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RESEARCH ARTICLE

Impact of brewery waste on the productive and reproductive traits in Jersey crossbred dairy cattle

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Abstract: The study was conducted on twenty four Jersey crossbred dairy cows for a period of one year with three treatments to see the impact of brewery waste on productive and reproductive traits. The control (T0), brewery waste (T1) treatment and balanced ration (T2) treatment was carried out in farmer's field with eight animals in each group. The control, brewery and balanced ration animals were fed as per traditional and standard feeding practices. Productive traits *viz*., milk yield, milk fat, solids not fat (SNF), body weight were assessed before and at the end of experiment. Productive traits *viz*., lactation period and dry period and reproductive trait like number of services per conception (SPC) were also assessed. The results for milk yield and body weight showed that T0 is at par with T1 and T1 at par with T2 (P>0.05), and only in T2 significant increase (P<0.05) compared to T0. Notable decrease of milk fat and SNF is evident for T1, compared to T2 although the loss deemed to be non significant (P>0.05). Among the reproductive traits, no significant difference (P>0.05) is evident in lactation period between the treatments, with the values being higher for T2 (302.39 days) and lower for T0. With regard to dry period and SPC, no significant difference (P>0.05) is evident between treatments with values being higher for T0 (70.60 days & 2.16) and lower for T2 (63.11 days & 1.83). To conclude, balanced ration significantly increased (P<0.05) the milk yield and body weight of the animals followed by brewery waste and control in the descending order of magnitude.

Key words: Balanced ration, Body weight, Brewery waste, Milk fat, Milk yield, Solids not fat, Reproductive traits

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Introduction

India being an agricultural country, the role of livestock has its own significance in economy and socio- economic development. India is an agrarian economy and farmers are known as the backbone of the economy. For many years livestock plays an important role in generating income towards sustenance and for their livelihood. In the present scenario due to dwindling variations in the climate the expected crop returns could not be achieved and under such circumstances, dairying is considered as a major component in the era of Indian agriculture. In the recent past, dairy farming has turned up in to a vital component in alleviating the problem of unemployment for augmenting income generation and livelihood security. In dairy farming, feeding cost plays an important role which could affect the profit of the enterprise. The cost of feeding is the single most important factor affecting the profitability of a dairy enterprise. Due to the shortage of raw feed ingredients, feed cost increased day by day continuously. The scarcity of raw feed ingredients will compel to utilize the newer or non-conventional feed resources for feeding of livestock. To attain maximum profit through livestock, farmers can use agricultural and industrial by products which are cost effective.

During computation of cattle feed in lactating cows, it has been stated that after drying wet brewer's grain could be efficiently used (Dhiman et al. 2003). Wet brewery grain has 20 – 32% dry matter which is good source of rumen un-degradable or "bypass – protein" and the concentration of rumen degradable protein ranges from 28 – 43% (Thomas et al. 2016). In the recent past, wet brewery is used by most of the dairy farmers because of its affordable price. Hence, the present study was undertaken to see the comparative performance of brewery waste on the productive and reproductive traits in Jersey crossbred dairy cattle.

Materials and Methods

Experimental site and selection of animals

The study was carried out in two farmer's field at Melvenkatapuram village, Ranipet District of Tamil Nadu. A total of 24 dairy animals were selected and randomly distributed in to three groups with eight animals in each group possessing uniform body weight and milk yield. The experiment was initiated in farmer's field wherein the first possess 16 animals and the second farmer had 8 animals. Selected dairy animals were of Jersey crossbred in 1st lactation of 3 – 4 years which were calved around 45 – 60 days with an average milk yield of 5 - 5.5 kgs/day and body weight of 250.02 kgs. The study was carried out in September 2019 with deworming being carried out as per standard schedule using fenbendazole. All the selected dairy animals were given an adaptation period of two weeks prior to the experimental study from continued from October 2019 to September 2020.

