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Impact of probiotics feeding on performance of crossbreed cattle

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Abstract
The present study was planned to evaluate the effect of probiotics feeding on production and economic parameters of Crossbreed cattle. An Open Field Trial was conducted during 2020, 2021 and 2022, by KVK Hanumangarh. Total 30 Lactating crossbred cows from 30 different farmer herd, with average milk yield of 9.8 lit were selected. Each animal was first treated with T1 Balance feeding (include Mineral mixture) for 30 days and then treated with Balance feeding + Probiotics for 30 days. The results showed that supplementation of probiotic with balance diet improves milk yield and net profit along with Cost Benefit ratio. To ascertain the synergistic benefits of these 2 safe supplementary products, however, long-term *in vivo* investigations are still necessary.

Keywords: Probiotics, crossbreed, open field trial, mineral mixture

Introduction
According to Sansoucy (1999) [18], maintaining rural livelihoods and maybe boosting food security are also important aspects of animal breeding and husbandry in addition to producing high-quality proteins. Ruminant animals made up around 75.7% of the world's livestock biomass, according to FAO (2010) [11]. The overall number of dietary proteins provided by animal sources between 1980 and 2010 in Africa, which is primarily in the tropics, and other least developed nations, however, was 25% lower than in developed countries (FAO, 2013) [11]. In the tropics, ruminant production is limited to grazing on forages, agricultural leftovers, and agro-industrial by-products with very low concentrate allowances (Adegoke and Abioye, 2016) [1]. According to Santra and Karim (2003) [19], this roughage is high in neutral detergent fibre (NDF) and low in nitrogen. As a result, during ruminal fermentation, fewer volatile fatty acids (VFA) and microbial biomass (microbial protein) are produced, which invariably reduces productivity. Therefore, it is essential to manipulate the digestive process through feed supplementation in order to improve the utilisation of these available feed resources and boost ruminant output in the tropics. However, due to the negative effects on health and the environment, their use has been considerably curtailed (Gaggia *et al*., 2010) [9]. Additionally, the European Union banned the non-therapeutic use of antibiotics in 2006 due to the emergence of resistant pathogenic bacteria and the potential contamination of animal products that could endanger the health of consumers (Russell and Houlihan, 2003; Jouany and Morgavi, 2007) [17, 12]. Since then, many other nations have followed suit. Due to customer desires for more natural animal products, there is a need to explore for more natural feed additives as antibiotic alternatives (Khan *et al*., 2016) [13].
In light of this, numerous studies have documented the benefits of probiotics (Khan *et al*., 2016) [12] and plant extracts (Cruz *et al*., 2014) [6] as beneficial feed additives to prophylactic use of antibiotics by reducing the load of pathogenic bacteria, improving dry matter intake and feed conversion efficiency, enhancing nutrient utilisation efficiency and production performance, stimulating and activating immune cells, reducing methane production thereby minimizing.
Probiotics were described by Ezema (2013) [8] as live, non-pathogenic bacteria that, when administered in the proper amount, can have a positive impact on the host animals. Direct-fed microbes like yeast (*Saccharomyces cerevisiae*) and bacterial species including Bacillus, Bifidobacterium, Enterococcus, Lactobacillus, Propionibacterium, *Megasphaera elsdenii*, and *Prevotella bryantii* are examples of probiotics specifically made for ruminants (Seo *et al*., 2010) [20].

According to Krause *et al*. (2003) [14], fibre digestion in the rumen is not sufficiently efficient despite the presence of fibrolytic microorganisms, as shown by the fact that recovered fibre from the faeces can still be fermented. As a result, research to improve the efficiency of fibre degradation in the rumen is now necessary. According to a study by Chaucheyras-Durand *et al*. (2012) [5], SC I-1077 live yeast supplementation boosts the activity of cellulolytic bacteria while also stimulating the fungi responsible for solubilizing lignin tissues. In a different study, Mosoni *et al*. (2007) [16] found that when calves were fed diets enriched with live yeast, the populations of the fiber-degrading bacteria *Fibrobacter succinogens* and *Ruminococcus flaveafaciens* increased by 45 percent and 85 percent, respectively.

