WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Effect of Inclusion of Dried Brewers Waste in Basal Diet of Dairy Animals on Milk Production and its Parameter

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ABSTRACT

An experiment was conducted at National Cattle Research Programme, Rampur, Chitwan from 26th April to 15th May for 50 days to test the effect of dried brewers waste in basal diet of dairy animals on milk production and its parameters. Altogether 16 crossbreed cattle were selected and divided into 4 replications (one animal in each replication) by using Randomized Complete Block Design (RCBD). Before experimentation the average daily milk production of T0,T1,T2and T3 group of cattle were 9.06, 9.15, 9.23 and 9.55 liter respectively. The dry matter was offered to dairy animals at the rate 3% by their body weight. The control (T0) and treatment group (T1, T2 and T3) were offered daily with 15kg green mixed forage along with concentrate at the rate 2.5 kg per day. The T1, T2 andT3 groups concentrate feed were replaced by 15%, 20% and 25% dried brewers waste whereas in control group normal concentrates (16% CP) were provided. Feed intake and milk production were recorded daily. The average milk production of first week, second week, third week, fourth week, fifth week, sixth week and seventh week between treatment groups of animals were 9.84±1.59, 9.94±1.06, 10.46±1.15, 10.46±1.26, 10.84±1.32, 10.87±1.29 and 11.09±1.74 liter respectively. There was non- significant effect among diet groups at (P>0.05) in terms of milk production. The average Fat%, SNF%, Protein%, Lactose% were 4.04±0.65, 8.96±0.38, 3.27±0.13 and 4.92±0.21 respectively at 15 days of experiment. There was non- significant effect among diet groups at fifteen days for quality content of the milk. The average Fat%, SNF%, Protein%, and Lactose% were 4.00±0.78, 8.89±0.35, 3.24±0.12 and 4.88±0.19 respectively at 30 days of experiment. The average Fat%, SNF%, Protein%, Lactose% were 3.62±0.67, 8.72±0.51, 3.19±0.19 and 4.79±0.28 respectively at 45 days of experiment. Similarly, the average Fat%, SNF%, Protein%, and Lactose% were 4.13±0.88, 8.89±0.29, 3.24±0.10 and 4.88±0.16 respectively at 60 days of experiment. There was non- significant effect among diet groups at in terms of fifteen days, thirty days, forty-five days and sixty days for quality content of the milk. So, dried brewers waste could replace normal concentrate by 15%, 20% and 25% of its total mass. Experiment suggested that further study should be carried out to precise the other inclusion level of dried brewers waste and higher cost benefit ratio.

Key words: Dairy cattle, Brewers waste feeding

INTRODUCTION

Brewer's waste are the byproduct of brewery industry which uses malted barley grains feed stock (Westendorf *et.al*, 2002). When grain is fermented to produce ethanol, primarily the starch is utilized, leaving behind a protein rich residue that can be used in livestock diets and locally known as Beer waste. Zanton, (2010) stated that the interest in feeding brewers waste has increased because of comparatively less cost.

Feeds and fodders are the important factor for meat and milk production. The farmers are paying high cost for the feeds as they are being purchased from neighbouring countries because the raw material or the ingredients needed for the feed which we have are not in sufficient amount. To minimize the feed cost there are many industrial by products such as brewery waste which can be used somehow to replace the cost of concentrate feed in the diet of cattle and goat. Most of the cattle rearing farmers are having marginal and small farmers who depends mainly on the raw materials for feeding the animals as the agricultural land availability is not sufficient to meet their requirement. In order to make the dairy farming sustainable, the locally available unconventional agro-industrial by products are increasingly used as animal feed.

In Nepal the total population of milking cattle is about 1209041 MoAC (2020/21). In our context the feeding of brewers waste is not commercial but the farmers are using the wet brewers waste because of their availability only in beer industry areas. They are feeding their cattles and dairy animals in traditional ways without any effective feeding package. Therefore, brewers waste feeding technologies are necessary. During winter season the brewers waste would be good dietary supplement for the ruminants. For feeding ruminant animals the brewers waste is beneficial to increase milk and during advance pregnancy stage because of high protein content.

In dairy farming, feeding of roughages requires so much labour, mostly because of bulkiness of roughages like hay, silage, mechanical handling, transport and provendering is difficult. But the brewers waste are sundried because of high moisture content and then can be stored for a longer period. In winter season feed scarcity is great problem in Nepal so, dried brewers waste feeding in dairy animal is definitely good feeding method. This feeding technology definitely improves the milk production and reduces the feed cost.

