Original Research

Effect of Urea Treated Rice Straw Along with Urea Molasses Mineral Block Supplementation on Body Weight Gain, Feed Intake and Haemato-biochemical Parameters of Working Bullocks

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Abstract

An investigation was carried out to study the effect of urea molasses mineral block supplementation along with feeding of urea treated rice straw on changes in body weight, feed intake and haemato biochemical parameters of working bullocks. For study nine pairs of working bullocks were divided into three groups, T1, T2 and T3 of three pairs each. The bullocks of T1 group were fed with ad lib. rice straw and 1 kg concentrate mixture, T2 group with ad lib rice straw and 1 kg concentrate mixture along with supplementation of 500 grams of urea molasses mineral block and T3 group with ad lib urea treated rice straw and 1 kg concentrates mixture along with supplementation of 500 grams of urea molasses mineral block daily for experimental period of 90 days. At the end of experimental feeding significant differences (P<0.01) were observed in body weight gain, straw intake and total dry matter intake. Almost all the haemato biochemical parameters showed significant differences (P<0.01) except total erythrocyte count, packed cell volume and serum globulin values in bullocks of T3 group.

Key words: Urea Treated Rice Straw, Urea Molasses Mineral Block, Working Bullocks

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Introduction

The crop residues like rice straw are the cheapest available source of roughage for feeding bullocks and it forms the basal diet. As they are deficient in protein, energy and minerals the animals cannot meet nutrient requirements without supplementation even for body maintenance. Their utilization in terms of total feed

intake and digestibility is very poor. Traditionally in villages bullocks are reared mainly on a rice straw-based diet and the practice of supplementation is not common. Straws are poor livestock feed and rice straw is no exception. It contains about 80 percent of substances which are potentially digestible and are therefore sources of energy, but actual digestibility by ruminants is only 45 to 50 percent. Furthermore, the amount an animal can eat is limited to less than 2 percent of body weight because of the slow rate at which it is fermented in the rumen. Many experiments have been conducted to improve the nutritive value of cereal straws through chemical treatment and supplementation with protein and energy feeds. Among which urea treatment of straws has been found relevant to farming system in India. Urea treatment increases the crude protein contents and digestibility of the straw and as result feed intake of the animals is generally increased. Feeding of urea molasses mineral block (UMMB) has been widely advocated as a useful supplementary strategy that provides critical nutrients for optimizing rumen fermentation in animals fed with poor quality roughages. Many researchers have conducted experiments which revealed that UMMB feeding significantly increases body weight, dry matter intake and milk production in cows fed with low quality roughages. Therefore, feeding of UMMB during scarcity period can be more beneficial. Non protein nitrogenous substance like urea provides additional nitrogen to animals. Treating rice straw with 3 or 5% urea solution effectively increased nutritive value and degradability of rice straw. (Wanapat *et al.,* 2009). Studies on feeding of urea treated crop residue with UMMB supplementation are scarce in bullocks. Therefore, the present experiment was be carried out to observe the effect of feeding urea treated rice straw and UMMB on growth performance, feed intake and general health of bullocks.

Materials and Methods

The present experiment was carried out in Village- Rasni, Arang block of Raipur district of Chhattisgarh. Nine pairs of working bullocks of approximately similar age and body weight were selected and divided into three groups (T1, T2 and T3) of three pairs each depending on their body weight.

Feeding and Management of Animals

All the nine pairs of bullocks were kept under stall fed condition. The straw diet was offered to all animals on *ad libitum* basis. The bullocks of T1 group (control) were fed. untreated rice straw *ad lib*. + 1kg concentrate mixture. The bullocks of T2 group were fed untreated rice straw *ad lib* + 1 kg concentrate mixture + Urea Molasses Mineral Blocks (UMMB) and bullocks of T3 group were fed urea treated rice straw *ad lib* + 1 kg concentrate mixture + UMMB. UMMB weighing 500 grams was placed in feeding troughs for licking in front of each animal of T2 and T3 group during evening time. The bullocks had free access to clean and fresh water.

Preparation of UMMB

Urea molasses mineral blocks were prepared with following ingredients as mentioned below in Table 1.

