

TECHNICAL BULLETIN

No. 21, 2021

Treatment of Rice Straw with Probiotics to Improve Cattle Feed Quality

Rice straw alone contributes 87% of the roughage feed of animals in Bangladesh. However, the value of such rice straw as a cattle feed is limited by its low voluntary intake, slow rate of digestion and low contents of available energy, protein, minerals and vitamins. Extensive research has been carried out for improving the nutritive value of cereal straws using physical, chemical and biological treatments for several decades with varying degrees of success. Probiotics have been reported to increase the crude protein level of rice straw and improve fiber



Cattle feeding with probiotics-treated rice straw

digestion in the rumen, reduce the number of pathogenic microbes in the digestive tract and help balance the microbial consortium by optimizing the fermentation process. Direct fed microbes (DFM) were found to significantly reduce the probability of new infections with *Salmonella* in cattle. Consumption of probiotics with *Lactobacillus acidophilus* and *Bifidobacteria cepas* by ruminants reduced total cholesterol and low-density lipoproteins in cattle. The present study focused on improving the nutritional value of rice straw by treatment with probiotics and investigated the effect of probiotics on dairy cattle production in terms of digestibility, milk yield, milk composition and health status of dairy cows. Research was carried out at the Livestock and Poultry Farm of Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU). The *in vitro* studies were done at the Laboratory of Animal Nutrition of Texas A & M University, USA.

Results and Outputs

Seven commercial probiotic preparations, designated as Pro-1, Pro-2, Pro-3, Pro-4, Pro-5, Pro-6 and Pro-7, collected from local markets near BSMRAU were characterized morphologically and biochemically and their quality was assessed.

In vitro digestibility

In general, probiotic treatment of rice straw increased crude protein (CP) content and reduce acid detergent fiber (ADF) in rice straw. The relative feed value (RFV) was also increased. A



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higher percentage of non-fiber carbohydrate (NFC) was released from probiotic treated straw than from untreated rice straw. The effect of probiotic, urea, *Trichoderma* or *Aspergillus* on predicted total digestible nutrients (TDN), assuming kp of 4 and 6%/h, was recorded. There was a significant ($P<0.05$) difference in predicted TDN among the treatments. The average TDN, assuming a kp of 4%/h, ranged from 40.7 to 43.4% in treated groups.

In vivo digestibility, blood parameters and milk yield

There was a significant ($P<0.05$) difference of CP digestibility (63.60 vs 77.58%) over control after feeding probiotic treated rice straw. The DM (dry matter), OM (organic matter), neutral detergent fiber (NDF) and acid detergent fiber (ADF) digestibility were not affected by probiotic treatment.

Albumin, glucose, LDL, HDL and creatinine are important blood parameters of heifers. Blood albumin, glucose, HDL and LDL were at normal levels in cows fed with probiotic treated rice straw.

Effect of probiotic treated rice straw on blood parameters

		Days				
Parameters	Treat	0	7	14	21	28
	T1	5.69 ^a	5.28 ^a	4.05 ^b	4.37 ^b	4.24 ^b
	T2	3.70 ^a	4.17 ^a	4.08 ^a	4.15 ^a	4.18 ^a
Albumin (g/dl)	SEM	0.31	0.35	0.35	0.43	0.18
	P-value	0.0002	0.0052	0.9461	0.3817	0.7747
	T1	83.41 ^a	93.20 ^b	100.6 ^c	52.44 ^d	123.01 ^e
	T2	75.49 ^a	95.07 ^b	109.45 ^c	125.08 ^d	115.43 ^d
Glucose(mg/dl)	SEM	1.48	2.20	1.68	2.08	3.03
	P-value	0.002	0.0637	0.0360	0.0001	0.0001
	T1	245.2 ^a	241.7 ^a	184.9 ^b	195.8 ^b	251.5 ^a
	T2	247.6 ^a	243.1 ^a	233.5 ^a	232.3 ^a	162.2 ^b
LDL (mg/dl)	SEM	7.50	9.30	6.18	4.89	5.30
	P-value	0.0637	0.0360	0.0023	0.0001	0.0001
	T1	120.42 ^a	130.29 ^a	119.92 ^a	135.75 ^a	136.19 ^a
	T2	106.63 ^a	139.89 ^b	148.46 ^c	165.28 ^d	148.09 ^c
HDL (mg/dl)	SEM	3.50	2.30	3.18	3.89	2.30
	P-value	0.003	0.060	0.0043	0.0021	0.0031
	T1	2.82 ^a	2.71 ^a	2.51 ^a	2.18 ^a	2.21 ^a
	T2	3.00 ^b	2.05 ^a	1.54 ^a	1.84 ^a	1.27 ^a
Creatinine	SEM	0.11	0.15	0.25	0.13	0.16
(mg/dl)	P-value	0.067	0.075	0.0003	0.081	0.0003

Mean values within a row with different superscripts are significantly different ($P < 0.05$)

T₁= control group, T₂= treatment group, SEM= standard error of mean

The average weekly milk yield ranged from 2.67 to 3.27 L. The average weekly milk yields of cows of T₁ and T₂ groups were 2.83 and 3.03 L, respectively indicating slightly higher milk production by cows fed with probiotic treated straw.

Fat, solid not fat (SNF), protein, lactose, ash and total solid contents were not affected significantly by probiotic treated rice straw feeding.

Expected Impacts

- ❖ Probiotics treatment of rice straw is a promising technology for improving the nutritional value of rice straw as a cattle feed, nutritionally improved roughage feed will be available for sustainable livestock production
- ❖ Healthy cows and calves will be available in the country
- ❖ Safe milk will be available for human consumption
- ❖ Cattle feed treatment with hazardous chemicals will be prevented, livestock farming will become more environment friendly
- ❖ Socio-economic conditions of farmers will be improved.

Recommendations

- ❖ Extensive trials on probiotic treatment of cattle feed should be conducted at farm levels
- ❖ Intensification of research on milk production using probiotics
- ❖ Farmers need to be trained on the use of probiotics
- ❖ There is a need to isolate new probiotic products using indigenous resources
- ❖ Media publicity of the technology.

This technical bulletin has been prepared on the basis of technical information available from a completed CGP project of KGF, the details of which are given below:

Project Code and Title: CGP/TF 21-DL/15. Use of probiotics to improve nutritional quality of rice straw as cattle feed

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