Experimental diets

The study was carried out with three treatments Viz., T0 (Control), brewery waste (T1) and balanced ration (T2) with T0 and T1 treatment being carried out in 1st farmers field and T2 treatment in 2nd farmers field. In T0 (Control), animals were fed with rice bran/ wheat bran, oil cakes as per their traditional feeding practices being followed in the field. Based on the dry matter requirement and milk production, T1 and T2 animals were fed during the trial period. During this period, green fodder @ 9 Kgs /animal/day and dry fodder (paddy straw) @ 5 Kgs/animal/day were fed to the experimental groups animals. The brewery waste was fed @ 1 Kg/kg of milk production in T1 group and the concentrate feed was provided @ 400 gms/Kg of milk production in T2 group dairy cattle. For 1 kg of milk production, approximately 1000 kcal of gross energy is required and the brewery waste (T1) contained 1931 kcal/ kg on dry matter basis. Hence, 1 kg of brewery waste, is needed for every 1 kg of milk production and for every 1 kg of milk production, 400 grams of concentrate feed is required which could equate with ICAR 2013 standard. During dry period, T1 and T2 were fed @ 4 kgs of brewery waste and 1.5 kgs per day per animal respectively as maintenance requirement.

Initially the experimental diet on control (T0 - control), brewery waste (T1) and balanced ration (T2) were analysed for proximate principles at Animal Feed Analytical and Quality Assurance Laboratory, Namakkal (AOAC, 1990) and are presented in Table 1.

Body weight estimation

The body weight of the dairy cattle was calculated before and final experimentation using Shaffer's Formula (Sastry et al. 1983) in all three treatment groups (T0, T1 and T2).

$$\text{Body weight (kgs)} = \frac{L \times G^2 \times 0.4536}{300}$$

L = Length from the point of shoulder to the point of pin bone (in inches)

G = Heart girth of the animals (in inches)

Collection of milk for estimation of Milk fat and Solids not fat

Milk samples were collected in wide mouthed plastic bottles from the cows prior to start of the experiment and on every month till the end of experiment for analysis of milk fat and solids not fat (SNF) by Gerber's method (Indian Standard, 1977).

Recording of Milk production

The milk production of the control (T0), brewery waste (T1) and balanced ration (T2) feeding was recorded daily from the start to the end of experiment.

Collection of data for productive and reproductive traits

The data pertinent to date of calving, number of services, date of conception, and date of drying were recorded. The lactation length, dry period and number of services/conception were also assessed.

Statistical Analysis

The data collected on productive traits (milk yield, fat, solids not fat, body weight, lactation period and dry period) and reproductive traits (number of services per conception)

from the Jersey animals were subjected to one way Analysis of Variance (ANOVA) using statistical software, IBM SPSS version 20.0. This analysis was performed to find out the significant difference between treatments and final interpretation was done as per procedure of Gomez and Gomez (1984).

Table 1: Proximate Principles (in %)

Sr.No	Particulars	Control (T0)	Brewery waste (T1)	Balanced ration (T2)
1.	Moisture	9.15	73.17	12.22
2.	Crude protein	7.36	13.90	19.18
3.	Crude Fibre	5.95	6.40	9.02
4.	Ether Extract	4.95	5.13	6.09
5.	Total Ash	5.02	5.76	7.19
6.	Gross Energy (K.Cal/kg)	1323	1931	3708

Results and Discussion

Productive traits

Milk Yield: The mean values/ gain in milk yield (kgs/animal/day) and total milk production / daily body weight gain of the Jersey cross bred cattle under various treatment regimens are presented in Table 2 and 3. It was evident that there was a marginal gain in milk yield for all the treatments after the end of experimentation. A significant difference (P<0.05) in gain of milk yield was observed between the treatments. There was maximum increase in gain of milk yield in balanced ration group (T2:1.56 kgs/animal/day) followed by brewery (T1: 0.73 kgs/animal/day) and control (T0: 0.13 kgs/animal/day) groups. The total milk production was higher for T2 followed by T1 and T0, but the difference was non-significant (P>0.05).

