Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
www.entomoljournal.com
JEZS 2020; SP-8(2): 110-113

Received: 02-01-2020
Accepted: 04-02-2020

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Study the effect of synbiotics on quantity, quality of milk and economic analysis of feeding in cross breed dairy cow

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Abstract
A 30 days pre-trial and 90 days trial was conducted to study the effect of different dose of synbiotics (Synbiotics used in study was Chromyeast® Intas-pharmaceutical Ltd., Ahmadabad, per gram of Chromyeast® contains Saccharomyces cerevisiae-5 billion CFU, Lactobacillus acidophilus- 200 million CFU and fructo-oligosaccharide -100 mg) on quantity, quality of milk and economic analysis of feeding in cross breed lactating cow. In pre-trial period all 30 selected cows were fed only basal diet and recoded milk yield, fat, protein, SNF, lactose, density and freezing point were recorded on 0,15 and 30 day. In trial 30 cross breed lactating cows were divided in three groups FP (Farmers practice group), T1 and T2 on the basis lactation stage, lactation number and average milk yield of all three groups were more or less similar. The Farmers practice group (FP) kept as control- only basal diet were given, Group (T1) basal diet and synbiotics @ 10 gram/cow/day and Groups (T2) basal diet and synbiotics @ 20 gram/cow/day. On 30, 60 and 90 day of trial milk yield, fat, protein, SNF, density were increased significantly (P<0.05), lactose and freezing point were decrease significantly (P<0.05) in T1 and T2 as compared to control group (FP). The B:C (benefit cost ration) ratio of FP, T1 and T2 groups was calculated 1.66, 1.78 and 1.86 respectively. Supplementation of synbiotics @ 20 gm/ cow/ day was found more beneficial than synbiotics @ 10 gm /cow/day.

Keywords: Trial, Synbiotics, yield, Fat, Protein, SNF, Lactose, density and freezing point

Introduction
India emerges as the milk bowl of the world and ranks first in milk production, accounting more than 19 % of world's total milk production, achieving an annual production of 187.7 million tonnes of milk [1]. The rapid growth of milk production in India has been mainly because of the increase in the number of dairy animal rather than that of increased productivity. The low productivity of milk in dairy cow might be due acute shortage of green fodder. In Jharkhand, steepest shortage of green fodder and the common feed practices for dairy cow is the use of chopped paddy straw and concentrate. The feeding excessive amounts of carbohydrates with low fibre in diet lead to subacute ruminal acidosis (SARA) and thereby reduced productivity of dairy cows. Use of rumen manipulators like antibiotics and hormone is an option to enhance animal productivity but these products have residual effect on human health and development of antibiotics resistance bacteria. The potential alternative option is feeding of prebiotics and probiotics for enhancing productivity of dairy cows. The single use of either probiotics or prebiotics is less effective than simultaneous use of probiotics and prebiotics on the animal body [2]. Probiotics does not perform well in gastrointestinal tract in absence of prebiotics food. Synbiotics is a combined mixture of probiotics and prebiotics that produces beneficial effect on host by increasing the survival and deposition of viable beneficial bacteria in the gastrointestinal tract by selectively increasing the growth and metabolism of beneficial bacteria [3]. Synbiotics might be very effective than alone use of probiotics and prebiotics [4]. So, keeping the consideration of above fact, present study was planned to evaluate the different dose of synbiotics on quantity, quality of milk and economic analysis of feeding in cross breed lactating cow.

Materials and Methods
An On Farm Trial (OFT) was conducted during April to September 2017 in private dairy farm located in Chandwara, Koderma, Jharkhand, India.

Study the effect of different dose of synbiotics on quantity, quality of milk and economic analysis of feeding in cross breed lactating cow.

Experimental Design

The experiment was conducted in 30 cross breed dairy cows of mid lactation stage (150 to 200 days after calving) and average milk yield between 5.0 to 6.0 litres per cow/day and body weight varies between350 to 400 kg were selected for trial. The trial was conducted in two periods i.e. Pre-trial period and trial period. Pre-trial was conducted for 30 days after that, trial was conducted for 90 days. In pre-trial period all the selected cows were fed only basal diet. In trial period all the30 cows were divided in to three groups (FP, T1 and T2) in that way the lactation stage, lactation number and average milk yield of three groups were more or less similar. The Farmers practice group (FP) kept as control- only basal diet were given, Group (T1) basal diet and Synbiotics @ 10 gram/cow/day and Groups (T2) basal diet and Synbiotics @ 20 gram/cow/day. Synbiotics used in study was Chromyeast® Intas-pharmaceutical Ltd., Ahmadabad, per gram of Chromyeast® contains Saccharomyces cerevisiae-5 billion CFU, Lactobacillus acidophilus- 200 million CFU and fructo-oligosaccharide-100mg.

