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Effect of supplementation of sodium bicarbonate and yeast bolus on milk production performance of dairy cows

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Abstract
The study was conducted with 36 crossbred lactating cows to compare the effects of sodium bicarbonate and yeast bolus and their combination on milk yield and milk composition. 3 small dairy farms were selected and experiment design of this study was Complete Randomized block Design. Each farms grouped into four, Each group consist of 3 animals. All the animals are in early lactation stage with same feeding schedule. The experimental animals were divided into four treatments. Control, Sodium bicarbonate, Yeast culture bolus and combination of sodium bicarbonate and live yeast culture bolus. The dose of sodium bicarbonate and yeast culture bolus used in this study was 50 g/day/animal and 2 bolus/day/animal. The trial was conducted for 30 days with 10 days for pretrial period and last twenty days milk yield, milk fat and Solid Not fat were recorded. Data was analyzed statistically. In this study, dairy cow supplemented Sodium bicarbonate, Yeast culture bolus and combination of sodium bicarbonate and yeast culture bolus were shown significant (P<0.01) increase in milk yield and milk fat percentage compared with control. However, Solid Not Fat percentage of milk was not significantly increased in Sodium bicarbonate, combination of sodium bicarbonate and live yeast culture bolus and yeast culture bolus against control.

Keywords: sodium bicarbonate, yeast, milk, fat, solid not fat

1. Introduction
In India feeding strategies changed from roughage to high concentrate diet in dairy ration to meet higher milk production of cross bred dairy cows. Feeding of high concentrate diet cause sub acute ruminal acidosis (SARA) lead to decrease rumen pH (Russell and Hino, 1985; Nocek, 1997) [27, 20], alteration of rumen microflora (Petri *et al*, 2013) [22], change in rumination (DeVries *et al*, 2009) [9] and decreased milk fat percentage (Rustomo *et al*, 2006) [28]. With the aim of enhancing production performance of cattle, numerous studies conducted on supplementation of sodium bicarbonate (Roche *et al*, 2005) [26] and yeast (Thrune *et al*, 2009) [29] to manipulate the rumen for higher milk production. Dietary supplementation of sodium bicarbonate stabilize the rumen pH (Meschy *et al*, 2004) [18], increased milk production and mill fat percentage (Musa *et al*, 2017) [19].
Meta-analyses (Desnoyers *et al*, 2009; de Ondarza *et al*, 2010; Poppy *et al*, 2012) [8, 6, 23] and research studies (Evans *et al*, 2012; AlZahal *et al*, 2014) [12, 1] reported that dietary supplementation of yeast showed inconsistent results in dairy cows. However, positive effect of dietary supplementation of yeast on digestibility depends on percentage of concentrate and NDF in the diet. The negative effect of yeast supplementation on lactic acid production due to higher feed intake and increased concentrate in the diet (Desnoyers *et al*, 2009) [8]. Live yeast culture probiotics stabilize the rumen pH by decreased lactate production (Williams *et al*, 1991 and Marsola *et al*, 2010) [32, 16] and improve milk production (Nocek *et al*., 2011) [21]. Furthermore, only few study combined the sodium bicarbonate and yeast on milk production performance in cow (Erdman and Sharma, 1989; Musa *et al*, 2017) [11, 19]. Hence, The objective of this study was to assess the effects of sodium bi carbonate with and without yeast culture on milk production, fat and solid not fat (SNF) content of milk.

2. Materials and Methods
The study was conducted at Jambumadai Village in Erumapatti block of Namakkal District in Tamilnadu. The experiment design of this study is Completely Randomized Design (CRD). In Jambumadai Village, 3 small dairy farms were selected for this study.

Each farms grouped into four, Each group consist of 3 animals. All the animals are in early lactation stage with the same feeding schedule. The dairy cow fed with cereals, oilcakes, milling by products, agro-industrial by-products and dry roughage. The experimental animals were divided into four treatments. Control (C), Sodium bicarbonate (SB), Yeast culture bolus (YB) and combination of sodium bicarbonate and yeast culture bolus (SB+YB). The dose of sodium bicarbonate and yeast culture bolus used in this study was 50 g/day/animal and 2 bolus/day/animal respectively. The trial was conducted for 30 days with 10 days allotted for acceptance of test ration and last twenty days milk yield, milk fat and SNF were recorded. The animals were milked twice a day both morning and evening.