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Table 1: UMMB lick formulation

S. No.	Ingredients	Percentage
1	Molasses	40
2	Wheat bran	28
3	Cotton seed cake	8
4	Urea	10
5	Cement	5
6	Lime stone powder	5
7	Mineral mixture	2
8	Common salt	2

Firstly, exact amount of molasses was taken in a large container and mixed with powdered urea and half amount of salt thoroughly. After that mineral mixture was added. In separate dish cement, limestone powder and rest half amount of salt were mixed with small amount of water to make thick paste. This mixture was added in container containing molasses mixture and mixed properly. Then in this mixture crushed cotton seed was added followed by wheat bran. Whole ingredients were mixed properly to make thick consistency. Then 2 kg of this mixture was placed in frame of size 9x 3x 3inch made up of aluminum sheet and compressed with wooden weight of suitable size to make more compact blocks. Then frame was removed leaving UMMB block on the polythene sheet. The blocks were left in room temperature to air dry. After one day the blocks are left outside room for drying but not in direct sunlight. After solidification the blocks were ready for distribution.

Urea Treatment of Straw

In a big plastic container 50 lit of water was taken and in it 3 kg of crushed urea was dissolved properly by stirring with long wooden stick. 100 kg of chaffed rice straw was spread uniformly on a big plastic sheet laid on the ground. The prepared urea solution was sprayed throughout the chaffed straw with a hand garden sprayer and simultaneously mixed properly by hand to achieve uniform wetting by the second person. After proper mixing of urea solution in straw the wet straw was filled in a big polyethylene bag. During filling the straw was pressed with hands and feet to expel excess air. The mouth of the bag was tied tightly with rope to make it air tight and covered with polyethylene sheet. The treated straw was incubated for 21 days before feeding the bullocks. After 21 days the treated straw was used for feeding the bullocks. Before offering to bullocks the required amount of treated straw was removed from the bag and exposed in air for about 1- 1 ½ hours to get rid of ammonia.

Collection of Samples and Analysis

The representative feed samples were collected and analyzed for dry matter (DM), crude protein (CP), crude fiber (CF), ether extract (EE), nitrogen free extract (NFE), total ash (TA) by standard methods

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suggested by AOAC, 1995. Calcium (Ca) and phosphorus (P) were determined according to methods of Talapatra *et al.* (1940). The chemical compositions of different feed ingredients are presented in Table 2.

Table 2: Chemical composition of feed ingredients (% DM basis)

S. No.	Attributes	Rice Straw (Untreated)	Rice Straw (Urea Treated)	Concentrate Mixture	UMMB
1	Dry Matter, %	94.8	60.96	93.64	91.6
2	Crude Protein, %	3.8	8.04	16	34.8
3	Crude Fibre, %	34.53	31.21	10	4.54
4	Ether Extract, %	0.65	0.95	2.75	2.55
5	Nitrogen Free Extract, %	46.37	42.05	58.75	52.13
6	Total Ash, %	14.65	17.75	12.5	5.98
7	Calcium, %	0.68	0.28	2.68	1.8
8	Phosphorus, %	0.29	0.18	0.52	0.24

The blood samples of bullocks were collected in sterile vacutainer tubes. 2 ml of blood sample was kept for haematological examination and 8 ml of blood was kept for serum collection. Haematological parameters were determined by using Automated cell counter machine. The collected serum samples were analyzed for biochemical parameters in Semi - Auto Chemistry Analyzer using standard biochemical kits.

Record Keeping

The body weight of each bullock of all three groups was taken at the beginning of the experiment and at the end of 90 days of experimental feeding on the electronic weighing bridge. Daily intake of rice straw by individual animal was recorded by subtracting amount left from total amount offered. Total DM intake by bullocks was determined after completion of experimental feeding on the basis of dry matter present in feed samples. The differences in the haemato biochemical parameters of bullocks of three groups were determined at the end of experimental feeding.

Statistical Analysis

Data were analyzed using one-way analysis of variance (ANOVA) by Statistical Analysis System (SAS, 2011) Software Programme, version 9.1 and results were expressed as mean ± SE and considered statistically significant at 5% level.

