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ENHANCING BUFFALO PRODUCTIVITY THROUGH USAGE OF LOW QUALITY FEED STUFFS

M. Sarwar, M. A. Shahzad, M. Nisa, S. A. Bhatti and N. A. Tauqir

Institute of Animal Nutrition and Feed Technology, University of Agriculture, Faisalabad, Pakistan
Correspondence: drms01@gmail.com

ABSTRACT

Livestock farming is considered the backbone of Agriculture sector and its contribution in the Pakistan's economy can't be neglected, as contribution by this sector in overall Agriculture and national economy is more than 53 and 11%, respectively. Out of 32 billion liters of annual milk produced in the country, buffaloes share more than 65%. Milk production by buffaloes can be enhanced by addressing the issues like imbalance and poor nutrition, the main constrains to exploit the real potential this animal inherits. Available feed resources indicate that ruminants are deficient of 38% crude protein and 26% total digestible nutrients. In addition to two fodder shortage periods, high fiber and low nutrient profile and digestibility of available feedstuffs further worsen the nutrient availability index. Improving nutritive profile and utilization of low quality fodder/forages/ fibrous crop residues through various means may be used as a toll to narrow down the gap between nutrient availability and demand. Numerous ways and means to improve the nutritional aspects of fibrous stuffs have been documented with varying degree of success. Treatment of Jambo grass, mott grass and oat fodder with 2% molasses and its ensiling for 30 days has successfully replaced the conventional fodders in the diets of lactating buffaloes. Berseem and lucerne fodders ensiled at 30% DM level with 2% molasses also replaced the conventional leguminous fodder in the diets of lactating buffaloes. Increased crude protein, intake and digestibility of straw treated with 5% urea and 6% acidified cane molasses have been reported in buffaloes. It was further noticed that inclusion of treated straw and corncobs in lactating buffalo ration reduced 50% concentrate. In fodder shortage periods, wheat straw treated with urea and ensiled with acidified molasses may be used in animal diet as substitute of green fodder. Wheat straw treated with manure (at the rate of 30% DM weight of wheat straw) and urea (at the rate of 4% DM weight of wheat straw) and ensiled with molasses (at the rate of 4% DM weight of wheat straw) for 40 days under anaerobic condition can be used as concentrate source in the diet of buffalo for better milk production and growth. This brief article recapitulates the potential effects of different treatments to fibrous stuffs aimed to improve its nutritive profile and utilization in lactating buffaloes.

Key words: Buffalo productivity, nutrition, treated fibrous stuff

INTRODUCTION

Ruminant animals have worth mentioning share in agriculture, the backbone of Pakistan's economy, by virtue of its excellent services especially provision of milk and meat to rapidly growing human population (Sarwar *et al*., 2002a). This sector accounts for more than 53% of agricultural GDP and 11% of total GDP. More than 34 million rural population is engaged in this sector for their livelihood. Foreign exchange earning from this sector is Rs. 53 billion which accounts for 11% of over all foreign exchange earnings of the country. Annual milk production in the country is more than 32 billion liters. Despite that per capita availability of milk and meat is not more than 180 lit. and 20 kg respectively, which is far below the recommendations of WHO. Ever increasing human population further widens the gap between demand and supply of milk and meat.

Yearly increase in milk and meat is due to increase in ruminant animal number (horizontal expansion) rather than their productivity (vertical expansion). After genetics, animal productivity is at the mercy of balance nutrition. Nutritional requirements are mainly met through fodder crops, shrubs, grasses and agro-industrial by products (Sarwar *et al*., 2002b). These feedstuffs are also low in protein, minerals, energy, and digestibility and high in fiber. Fodder scarcity periods during hot summer and cold winter also hamper animal productivity. Manipulation of better nutrition can perk up the animal productivity upto 50% with the existing gene pool as our animals are getting just 62 and 74% of the required CP and TDN, respectively.

Under these circumstances, efficient utilization of existing feed resources and improvement in nutritional value of fodder / forages / fibrous crop residues through various chemical and biological means can increase their nutritive value and thus offers a promising tool to reduce the gab between nutrient availability and demand (Sarwar *et al*., 2002b). This paper briefly reviews some practical means to improve the fodder / forages / crop residues and their impact on milk and calf crops.

