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EFFECT OF DIETARY SUPPLEMENTATION OF SACCHAROMYCES CEREVISIAE ON GROWTH PERFORMANCE AND COST OF FEEDING IN DAMANI GOAT KIDS

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ABSTRACT

This experiment was carried out to investigate the effect of *Saccharomyces cerevisiae* (*S. cerevisiae*) on weight gain, dry matter intake, feed conversion, and cost-benefit in Damani goat kids. For the said trial, a total of 12 male Damani goat kids of age approximately 06 months and almost the same bodyweight of 11.8kg were selected and divided into two groups randomly in such a way that each group had 06 replicates. Yeast in dried active state was supplemented to the experimental group at 2g/day/animal. The second group was kept as the control without adding yeast as a supplement. Offered animals of both groups 250g of Shandar Wanda (CP 17%) per day and green fodder ad libitum with freshwater supply round the clock. The trial was conducted for 106 days and 14 days of adaptation. The animals were weighed on the first day and the last day of the trial. The results declared that the weight gain and economics of the supplementation cost was significantly higher ($P<0.05$) in supplemented group and has not affected the overall feed intake between the two groups. Therefore, it has been derived from the experiment that the addition of yeast *S. cerevisiae* @ 2g/day/animal has positive affect on the weight gain and cost of feeding in Damani goat kids without affecting the feed intake.

***Keywords*:** *Saccharomyces cerevisiae*, Yeast, Damani goat kids, Shandar Wanda, Feed Intake, Growth Performance, Economics

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1. INTRODUCTION

Livestock is playing a role of back bone in the Agricultural industry by contributing about 60.1% of the total production of agriculture sector and is single handedly contributing about 11.5% to the total GDP (Gross Domestic Products) of the country (Economic Survey of Pakistan 2020-21). About 8 million of rural families are raising livestock and are earning about 35-40% of their income from the livestock rearing. Among livestock, small ruminants are also contributing a lot by producing 765000tons of mutton during the financial year 2020-21 and 991000tons of milk accordingly (Economic Survey of Pakistan 2020-21). Keeping in view this huge contribution by small ruminants in the livestock productivity, the scope of small ruminant farming cannot be underestimated. Pakistan harbors about 80.3million of Goat population which is an integral portion of small ruminants. Out of many goat breeds, Damani goat is a breed of goat found in the District Dera Ismail Khan of Khyber Pakhtunkhwa province. This is a local breed of the area, and its name is derived from the term "Daman" which means arid area or area depending upon rainfall. Damani goats have the potential to utilize the agricultural by-products and crop residues and convert into valuable biological products with the help of microbial digestion. (Pradhan et al. 2018). Keeping in view the contribution of the small ruminants towards milk and mutton production, as evident from the Economic Survey of Pakistan, and further exploring the potential of rapid weight gain, this study was designed to explore the potential effect of yeast on weight gain. During the growing age of goat kids, the demand for energy rich diet intensifies as negative energy balances can lead to metabolic derangements and health issues. Moreover, the nutritional status of the growing kids has been revealed to have a strong impact on the development, growth and weight gain in many species (Hansen et al. 2012; Faubladier et al. 2013).

Yeast is one of the probiotics commonly applied in ruminant nutrition research and production. The ability of yeast to consume oxygen contributes to the maintenance of an oxygen-free environment in the rumen, thus facilitating the growth and reproduction of anaerobic rumen microbes, especially the majority of cellulolytic bacteria (Chaucheyras-Durand et al. 2008; Chaucheyras-Durand and Fonty 2009; Ismael et al. 2022). Supplementation with yeast culture was also reported to improve the concentrations of NH3-N and TVFA and the

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digestibility of DM, NDF and ADF of dairy cows (Miller-Webster et al. 2002). Yeast, *Saccharomyces cerevisiae* (*S. cerevisiae*), also called as Baker's yeast (Lynch and Martin 2002) is nowadays added to the diet of small ruminants to manipulate the rumen microbial ecosystem in order to enhance the nutritive value and utilization of low-quality roughages (Tang et al. 2008; Nehra et al. 2018). This yeast enhances the productivity of the animals and keep animal healthy by establishing healthy gastro-intestinal tract (Chaucheyras-Durand and Fonty 2099). Yeast, as a probiotic, is well known for its positive effects on the gut, metabolic health status and overall wellbeing of the host animal (Awaad et al. 2019; Mousaie 2021).