Results and Discussion

Effect on Body Weight Gain and Straw Intake

The cumulative body weight gain, straw consumption and dry matter intake by experimental bullocks of T1, T2 and T3 groups are presented in Table 3. There was non-significant difference ($P>0.05$) between the initial and final mean body weights of bullocks of experimental groups T1, T2 and T3. But highly significant differences ($P<0.01$) in cumulative weight gain was observed among three groups. The highest

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weight gain was observed in bullocks of T3 group (19.17±2.71kg) fed with urea treated rice straw, urea molasses mineral block and concentrate mixture, followed by bullocks of T2 group (12.33±0.92 kg), fed untreated rice straw, urea molasses mineral block and concentrate mixture. The lowest weight gain (4.17±0.54 kg) was observed in bullocks of T1 group, who were fed only concentrate mixture and untreated rice straw. The lower weight gain in T1 group might be due to low intake of nutrients which was only from concentrate mixture. The higher weight gain might be due to extra nutrition obtained from urea molasses mineral block in T2 and from urea treated straw and urea molasses mineral blocks in T3 group. The findings are in agreement with Waruiru *et al.,* 2003, who reported significantly higher (P< 0.05) cumulative live weights of heifers supplemented with urea molasses mineral blocks than no block supplemented group of heifers reared on grazing. Sahoo *et al.,* 2004 also observed that supplementation of urea molasses block to buffaloes fed straw based diet increased the growth and milk production. Akter *et al.,* 2004 observed no significant increase in live weight and feed intake of cows who received 250 g of UMMB in addition to normal diet than cows who received only normal diet. This might be due to in sufficient UMMB intake. In the present experiment feeding of UMMB @ 500 g per day was sufficient to meet the nutrient requirement for weight gain in T2 group and T3 group. The higher weight gain in T3 group than T2 group might be due to additional nutrient intake from feeding of urea treated paddy straw.

Table 3: Cumulative body weight gain, straw consumption and DM intake

Attributes	Experimental Groups			F- Value
	T1	T2	T3	
Body Weight				
Initial body weight (kg)	346.7 ± 22.46	340.0 ± 17.13	341.7 ± 23.01	0.027 ^{NS}
Final body weight (kg)	351.67 ± 21.63	352.33 ± 16.34	360.8 ± 22.38	0.063 ^{NS}
Body weight gain/loss (kg)	4.17 ± 0.54	12.33 ± 0.92	19.17 ± 2.71	19.905 **
Rice Straw Intake				
Initial (kg/day/animal)	4.05 ± 0.17	4.13 ± 0.21	4.00 ± 0.16	0.117 ^{NS}
Final (kg/day/animal)	4.455 ± 0.15	6.575 ± 0.04	7.505 ± 0.13	184.28 **
Dry Matter Intake				
Straw DM intake (kg /day/animal)	4.223 ± 0.14	6.233 ± 0.04	4.575 ± 0.08	129.48**
Total DM intake (kg/day/animal)	5.16 ± 0.14	7.628 ± 0.04	5.969 ± 0.08	177.87 **

^{NS} *Non significant; ** P<0.01*

The observations on rice straw intake revealed that initially the rice straw intake by bullocks of all three groups did not differ significantly. But after the end of experimental feeding period significant (P<0.01) differences in straw intake was observed among groups. The lowest straw intake was in control group which received untreated rice straw. An increase in straw intake was due to improvement in digestibility and palatability of straw in UMMB and urea treated straw supplemented groups. Rudraswamy *et al*. (2012) also concluded that extra nutrition obtained from supplementation of UMMB in local cattle raised solely on

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grazing enhanced the paddy straw intake from 4.10 t0 4.73 kg/ day to a significant level. The present findings are also in agreement with Misra *et al.* (2006) who reported that supplementation of UMMB licks significantly increased feed intake, milk yield and maintained live weight and body condition score of cows. Similarity, highly significant (P<0.01) differences in total dry matter intake was observed among the groups. The total dry matter intake was the highest in T2 group followed by T3 group and lowest in T1 group. The dry matter intake was highest in T2 group as untreated rice has higher dry matter content than urea treated rice straw. The total dry matter intake ((kg/day/animal) was found the highest in T2 group (7.628±0.04), followed by T3 (5.969±0.08) and T1 (5.16±0.14).