Formulation of basal diets

The selected cows were received same basal diet includes dry and green roughages and concentrates. The dry and green roughages used for feed the cows were chopped paddy straw-6 to 7 kg/cow/day and Hybrid Napier-4to 5 kg/cow/day. The concentrate mixture was prepared locally and its contains maize- 40%, wheat bran-20%, rice bran-10%, mustard seed cake-10% and linseed cake-10%, gram husk-7%, mineral mixture-2% and salt-1%.The concentrate was given 500 gm/cow/day for maintenance and 1 kg / 2.5 litres of for milk production. Cows were offered feed two times in day and concentrate was given prior to milking. The cow milked twice in a day at 6 a.m. and 5 p.m. throughout the experimental period. All the cows were dewormed 21 days prior to pre-trial with Albendazole (Albomar) @ 7.5 mg/kg body weight and also given liver tonic (Livotas) 20 ml per day for 7 days. Proximate composition of feeds are analysed and given as per given in table 1.

Table 1: Proximate analysis of feeds given to the lactating cow (On dry matter basis)

Parameters	Paddy straw	Hybrid Napier	Concentrate
DM	90.11	89.12	90.55
CP	4.0	15.12	20.78
CF	37.0	26.40	9.57
EE	1.40	3.29	4.37
Ash	15.23	10.42	7.40

Collection of Milk Sample

In pre-trial period the milk yield and quality parameters viz. fat, SNF, protein, density, lactose, and freezing point of all the milk samples were recorded on 0, 15 and 30 day. In trial period milk yield and quality parameters viz. fat, SNF, protein, density, lactose, and freezing point of milk samples collected from cows of different groups were recorded on 15, 30, 60 and 90 day. The quality parameters likes Fat, SNF, protein, density, lactose and freezing point were analyzed by Automatic milk analyzer (lacto scan ®Reil Company). The cost of feeding of under different groups per cow/day was calculated and net returns were obtained from seal of milk and B: C ratio was calculated by dividing total income by cost of production.

Statistical Analysis

Data analysis was done using software SPSS 16.0. Data pertaining to milk parameters were analyzed by ANOVA technique to assess the significance of means as per the method described by Snedecor and Cochran (1994) [5].

Results and Discussions

The average milk yield of cows on 0, 15 and 30 day of pre trial were recorded 5.45± 0.15, 5.37±0.21 and 5.43± 0.41litres respectively (Table 3). The average milk yield of cows on 0 day of pre trial varied non-significantly (P<0.05) from 15 and 30 day of pre-trial. On day 15 of trial the average milk yield in cows of T1 and T2 groups were varies non-significantly (P<0.05) from control group (FP). On 30, 60 and 90 day of trial milk yield in cows of T1 and T2 groups increase significant (P<0.05) as compared to control group (FP). On day 90 of trial the milk yield of cow in FP, T1 and T2 were recorded 5.70± 0.17, 6.34±0.32 and 6.75±0.21 litres respectively (Table 3).The highest average milk yield was recorded in cows of T2 groups. The percentage increase in average milk yield in cows of T1 and T2 groups were recorded 11.22 % and 18.42 % respectively as compared to cows of FP group on 90 days of trial. The present findings are in an agreement with other earlier workers who also recorded higher milk yield in cows supplemented with synbiotics by earlier workers [6, 7]. The increase milk yield was recorded in synbiotics supplemented group might be due to it contains prebiotics like fructo-oligosaccharides and probiotics likes *Saccharomyces cerevisiae* and *Lactobacillus acidophilus*. Fructo-oligosaccharides provide nutrient to intestinal micro flora that stimulate growth and development of beneficial micro flora in digestive tract, suppress the growth of harmful pathogens and absorb toxins from intestinal tract [8]. Yeast (*Saccharomyces cerevisiae*) produces stimulatory effect on ruminal fermentation and increase the population of cellulolytic bacteria, fibre digestion, propionate and microbial protein productions in the rumen [9]. In addition, bacteria (*Lactobacillus acidophilus*) produce lactic acid which reduce the gut pH and inhibited the growth of many harmful bacteria in the gastro-intestinal tract [10] thereby enhance the digestion and assimilation of feed ingredients. On day 0 of pre-trial milk fat %, protein%, lactose%, SNF% density and freezing point were varied none significantly (P<0.05) from day15 and 30 of pre-trial. On day 15 of trial fat %, protein%, lactose %, SNF %, density and freezing point of milk in T1 and T2 groups were varies non-significantly (P<0.05) from control group (FP).On day 30, 60 and 90 of trial period increased fat % in milk was recorded in synbiotics supplemented groups (T1 and T2) varied significantly (P<0.05) from control group (FP).On day 90 the fat percentage eof milk in FP, T1 and T2 groups were recorded 4.11 ±0.21, 4.73 ±0.24 and 4.85 ± 0.23 percent respectively. The highest fat percentage in milk was recorded in T2 group. The present findings are in agreement with the results of those reported by earlier workers [11, 12].The protein percentage in milk on 90 day of trial period in FP, T1 and T2 groups were recorded 2.76 ±0.10, 3.15 ±0.11 and 3.31 ±0.09. The significant (P<0.05) increased protein percentage was recorded on 30, 60 and 90 day in synbiotics supplemented groups. Increase protein % was also recorded by Singh and Kumar (1996) [13]. Unlike others parameters the