Although the use of yeast as a feed supplement has been well documented in large ruminants during various physiological states (Nocek and Kautz 2014), data about its use in goat kids are limited. Supplementation of yeast culture in ruminant diet can enhance dry matter intake (DMI), efficient production performance, cellulose degradation and nutrient digestibility (Lesmeister et al. 2004; Emu et al. 2021). A meta-analysis of 61 studies by Poppy et al. (2012) showed that under normal environmental conditions, milk production and composition were improved with yeast supplementation in dairy cattle (Bitencourt et al. 2011). In past, S. cerevisiae has been used as feed supplement in small ruminants but the knowledge about its effect is not clear as there is scarcity of data about the effects on the productive performance in goat kids (Abu El-Ella and Kommonna 2013; Alkass et al. 2013; Faubladier et al. 2013). Therefore, the present study was carried out to estimate the effect of S. cerevisiae on live weight gain, nutrients utilization and cost economics in Damani goat kids.

2. MATERIALS AND METHODS

2.1. Ethical Approval

The trail Ethical Approval was sanctioned by the Annual Technical Research Program Evaluation Committee at the Directorate General (Research), Livestock & Dairy Development Department, Khyber Pakhtunkhwa, Peshawar. All the procedures were monitored by the above-mentioned committee.

2.2. Housing and Feeding Protocol

The trail was carried out at Livestock Research & Development Station, Paharpur, Dera Ismail Khan, Khyber Pakhtunkhwa, Pakistan. Twelve Damani goat kids of similar age (about 06 months) with identical body conditions were selected for the said trail. The trail was conducted for the period from February 2021 till May 2021. The trail animals were treated for internal and external parasites using (Ivermactin 1% @ of 1mL/animal) & (Albendazole @ 10mg/kg body weight) at the day first of the trail. The animals were subjected to two weeks adaptation period. Experimental animals were randomly divided into two groups (A & B Group). Each group included 06 male Damani kids. The animals were housed in individual pens (1.5 X 2.5m). The pens were cleaned and disinfected prior to housing of animals. Group A, being control group was offered with Berseem (*Trifolium alexandrinum*) as green fodder at the rate of 10% of body weight, 250g of compound concentrate feed (Shandar Wanda having CP 17%) and round the clock fresh water supply, whereas Group B, being trail group, besides above diet, 2g of S. cerevisiae was supplemented per animal per day. The S. cerevisiae was commercially prepared and purchased from the Ghazi Brothers, Pvt. Ltd. This feeding protocol was continued for 106 days. Standard management practices were under identical conditions.

2.3. Animal Studies

The animals were kept under observation and care. Feeding of animals was observed and recorded carefully on daily basis. The animals of both the groups were weighed on the first day and at last day of trail period and the values along with other values were recorded. Cost of the green fodder (*Trifolium alexandrinum*), compound concentrate feed (Shandar Wanda) and S. cerevisiae was calculated. On 50% dressing percentage, economics of the trail was calculated.

2.4. Statistical Analysis

The data was analyzed by using T-Test to determine significance of difference. P-value equal or less than 0.05 was considered as statistically significant.