MATERIALS AND METHODS

Experimental animals

The experiment was carried out at National Cattle Research Programme, Rampur, Chitwan for 50 days from 26th March 2019 to 15th May 2019.with one week adaptation period. There were 16 animals with 4 treatment and were replicated four times having one cattle in each replication by using Randomized Complete Block Design (RCBD). In each treatment the three animals were of same breed ie., Jersey and one was Holstein frezien. All experimental animals health were examined and they were dewormed by albendazole@10mg/kg body weight following the adjustment period of one week before the trial initiation. The average milk production ofT0, T1, T2 and T3 group of cattle were 9.06, 9.15, 9.23 and 9.55 Liters respectively.

Diet Composition

All the group of animals were fed with concentrate at the rate 2.5 kg for 4 liter milking animals along with 15 kg farm forage per animal with access drinking water. The control group (T0) was offered without dried brewers waste inclusion in their diets whereas T1, T2 and T3 group of cattle were offered concentrate mixture replaced with 15%, 20% and 25% dried brewers waste respectively in their diets.

Chemical Analysis

Representative samples were analyzed for dry matter (DM), crude protein (CP), crude fiber (CF), total ash content (TA) and gross energy (GE). The dry matter was determined by oven drying the sample overnight at 100C for 24 hours. Crude protein of the samples were determined by using the Kjeldahl method. Ash content of the samples were determined by ashing the sample at 550C in Muffle furnace for 3 hours (AOAC,1990). Crude Ether of the samples were determined by using the Van Soest method (Goering, H.K and Van Soest 1970).

Experimental Diet

The following experimental diet was provided to the experimental animals (Table 1).

Table 1: Experimental diet for cattle

Treatment	Diet
T0	Concentrate mixture @ rate 2.5 kg for milking animals + 15 kg forage per cattle
T1	Concentrate mixture (replaced by 15% dried brewers waste) @ rate 2.5 kg for milking animals + 15 kg forage per cattle
T2	Concentrate mixture (replaced by 20% dried brewers waste) @ rate 2.5 kg for milking animals + 15 kg forage per cattle
T3	Concentrate mixture (replaced by 25% dried brewers waste) @ rate 2.5 kg for milking animals + 15 kg forage per cattle

Feeding Regime

Concentrate mixture was given on group basis and was provided to the experimental animals twice a day (morning and evening) at the rate 2.5 kg for 4 liter milking cattle till 50 days of the experiment. Daily 15 kg forage was also offered to each cattle. Drinking water was provided in adequate amount.

Data Measurement

The trial period lasted for 50 days. Quantity of concentrate and forage given daily to the cattle was weighted. The daily intake of concentrate and forage was also recorded. The milk production was recorded daily and the milk quality like Fat, SNF, Protein and Lactose were recorded at 15 days interval.

Data Analysis

Data of daily milk production and milking parameters were analyzed by “One way Anova” test for every measurement using statistical package SPSS software 2006, with released versions 15.0.

RESULT AND DISCUSSION

Chemical composition of concentrate mixture

The chemical composition of concentrate mixture and dried brewers waste is given in Table 2.

Table 2: Chemical composition of compound feed (on DM basis)

Concentrate mixture	FDM	CP	CF	EE
Cattle feed	89.92	13.98	9.08	0.89
Dried brewers waste	22.72	17.58	27.72	2.71

The average feed intake of the experimental animal is presented in table 3.

Table 3: Concentrate intake of the experimental cattle/day, kg (Mean± SD)

	Days							
TRT	**1**	**7**	**14**	**21**	**28**	**35**	**42**	**49**
T0	6.62±0.82	6.62±0.86	5.86±0.75	5.86±0.75	5.86±0.02	6.62±0.82	6.87±0.89	6.46±0.92
T1	6.08±0.90	6.08±0.90	6.87±0.89	6.87±0.89	5.86±0.42	6.08±0.82	6.94±0.82	6.43±0.47
T2	5.89±0.96	7.46±0.74	6.59±0.67	6.95±0.67	5.24±0.02	6.59±0.74	6.34±0.82	6.43±0.47
T3	6.86±0.97	6.53±0.67	6.94±0.67	6.54±0.78	6.28±0.43	6.35±0.87	6.67±0.28	8.29±0.74
P-value	**p>0.05**	**p>0.05**	**p>0.05**	**p>0.05**	**p>0.05**	**p>0.05**	**p>0.05**	**p>0.05**

There was non-significant (p>0.05) effect between treatment groups in feed intake during the experimental periods.