In control (T0) animals, there was a marginal increase in milk yield of 0.13 kgs/ animal/ day at the end of experimentation and they were actually fed with wheat/rice bran, rice gruel and ground nut oil cake (GNC) in an imbalanced proportion without meeting the dietary requirement of the animal. The concentrates fed to the control animals contained 1323 K.cal/kg energy, 7.36% protein and 5.95% crude fibre. This could be the probable reason for comparative less milk yield than brewery (T1) and balanced ration (T2) fed groups. Any animal if underfed or fed imbalanced ration without meeting the requirement, there will be definite decline in milk production. This corroborated with the findings of Garg et al. (2016) who observed 10.36 kgs/day milk production before experimentation and after ration balancing program, the milk yield significantly increased (P<0.01) to 11.67 kgs/day implying the importance of balanced feeding on milk production. Research also suggested that the increase in dietary crude protein (on a dry matter basis) from 17 % to 19 % for lactating dairy cows would definitely meet the nutritional requirements (Ibtisham et al. 2018). Protein sources provide specific amino acids to the dairy animals which are very essential for body maintenance, milk production and reproduction. Nutritional management during pre-parturient and early lactation is most important in dairy cattle in which the milk yield increases at a faster rate than energy intake in the first 4 to 6 weeks after parturition and hence the intake of balanced ration is very important to meet out the nutritional requirement.

In lactating dairy cows the protein deficiency may decrease appetite and dry matter intake resulting in low milk production (Ibtisham et al. 2018).

In case of brewery waste fed dairy cattle (T1), the gain in milk yield (0.73 Kgs/animal/day) at the end of experimentation were higher than the control (T0) animals, but marginally lower than the balanced ration (T2) fed animals. The higher milk yield for brewery treated animals could be attributed to the fact that the brewery waste had larger degradable fraction of protein, which is converted into microbial cell protein, digested and absorbed in the duodenum and increased the milk yield. This is in accordance with the findings of Senthil Murugan et al. (2015), who stated that feeding ration with 20% wet brewer's grain increased the milk yield than 30% inclusion level and control diets. The results also supported with the earlier findings of Imaizumi et al. (2015), who reported increased milk yield in lactating Holstein dairy cows fed with ration containing wet brewer's grain.

The higher milk yield of brewery treated animals in current study could be due to the presence of high amount of un-degradable protein in brewery waste, which is essential for body building and body reserves needed for milk synthesis during lactation. Moreover, the high amount of un-degradable protein makes them a good source of rumen by pass protein which remains intact and becomes available in the abomasum and small intestine where they are utilized by the animals for milk production. Further, Chiou et al. (1998) observed that the brewery grain had higher amount of un-degradable protein, making them a good source of rumen by pass protein and the use of increased amount of rumen un-degradable protein (by pass protein) from dietary concentrates increased the milk yield because of improved protein supply and improved intake of metabolisable energy from concentrates. The gain in milk yield (1.56 kgs/animal/day) and total milk production (2099.09 kgs) were higher in balanced ration fed animals (T2) than control (T0) and brewery waste (T1) fed animals. This increase in milk yield could be due to the supply of balanced nutrition which increased the rumen microbial protein synthesis to make more optimal rumen function for increased milk production (Garg et al. 2014). They also stated that feeding of balanced ration increased (P<0.05) the average daily milk yield by 6.7% than unbalanced feeding regimen. Energy and protein are the most important limiting factors for milk production and its supplementation in the diets of lactating ruminants would have increased milk yield (Manjunatha et al. 2018; Garg et al. 2016). Further the increase in milk yield could be due to balanced nutrients which would have improved the microbial protein synthesis and supplied essential nutrients (Garg et al. 2016). On feeding a balanced ration, dietary energy and protein can be utilized in a more efficient manner resulting in higher milk yield.