Livestock production and feeding scenario: Livestock population is more than 160 million heads and is proliferating at the rate of 2% per annum. At present, more than 32 billion liters milk is produced annually in the country, 70% of which is produced by buffaloes. On an average the age at first breeding in cattle and buffalo is 3 and 5 years, respectively. While in developed countries heifers are usually bred at 14 month of age (Sarwar *et al*., 2002a). Late age of maturity significantly reduces the productive life span of a dairy animal. Low milk yield, reproductive inefficiency, delayed maturity and poor animal growth rate are the consequences of poor and imbalance nutrition (Shahzad *et al*., 2011).

Available feed resources are categorized into fodder crops, range vegetation, crop residues and non-conventional feeds and industrial byproducts. Livestock are getting 50.7, 37.85, 6.10, 2.35 and 3% of their total nutrient requirements from crop residues, fodders, cereal by-products, oilcakes and other wastes, respectively (Fig.1.). In irrigated areas about 85 to 90% nutrient requirements are derived by fodder crops (Bulla *et al*., 1977). Available cultivation land for fodder production (14%) has strong competition with cash crops and is decreasing @2% per decade. Two scorching period (May and November) of fodder scarcity further adversely affects the livestock productivity. Crop residues like wheat straw, rice straw, barley straw, corn stovers and gram straw are also used as animal feed (Sarwar *et al*, 2002b). Due to low energy, protein, minerals and digestibility, they couldn't narrow down the gap between nutrient availability and supply.

At present about 60% of the total area of the country is rangelands. About 60% of nutrients requirements of sheep and goat are met through rangelands (Zaffruddin, 1977). Particularly, in Baluchistan about 90% of required nutrients are met by rangelands (Younis, 1997). Rangelands are not efficiently utilized by livestock due to poor management, rainfall, soil fertility and presence of some toxic plant species.

Rapidly growing human and livestock population is constantly decreasing the land available for fodder production. In this regards, strong struggle to explore the new feed resources has opened a new horizon for livestock feed sources, referred as non-conventional feed resources. It includes various non-conventional feeds like molasses, sugar cane pith, rice polishing, hulls, maize gluten, maize bran, corn steep liquor, enzose, farm yard manure and urea feeding. However, these feedstuffs are not as resourcefully used by farmers as it should be, probably due to lack of extension services and some technical aspects involved in their use.

Ensuring nutrient availability for enhanced buffalo productivity: Strong struggle to explore new feed resources and efficient utilization of existing feed stuff are considered the grave need of time as the current feedstuff availability and feeding scenario indicate that animals are not getting the required crude protein and total digestible nutrients. Improvement in nutritive value of available fodder / forages / crop residues through chemical and biological means offers a considerable potential to minimize the gab between nutrient availability and demand (Sarwar *et al*., 2004; Nisa *et al*., 2004). Urea molasses treatment to fibrous crop residue like wheat straw and corn cobs has earned good name not only in improving nutritive value but also their efficient utilization in animal body (Table 1, 2, 3 and 4). Urea and molasses treatment to wheat straw has increased its nutritive value and digestibility (Nisa *et al*., 2004 b; Sarwar *et al*., 2005). The 5% urea treated wheat straw ensiled with 6% acidified cane molasses or corn steep liquor for 15 days under anaerobic conditions has improved crude protein contents, increased digestibility, intake of straw and thereby increased milk production in buffaloes (Nisa *et al*., 2004a,b). Inclusion of treated straw and corncobs reduced the 50% concentrate in the diets of lactating buffaloes. Urea treated wheat straw ensiled with organic acid also increased dry matter and neutral detergent fiber digestibilities in buffaloes (Table 5). During periods of fodder scarcity wheat straw treated with urea and ensiled with acidified molasses could be used as a promising alternate to green fodder.