The average forage intake of the experimental animal is presented in table 4

Table 4: Forage intake of experimental animal/day, kg (Mean±SD)

	Days								**Cumulative forage intake**
TRT	**1**	**7**	**14**	**21**	**28**	**35**	**42**	**49**	
T0	15±0	15±0	15±0	15±0	15±0	15±0	15±0	15±0	600
T1	15±0	15±0	15±0	15±0	15±0	15±0	15±0	15±0	600
T2	15±0	15±0	15±0	15±0	15±0	15±0	15±0	15±0	600
T3	15±0	15±0	15±0	15±0	15±0	15±0	15±0	15±0	600
P-value	**p>0.05**	**p>0.05**	**p>0.05**	**p>0.05**	**p>0.05**	**p>0.05**	**p>0.05**	**p>0.05**	**p>0.05**

There was non-significant (p>0.05) effect between treatment groups in forage intake during the experimental periods.

Milk production of Animal

The milk production and milk composition of the experimental animal was given in Table 4,5, 6, 7 and 8 respectively.

Table 5: Weekly milk production of experimental animals, liter/day (Mean±SD)

	Days							
TRT	1	7	14	21	28	35	42	49
T0	9.06±1.78	9.21±1.46	9.56±1.98	10.39±1.07	10.69±1.42	10.78±1.56	10.90±2.64	10.52±1.08
T1	9.15±1.49	9.45±1.72	9.76±1.58	9.87±1.47	10.18±1.59	10.55±1.78	10.87±1.49	11.30±1.68
T2	9.23±0.90	9.28±0.89	9.67±2.04	10.28±0.43	10.52±0.79	10.67±0.42	10.81±1.53	11.04±1.03
T3	9.55±1.84	9.72±2.82	10.20±0.71	10.56±1.54	10.84±1.77	10.91±0.71	11.36±1.64	11.94±1.61
Mean	9.09±2.72	9.84±1.59	9.94±1.06	10.46±1.15	10.46±1.26	10.84±1.32	10.87±1.29	11.09±1.74
P-value	P>0.05	P>0.05	P>0.05	P>0.05	P>0.05	P>0.05	P>0.05	P>0.05

At the 7 days experiment, highest milk production was observed at T3 (9.72) followed by T1 (9.45). During 7 days of experiment, higher milk production was found in T3 (10.20) followed by T1 (9.76). Similarly, at 21 days of experiment, the higher milk production was found in T3 (10.56) followed by T0 (10.39). likewise at 28 days of experiment, the higher milk production was found in T3 (10.84) followed by T0 (10.69). Similarly at 35 days of experiment the higher milk production was found in T3 (10.91) followed by T0 (10.78). Likewise at 42 days of experiment the higher milk production was found in T3 (11.36) followed by T0 (10.90). And also at 49 days of experiment the higher milk production was found in T3 (11.94) which was also followed by T1 (11.30) respectively. However, experiment revealed that there was non-significant effect among diet groups at (P>0.05) in terms of weekly milk production.

Table 6: Comparision of milk parameters of experimental animals at 15 days, (Mean±SD)

Treatment	Fat %	SNF %	Protein %	Lactose %
T0	3.77±0.71	9.01±0.55	3.29±0.19	4.95±0.30
T1	3.70±0.27	8.74±0.50	3.19±0.18	4.80±0.28
T2	4.45±0.59	9.08±0.20	3.31±0.78	4.99±0.11
T3	4.25±0.81	9.00±0.17	3.28±0.06	4.95±0.09

Mean	4.04±0.65	8.96±0.38	3.27±0.13	4.92±0.21
P>value	P>0.05	P>0.05	P>0.05	P>0.05

During 15 days of experiment, higher milk Fat % was found in T2 (4.45) followed by T3 (4.24). Similarly SNF % was found higher in T2 (9.08) followed by T0 (9.01). Similarly protein % was found highest in T2 (3.31) followed by T0 (3.29). Likewise lactose % was found higher in T2 (4.99) followed by T0 and T3 (4.95). Experiment revealed that there was non-significant effect was found among the treatment groups at (P>0.05) in terms of parameters of milk.

Table 7: Comparision of milk parameters of experimental animals at 30 days, (Mean±SD).

Treatments	Fat %	SNF %	Protein %	Lactose %
T0	3.86±1.28	8.88±0.61	3.24±0.21	4.88±0.33
T1	3.74±0.48	8.76±0.40	3.20±0.14	4.81±0.22
T2	4.19±0.37	8.96±0.15	3.27±0.05	4.93±0.08
T3	4.21±0.91	8.95±0.15	3.26±0.06	4.92±0.09
Mean	4.00±0.78	8.89±0.35	3.24±0.12	4.88±0.19
P>0.05	P>0.05	P>0.05	P>0.05	P>0.05

During 30 days of experiment, higher milk Fat % was found in T3 (4.21) followed by T2 (4.19). Similarly SNF % was found higher in T2 (8.96) followed by T3 (8.95). Similarly protein % was found highest in T2 (3.27) followed by T3 (3.26). Likewise lactose % was found higher in T2 (4.93) followed by T3 (4.92). Experiment revealed that there was non-significant effect was found among the treatment groups at (P>0.05) in terms of parameters of milk

Table 8: Comparision of milk parameters of experimental animals at 45 days, (Mean±SD).