3. RESULTS

The detailed results of supplementing *Saccharomyces cerevisiae* and effect of live weigh gain, feed intake, Feed conversion ratio (FCR) and cost of feeding on Damani Goat kids is reflected in Fig. 1 and Table 3. The average body weight gain of kids was significantly ($P<0.05$) higher in the group B (supplemented group) while

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Table 1: Proximate analysis of green feed offered to goat kids

Proximate Analysis (%)	Green Fodder
Organic Matter	88.25
Crude Protein	6.80
Ether Extract	3.32
Total Carbohydrates	78.88
Ash	11

Table 2: Composition of Shandar Wanda (concentrate)

Name of Ingredient	Percentage
Corn Gluten	15
Rice Polish	15
Cotton Seed Cake	10.5
Maize Grain	10.5
Wheat Bran	30
Maize Oil Cake	5
Mustard Seed Cake	3
Molasses	3
Soyabean	4.5
Salt	2
Dicalcium phosphate (DCP)	1
Toxin Binder	0.5

comparing with the Control Group (Fig. 1). The average daily weight gain of animals kept in Group-A (Control Group) was 80g whereas the same was found to be 119g/day in case of Group-B (Supplemented Group). The average final weight of Group-A animals was found to be 20.48kg whereas the average final weight of Group-B (supplemented group) was noted as 24.33kg (Fig. 1), showing significant increase in final body weight ($P<0.05$).

The daily intake of feed was not influenced in the supplemented group (Table 3) and remained same in both the groups indicating that the overall feed intake was not influenced by the supplementation of Saccharomyces. The FCR was found to be efficient for the Group B (Supplemented group) as compared to the Group A (control Group). As far as the overall economics of the trial is concerned, the Group-B (Supplemented group) kids were found to be economically suitable than the kids in Group-A (Control Group), showing significant ($P<0.05$) increase in the profitability (Table 3).

Table 3: Effect of yeast (*Saccharomyces cerevisiae*) supplementation on growth, feed intake and cost of feeding in Damani goat kids

Parameters	Group A (n=6)	Group B (n=6)	P Value
Growth Rate (g/day)	80.00±3.51	119.52±5.69	0.451
Dry Matter Intake (g/day)	420.0±20.00	424.0±22.00	0.000
Feed Conversion Ratio (FCR)	5.25±0.25	3.54±0.30	0.022
Feeding cost of trial (Rs)	2200±8.00	3260±8.00	0.000

Values are mean±SD. Group A (Control); Group B (Supplemented Group).

Table 4: Effect of yeast (*Saccharomyces cerevisiae*) supplementation on cost benefit ratio in Damani goat kids

Treatment	Final body weight (kg)	Gain in body weight (kg)	Total operational cost Rs.	Net income Rs.	Cost benefit
Group A	20.48	8.48	2200.0	11264.0	-
Group B	24.33	12.67	3260.0	13381.0	1.23

Cost of feeding per animal (Group A & B). Green fodder @2kg/animal/day (Rs.5/kg; Shandar Wanda 250g/day (Rs.10.75); Yeast @ 2gm/animal/day (Rs.5/g); Dressing percentage: 50%; Chevon market rate @ Rs.1100.00. Group A (Control); Group B (Supplemented Group).

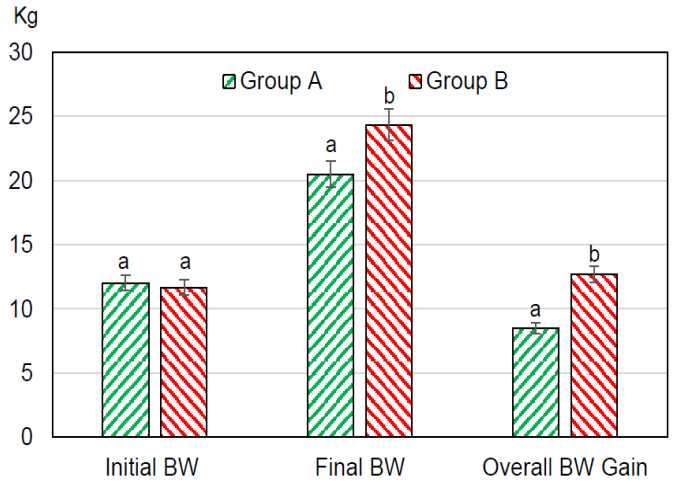

Fig. 1: Effect of yeast (*Saccharomyces cerevisiae*) supplementation on body weight gain in Damani goat kids. Bars of a parameter having different alphabets differ significantly ($P<0.05$). Group A (Control) and Group B (Supplemented Group). Each group has 6 kids.

