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# Effect of buffer addition to total mixed rations on feed intake, milk production and rumen fermentation in HF

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## ABSTRACT

*The aim of the present study is to investigate the effect of CRB-advance as a dietary supplement on rumen fermentation, microbiota and production performance (milk, fat & SNF). In dairy animal trials in India,buffers are the crucial for maintaining ruminal health and optimizing milk production by neutralizing excess rumen acidity and preventing ruminal acidosis.Total 40 animals early to mid-lactation Holstein were selected for 60 days study and divided into two treatment groups. In both the group buffer was added separately to the total mixed ration (TMR) and fed at a rate of 100 gm per animal/day. Group 1 offered CRB-Advanced commercially available buffer along with TMR while group 2 treated with Sodium bicarbonate @100 gm/cow per day and 40 gm magnesium oxide per cow per day. Both the group were similar in milk production, and milk components. The result indicated that CRB-Advanced dietary supplementation stabilized rumen ph., improved gut micro biota, richness and partial probiotic colonization and considerably increased dry matter intake, milk production, compare to the traditional buffer available in the market.*

***Keywords:*** *Buffer, feed additives, Ruminant, concentrate, Milk Product, Gut micro biota,Total Mixed Ration,Dietary supplement, Sodium bi carbonate,CRB-Advance.*

## Introduction

Rumen buffers are essential for maintaining optimal rumen pH in dairy cows, especially when offer high-concentrate diets. A buffer's ability to neutralize excess acid is a key indicator of its efficacy. In early lactations, ruminal buffers will help make the transition from high roughage during dry period to high concentrate rations after calving since the risk of acidosis is greatest at this point of time. During the period of heat stress, there will be a reduction in dry matter intake and loss of electrolytes from the body[1]. The addition of ruminal buffer could help to restore the feed intake and replace lost electrolytes. Acid buffer provides calcium, magnesium and a range of important trace minerals. It is normally fed at 100gms-150 gms/cow which exert excellent effect.CRB-Advance is a premium rumen buffer formulation that claims superior acid-neutralizing capacity compared to traditional buffers. The most common reasons for adding buffers to the diet are to compensate for reduced saliva secretion of cows fed inadequate amounts of forage and to neutralize excess rumen acidity resulting from the fermentation of starchy grains. Ideally, buffers should be released during the interval of most severe acid production in the rumen or they should provide a continuous release to prevent sudden drops in rumen ph. Palatability is a consideration when selecting a buffer. Palatability is usually not a problem when buffers are fed in a TMR or when mixed with the silage portion of the ration.

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Because high-energy diets are fed in early lactation, it is practical to include buffers during this stage.

This study evaluates the neutralizing capacity of traditionally available buffer (Soda and MgO) in the market and compares with CRB-Advance to determine their relative effectiveness. CRB-Advance is a premium rumen buffer formulation that claims superior acid-neutralizing capacity compared to traditional buffers.

## Materials and Methods

To evaluate the buffering capacity and effect of their inclusion in the diet on in vitro ruminal fermentation parameters. 40 animals were selected early to mid-lactation HF for 60 days' study and compares of two buffers and their effects on milk components and production. The experiment was conducted at a commercial dairy farm of Raipur district of Chhattisgarh, Both the buffer added separately to the total mixed ration and fed at a rate of 100 gm per animal/day. Group 1 was fed CRB-Advance, a commercially available buffer in the market and group 2 treated with Sodium bicarbonate and magnesium oxide buffer (100gm Sodium bicarbonate and 40 gm MgO). The mass of nearly similar age and stage of lactation were selected for the study. All cows were kept under the same feeding schedule for 9 days under preliminary period to adapt the test diet followed by 28 days' experiment period for record data and milk sample of experimental animals was examined for milk fat percent, milk solid not fat percent, milk lactose percent, and milk protein percent.

### Feeding and management of animals

The buffering effect of saliva becomes very important in maintaining a desirable rumen ph.

The fermentation of grain by rumen microorganisms results in acid production, as these rations are low in fiber content resulted in less chewing time, reduced production of saliva and subsequently leads to acidosis, with the sign of less feed intake and dropdown of milk production[2]. If a cow is fed a diet with a 70:30 grain-to-forage ratio, the diet would have to be supplemented with about 0.5% sodium bicarbonate to produce the same natural buffering capacity as a cow fed a diet with a 50:50 grain to forage ratio.The experimental animal was kept in separate pen throughout the study. The total mixed ration (TMR) provided to both the group full fill their all essential requirement.

### Milk sample analysis

Daily milk production of each animal was recorded and weighted through digital balance. Milk samples consisting of proportional volumes of morning milk were taken after cleaning and disinfection of teats and discarding the first stream of foremilk. Milk samples were collected in 100ml sterile plastic vials at last consecutive 10days through the lactation period and taken to the laboratory. Specific gravity was determined in milk sample by using lactometer according to the Murphy (1999)[3], Total solids was done by Badcock's formula according to Prasad et al.,(1999),Fat percent was determined in milk samples by using Gerber's method according to BIS (1977)[5],solid not fat was calculated according to Prasad et al (1999)[4] and milk yield of cow was recorded daily in morning at 4.00 to 5.00 am and evening at 4.00 to 5.00 pm.