Milk Fat and Solids Not Fat

The mean values and gain/ loss of milk fat and SNF (%) in Jersey crossbred cattle under different treatment regimens are presented in Table 2. Significant difference (P<0.01) is evident between treatment groups after the end of experimentation and the milk fat and solids not fat content was higher for balanced ration fed groups (T2) than control (T0) and brewery (T1) fed groups. The milk fat and SNF loss was higher for control groups (T0: - 0.05% & - 0.03%) followed by brewery (T1: - 0.35 % & - 0.12%) fed group animals. On the other hand there was a gain in milk fat for balanced ration animals (T2: 0.47%), but the difference was non-significant (P>0.05) among the groups.

Table 2: Average and gain in milk yield, fat, solids not fat and body weight (mean ± S.E) of the Jersey crossbred cattle under different treatment regimens

Sr. No	Parameter	Before experimentation			F value	At the end of experimentation			F value	Gain/ loss			F value
		T0	T1	T2		T0	T1	T2		T0	T1	T2	
1.	Milk yield (kg/animal/ day)	4.91 ±0.31	5.01 ±0.20	5.38 ±0.47	0.52^{NS}	5.04 ± 0.71^{b}	5.74 ± 0.38^{ab}	6.94 ± 0.50^{a}	2.72^{NS}	0.13 ± 0.02^{b}	0.73 ± 0.07^{ab}	1.56 ± 0.15^{a}	3.63^{*}
2.	Fat (%)	4.43 ± 0.09	4.75 ± 0.51	4.65 ±0.62	0.12 NS	4.38 ± 0.07^{b}	4.40 ± 0.14^{b}	5.12 ± 0.28^{a}	14.13^{**}	− 0.05 ± 0.09	− 0.35 ± 0.50	0.47 ± 0.65	0.75 NS
3.	Solids Not Fat (%)	8.48 ±0.09	8.45 ±0.08	8.37 ±0.14	0.30 NS	8.45 ± 0.06^{b}	8.33 ± 0.04^{b}	8.62 ± 0.05^{a}	8.42^{**}	− 0.03 ± 0.13	− 0.12 ± 0.09	0.25 ± 0.11	3.03 NS
4.	Body weight (kg/animal)	258.79 ± 10.87	234.78 ± 18.19	266.48 ± 17.40	1.01^{NS}	254.04 ± 13.03	254.31 ± 20.93	300.31 ± 30.78	2.12^{NS}	-4.75 ± 1.78^{b}	19.52 ± 2.53^{ab}	33.83 ± 3.42^{a}	5.32*

Means bearing same superscripts within rows do not differ significantly

** - Highly Significant (P<0.01) * - Significant (P<0.05)   NS – Non Significant (P>0.05)

Table 3: Average total milk production and daily body weight gain (mean ± S.E) of the Jersey crossbred cattle under different treatment regimens

Sr.No	Parameters	Mean gain/ loss			F value
		T0	T1	T2	
1.	Total milk production (kg/animal)	1488.30 ± 36.28^{b}	1722.45 ± 62.67^{ab}	2099.09 ± 74.92^{a}	3.15^{NS}
2.	Average daily gain (gms/day/animal)	-13.01 ± 0.35^{b}	53.48 ± 3.26^{ab}	92.68 ± 3.99^{a}	5.32*

Means bearing same superscripts within rows do not differ significantly

NS – Non Significant (P>0.05) * - Significant (P<0.05)

Table 4 : Average productive and reproductive traits (mean ± S.E) of the Jersey crossbred cattle under different treatment regimens

Sr.No	Parameters	Mean values on reproductive parameters			F value
		T0	T1	T2	
1.	Lactation period (days)	295.20 ± 6.48	299.99 ± 12.96	302.39± 4.14	0.18^{NS}
2	Dry period (days)	70.60 ± 6.48	66.10 ± 12.96	63.11 ± 3.22	0.13^{NS}
3.	Number of Services Per Conception (SPC)	2.16 ± 0.31	2.00 ± 0.26	1.83 ± 0.31	0.33^{NS}