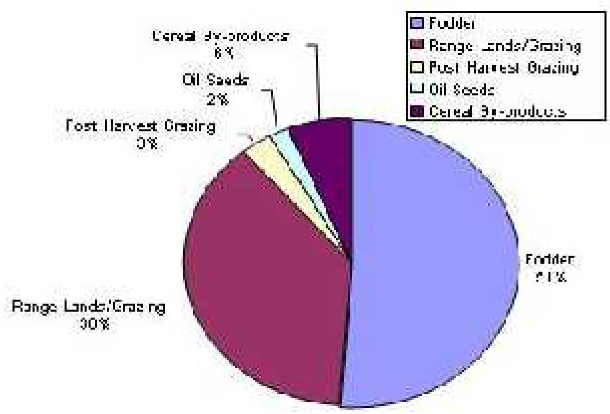

Figure 1. Feedstuff Available for Livestock Feeding

Table 1. Chemical composition of urea treated corn cobs ensiled with or without use of enzose

Parameters (%)	UT	UET
Dry matter	74.2	74.0
Crude protein	8.15	14.25
Neutral detergent fiber	79.1	84.2
Acid detergent fiber	52.5	53.0
Hemicellulose	27.0	31.1
Cellulose	47.0	48.1
Acid detergent lignin	4.8	4.8
Ash	2.1	2.1

UT and UET represent 5% urea treated corncobs ensiled without and with 5% enzose, respectively.

Table 2. Influence of urea treated wheat straw on dry matter intake and milk yield in buffaloes

Items, Kg/d	WS35	WS45	WS55	WS65	SE
Dry matter intake	11.9	11.6	11.2	11.9	0.50
Milk Yield	10.64	13.20	12.91	13.49	1.42

Means within the same row having different subscripts differ significantly (P<0.05)
WS35 contained 35% urea treated wheat straw ensiled with 0% CSL, while WS45,WS55 and WS65 contained 45,55 and 65% urea treated wheat straw ensiled with9% CSL.

Table 3. Dry matter intake, digestibility, nitrogen balance and daily weight gain in sheep fed diets containing urea treated corn cobs ensiled with or without enzose

Items	UT30	UET30	UET35	UET40	SE
Dry matter, Kg/d	0.82[b]	0.93[b]	1.13[a]	1.36[a]	0.13
Digestibility, %	66.6[b]	70.7[a]	71.6[a]	72.0[a]	0.41
Nitrogen balance,%	7.02[c]	9.08[c]	10.9[b]	13.4[a]	2.90
Daily weight gain,g/d	160[c]	180[c]	220[b]	270[a]	40.0

UT30 diet contained 30% DM from urea treated corn cob ensiled without enzose; UET30,UET35 and UET40 diets contained 30,35 and 40% DM from 5% urea treated corn cobs ensiled with 5% enzose, respectively.
Means in the same row followed by the same letter are not significantly different at *P=0.05*.

Table 4. Influence of urea treated corncobs on dry matter intake and milk yield in cross bred cows

Items	Treatments					
	Control	UTC40	UTC50	UTC60	UTC70	SE
Dry matter intake kg/d	10.9[a]	10.7[a]	11.9[b]	12.1[b]	12.2[b]	0.6
Milk yield, 4% FCM	10.41	13.11	12.61	13.52	13.67	1.01

Means within the same row having different subscripts differ significantly (P<0.05).
Control contained 30% urea treated corncobs ensiled with 0% enzose while UTC40, UTC50, UTC60 and UTC70 contained 30,40,50,60 and 70% urea treated corn cobs ensiled with 6%enzose, respectively.

Table 5. Nutrients intake and digestibilities in buffalo bulls fed diets containing urea treated wheat straw ensiled with acetic acid, formic acid, acidified molasses and corn steep liquor

Nutrients	AD	FD	MD	CD	SE
Dr matter intake, g/d	8000	8041	8011	8021	659
Digestibility, %	56.0[a]	56.0[a]	60.2[b]	60.0[b]	0.97
Organic matter, g/d	6376	6408	6384	6392	563.1
Digestibility, %	58.2[a]	59.2[a]	61.9[b]	63.1[b]	5.71
Crude protein,g/d	1072	1077	1073	1074	612.11
Digestibility, %	66.0	67.0	68.01	69.01	5.61
Neutral detergent fiber	4288	4229	4365	4219	450.12
Digestibility, %	52.7[a]	55.0[a]	58.0[b]	62.0[b]	6.01

Means in the same row followed by the same letter are not significantly different at *P=0.05*
AD, FD, MD and CD contained 4% urea treated wheat straw ensiled with acetic acid, formic acid, acidified molasses and corn steep liquor, respectively.
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Table 6. Chemical composition of wheat straw and manure fermented wheat straw

Parameters (%)	Wheat straw	Fermented wheat straw
Dry matter	90.70	60.5
Crude protein	3.90	15.1
True protein	0.23	9.61
Neutral detergent fiber	85.10	32.20
Acid detergent fiber	51.21	19.9
NE_L(Mcal/kg)	1.02	1.47

Wheat straw treated with manure(@ of 30% DM of wheat straw) and urea (@4% DM weight of wheat straw) and was ensiled with molasses (@ 4% DM wheat of wheat straw) for 40 days in cemented pit.