Treatment	Fat %	SNF %	Protein %	Lactose %
T0	3.55±1.02	8.63±0.79	3.16±0.29	4.74±0.44
T1	3.39±0.38	8.56±0.69	3.12±0.25	4.70±0.38
T2	4.11±0.57	8.79±0.27	3.21±0.10	4.83±0.15
T3	3.43±0.57	8.91±0.21	3.27±0.09	4.90±0.11
Mean	3.62±0.67	8.72±0.51	3.19±0.19	4.79±0.28
P>0.05	P>0.05	P>0.05	P>0.05	P>0.05

During 45 days of experiment, higher milk Fat % was found in T2 (4.11) followed by T0 (3.55). Similarly SNF % was found higher in T3 (8.91) followed by T2 (8.79). Similarly protein % was found highest in T3 (3.27) followed by T2 (3.21). Likewise lactose % was found higher in T3 (4.90) followed by T2 (4.83). Experiment revealed that there was non-significant effect was found among the treatment groups at (P>0.05) in terms of parameters of milk.

Table 9: Comparision of milk parameters of experimental animals at 60 days, (Mean±SD).

Treatment	Fat %	SNF %	Protein %	Lactose %
T0	4.39±1.70	8.89±0.38	3.24±0.13	4.88±0.20
T1	3.77±0.53	8.67±0.30	3.16±0.10	4.76±0.16
T2	4.24±0.24	8.98±0.11	3.28±0.04	4.93±0.06
T3	4.11±0.64	9.02±0.29	3.29±0.11	4.95±0.16
Mean	4.13±0.88	8.89±0.29	3.24±0.10	4.88±0.16
P>0.05	P>0.05	P>0.05	P>0.05	P>0.05

During 60 days of experiment, higher milk Fat % was found in T0(4.39) followed by T2 (4.24). Similarly SNF % was found higher in T3 (9.02) followed by T2 (8.98). Similarly protein % was found highest in T3 (3.29) followed by T2 (3.28). Likewise lactose % was found higher in T3 (4.95) followed by T2 (4.93). Experiment revealed that there was non-significant effect was found among the treatment groups at (P>0.05) in terms of parameters of milk.

Discussion

This experiment was initiated with an aim to increase the milk production of dairy animals by the inclusion of different level of dried brewers waste for the reduction of feed cost. The average milk production of experimental animals at day 60 was T4 (11.94), T1 (11.30), T2 (11.04) and T0 (10.52) respectively. There was non-significant (p>0.05) effect in feed intake, milk production and also in milk parameters (Fat %, SNF %, Protein % and Lactose %) at 15, 30, 45 and 60 days. According to Subba *et,al*; (1999) in series of feeding trial including measurement of intake and palatability of fodder and unconventional feeds by ruminants varies according to the locality in our Nepalese context.

Nyokabi *et,al*: 2011, reported that there was no difference in milk production who replaced forage in the diet upto 30% DM and 26% DM respectively. However, according to Asghar (2017), tested three different levels of wet brewers waste inclusion (13.0 %, 20.6 % and 29.0 % DM) and compared them to the basal diet, the cows fed with wet brewers waste produced more milk. Mean while, Aliyu and Bala, (2011) observed significant reduction in milk production of dairy cows fed with diets containing wet brewers waste.

According to Erickson *et,al*: 2020 upto 35% (dry matter basis) brewers spent grain can be included in finishing diets of cattle by as a forage source without any adverse effect and also said that by using of byproduct in diets is seen to be a way to reduce pollution by industries and a way to provide inexpensive animal feed ingredients and it was also supported by Alura (2019). The use of brewers spent grain as a partial replacement for corn silage in beef cattle diet can be adopted as a strategy to reduce feeding cost and also as an alternative source of polyphenols from a material that needs to be recycled by Chandel *et,al*;2010. As brewers waste are easily available from beer industries we can use them in our animals diets.

Conclusion

Brewers dried waste is relatively cheap and easily available with no competition between human, farm animals and industries. As this present study was therefore designed to determine the feeding value of brewers dried waste as a replacement for concentrate feed and there was no significant difference found in milk production and in milk parameters so, we can say that the concentrate feed can be easily replaced by 15 – 25 % dried brewers waste in cattle feed.

Acknowledgement

The authors acknowledge the staffs of National Cattle Research Programme Chitwan, Rampur for their participation and providing animals for this study. Similarly many thanks goes to our department National Animal Nutrition Research Center for continuous support and my friends and juniors for their constant support during this study.

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