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Evaluation of Milk Production Performance of Lactating Fogera Cows Fed With Urea and Effective Micro-Organisms Treated Rice Straw as Basal diet

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ABSTRACT

The study was conducted for Nine Fogera cows with average age, parity, initial body weight and stage of lactation was 9.3 year, 4.4, 262.7kg and 53.1 days, respectively used for the feeding trial were randomly assigned to three treatments. The treatments were 67% wheat bran and 33% NSC from 2kg concentrate + untreated rice straw (T1), 67% wheat bran and 33% NSC from 2kg concentrate +urea treated rice straw (T2) and 67% wheat bran and 33% NSC from 2kg concentrate + rice straw treated by effective micro-organism (T3). Animals were blocked based on their initial body weight in randomized complete block design. Feeding of Fogera cows with EMO treated rice straw resulted in significantly ($p<0.05$) higher daily dry matter intake (8.52 kg/cow, higher daily weight gain (27.7 g/day), higher daily milk yield (2.82l/day) and highest net income and marginal return rate (MRR) (82.6 and 194%, respectively) when compared with those cows fed on untreated rice straw. Hence, according to the results of this study feeding of lactating Fogera cows with EMO treated rice straw is efficient for both biologically and economically compared to urea treated rice straw.

Keywords: effective microorganism, lactating cows, rice straw, milk yield, urea treatment

Livestock in Ethiopia provide draught power; serve as source of income for farming communities, means of investment and important source of foreign exchange earnings. Of the total household cash income of farming community, livestock account for 37 to 87% in different parts of the country (Ayele *et al.,* 2003). The livestock population in Amhara National Regional State (ANRS) is estimated at 10.5 million cattle, 8.2million sheep and 5.1 million goats. Of the cattle population in the region, about25, 744 are believed to have indigenous and exotic blood (Eshete, 2007), which is only 0.25% of the population is exotic blood and the remaining vast cattle population of the country (99.75%) belongs to indigenous/ local breed.

In Fogera Woreda, rice straw is the most abundant livestock feed resource. But this straw has high fiber content and low digestibility and protein content (3.35%) (Ambay, 2009). The treated low quality roughages have higher digestibility and crude protein than untreated roughages. According to AlemuYami (2008), farmers feed their high nutrient requiring animals, such as lactating or fattening animals treated low quality roughage by using different mechanism. Therefore, rice straw can be improved by; using different treatment methods like urea and effective micro-organisms. The protein content of feed treated by mixing of different treatment; the mixture of EM contained treatment had highest protein content as compared to the others (Nassia, B. *et al.*, 2013). Hence this study was conducted with the objectives of evaluating the milk production performance and feed intake of Fogera cows provided with rice straw treated by urea and EMO and to compare the nutritive value and the economic benefits of urea and EMO treated rice straw.

MATERIALS AND METHODS

The study was conducted at Andassa Livestock Research Center which is located 11˚.4 N and 37˚.3 E and is located

19 km from Bahir Dar. The minimum and maximum temperature was 22° and 30°, respectively with annual rainfall of 1300 mm. Before commencement of the experiment, all animas were dewormed for internal parasites and nine lactating cows with parity 4 and 5 and two weeks after calving were selected. The experimental cows were assigned to each treatment based on their initial body weight randomly and experimental cows were given experimental diets for 45 days including 15 days of adaptation and milk yield and feed intake was taken from each treatment for one month. The was randomized complete block design for the following treatments:

- **T1:** 2kg of concentrate+ 3% their body weight untreated rice straw per day/head
- **T2:** 2kg of concentrate+ 2.5% their body weight rice straw treated by urea per day/head
- **T3**: 2kg of concentrate + 2.5% their body weight rice straw treated by EMO per day/head

Partial budget analysis

The partial budget analysis was performed to evaluate the economic advantage of the different treatments by using the procedure of Upton (1979). The data was analyzed ANOVA for Feed intake, milk yield and composition was done using the GLM or Mixed model procedure in SAS software version 9.0.

RESULTS AND DISCUSSION

Chemical composition of experimental feeds

The chemical composition of different experimental feeds is shown in Table 1. The dry matter of rice straw treated by urea in this experiment was contradictory to the DM content of 95.5% and 69.1% reported by Teshome (2009) and Promma *et al.* (1993), respectively. But similar with Hany (2000) reported 91.5% DM content of rice straw. The CP content of rice straw in this experiment disagrees with the CP content of 7.6 reported by Promma (1993). But agree with the Cp content of 3.35% and 3.5% reported by Teshome (2009) and (Yuangklang *et al.*, 2009), respectively. The CP content of rice straw used in the current experiment is greater than the Cp content of 2.76% and 4.99% that reported by Parnich (1983) for untreated and urea treated rice straw, respectively. The fiber content of rice straw treated by effective micro- organisms was low as compared to untreated rice straw.