### Statistical analysis

The data on milk yield and its composition were analyzed statistically using one way ANOVA technique as per snedecor and Cochran (1994)[5].

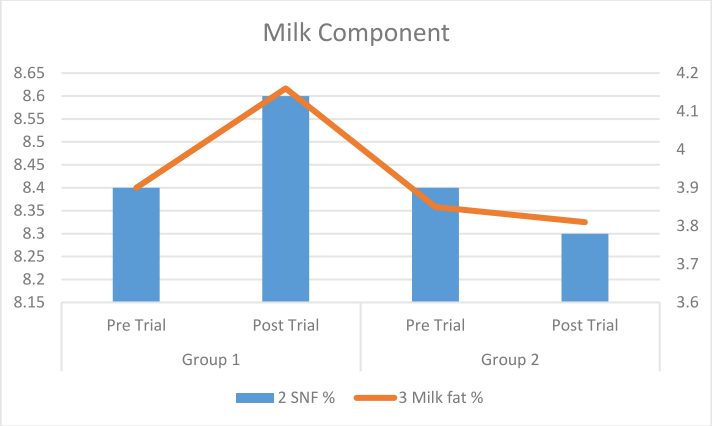
### Results & Discussion

Table 1. Showing the result of milk parameter. The highest specific gravity was recorded in Group 1 (1.0478) while in Group 2 (1.0370). The difference in these values were found non-significant between these two groups, similar findings with Counotte et al., (1979). Solids not Fat % in Group 1 (8.6) while in Group 2 (8.3). The difference in these values of total solids were found Significant($P<0.05$) between these two groups, similar findings were also agreements with Xu and Harrison (1994), who showed feeding of buffer CAB has significant effect on total solid percentage of milk, a simultaneously. Milk Fat percentage also significantly high in group 1 (4.16) as compared to group 2 (3.81).

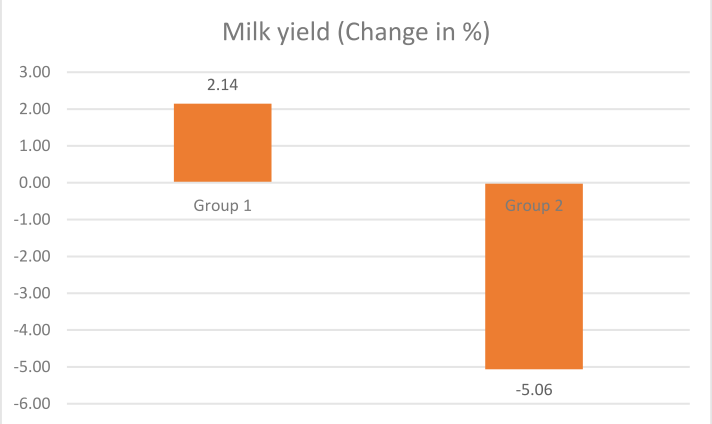
Change in milk component pre and post-trial in both groups is shown in Graph -1, indicating a favorable change in milk component which is directly proportional to milk price.Graph -2 Showing the change in milk yield in percentage indicating the 2.14% increment in CRB-Advance group while 5.06% drop in Group 2 fed with soda and MgO.

*Table 1.*

| S.NO. | Parameters | Group 1 | | Group 2 | |
|---|---|---|---|---|---|
| | | Pre Trial | Post Trial | Pre Trial | Post Trial |
| 1 | Specific gravity | 1.039 | 1.047 | 1.038 | 1.037 |
| 2 | SNF | 8.4 | 8.6 | 8.4 | 8.3 |
| 3 | Milk fat | 3.9 | 4.16 | 3.85 | 3.81 |
| 4 | Milkyield | 34.8 | 35.546 | 34.9 | 33.133 |




*Graph -1 Milk component in pre and post trial in both groups.*




*Graph -2 – milk yield change in percentage pre and post in both groups.*

### Discussion

The results demonstrate that CRB-Advance has a significantly higher neutralizing capacity compared to Buffer A. This can be attributed to its advanced formulation, which includes a balanced combination of bicarbonates from different sources, and marine algae. The superior neutralizing capacity of CRB-Advance makes it more effective in stabilizing rumen pH and preventing SARA in dairy cows.

### Conclusion

Dietary buffer supplementation in high-producing lactating animals maintains ruminal homeostasis by resisting any change in ph. Buffer supplementation tends to increase rumen acetate: propionate ratio and fibre digestibility thereby increasing fat percentage and milk production, respectively. Buffers also tend to increase the dry matter intake of animals which help to maintain the high productivity in lactating animals. Buffer supplementation may thus serve as an effective and economical tool for dairy farmers to fulfill the increasing demands of milk and milk products[3]. This study highlights the superior efficacy of CRB-Advance as a rumen buffer and recommends its use for optimal rumen health and dairy cow performance.

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