3. Results and Discussion

Effect of sodium bicarbonate and yeast culture bolus and combination of sodium bicarbonate and live yeast culture bolus on milk yield, milk fat and SNF percentage is presentedin Table 1.

3.1 Effect on milk yield

Milk yield of dairy cows was significantly (P<0.01) increased in SB+YB, YB and SB compared to control. Among the treatment group, SB+YB group was showed significantly higher milk yield compared to SB and YB. The results of the present study supported by (Tucker *et al*, (1988) [30] who observed dietary supplementation of sodium bi carbonate significantly increased milk production in dairy cows. Similarly Block (1994) [3] reported that high Na or K contents from sodium or potassium bicarbonate increased milk production in lactating cows. Further stated that dietary supplementation of sodium bi carbonate decrease the cellular acidity and increases cellular glucose uptake results in increased milk production. The results of the current study contrary with the finding of Bach *et al*, (2017) [2] who reported that dietary supplementation sodium bi carbonate and magnesium oxide decreased milk production.

Table 1: Effect of sodium bicarbonate and live yeast culture bolus and combination of both sodium bicarbonate and live yeast culture bolus on production performance of dairy cows.

Treatment no	Milk yield (Lit/animal/day)	Fat (%)	Solid Not Fat (%)
C	5.13^{a}	4.21^{a}	8.00
SB	5.33^{b}	4.72^{c}	8.13
YB	5.50^{b}	4.43^{b}	8.10
SB+YB	5.72^{c}	4.52^{b}	8.09
SEM	0.04	0.03	0.02
P Value	0.001	0.001	0.19

^{a,b,c}Values with different superscripts within a column differ (P<0.01).

C = control ration (no supplementation); T1 = sodium bicarbonate; T2 = live yeast culture bolus; T3 = combination of both sodium bicarbonate and live yeast culture bolus

Similar to the results of the present study, dietary supplementation of yeast increase the milk yield in dairy cows (Williams *et al*, 1991; Desnoyers *et al*, 2009; Nock, 2011; Musa *et al*, 2017) [8, 21, 19]. Some of the authors reported that yeast supplementation non significantly increased milk yield (Wang *et al*, 2001 and Maamouri *et al*, 2014) [31, 15]. Dietary supplementation of dried yeast has not significantly improved milk production and composition of milk (Kalmus *et al*, 2009) [14]. A Meta-analysis study using 22 published studies with supplementation of Yea-Sacc to more than 9039 cows stated that the increased average milk production of 7% (Dawson, 2000) [5]. However, Yeast supplementation is highly effective when diet rich in energy (Masek *et al.*, 2008) [17] and or low in protein (Putman *et al.* 1997) [24].

3.2 Effect on milk fat and SNF

In this study, dairy cow supplemented SB, SB+YB and YB significantly (P<0.01) increased milk fat percentage compared control. Among the treatment group, SB significantly increased milk fat percentage over SB+YB and YB. SNF percentage of milk not significantly increased in all the treatment groups (SB, SB+YB and YB) against control. Similar to results of the present study, dietary supplementation of sodium bi carbonate significantly increased milk fat percentage in dairy animal (Donker and Marx, 1980; Roche *et al*, 2005; Musa *et al*, 2017) [10, 26, 19]. A statistical evaluation of 27 studies with 369 dairy cows supplemented with sodium bi carbonate reported proportion of milk protein, protein yield not affected. However, dairy cow fed with maize silage with sodium bi carbonate significantly increased milk fatproportion (Hu and Murphy, 2005) [13]. In contrast to results of the current study dietary supplementation of sodium bi carbonate non significantly increased milk fat percentage in dairy animal (Bach *et al*, 2018) [2]. Supplementation of sodium bi carbonate decreased milk fat percentage and non significantly increased lactose and protein percentage in dairy cattle (Clayton *et al*, 1999) [4]. Generally, Milk composition is not or only slightly altered by yeast supplementation in dairy animals (de Ondarza *et al*, 2010) [7]. A meta- analysis study of 110 research papers consist of 157 experiments indicated that dietary supplementation of yeast numerically increased milk fat and slightly decreased the milk protein percentage compared to control (Desnoyers *et al*, 2009) [8]. Yeast supplementation decreased milk fat percentage with increased milk production compared to control in dairy cow (Robinson and Garrett, 1999 [25]; Maamouri *et al*, 2014) [15]. Multiple study analysis of 14 trials with 1615 dairy cow supplemented with yeast slightly decreased the milk fat and true protein percentage compare to control (de Ondarza *et al*, 2010) [6].

