

Influence of Microbial Feed Supplement on Milk Composition of Dairy Cows at Organized Farm and Field Level

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Abstract

This study was conducted to determine the effect of microbial feed supplement on dairy cows at farm and field level with regard to nutritional quality of milk. Rumicell®Dry is a powder feed supplement composed of yeast, fungal and probiotic bacterial culture with their growth media. Daily 20 g Rumicell®Dry was supplemented to two group of dairy animals in addition to their diet; one group maintained at a farm and another group (randomly selected) reared by village farmers and all the animals were belonging to 2nd or 3rd lactation. Microbial feed supplementation significantly ($P < 0.01$) increased milk quality with respect to fat, SNF and Protein percentage. As a conclusion a microbial feed supplement to the dairy animals irrespective of the environment, improves the nutritional quality of milk.

Key words: *Yeast Culture, Fungal culture, Probiotic bacteria, Milk composition*

The broad role of nutrition on milk composition is well established and indicates the potential to rapidly respond to changes in milk markets. Nowadays fat and SNF output of milk is the economically important parameters for dairy farmers. Recent evidence has increased our understanding of factors affecting milk fat synthesis in the mammary gland that should allow the

development of nutritional management systems that allow strategic changes in milk composition. Lock and Shingfield (2004) provide a comprehensive review of the impact of nutrition on milk fat and protein. Yeast and yeast products have been widely used in ruminant nutrition to manipulate rumen fermentation and improve animal performance. Robinson and Garrett, 1999 and Dann et al., 2000 have shown that live yeast and yeast culture supplementation may increase feed intake and milk production of dairy cows.

Hence, this study is focused to work on effect of microbial feed supplement which consists of yeast culture, fungal culture, probiotic bacterial culture, growth media, buffering agents and free flow agents on nutritional quality of milk at farm and field dairy cows.

Materials and Methods

Rumicell®Dry is a cream to tan colored free flowing powder with a pleasant odour. Change in colour of the product does not affect its performance. It is composed of dried cultures of *Saccharomyces cerevisiae*; Fungal cultures producing fibre degrading enzymes like

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cellulase, hemicellulase etc; Probiotic bacteria like *Bacillus subtilis*, *Bacillus coagulans*, and *Bacillus licheniformis* and their fermentation products; Growth media; Buffering agents; Mineral oils and Free flow agents. Mechanism of action of Rumicell®Dry for the beneficial effects upon the dairy animal includes

- **Yeast Cultures** decreasing the lactate accumulation by stimulating the lactate utilizing bacteria; reduce ammonia accumulation without reducing proteolytic, peptidolytic or deaminative activity of rumen microbes; divert hydrogen flow away from methane and into propionate and butyrate ; nurture the healthy, dynamic population of cellulolytic bacteria; produce certain unidentified factors capable of stimulating the growth of rumen bacterial population; enhance the palatability of feed
- **Fungal Cultures** producing fibre degrading enzymes such as cellulases and hemicellulases which help digesting fibre and liberating energy for self and the ruminant animal
- **Probiotic bacterial cultures** such as *Bacillus subtilis*, *Bacillus coagulans*, *Bacillus licheniformis* etc thrive well in the rumen environment and maintain the rumen pH at around 6.0
- **Microbial supporting nutritive growth media** help the fungal/yeast and bacterial cultures to grow and multiply rapidly and establish an optimal population that helps optimising rumen environment.
- **Rumen buffering agents** establishing the initial microbial population when

exogenous microbial cultures are introduced into the rumen

- **Free flow agents** minimize dustiness and improve flowability

Experimental design

Two groups of dairy animals were used in this study. One group of animals were cared under Teaching Cattle Research Farm, Agricultural College and Research Institute, Madurai, Tamilnadu, India. Another group of animals were belonging to local dairy farmers of Usilampatti Taluk, Madurai which are randomly selected. All the selected dairy animals for this trial were in second or third lactation. For both the groups, feeding schedule was instructed to maintain according to their body weight and milk production. Milk samples were collected 2 weeks prior to the Rumicell®Dry inclusion in the diet of the dairy animals and composition of milk were recorded as control (before treatment). Rumicell®Dry was fed to all the animals @ 20 g/day/head for 45 days in addition to their normal feed. After 45th day, milk samples were collected from all the dairy animals and analysed the milk composition using Milk-O-Analyser (Laktan, Mumbai, India). The results of Milk-O-Analyser were validated through standard BIS methods for each and every composition.

Statistical analysis of the data were carried out using VETSTAT software and compared the control and Rumicell®Dry treated milk samples

Results and Discussions

Milk samples from farm and field dairy animals were collected safely and immediately analysed with Milk-O-Analyser. Two weeks before the treatment with Rumicell®Dry inclusion in the diet of dairy animals, milk samples collected and recorded their composition as control values. Composition of milk for Rumicell®Dry fed samples of farm milk component were significantly higher ($P < 0.01$) with control milk samples. Fat, SNF and protein values of control and treated samples were 4.26 ± 0.0288 , 8.18 ± 0.0207 and 3.41 ± 0.0288 ; 4.36 ± 0.0336 , 8.29 ± 0.0193 and 3.51 ± 0.0288 respectively. (Table - 1).