Means bearing same superscripts within rows do not differ significantly

NS – Non Significant (P>0.05)

The control animals were fed with wheat/rice bran, rice gruel and ground nut oil cake (GNC) in an imbalanced proportion without meeting the dietary requirement of the animal. Feeding diet with low nutrient content may cause reduction of the milk fat and SNF percentage. Hence, ration balancing is most important to augment fat and SNF content in milk. Garg et al. (2016) stated that the milk fat and SNF significantly increased ($P<0.01$) from 3.98% to 4.35% and from 7.93% to 8.93%, respectively in cows maintained on ration balancing program compared to those on unbalanced ration.

In case of brewery waste fed animals (T1), the mean milk fat and SNF decreased from 4.75% to 4.40% and from 8.45% to 8.33%, respectively during the study period. A notable decrease of – 0.35% and – 0.12% of milk fat and SNF was observed in the animals after experimentation. The depression of milk fat and SNF after experimentation could be due to the presence of rich source of poly unsaturated fatty acid in brewery waste which would have promoted for its depression. This corroborated with the findings of Faccenda et al. (2017), who noted 0.04 g/kg of milk fat depression for every 1% soybean meal replacement with DBG. Moreover, the poly unsaturated fatty acids in brewery waste would have reduced the SNF content of milk after experimentation. This corroborated with the findings of Senthil Murugan et al. (2015). They observed that the SNF content of milk decreased from 7.775% to 7.674% at 20 and 30 percent inclusion level of WBG respectively. Brewery spent grain mainly consists of polyunsaturated fatty acids (67.46%), followed by saturated fatty acids (26.92%) and mono unsaturated fatty acids (10.62%) respectively (Arranz et al. 2008; Niemi et al. 2012). The decrease in milk fat might be due to decrease in dry matter intake (DMI) of the lactating animals. Davis et al. (1982) observed that the milk fat content decreased at 20 & 30% (3.3%) level due to depression in DMI with increasing levels of pressed brewer's grain. The decrease in milk fat could also be due to complete change of concentrate in terms of brewery waste which contained higher level of ether extract composition (5.13%) with higher amount of unsaturated fatty acids and the same fed to dairy cattle causes a bio hydrogenation process in rumen leading to depression in milk fat. Solomon (2007) stated that feeding of a diet containing 5 – 6% ether extract with large amounts of unsaturated fatty acids in dairy cattle depressed the milk fat. Mahnken (2010) reported that the short and medium chain fatty acids production decreased with increasing brewery spent grain inclusion. In other words, the total long chain fatty acids and total unsaturated fatty acids increased with increasing brewery spent grain feeding. Also increased amounts of long chain fatty acids supplied in the diet can inhibit de novo synthesis. As a consequence of decreased production of short and medium chain fatty acids, the fat percentage reduced in milk.

In case of balanced ration (T2) animals, the milk fat and SNF percentage increased to from 4.65% to 5.12% and from 8.37% to 8.62%. The reason for the increased milk fat and SNF (T2 group) may be due to feeding of balanced ration containing adequate amount of energy and protein which would have beneficial effects. This was in accordance with the findings of Garg et al. (2013) who stated that feeding balanced ration increased the milk fat by 0.2 – 1.5%. The improvement in milk fat may be due to balanced nutrients which would have improved rumen environment with maximum utilization of nutrients. Also in balanced ration the essential minerals fulfilled the requirement for better performance. On feeding a balanced ration, the dietary energy and protein could be utilized in a more efficient manner for lactating cows (Garg and Bhanderi, 2011). Moreover, it could be attributed to increased rumen microbial protein synthesis due to more optimal rumen function because of the more balanced nutrient supply (Garg et al. 2014). Similarly the increase in SNF content of milk in balanced ration fed (T2) animals could be due to feeding of balanced ration containing all essential amino acids which helps for synthesis of milk protein and SNF content. The optimum levels of energy, protein and minerals are essential for rumen fermentation functions and used for synthesis of milk components in mammary gland. Rumen microbes convert dietary protein into microbial protein, which is a primary source of essential amino acids for the dairy animals (Bailey et al. 2005) and these amino acids are used for the synthesize milk proteins in mammary gland. The increase in SNF content may be due to availability of energy, protein and minerals in appropriate quantity (Bhanderi et al. 2016).