4. Conclusion

In this study dietary supplementation of sodium bicarbonate and yeast and combination of sodium bicarbonate and yeast significantly increased milk yield and milk fat percentage without significant increase in solid not fat (SNF). In future, study need to be conducted on effect of sodium bi carbonate and yeast on acidity, somatic cell count and microbial count of milk.

5. Acknowledgment

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6. References

1. AlZahal O, Dionissopoulos L, Laarman AH, Walker N, McBride BW. Active dry *Saccharomyces cerevisiae* can alleviate the effect of sub acute ruminal acidosis in lactating dairy cows. Journal of Dairy Science 2014;97:7751-7763.
2. Bach A, Guasch I, Elcoso G, Duclos J, Khelil-Arfa H. Modulation of rumen pH by sodium bicarbonate and a blend of different sources of magnesium oxide in lactating dairy cows submitted to a concentrate challenge. Journal of Dairy Science 2018;101(11):9777-9788.
3. Block E. Manipulation of dietary cation-anion difference on nutritionally related production diseases, productivity, and metabolic responses of dairy cows. Journal of Dairy Science 1994;77:1437-1450.
4. Clayton EH, Lean IJ, Rowe JB, Cox JW. Effects of Feeding Virginiamycin and Sodium Bicarbonate to Grazing Lactating Dairy Cows. Journal of Dairy Science 1999; 82:1545-1554.
5. Dawson KA. Some milestones in our understanding of yeast culture supplementation in ruminants and their implications in animal production systems. In: Lyons TP, Jacques KA (eds): Biotechnology in the feed industry. Proc. 16th Annual Symposium, Nottingham, UK 473-486.
6. De Ondarza MB, Sniffen CJ, Dussert L, Chevaux E, Sullivan J, Walker ND. Case study: Multiple-Study analysis of the effect of live yeast on milk yield, milk component content and yield, and feed efficiency. The Professional Animal Scientist 2010;26:661-666.
7. De Ondarza MB, Hall T, Sullivan J, Chevaux E. Effect of live yeast supplementation on milk yield, milk components, and rumen pH in dairy cows. Journal of Dairy Science E-suppl. In press 2012.
8. Desnoyers M, Giger-Reverdin S, Bertin G, Duvaux-Ponter C, Sauvant D. Meta-analysis of the influence of *Saccharomyces cerevisiae* supplementation on ruminalparameters and milk production of ruminants. Journal of Dairy Science 2009;92:1620-1632.
9. DeVries TJ, Beauchemin KA, Dohme F, Schwartzkopf-Genswein KS. Repeated ruminal acidosis challenges in lactating dairy cows at high and low risk for developing acidosis: Feeding, ruminating, and lying behavior. Journal of Dairy Science 2009;92:5067-5078.
10. Donker JD, Marx GD. Sodium bicarbonate in diets for milking Holstein cows. Journal of Dairy Science 1980;63:931-935.
11. Erdman RA, Sharma BK. Effect of yeast culture and sodium bicarbonate on milk yield and composition in dairy cows. Journal of Dairy Science 1989;72:1929-1932.
12. Evans E, Patterson RJ, Clark N. Case study: effects of a supplemental enhanced yeast product on digestion and milk production in dairy cows. Prof Anim Sci 2012;28:682-688.
13. Hu W, Murphy MR. Statistical evaluation of early and mid lactation dairy cow responses to dietary sodium bicarbonate addition. Anim. Feed Sci. Technol 2005;119:43-54.
14. Kalmus P, Orro T, Waldmann A, Lindjarv R Kask K. Effect of yeast culture on milk production and metabolic and reproductive performance of early lactation dairy cows.Acta Veterinaria Scandinavica 2009;51:32.
15. Maamouri O, Selmi H, Hamdi NM. Effect of yeast (*Saccharomyces cerevisiae*) feed supplement on milk production and its composition in Tunisian Holstein Friesian cows. Scientia Agriculturae Bohemica 2014; 45(3):170-174.