lactose content of the milk in day 30,60 and 90 of trial decreased significantly (P<0.05) in synbiotics supplemented groups as compared to respective day in control group(FP).The decrease lactose percentage in treatment groups might be due inverse relationship between lactose with protein and fat content of milk [6]. The Solid not fat (SNF) of milk on was increased significantly (P<0.05) on 30, 60 and 90 day of trial in synbiotics supplemented groups (T1 and T2) as compared respective day in control group (FP), Table 2. The increase in SNF of milk of in synbiotics supplemented groups might be due to increase in protein percentage of milk. In present study significant increased (P<0.05) was found in protein content and solids-not-fat content of milk of synbiotics supplemented groups. The Density of milk increased significantly (P<0.05) on30, 60 and 90 day of trial in synbiotics supplemented groups (T1 and T2) as compared respective days in control group (FP) as mentioned in table 2. The significant increase in the density of the milk may be due to increase in the fat % and the protein % content of the milk in Synbiotics supplemented groups T1 and T2. The freezing point of the milk on 15, 30 60 and 90 day of trial were recorded -0.518 ±0.14, -0.520 ±0.19-0.519 ±0.11 and 0.524 ±0.12 in control group. The significant decrease in freezing point of the milk was noticed in synbiotics supplemented groups on day 30, 60 and 90 day of trial as compared to farmers practice group (FP) (Table-2). The decrease in the freezing point of the milk might be due to increase in the fat and protein content of the milk in the synbiotics supplemented groups [6]. The results of economics study (Table 4) revealed that the average expenditure in cow / day in FP, T1 and T2 were calculated Rs.137 and Rs. 142 and 147 respectively (Table 4). Slightly more expenditure in synbiotics supplemented group is due to cost of synbiotics. The income from sale of milk per cow/day in FP, T1 and T2 were Rs.228 and Rs. 253.60 and Rs. 270 respectively and highest B: C ratio was recorded in group T2, cows of the group supplemented with 20 gram of synbiotics.

Table 2: Quantity and quality (Mean ± SE) of cross breed cow's milk recorded on day 0, 15 and 30 days of Pre-trial

Parameters	Pre-trial period		
	0 day	15 day	30 day
Av. milk yield(litre)	5.45± 0.15	5.37±0.21	5.43± 0.41
Fat	3.85 ±0.15	3.80 ±0.21	3.81 ±0.50
SNF	8.15 ±0.01	8.18 ±0.12	8.14 ±0.01
Protein	2.78 ±0.13	2.81 ±0.21	2.83 ±0.17
Lactose	4.28 ±0.13	4.41 ±0.27	4.37 ±0.24
Density	25.53 ±0.16	25.41 ±0.14	25.15 ±0.19
Freezing point	-0.517 ±0.15	-0.520 ±0.16	-0.518 ±0.11

Means bearing different superscripts in a row differ significantly (P<0.05)

Table 3: Effects of Synbiotics on quantity and quality (Mean ± SE) of cross breed cow's milk recorded on day 15 and 30 days of trial