However, the body weight gain was higher in T3 group than T2 group. This might be due to more nutrient intake by bullocks of T3 group which were fed both UMMB and urea treated rice straw and increase in total dry matter intake might be due to increased palatability and digestibility of straw. The findings were in accordance with Gelane and Mitiku (2018) who observed a significant increase in daily dry matter intake and daily weight gain in crossbred lactating dairy cows fed with urea molasses block+ untreated straw + concentrate than cows fed with urea treated straw + concentrate and lowest in cows fed with untreated straw and concentrate in an on farm study. Atiqur Rahman *et al.* (2009) also observed significantly (P<0.01) higher live weight (56.0, 46.0 and 40.0 kg, respectively) and significant (P< 0.01) difference in average DM intake (4.66, 4.79 and 5.14 kg) in fattening emaciated bulls supplemented with urea molasses straw (UMS) based diet with different levels of concentrates (10, 20 and 30% of DM requirement, respectively) than bulls fed with only UMS (80% and) green grass (20%). The findings in the present experiment are also in agreement with Gunun *et al.*, 2013 who reported significant increase (p<0.05) in dry matter intake by dairy steers who were fed concentrates at the rate of 0.5% body weight per day and urea- treated (3%) rice straw on *ad lib.* basis. Mesfin and Ktaw (2010) also observed that cows fed urea treated wheat straw-based diet has consumed higher total dry matter (10kg) than those fed untreated straw-based diet (9.6kg). Singh *et al.*, 2010 also reported that UMMB being a good source of energy, protein and minerals improved dry matter intake and general health status of buffaloes. The visual observation by owners also concluded improvement in weight gain, general appearance and health of bullocks. They also reported increase in draught ability of bullocks while ploughing work in fields.

Effect of UMMB and Urea Treated Rice Straw on Haematological and Bio-Chemical Parameters

Haematological Parameters

The effect of different feedings on haematological parameters viz. haemoglobin (Hb), total erythrocyte count (TEC), total leukocyte count (TLC) and packed cell volume (PCV) of experimental bullocks of different groups are given in Table 4. The results showed the highest values of haematological parameters in T3 group, followed by T2 and T1 group. However, haemoglobin and total leukocyte count showed highly

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significant (P< 0.01) difference. The increase in values in T2 and T3 group might be due to higher intake of nutrients through UMMB and improved digestibility of straw by urea treatment. Haili *et al.* (2014) also observed significant (P<0.05) increase in hemoglobin content in UMMB supplemented fattening cattle when compared with control group.

Table 4: Effect on haematological parameters of different treatment groups

Parameters	Experimental Groups			F-Value
	T 1	T 2	T 3	
Hb (gm%)	9.63 ± 0.37	10.83 ± 0.19	12.18 ± 0.20	19.29**
TEC (10^{12}/L)	5.61 ± 0.43	5.97 ± 0.32	6.53 ± 0.28	1.75^{NS}
TLC (10^{9}/L)	8.2 ± 0.51	9.37 ± 0.61	11.73 ± 0.68	8.75**
PCV %	30.78 ± 1.68	33.18 ± 1.28	35.66 ± 1.19	3.04^{NS}

*^{NS} Non significant; ** P<0.01*

Biochemical Parameters

The effect of different feeding on bio chemical parameters of bullocks of all three groups is presented in Table 5. The analysis of serum samples of experimental bullocks revealed that the values of different biochemical parameter *viz.* total serum protein (TSP), albumin, globulin, glucose, blood urea nitrogen (BUN), calcium, phosphorus, serum glutamic oxaloacetic transaminase (SGOT) and serum glutamic pyruvic transaminase (SGPT) were higher in T3 group followed by T2 group than T1 group which received only untreated rice straw and concentrate mixture.

