

The Comparison of In Vitro Digestibility of Wheat Straw By Rumen Microorganism of Khuzestani Buffalo and Hostein Cow

In Vitro Digestibility by Khuzestani Buffalo

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Abstract—The objective of this study was to compare the *in vitro* digestibility of wheat straw by rumen microorganisms of water buffalo of Khuzestan in Iran and Holstein cow. *In vitro* digestibility of dry matter (DM) and neutral detergent fiber (NDF) was measured by procedure of Tilley and Terry. The results of this experiment indicated that the DM digestibility of wheat straw by rumen microbial population of Khuzestani buffalo was higher than that by rumen microorganism of Holstein cow (49.35 and 40.14 g/100 g, respectively) ($P<0.05$). Neutral detergent fiber digestibility of wheat straw was 46.71 and 30.89 g/100 g for rumen microbial population of buffalo and cow, respectively ($P<0.05$). Therefore, under the same diet, the DM and NDF digestibility by rumen microorganism of Khuzestani buffalo was 1.22 and 1.51 folds higher than Holstein cow, respectively.

Keywords- Fiber digestion, Buffalo, Rumen microorganism

I. INTRODUCTION

Many authors have reported that buffalo digest fibrous feeds more efficiently than cattle, particularly with diets which have a high proportion of cellulose [2]. There are probably several reasons why the buffalo is more efficient, including: ruminal characteristics being more favourable for utilization of ammonia-nitrogen, less inhibition of cellulose digestion by soluble carbohydrates, superior ability to handle stressful environments and adaptation to a wider range of roughage sources [12]. Many workers have carried out *in vitro* comparisons between the rumen fermentative processes of buffalo and cattle. The researchers [14] studied the influence of the rumen fluid source (Philippines cattle and buffalo) on *in vitro* true dry matter digestibility of forages, and reported that the digestibility was the same for the two inocula if the donor animals were consuming the same diet. The rumen of buffaloes is well adapted to utilize the lignocellulosic residues [1]. It has been reported that when cattle and buffaloes were kept under similar conditions, buffaloes utilized feeds more efficiently (about 2-3%) than cattle [10]. Any variations between cattle and buffalo in proportions and numbers of ruminal bacteria, protozoa and fungi might contribute to the explanation of differences in

digestive capability due to fermentation end products available for absorption and utilization by ruminants. Wanapat et al [11] found higher total bacterial count and cellulolytic bacteria in buffalo than in cattle. The aim of this study was to compare the *in vitro* digestibility of wheat straw by rumen microorganisms of water buffalo of Khuzestan in Iran and Holstein cow.

II. MATERIAL AND METHODS

A. In Vitro Digestibility

The *in vitro* procedure was modified from that reported by Tilley and Terry (1963) [5]. Ruminal fluid was collected from two Holstein and buffalo were fed a 30:70 concentrate: forage (corn grain, barley grain and wheat bran: sugarcane silage, corn silage, alfalfa hay and wheat straw) by stomach tube in prior to the morning meal, homogenized in a laboratory blender, filtered through four layers of cheese-cloth, which was maintained in a water bath at 39 °C. 40 ml of McDougall's artificial saliva [4] and 10 ml of strained ruminal fluid were added to each tube. About 500 mg experimental sample (1.0 mm screen, wheat straw), then was mixed with McDougall buffer in a ratio 1:4. After gasifying with CO₂, tubes were incubated at 39 °C. After 48 h the fermentation, 6 ml of HCl solution (20 %) and 5 ml pepsin solution were added and the incubated for 48 h stimulating post-ruminal degradation.

B. Calculation and statistical analysis

After incubation, the residual substrates were collected from each tube, after washing twice with distilled water followed by filtration using grade 1 sintered glass crucibles. They were then dried in oven to constant weight for DM determination. The dry matter disappearance of each sample was calculated as the difference between initial and the residual weight of the dried substrate. Content of neutral detergent fibre (NDF) of samples were determined from the dried samples using the method of [13], and losses of each sample were calculated as the difference between initial and the residual weight of the dried substrate.

Data of DM and NDF disappearance were analyzed as a completely randomized design using the General Linear Model (GLM) procedure of SAS [15]. Duncan's multiple range test was used to compare treatment means at ($P < 0.05$).

III. RESULT AND DISCUSSION

Data of DM and NDF disappearance during the incubation periods are given in Table 1. The results of this experiment indicated that the DM digestibility of wheat straw by rumen microbial population of Khuzestani buffalo was higher than that by rumen microorganism of Holstein cow ($P < 0.05$). Neutral detergent fiber digestibility of wheat straw was 46.71 and 30.89 g/100 g for rumen microbial population of buffalo and cow, respectively ($P < 0.05$). This was digestibility different due to differences in the composition and activity of the microflora between the buffalo and cow [16]. However, the others [13] suggested that, although the cow has a smaller fibrolytic rumen bacterial population than the buffalo, this was compensated for by the higher fibrolytic fungal population in the cow rumen compared with the buffalo. In contrast Sadhana *et al* [18] found that the cellulolytic bacterial population was approximately three times higher in buffalo compared with cattle fed straw-concentrate diets and that cellulolysis started earlier in buffalo. A similar result was also obtained by [8]. The workers reported higher ruminal bacteria numbers in cattle than in buffalo when fed a diet with high fibre content [17].

The studies showed that the rumen of the buffalo harbored active populations of ciliate protozoa and bacteria than those of cow [9]. It is verified higher *in vitro* cellulose digestion in the rumen fluid of buffalo's faunated than that in ciliate-free. The protozoa would be responsible for 34% of total rumen microbial fiber digestion [6]. The researchers [7] observed that there was a significant increase in the digestibility of lignocellulose (3 to 10%) due the presence of rumen ciliate protozoa.

IV. CONCLUSION

Therefore, *in vitro* fiber digestion activity of total rumen microbial of Khuzestan water buffalo was higher in compared with Holstein cow under the same diet. The DM and NDF digestibility by rumen microorganism of Khuzestani buffalo was 1.22 and 1.51 folds higher than Holstein cow, respectively

TABLE I. DIGESTIBILITY OF WHEAT STRAW BY TOTAL RUMEN MICROBIAL OF KHUZESTAN WATER BUFFALO AND HOLESTINE COW

	<i>MRB</i>	<i>CMR</i>	<i>SEM</i>	<i>P</i>
DM	49.35 ^a	40.14 ^b	0.2	<0.05
NDF	46.71 ^a	30.89 ^b	0.3	<0.05

BTRM: Buffalo rumen microorganisms

CTRM: Cow rumen microorganisms

S.E.M: standard error of mean, means within each column with different letters are significantly different ($P < 0.05$).

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