Body Weight

The mean values of body weight (in kgs/animal) and the gain/ loss of body weight in Jersey crossbred dairy cattle under different treatment regimens are presented in Table 2. There was a reasonable increase in body weight of the animals fed with brewery (T1) and balanced ration (T2) and a marginal decrease in body weight was noticed in control (T1) animals. The average daily gains for the crossbred animals are presented in Table 3. The total body weight gain and average daily gain was significantly ($P<0.05$) higher for balanced ration fed animals (T2: 33.83 kgs & 92.68 gms/day/animal) followed by brewery (T1: 19.52 Kgs & 53.48 gms/day/animal) and control (T0: - 4.75 Kgs & - 13.01 gms/day/animal) in the descending order of magnitude.

A marginal loss in total body weight (- 4.75 kgs/animal) and average daily weight loss (-13.01 gms/day/animal) was observed in control (T0) animals after the end of experimentation. This could be due to feeding of imbalanced ration containing wheat/ rice bran, rice gruel and ground nut oil cake (GNC) which would not met the dietary requirement of the animal. The concentrates feed offered to the control animals contained only 1323 k.cal/kg energy, 7.36% protein and 5.95% crude fibre, which was not sufficient to meet out the nutrient requirement. When protein is lacking, microbial growth is depressed and as a result, microbial fermentation was reduced and less energy become available.

Moreover, cows would lose weight to compensate for the lack of dietary energy (John Moran, 2005).

In case of brewery (T1) fed animals a significant (P<0.05) increase in gain in body weight was observed. This might be due to the increased availability of undegradable protein (UDP) in the brewery waste which has a positive effect on body weight. Also the rate of degradable protein (RDP) in brewery waste was 47.5%, which was higher than the requirement of 35% RDP (NRC, 2001). Further, the presence of protein in the brewer's grain is a source of amino acids, which are absorbed from the intestines showing marked improvement of feed utilization efficiency (ARC, 1984). Davis et al. (1982) observed a significant improvement on dry matter consumption and weight gain in milking cows while feeding different levels of dried brewer's grains when compared to control group. The increase in body weight might be attributed to increased dry matter intake (DMI).

A significant (P<0.05) increase in gain in body weight (in kgs) and average daily gain (g/day) in balanced ration (T2) fed animals may be due to feeding of balanced ration containing sufficient quantity of energy, protein and mineral mixture which would have beneficial effects in boosting up the body weight of the animal. Provision of balanced ration to the dairy animal augments DMI which leads to increase in body weight. This is in accordance with the findings of Sherasia et al. (2016), who observed a highly significant (P<0.01) increase in body weight in early lactating cows. Significant (P<0.05) increase in dry matter intake was also observed on feeding a balanced ration in dairy cows which eventually reflected the increase in body weight of the animal (Garg et al. 2016). Further, Krishnamurthy et al. (2018) studied the effect of balanced ration supplementation on body weight gain and milk yield in different breeds of cattle (cross bred Jersey, HF & Ongole) and observed that the body weight increased by 13.9%, 9.32% and 16.3%, respectively than initial weights implying that the balanced ration improved the body weight in dairy cattle.