Likewise field cows are also responded well in the aspect of fat, SNF and protein values of milk. Fat, SNF and Protein values of control samples are 3.93 ± 0.0465 , 8.21 ± 0.0205 and 3.56 ± 0.1055 respectively; and for Rumicell®Dry treated samples the values are 4.54 ± 0.0533 , 8.50 ± 0.0227 and 4.51 ± 0.0383 . (Table -2)

Many previous studies documented that milk yield, fat corrected milk, milk fat, milk protein were raised due to inclusion of live yeast and yeast supplement to the dairy cows. *Sacchromyces cervisiae* was the major culture showed many positive results in the past research findings. Yalçın *et al.* (2011) proved that yeast culture

supplementation significantly increased milk yield, tended to increase fat yield, protein yield and lactose yield of milk. Their results showed that milk fat of control and yeast treatment group were 29.63 ± 1.17 and 31.41 ± 1.62 respectively. Likewise protein and lactose yield of control and yeast treated group were 0.86 ± 0.07 and 0.91 ± 0.07 ; 1.25 ± 0.10 and 1.31 ± 0.11 respectively. Desnoyers *et al.* (2009) concluded that the addition of yeast and yeast culture improved milk yield by 1.2 g/kg of bodyweight, or 0.75 kg more milk for a 625 kg cow and improved fat and protein percentage of milk. Belewu *et al.*, 2008 tested the effect of yeast culture supplementation on milk quantity and quality of West African dwarf goat and reported that yeast culture supplementation of goat diet had a favourable effect on milk quantity and quality.

In this study, Rumicell®Dry is tried as feed supplement to the dairy cows which is composed of yeast culture, fungal culture, probiotic bacterial culture, growth media and rumen buffering agents. Over and above the beneficial organisms, the beneficial effect for the host might be due to the better rumen environment. Buffering agents of Rumicell®Dry stabilises the rumen pH which is favour for the growth of the beneficial microbes.

Table-1 Milk composition of College farm dairy cows before and after giving Rumicell®Dry

Animal No.	Fat		SNF		Protein	
MDU-331	4.1	4.2	8.3	8.4	3.4	3.45
MDU- 345	4.2	4.2	8.1	8.3	3.3	3.35
MDU-349	4.4	4.6	8.2	8.3	3.6	3.7
MDU-350	4.3	4.4	8.1	8.2	3.5	3.6
MDU- 351	4.3	4.4	8.2	8.3	3.4	3.5
MDU-353	4.3	4.3	8.2	8.3	3.5	3.6
MDU-354	4.4	4.5	8.3	8.4	3.5	3.6
MDU- 355	4.3	4.4	8.2	8.3	3.4	3.45
MDU-356	4.2	4.3	8.2	8.3	3.3	3.5
MDU-357	4.3	4.4	8.1	8.2	3.3	3.4
MDU- 358	4.2	4.3	8.2	8.3	3.4	3.45
MDU-359	4.1	4.3	8.1	8.2	3.3	3.5

Statistics result – paired T test

Variables	Group - X			Group – Y		T - test	P - value	Result
	N	Mean	±SE	Mean(Y)	±SE(Y)			
A (Fat)	12	4.26	0.0288	4.36	0.0336	5.74	0.0001	**
B (SNF)	12	8.18	0.0207	8.29	0.0193	13.00	0.0000	**
C (Protein)	12	3.41	0.0288	3.51	0.0288	6.63	0.0000	**

** Statistically Highly Significant (P< 0.01)

Table-2 Milk composition of field dairy cows before and after giving Rumicell®Dry

Animal No.	Fat		SNF		Protein	
MDU - 101	3.7	4.1	8.11	8.64	3.15	4.45
MDU - 132	3.9	4.6	8.23	8.62	3.05	4.51
USI - 144	3.8	4.6	8.24	8.41	3.62	4.7
USI - 151	4.1	4.4	8.06	8.41	3.95	4.6
USI - 121	3.9	4.3	8.11	8.32	3.45	4.5
USI - 123	4.1	4.4	8.23	8.53	4.55	4.6
USI - 125	4.2	4.6	8.32	8.54	3.33	4.6
USI - 133	4.0	4.9	8.22	8.55	4.12	4.45
USI - 154	4.3	4.8	8.22	8.44	3.32	4.5
USI - 163	3.8	4.4	8.13	8.55	3.35	4.4
USI - 166	3.7	4.5	8.24	8.45	3.45	4.85
USI - 167	3.8	4.6	8.15	8.45	3.33	4.5
USI - 168	3.9	4.8	8.25	8.56	3.22	4.4
USI - 156	3.8	4.5	8.22	8.45	3.85	4.25
USI - 159	4.0	4.6	8.35	8.56	3.73	4.33

Statistics analysis- Paired T test

Variables	Group - X			Group - Y		T - test	P - value	Result
	N	Mean	±SE	Mean(Y)	±SE(Y)			
A (Fat)	15	3.93	0.0465	4.54	0.0533	11.08	0.0000	**
B (SNF)	15	8.21	0.0205	8.50	0.0227	11.48	0.0000	**
C (Protein)	15	3.56	0.1055	4.51	0.0383	8.51	0.0000	**

** Statistically Highly Significant (P<0.01)

Summary

Results from the present research show that a feed supplement which consists of yeast culture, fungal culture, probiotic bacterial culture, growth media, rumen buffering agents and free flow agents to the dairy cows improved the nutritional quality of milk such as fat, SNF and protein values. Rumicell®Dry is composed of beneficial microbes and their growth media. As the buffering agents of Rumicell®Dry maintains the rumen pH, rumen microbial environment will be balanced and digestion of carbohydrate, fibre etc will be improved. It leads naturally to the production of improved quality of milk. Daily 20 g Rumicell®Dry increased the milk fat percentage, SNF and protein percentage significantly. Since the milk quality improvement is observed in field condition also, we can say that it improves the quality of milk at the village level.

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