Parameters	Trial period											
	FP				T1				T2			
	15	30	60	90	15	30	60	90	15	30	60	90
Av. milk yield (l/day)	5.50± 0.15^{b}	5.60 ± 0.18^{b}	5.64± 0.22^{b}	5.70± 0.17^{b}	5.68± 0.23^{b}	5.91± 0.13^{ab}	6.27 ± 0.16^{a}	6.34± 0.32^{a}	5.74± 0.21^{b}	6.21± 0.17^{a}	6.64 ± 0.17^{a}	6.75± 0.21^{a}
Fat	4.02 ± 0. 12^{b}	4.09 ± 0.09^{b}	4.07 ±0.18^{b}	4.11 ± 0.21^{b}	4.10 ± 0.17^{b}	4.25 ±0.17^{b}	4.54 ± 0.17^{a}	4.73 ± 0.24^{a}	4.12 ± 0.23^{b}	4.31 ±0.25^{a}	4.79 ± 0.17^{a}	4.85 ± 0.23^{a}
SNF	8.12 ±0.11^{b}	8.18 ± 0.07^{b}	8.22 ±0.09^{b}	8.26 ± 0.05^{b}	8.29 ± 0.06^{b}	8.35 ±0.06^{ab}	8.65 ± 0.06^{a}	8.77 ± 0.72^{a}	8.31 ± 0.05^{b}	8.47 ±0.09^{b}	8.87 ± 0.16^{a}	8.91 ± 0.15^{a}
Protein	2.64 ±0.08^{b}	2.71 ± 0.11^{b}	2.68 ±0.07^{b}	2.76 ± 0.10^{b}	2.79 ± 0.06^{b}	2.89 ±0.06^{a}	2.98 ± 0.06^{a}	3.15 ± 0.11^{a}	2.81 ± 0.12^{b}	3.11 ±0.06^{a}	3.22 ± 0.09^{a}	3.31 ± 0.09^{a}
Lactose	4.46 ±0.21^{a}	4.51 ± 0.26^{a}	4.55 ±0.19^{a}	4.56 ± 0.28^{a}	4.52 ± 0.23^{a}	4.68 ±0.27^{a}	3.82 ± 0.14^{ab}	3.21 ± 0.22^{b}	4.76 ± 0.18^{a}	3.73 ±0.29^{b}	3.17 ± 0.22^{b}	3.41 ± 0.24^{a}
Density	24.63^{b} ±0.27	24.69 ± 0.12^{b}	25.13 ±0.21^{b}	25.33 ± 0.19^{b}	25.71 ± 0.26^{b}	25.87 ±0.21^{ab}	25.95 ± 0.22^{a}	26.15 ± 0.24^{a}	25.83 ±0.22^{b}	25.91 ±0.24^{a}	26.22 ±0.27^{a}	26.42 ±0.21^{a}
Freezing point	-0.518 ±0.14^{a}	-0.520 ± 0.19^{a}	-0.519 ±0.11^{a}	-0.524 ±0.12^{a}	-0.521 ±0.17^{a}	-0.552 ±0.19^{a}	-0.575 ± 0.13^{b}	-0.593 ± 0.10^{b}	-0.521± 0.17^{a}	-0.555 ±0.19^{ab}	-0.572 ±0.13^{b}	-0.612 ±0.16^{b}

Means bearing different superscripts in a row differ significantly (P<0.05)

Table 4: Economics of feed supplementation of Synbiotics in of cross breed dairy cow

Cost of production	Farmers practice (FP)	Synbiotics@ 10gram (T1)	Synbiotics@20 gram (T2)
1.Dryfodder/cow/day-6 kg Rate of dry fodder @ Rs. 4 /kg	24.00	24.00	24.00
2. Green fodder/cow/day- 6/kg Rate of green fodder @6 Rs /kg	36.00	36.00	36.00
3. Concentrate/cow/day- 3.5 kg Rate of concentrate @ 22/ kg	77.00	77.00	77.00
4.Cost of Synbiotics-500Rs./kg	0	5	10
Total cost of production	137	142	147
Av. milk yield (litre)/cow/day	5.70	6.34	6.75
Total Income(Rate of milk Rs.40/ litre)	228	253.60	270.0
Profit	91	111.60	123.00
BC ratio	1.66	1.78	1.83

Conclusions

It can concluded from the study that Synbiotics (Chromyeast®) supplement in animal feed @ dose rate of 20gm / cow /day increases the quantity and quality of milk in cross breed dairy cows and also protects the ruminant from the harmful effects of gut pathogens. Moreover, increase return and benefit cost ratio.

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