Lactation Period and Dry Period

The mean lactation period for different types of treatments was presented in Table 4. The number of days in lactation were higher for balanced ration (T2: 302.39 days) fed animals and marginally lower for brewery (T1: 299.99 days) and control (T0: 295.20 days) animals, but the difference among the groups was non-significant (P>0.05). The mean dry period for different types of treatments was presented in Table 4. Although the dry period was higher for control (T0: 70.60 days) and slightly lower (T1: 66.10 days & T2: 63.11 days) for brewery (T1) and balanced ration (T2) fed animals, the different was non-significant (P>0.05).

The lactation period and dry period observed in this study are more or less comparable with the normal lactation and dry periods for dairy cattle. The standard lactation period for dairy cattle is 305 days and recommended dry period for dairy cattle is 60 days. Slight reduction of lactation length in T0 than other groups might be due to the feeding of imbalanced ration to the animals in control group. Although it was non-significant, nutritional imbalance in ration of control group may have resulted 3 days and 7 days longer dry period as compared to T1 and T2 groups.

Reproductive traits

Number of Services per Conception (SPC)

The mean number of services per conception for different types of treatments was presented in Table 4**.** The number of SPC for control (T0), brewery (T1) and balanced ration (T2) fed animals were 2.16, 2.00 and 1.83. The mean SPC among different groups did not differ significantly (P>0.05). In case of control (T0) animals, the average number of SPC was marginally higher than other treatments (T1 & T2). The imbalanced feeding in control animals might be attributed to more number of SPC than other treatment groups. Further the concentrate feed of control animals contained lower level of nutrients (1323 K.cal/kg energy, 7.36% protein and 5.95% crude fibre) to meet out the dietary requirement of the animals which was below the recommended level and hence the number of SPC increased. Research also suggested that 17% to 19% dietary crude protein (on a dry matter basis) should be provided to the lactating cows to improve reproductive performance particularly SPC (Ibtisham et al. 2018). The low level of protein along with energy supply may be the possible reason on increasing the number of services per conception.

In case of brewery (T1) fed animals, the average number of SPC was 2.0 which was marginally higher than T2. The brewery fed animals contained lower level of nutrients (1931 K.cal/kg energy, 13.90% protein, 5.13% ether extract and 6.40% crude fibre) which was also not sufficient to meet out the dietary requirement of the animals as like control and hence the number of SPC was increased. Rochijan et al. (2016) observed less number of services per conception (1.17 and 1.5, respectively) with 32.78% and 27.47% rumen undegradable protein supplementation while studying the impact of high rumen un-degraded protein supplementation on reproductive performance in early lactation dairy cows. The brewery waste contained higher amount of rumen un-degradable protein which could be responsible for improving the number of services per conception. The brewery waste should not be used as a complete independent diet instead of concentrates, because they are low in fat and carbohydrate content which lead to lowering the availability of micro nutrients, in turn causes higher number of SPC. Hence this could be served as an additive with other cereals shots e.g., corn silage, green fodder and protein rich legumes for improving the productive performances of dairy cattle.

In case of balanced ration (T2) fed animals, the average number of SPC was 1.83 which was marginally lower than other treatment groups (T0 & T1). The balanced ration contained sufficient nutrients (3708 K.cal/kg energy, 19.18% crude protein and 9.02% crude fibre) to meet the requirement of the animals which would have synergistic effect in conception rate of the animals. The number of services per conception depends on various factors such as quality of semen, state of reproductive system of the female, efficient heat detection, time of insemination, skill of the inseminator, management factors and agro-climatic conditions affects SPC in Jersey crossbreds (Vinothraj et al. 2016).

Conclusion

The results of the study indicated that complete feeding of brewery waste to dairy cattle, increased the milk yield compared with control but lower than balanced ration animals. On the other hand, the milk fat and solids not fat decreased when compared to balanced ration animals. Hence complete feeding of brewery waste to lactating dairy animals is not recommended so as to avoid the decrease in milk fat and SNF which could affect the net returns of the livestock farmers.

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