutrient content of feeds, feed intake, digestibility, growth and mixed internal parasitic load on local sheep at Debre Zeit, Ethiopia.* International Conference and exhibition on Probiotics. November 19-21, 2012 Hilton San Antonio Airport, USA. J Food Process Technology 2012, Volume 3 Issue 10, page 134.

Getahun L (2008). Productive and Economic performance of Small Ruminant production in production system of the Highlands of Ethiopia. Ph.D.dissertation. University of Hohenheim, Stuttgart-Hoheinheim, Germany.

Jaap van Bruchem, (1998). Effect of beneficial micro-organisms (EM): First results from experimental farm "De Ossekampen" in Wageningen. Wageningen Agricult ural University, Wageningen, the Net herlands.

KAZAPUA, B., (2005). Supplementing goats with EM-bokashi in Omaheke Region. *Report submitted for Bachelor of Technology Research Project*, Polytechnic of Namibia, Windhoek, Namibia.

HAIKALI, D., (2006). Control of ticks on cattle at Kwandu Conservancy. *Report submitted for Agroecology Project*, Polytechnic of Namibia, Windhoek, Namibia.

Markos Tibbo (2006) Productivity and Health of indigenous sheep Breeds and Crossbreds in the Central Ethiopian Highlands. Faculty of Medicine and Animal Science department of Animal Breeding and Genetics. Ph.D.dissertation. Swedish University of Agricultural Sciences,Uppsala,Sweden http://dissepsilon.slu.se:8080/archive/00001142/01/Markos_Tibbo_corrected.pdf

NANYENI, L., (2005). Composting manure in an airtight sack and applying EM-bokashi to soil at Drimiopsis Resettlement Farm. *Report submitted for Agroecology Project*, Polytechnic of Namibia, Windhoek, Namibia

Sisay A (2006). Livestock production systems and available feed resources in different agro-ecologies of north

Gonder zone, Ethiopia. M.sc. Thesis. Alemaya University. Alemaya

TJIZERA, E., (2005). Control of diarrhoea in young goats at Drimiopsis Resettlement Farm. *Report submitted for Agricultural Extension Project*, Polytechnic of Namibia, Windhoek, Namibia

Tsedeke K.(2007). Production and marketing systems of sheep and goats in Alaba, Southern Ethiopia. Msc Thesis, University of Hawassa, Hawassa.