Table 5: Effect on biochemical parameters of different treatment groups

Parameters	Experimental Groups			F- Value
	T 1	T 2	T 3	
Total serum protein (g/dL)	7.435 ± 0.03	8.31 ± 0.18	8.98 ± 0.21	23.27**
Serum albumin (g/dL)	3.26 ± 0.01	3.83 ± 0.08	4.42 ± 0.10	58.01**
Serum globulin (g/dL)	4.18 ± 0.03	4.49 ± 0.17	4.55 ± 0.11	2.83^{NS}
Serum glucose (mg/ dL)	44.76 ± 0.71	53.58 ± 0.63	57.57 ± 0.65	97.49**
Blood Urea Nitrogen (mg/ dL)	18.62 ± 0.02	32.86 ± 0.59	38.12 ± 0.45	553.62**
Serum calcium (mg/ dL)	8.3 ± 0.04	11.21 ± 0.31	11.51 ± 0.36	41.26**
Serum phosphorus (mg/dL)	4.26 ± 0.13	6.35 ± 0.27	7.79 ± 0.08	96.81**
SGOT (U/I)	54.65 ± 1.89	64.17 ± 0.88	78.09 ± 2.28	41.68**
SGPT (U/I)	26.55 ± 0.56	33.39 ± 0.27	37.21 ± 0.97	66.27**

*^{NS} Non significant; ** P< 0.01*

The differences were significantly higher (P<0.01) for TSP, albumin, glucose, BUN, calcium, phosphorus, SGOT and SGPT among the experimental groups. The bullocks of T2 and T3 group received more protein in the form of UMMB and urea treated rice straw in addition to concentrate mixture. The total serum protein was the lowest in T1 group as the bullocks received protein only from concentrate mixture. The supplementation of more protein in the diet of T2 and T3 groups helped to maintain more albumin level

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similar to total protein. The value of total serum protein was higher in bullocks of T3 group as they received additional protein from urea treated rice straw. The findings are in agreement with Haili *et al.* (2014) who reported significant increase in haemoglobin, TSP, albumin level in fattening cattle who received *ad lib* UMMB supplementation. Singh *et al.* (2010) also reported significant increase in total plasma protein and albumin level in buffaloes fed with urea molasses multi nutrient blocks enriched with area specific mineral mixture. The serum glucose level was also higher in T3 followed by T2 groups due to supplementation of molasses through UMMB intake. Kumar *et al.* (2016) reported significant increase ($P<0.05$) in plasma glucose level in Sahiwal and Karan Fries heifers supplemented with molasses. The increased level of blood urea nitrogen in T2 and T3 groups might be due to addition of urea as non-protein nitrogen in UMMB and urea treated rice straw. In the present experiment BUN values were within the normal physiological range indicating that UMMB and urea treated rice straw had not any harmful effect on liver. Pambu-Gollah *et al.* (2000) also suggested that blood urea concentrations are positively related to the intake when diets containing sufficient energy are provided. Choubey *et al.* (2015) also reported that the blood urea nitrogen level was higher ($P<0.05$) in animals offered UMMB supplemented diets as compared to conventional control group. Gunun *et al.* (2013) also reported significant increase ($P<0.01$) in BUN by feeding urea treated rice straw in dairy steers.

In the present experiment highly significant ($P<0.01$) differences in serum calcium and phosphorus content were observed. The findings were in accordance with Haili *et al.* (2014), who observed significant increase in calcium and phosphorus level in fattening cattle fed with *ad libitum* UMMB for an experimental period of 90 days. The values of serum calcium were higher in T2 and T3 groups as the bullocks were supplemented more calcium through cement and limestone powder added in UMMB. The level of serum phosphorus was also higher in T2 and T3 groups due to inclusion of bran in UMMB, the source of phosphorus. The SGOT and SGPT values were also higher in in T2 and T3 groups, but the highest in T3 group, but were within the normal range. All the haemato-biochemical parameters were within the normal physiological range in T3 group indicated that feeding of both UMMB and urea treated rice straw had not any harmful effect on health of bullocks.

Conclusion

In conclusion, supplementation of urea molasses block at rate of 500 g/animal/day above urea treated rice straw and 1 kg concentrate mixture had positive effect on the normal body function, feed intake, dry matter intake, weight gain and health status of bullocks. Therefore, this feeding practice could be recommended for working bullocks during idle period to improve the draught capacity of bullocks for efficient work.

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