Probiotic (i.e., yeast) supplementation has been seen to shorten the time between meals in lactating cows, which may help to stabilise the rumen pH and, in turn, increase the rate of fibre destruction in the rumen by promoting forage feed intake and nutrient digestibility (Bach *et al*., 2007; Chaucheyras-Durand *et al*., 2012) [3, 5]. When live yeast was added to cows' meals as a supplement, Bach *et al*. (2007) [3] saw a major shift in their feeding behaviour, including more frequent eating (i.e., shorter inter-meal interval of 3.32 h as against 4.32 h in unsupplemented cows). According to Callaway *et al*. (2004) [4], probiotics can promote live weight gain in ruminants by increasing the effectiveness of food utilisation, boosting nitrogen retention, and reducing the excretion of crucial nutrients.

Additionally, yeast is thought to enhance rumen function, which increases nutrient absorption and, in turn, improves milk production efficiency while maintaining the animal's digestive comfort (Maamouri *et al*., 2014; Ayad *et al*., 2013) [15, 2]. Therefore based on above researchers data the study was planned to evaluate the effect of probiotics feeding on production performance of crossbred cows.

Methodology

An On Farm Trial was conducted during 2020-2022, by KVK Hnaumangarh. Total 30 Lactating crossbred cows from 30 different farmer herd, with average milk yield of 9.8 lit. Were selected. Each animal was first treated with T1 (Balance feeding with Mineral Mixture @50 gm/ animal/day) for 30 days and then treated with T2 (Balance feeding with Mineral Mixture @50 gm/ animal/day @ 20g/Animal/day with probiotics) for 30 days. Under this trial, 20g probiotics with mineral mixture was provided to each Animal for 30 days each. The control animals (T1) fed green maize fodder with wheat straw as roughage source and concentrate mixture (consisting of maize, 29; barley, 5; GN cake, 20; mustard cake, 12; wheat bran, 20; deoiled rice bran, 11; mineral mixture, 2; salt, 1 part), as per requirement (NRC 2001) whereas experimental group (T2) fed T1 plus 20 gm probiotics. The animals were kept in well-ventilated Animal shed with access to fresh water and having separate mangers for fodder and concentrate. The animals were milked twice a day at morning, and in evening and the concentrate was given at each milking time. Probiotics was fed uniformly in morning individually to each animal. Milk samples from each animal in both groups were collected and analysed at weekly intervals for milk composition. During the whole trial period, the milk samples were collected and pooled in a container from all individual animals and analysed for milk fat % and solids-not-fat % (ISI 1961).

Results and discussion

Probiotics are feed additives used to strengthen the animal digestive system and increase digestibility. Probiotic increases the number of micro-organisms of the GI track (gastro intestinal track) in animals. Therefore, the maximum digestion of feed is done and proper use of the digestive food is utilized by animal for health and milk production. Details of effect of probiotics feeding on crossbred cows are shown in Table-1. The average milk production (litres) on feeding mineral mixture without bypass protein was 9.8 litres which was increased to 12.1 litres on addition of probiotics with balance feed. The results showed that supplementation of probiotic with balance diet improve digestion of animals, resulting in increased milk production of animals by 23.4%. The cost of feeding per animal per day was Rs. 168.1 in T1 group and Rs. 185.8 in T2 group. The net profit was found be higher in T2 group than T1 group (Rs. 141.5 vs Rs. 96.8). Cost Benefit ratio was found to be maximum in T2 group (1.76) as compared to T1 groups (1.58).

Table 1: Effect of probiotics feeding on performance of crossbred cow

Technology option	Avg. Milk Prod. (lit.)	Avg. increase in Milk Prod.	Cost of feeding (Rs./Ani./ day)	Gross cost of Milk (Rs./Ani. /day)	Net profit (Rs.)	B:C Ratio
T_1 Balance feeding (include Mineral mixture)	9.8	23.4%	168.1	264.9	96.8	1.58
T_2 : Balance feeding + Probiotics (Assessment)	12.1		185.8	327.3	141.5	1.76

Conclusion

Supplementing ruminant diets with probiotics has been shown to increase productivity through improved fibre degradation and fermentation, decreased growth of pathogenic bacteria in the gastrointestinal tract, modulation of immune cells, improved nutrient availability and utilisation, and increased yield of animal products like milk. Probiotics can be used to strengthen the animal digestive system and increase its digestibility. Use of probiotics increases animal production and reproductive efficiency.

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