Table 1: Chemical composition of rice straw treated by EMO, urea and untreated

Chemicals composition of Offered feed	Treatment diet		
	T1	T2	T3
DM (%)	91.9	92.8	92.8
Ash (%)	18.2	23.3	21.3
CP (% DM)	3.46	5.51	4.98
CF (% DM)	32.1	15.7	10.5
NDF (% DM)	69.1	68.0	56.3
ADF (% DM)	43.7	46.1	41.0
ADL (% DM)	4.1	6.4	4.9

ADF= acid detergent fiber; NDF= neutral detergent fiber; ADL = acid detergent lignin

Dry matter intake

Dry matter intake (DMI) of lactating Fogera cows fed diet containing rice straw treated by effective microorganism and urea is presented in Table 2. The daily dry matter intake of lactating cows fed rice straw treated by EMO was significantly ($P<0.05$) higher than untreated rice straw. The intake of rice straw in the current experiments agrees with the report of Wanpat *et al,* (2013). In the current experiment, the daily dry matter intake of urea treated and untreated rice straw was significantly greater than 5.65 kg and 4.91kg per day, respectively that reported by Parnicch (1983). But daily dry mater intake of urea treated rice straw reported by Wanapat (2013) was in line with the findings of this experiment.

Feed intake is a very important factor that determines the production of milk and body weight, in cows (McAinsh and Riise, 2005). The result of the present study indicates that the feed intake as well as milk production of lactating Fogera cows increased when the rice straw was treated by urea and effective micro-organism as compared to untreated rice straw.

Table 2: Feed intake and milk yield of Fogera cows fed untreated rice straw and treated by EMO and urea

Body weight	Treatment			SEM	SL
	T1	T2	T3		
TDMC (kg/cow)	190.2	239.33	255.47	13.4	Ns
DDMI (kg/cow/day)	6.34[b]	7.98[ab]	8.52[a]	0.15	*
MY (lt/Cow/day)	2.34 [b]	2.4[ab]	2.82[a]	0.007	*

[a, b] Means within a row with different superscripts are significantly different; Ns = no significant; * = significant at (P<0.05); TDMC = Total Dry Mater Consumed; DDMI = Daily Dry Matter Intake; MY = milk yield

Milk production and composition

As we observed from the table 3 milk composition of lactating cow for feeding of urea treated rice straw had good protein content as compared to the remaining treatments. As we absorbed from the table the protein content of milk when an animal's fed urea treated rice straw was also high as compared to other treatments. This is the reason urea has nitrogen rich compound which contribute protein for milk and feed. The nitrogen content of lactating cow's milk for the current experiment was higher than 3.2% and 3.3% animals that fed untreated and urea treated rice straw, respectively reported by Wanapat (2013) and Thaintip (2013). The fat content of the current experiment was similar with the study of Hart (1992). However, the fat and protein content of milk which animal's fed urea treated and untreated rice straw was lower than that reported by Wanapat *et al*. (2013) and Hart (1992), on Holstein crossbred dairy cattle in Thailand and Buffalo in Australia, respectively.

Table 3: Chemical composition of milk used for different experimental treatments

Chemical composition	Milk		
	T 1	T 2	T 3
DM (%)	13.12	15.61	13.56
CP (% DM)	3.42	3.77	3.48
CF (% DM)	3.50	3.63	3.33
Ash (% DM)	0.70	0.73	0.75

DM = Dry Mater; CP = Crude Protein; CF = Crude fat.

Milk composition and production are the interaction of many elements within the cow and external environments (O'Connor, 1994). Feeding of urea treated rice straw alone had given an extra milk yield of 1.16 kg in lactating animal per day in the study area, which is similar to 1-1.5 kg milk per day reported by Khan and Davis (1981) and Pedock *et al. (*1982). Similar results were also reported by Mesfin *et al.* (2009), and Getu (2006) indicating that cows fed urea treated teff straw and wheat straw respectively had significantly higher milk yield than non-supplemented crossbred cows. In the current experiment there was significant difference (P<0.05) between the cows fed on treated and untreated rice straw taking groups of cows in milk yield. The effect of inclusion of effective micro-organism treated rice straw in lactating Fogera cow's daily milk yield is depicted in Table 2 and Fig. 1. Milk yield of lactating Fogera cows that fed rice straw treated by effective micro-organism was significantly (P<0.05) higher than untreated rice straw. Milk production in all treatments of the current experiment is similar with Teshome (2009). Different experiments showed that cows fed urea treated rice straw produced higher daily milk yields compared to cows fed untreated rice straw (Wanapat, 2013). The milk production depends on the intake of feed. Therefore, this experiment also indicated that the milk yield increased with the increment in dry matter intake of Fogera cattle.