16. Marsola RS, Favoreto MG, Silvestre FT, Shin JC, Walker N, Adesogan A, *et al*. Effect of feeding live yeast on performance of holstein dairy cows during summer. Journal of Dairy Science 2010;93:1-432.
17. Masek T, Mikulec Z, Valpotic H, Antunac N, Mikulec N. Influence of live yeast culture *(Saccharomyces cerevisiae)* onmilk production and composition and blood biochemistry of grazing dairy ewes during the milking period. Acta Vet 2008;77:547-554.
18. Meschy F, Bravo D, Sauvant D. Méta-analyse des réponses de la vachelaitière à la supplémentation en substances tampons. INRA Prod Anim 2004;17:11-18.
19. Musa AA, Neeraj, Pandey R. Effects of feeding sodium bicarbonate and multi-strain probiotics on milk yield and milk composition of lactating Holstein Frisian crossbred cows. Journal of Pharmacognosy and Phytochemistry 2017;6(6):1912-1916.
20. Nocek JE. Bovine acidosis: implications on laminitis. Journal of Dairy Science 1997;80:1005-1028.
21. Nocek JE, Holt MG, Oppy J. Effects of supplementation with yeast culture and enzymatically hydrolyzed yeast on performance of early lactation dairy cattle. Journal of Dairy Science 2011;94:4046-4056.
22. Petri RM, Schwaiger T, Penner GB, Beauchemin KA, Forster RJ, McKinnon JJ, *et al*. Characterization of the core rumen microbiome in cattle during transition from forage to concentrate as well as during and after an acidotic challenge. PLoS One 2013;8:e83424.
23. Poppy GD, Rabiee AR, Lean IJ, Sanchez WK, Dorton KL, Morley PS. A meta-analysis of the effects of feeding yeast culture produced by anaerobic fermentation of *Saccharomyces cerevisiae* on milk production of lactating dairy cows. Journal of Dairy Science 2012;95:6027-6041.
24. Putman DE, Schwab CG, Socha MT, Whitehouse NL, Kierstead NA, Garthwaite BD. Effect of yeast culture in the diets of early lactation dairy cows on ruminal fermentation and passage of nitrogen fractions and amino acids the small intestine. Journal of Dairy Science 1997;80:374-384.
25. Robinson PH, Garrett JE. Effect of yeast culture (*Saccharomyces cerevisiae*) on adaptation of cows to postpartum diets and on lactational performance. Journal of Dairy Science 1999;77:988-999.
26. Roche JR, Petch S, Kay JL. Manipulating the dietary cation anion difference via drenching to early lactating dairy cows grazing pasture. Journal of Dairy Science 2005;88:264-276.
27. Russell JB, Hino T. Regulation of lactate production in *Streptococcus bovis*: A spiraling effect that contributes to rumen acidosis. Journal of Dairy Science 1985;68:1712-1721.
28. Rustomo B, AlZahal O, Odongo NE, Duffield TF, McBride BW. Effects of rumen acid load from feed and forage particle size on ruminal pH and dry matter intake in the lactating dairy cow. Journal of Dairy Science 2006;89:4758-4768.
29. Thrune M, Bach A, Ruiz Moreno M, Stern MD, Linn JG. Effects of *Saccharomyces cerevisiae*on ruminal pH and microbial fermentation in dairy cows. Livest Sci 2009;124:261-265.
30. Tucker WB, Harrison JK, Hemken RW. Influence of

dietary cation-anion balance on milk, blood urine, and rumen fluid in lactating dairy cattle. Journal of Dairy Science 1988;71:346.
31. Wang Z, Eastridge ML, Qiu X. Effects of forage neutral detergent fiber and yeast culture on performance of cows during early lactation. Journal of Dairy Science 2001;84:204-212.
32. Williams PEV, Tait CA, Innes GM, Newbold CJ. Effects of the inclusion of yeast culture (*Saccharomyces cerevisiae* plus growth medium) in the diet of dairy cows on milk yield and forage degradation and fermentation patterns in the rumen of steers. Journal of Animal Science 1991;69:3016-3026.