Table 7. Influence of varying level of manure fermented wheat straw on dry matter intake, nitrogen balance and daily weight gain in buffalo calves

	FWS 0	FWS15	FWS25	FWS35	SE
Dry matter, Kg/d	4.25[c]	4.85[b]	5.75[a]	5.94[a]	0.35
Nitrogen balance, g/d	25.45[c]	28.06[b]	31.79[ab]	32.05[a]	3.46
Daily weight gain, g/d	495[c]	572[b]	645[a]	672[a]	22.50

In FWS0, FWS15,FWS25 AND FWS 35, concentrate was replaced with 0,15,25 and 35% fermented wheat straw, respectively.
Means within the same row having different superscripts differ significantly at *P=0.05*.

Table 8. Influence of varying level of manure fermented wheat straw on dry matter intake, digestibility and milk yield in lactating buffaloes

	FWS 0	FWS15	FWS25	FWS35	SE
Dry matter, Kg/d	8.83	10.51	9.32	7.95	0.47
Digestibility, %	60.76	63.26	60.33	59.60	1.97
Milk yield, kg/d	9.16	9.81	9.98	10.08	0.35

Means within the same row having different superscripts differ significantly at *P=0.05*
In FWS0, FWS15, FWS25 AND FWS 35, concentrate was replaced with 0, 15, 25 and 35% fermented wheat straw, respectively.
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Fermentation of wheat straw with cattle manure also increased its nutritive value (Table 6). The chemical analysis of fermented wheat straw revealed that 4% urea and 4% molasses treated wheat straw fermented with cattle manure for 40 d, improved the crude protein content (Sarwar *et al*., 2006). The performance of growing calves implied that fermented wheat straw replaced 30 % concentrate in the diet of growing calves without any ill effects on their performance (Table 7). Likewise, another trial indicated that urea molasses treated what straw fermented with cattle manure did not affect the nutrient intake, digestibility and milk yield when substituted for concentrate up to 30% DM in lactating buffalo ration (Table 8.). These technologies not only increased the nutrient availability round the year for livestock but also provided an opportunity for cost effective farming. Introduction of high yielding, drought and disease tolerant fodder varieties can also be an important tool to cope with the problem of under feeding. Moreover, growing / feeding grasses and legumes in combination have improved efficiency of soil nutrient utility in addition to improved milk yield in lactating buffaloes. Harvesting fodder crops at proper stage of maturity can also increase the nutrient supply. Moreover, application of nitrogen fertilization to fodder crops also increased their nutritive value (Nisa *et al*., 2000). Ensiling the main grasses, during their surplus availability, to maintain their nutritional quality could also be an important consideration in this regard. Sometimes mature grasses are also ensiled with urea or molasses to increase their nutritive value for livestock. Application of nitrogen fertilizer has also improved the nutritive value of mott grasses. Ensiling of Jambo grass, mott grass and oat fodder with 2% molasses for 30 days could safely replace the conventional fodders in the diets of lactating buffaloes. Berseem and lucerne fodders ensiled at 30% DM level with 2% molasses could safely replace the conventional leguminous fodder in the diets of buffaloes (Sarwar *et al*., 2005b) .Wheat straw can be used to attain 30% DM before ensilation of legume fodder. This technique has not only preserved the fodder but it has also enhanced the nutritive value of wheat straw used as moisture absorbent. Wheat straw treated with manure (at the rate of 30% DM weight of wheat straw) and urea (at the rate of 4% DM weight of wheat straw) and ensiled with molasses (at the rate of 4% DM weight of wheat straw) for 40 days under anaerobic condition can be used as concentrate source in the diets of buffalo and cattle for better milk production and growth (unpublished research).

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