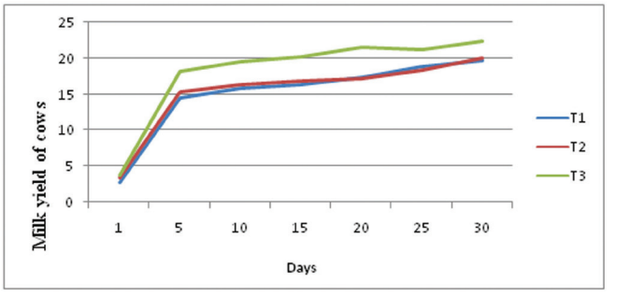

Fig. 1: Feed intake and milk yield of lactating Fogera cows fed untreated rice straw and treated by EMO and urea

Body weight change

The effect of inclusion of rice straw treated effective micro-organism on body weight change of Fogera cows is represented in Table 4. There was no significance difference in initial body weight and final body weight among treatments, but mean daily body weight gain of cows fed diet consisting rice straw treated by EMO was significantly (P<0.05) higher than T1. The result indicated

that the daily body weight gain and feed conversion efficiency was increased when lactating cows were fed rice straw treated by urea and effective micro-organism accordingly.

Table 4: Animal body weight and feed conversion efficiency of different treatments

Body weight	Treatment			SEM	SL
	T1	T2	T3		
Initial body weight (kg)	262.0	245.33	254.67	11.1	Ns
Final body weight (kg)	262.4	245.95	255.5	11.1	Ns
MDBWG (g)	13.3b	20.7ab	27.7 a	4.7	*
FCE	0.069	0.086	0.108	0.02	Ns

*[a, b] Means within a row with different superscripts are significantly different; Ns = no significant; * = significant at (P<0.05);* MDBWG *= Mean Daily Body Weight Gain in Gram; FCE = Feed conversion efficiency*

Partial budget analysis

The partial budget analysis for the feeding trial is presented in Table 5. The result of the partial budget analysis indicated that the gross financial margin or total return obtained in this trial was 411, 419, and 493 ETB/cow for lactating Fogera cows fed on T1, T2 and T3 diets, respectively.

The net return from each treatment was 194.25, 132.79 and 234.33 ETB/head for T1, T2 and T3, respectively. The percent of marginal rate of return (MRR) was 11 and 194 for T2 and T3, respectively. Thus, it indicated that each additional unit of one ETB per liter of milk cost increment resulted in one ETB and additional 0.11 and 1.94 ETB benefit for T2 and T3, respectively. Lactating Fogera cows fed on rice straw treated by effective micro- organism (T3) had the highest net income and MRR value (82.6 and 194%, respectively) as compared to the other treatment groups. Therefore, feeding of rice straw for lactating cows treated by urea and effective micro- organism had better economic benefits as compared to feeding of untreated rice straw.

Table 5: Partial budget analysis for lactating Fogera cows fed urea treated rice straw and EMO

Parameter	Treatments		
	T1	T2	T3
Purchasing price of milk ETB/cow	11.16	11.16	11.16
Feed consumed (kg/cow)	255.47	224.53	251.50
Rice straw consumed (kg/cow)	255.47	220.13	239.33
Total supplement consumed (kg/cow)	—	4.4	11.97
Labor cost ETB	25.5	27.70	31.48
Total feed cost (ETB/cow)(TVC)	216.99	286.37	259.51
Cost of rice (ETB/cow)	216.99	186.77	189.88
Cost of supplements (ETB/cow)	—	99.10	69.63
Gross income (R) (ETB/cow)	422.4	432.6	508.44
Total return (TR) (ETB/cow)	411.24	419.16	493.84
Net return (NR) (ETB/cow)	194.25	132.79	234.93
Change of net income (ΔNI)	—	7.92	82.6
Change of total variable cost (ΔTVC)	—	69.38	42.52
MRR (ΔNI/(ΔTVC)	—	0.11	1.94

TVC = Total variable cost; TR = Total return; NI = Net income; ΔTVC = change of total variable cost; ΔNI = change of net income; MRR = marginal rate of return; ETB = Ethiopian birr's NR = net return

CONCLUSION

Feeding of rice straw for lactating cows treated by effective micro-organism had better economic benefits as compared to feeding of untreated and urea treated rice straw. Hence, we recommended that, rice straw treated by effective micro-organism is higher than urea treatment in many aspects, like its effect on milk production, feed intake, and the aroma of the treated straw is also acceptable by the animals. In addition to this it is also economically profitable and hence we recommend effective micro-organism treated rice straw as an efficient way of treating rice straw. However, further on farm trial has to be conducted to verify the on-station findings of this; experiment.

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