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4. DISCUSSION

In this study, the Damani male goat kids showed positive response to the supplementation of *Saccharomyces cerevisiae* by showing increase in the daily weight gain, increase in final weight of the animals (Dawood et al. 2021) and economically profitable as well showing significant increase in all the three factors and also relieves stress (Mancini and Paci 2021; Sobotik et al. 2022). It has also been interpreted that by supplementation of the Saccharomyces, the daily feed intake of the animals was not affected but the overall digestibility of the nutrients and early digestion of the feed consumed (Mousaie 2021).

The results of this study are in agreement with the research trials of similar nature conducted on female goats supplemented with yeast where more milk was produced by supplemented animals as compared with control goats during the post-partum period. These findings agree with a number of studies that reported an increase in the productivity of goats supplemented with yeast (Giger-Reverdin et al. 1996; Abd El-Ghani 2004: Stella et al. 2007).

Jenkins and McGuire (2006) attributed the weight gain in goats supplemented with Saccharomyces to the fact that bioavailability of essential amino acids in the duodenum may lead to their enhanced absorption in blood and ultimate supply to the muscular tissues. Abu El-Ella and Kommonna (2013) reported that the average daily weight gain in the goat kids fed with yeast was higher than the non-supplemented ones and the birth weight of kids was also higher in supplemented animals than the others. The variation can be attributed to the change in the feeding protocols, age of animals as well as the environmental conditions.

Abbas et al. (2020) used saccharomyces for feeding in goats and judged the performance of the female goats in terms of milk production. They determined that by supplementing 5gm and 10gm per animal per day have significant effect on the overall milk production and milk fats, marking the importance of use of saccharomyces in feed of goats. In several other studies on goats (Ozsoy et al. 2013; Kamal et al. 2013; Pradhan et al. 2018) and in lambs (Haddad and Goussous 2004), declared that supplementation of S. cerevisiae has shown positive effect upon the live weight gain (Nehra et al. 2018), whereas some studies reported that live yeast supplementation did not have positive affect upon feed intake and weight gain except increased nutrients digestibility (Saha et al. 2018). In this experiment, the overall feed intake was not affected which is in agreement with the results of Saha et al. (2018), however, the increased digestibility of nutrients and early digestion of feed may be the factors for increased average live body weight in the yeast supplemented group (Group B).

Cai et al. (2021) in their experiment on Chinese goats found that the dry matter intake (DMI) and digestibility of dry matter (DM), Neutral detergent fiber (NDF) and acid detergent fiber (ADF) were significantly increased ($P<0.05$) in animals supplemented with yeast as compared with that of control group. It is concluded that supplementation of Saccharomyces enhances the rumen fermentation functions by increasing digestibility of nutrients and improve the volatile fatty acids production, and thereafter improve the growth production as compared to the control group (non-supplemented group).

Conclusion: The significant ($P<0.05$) increase in the dry matter intake caused statistically non-significant increase in the live body weight but numerical increase resulted in a significant improvement in the feed efficiency and cost benefit ratio in Damani goat kids supplemented with yeast.

Author's Contribution: Shah Zeb Khan, Imran Khan and Atta-ur-Rehman planned the study. Shah Zeb Khan, Amjid Ali, Safiullah, Saghir Imdad and Abidullah performed the trial and recorded the data. Shah Zeb Khan interpreted the data and Umm-E-Aimen, Israr-Ud-Din and Waseemullah helped in the paper writing. All the authors were involved in the revision and approval of final version of the manuscript.

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