

***In Vitro* Evaluation of Wheat Straw, Urea and Tapioca Rations**

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ABSTRACT

The effect of supplementation of urea and tapioca in varying levels on the wheat straw by ruminal microflora of buffalo bulls was studied by *in vitro* technique. Dry matter digestibility was significantly increased at 2 per cent urea with 10 per cent tapioca. No significant difference was observed among three levels of urea with 20 per cent tapioca. Cellulose digestibility was highest with 2 per cent urea and 10 per cent tapioca. Higher levels of urea with 10 per cent tapioca and higher amount of tapioca with three levels of urea lowered the cellulose digestibility. Gradual increase in TVFA production was observed with three levels of urea and two levels of tapioca. The pH values were within the range and had no effect of treatments.

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INTRODUCTION

Low grade roughages like cereal straws and mature pasture grasses form the main bulk of ration for livestock in India. The low grade roughages supplemented at a small cost can very well be improved in their nutritive value. *In vitro* evaluation of utilization of urea nitrogen in connection with cellulose digestibility have been studied by various workers (Bentley, Johnson, Venecko and Hund 1954, Ichhponani and Sidhu, 1966 and Mishra, 1969).

An attempt was made to study the improvement in the nutritive value of wheat straw when supplemented with urea and easily available carbohydrate source-tapioca in various proportions.

MATERIALS AND METHODS

Two fistulated *Surti* buffalo bulls (castrated) were maintained on 5 kg. green lucerne and wheat straw *ad lib*.

for collection of ruman liquor. Rumen liquor was collected 5 hours after morning feeding as per the method described by Pant, Rawat and Roy (1962). Proximate analysis of wheat straw and tapioca was carried out as per AOAC (1970) methods. Cellulose content was estimated by the method of Crampton and Maynard (1938). Treatment combinations are given in Table 1.

All glass *in vitro* technique recommended by Baumgardt, Taylor and Cason (1962) was followed. Dry matter digestibility (DMD), Cellulose digestibility (CD), production of total volatile fatty acids (TVFA) and pH were studied. Estimation of TVFA was done by standard steam distillation method. Statistical analysis of results was carried out as per Snedecor and Cochran (1968).

RESULTS AND DISCUSSION

Proximate analysis of wheat straw and tapioca revealed that the crude

TABLE 1

In vitro dry matter and cellulose digestibility, TVFA production and pH values (rumen liquor) of wheat straw, urea and tapioca in different proportions.

Treat No.	Substrate combinations (proportion in mg)	Dry matter digestibility (%)	Cellulose digestibility (%)	TVFA production mg/100 ml of fermentation mixture	pH values of fermentation mixture
T ₁	Wheat straw alone (1000)	35.29	34.83	135.0	6.72
T ₂	Wheat straw : Urea : Tapioca (890 : 10 : 100)	41.79	40.21	169.5	6.68
T ₃	Wheat straw : Urea : Tapioca (880 : 20 : 100)	44.17	44.69	190.5	6.80
T ₄	Wheat straw : Urea : Tapioca (870 : 30 : 100)	43.16	37.54	201.0	6.95
T ₅	Wheat straw : Urea : Tapioca (790 : 10 : 200)	45.78	37.67	214.5	6.72
T ₆	Wheat straw : Urea : Tapioca (780 : 20 : 200)	46.65	38.32	247.5	6.72
T ₇	Wheat straw : Urea : Tapioca (770 : 30 : 200)	46.02	40.37	234.0	6.77

protein, crude fibre and NFE contents were 3.59, 3.01; 34.46, 2.13; and 49.73 and 91.46 per cent, respectively. Cellulose content was 37.46 and 5.34 per cent respectively in wheat straw and tapioca.

The average results of all the parameters are shown in Table. 1.

Dry matter digestibility (DMD):

From the results in Table 1 it is revealed that the DMD of wheat straw is 35.29 per cent. In treatments T₂ and T₃ where urea formed 1 and 2 per cent of substrate combinations and tapioca formed 10 per cent, it was observed that the DMD was increased by about 18 and 25 per cent over T₁ respectively. In T₄ the urea and tapioca formed 3 and 10 per cent of substrate combinations, respectively and increase in DMD was about 22 per cent over T₁. Thus, the rate of increase in DMD in T₄ was reduced to some extent. In T₅, T₆ and

T₇ where 1, 2 and 3 per cent urea was added with 20 per cent tapioca, the DMD was increased by about 29.7, 32.2 and 30.4 per cent over T₁. Here again with 3 per cent urea and 20 per cent tapioca there was a slight reduction in DMD as compared to 1 and 2 per cent urea. With both the levels of tapioca 2 per cent gave better results than 3 per cent urea. All the treatments were differing significantly from T₁. With 20 per cent tapioca there was no advantage in increasing levels of urea.

Cellulose Digestibility (CD):

Cellulose digestibility of wheat straw alone was 34.83 per cent and all the treatments had significantly higher digestibility than T₁ i.e. wheat straw alone. The highest CD was obtained in T₃ i.e. 2 per cent urea and 10 per cent tapioca. This combination had a better DMD than others also. Comparison of

T₂, T₃ and T₄ where urea was added at 1, 2 and 3 per cent levels and tapioca at 10 per cent showed that the CD was significantly higher in T₃ than in T₂ and T₄. In fact in T₄ the CD was depressed to a great extent. Comparison of T₅, T₆ and T₇ revealed that there was no significant increase in T₆ than T₅ but T₇ had significantly higher digestibility than T₅. In short, the best combination for CD was found to be T₃ in this experiment.

Production of TVFA:

From the results it can be seen that the TVFA production from wheat straw alone was 135 mg per 100 ml of fermentation mixture. With increasing levels of urea there was a gradual increase in the TVFA production but with a decreasing rate. The highest TVFA production was found with 2 per cent urea and 20 per cent tapioca. The rate of increase in TVFA production was more pronounced from T₂ to T₃ as compared to T₃ to T₄. It was noted that 2 per cent urea added with 10 per cent and 20 per cent tapioca could perform well. It should be noted that the higher amount of TVFA production with 20 per cent tapioca may be due to higher amount of soluble carbohydrates in tapioca and its better utilization than cellulose.

pH values:

In general it was observed that the supplementation of wheat straw with 1, 2 and 3 per cent urea having 10 and 20 per cent tapioca could not bring any significant change in the pH values.

The improvement in the DMD of wheat straw as observed under the present study due to the supplementation of urea and tapioca was also obtained by Ichhponani and Sidhu (1966). However, they had not provided easily available carbohydrate source. Similarly Mishra (1969) also observed improvement in the DMD on supplementation of 1.8 per cent urea and 6 per cent each of tapioca and molasses on bajra straw.

As far as cellulose digestion is concerned it was improved to the maximum extent by 2 per cent urea and 10 per cent tapioca additions. Further additions of urea and tapioca did not prove beneficial. Bentley *et al.* (1954), Ichhponani and Sidhu (1966) and Ichhponani, Makkari and Sidhu (1971) also found improvement in the cellulose digestion on Urea supplementation. Latter workers found that the addition of higher amount than 25 mg (in addition to the 58 mg in basal medium) depressed the CD. This is in line with the results obtained under the present study.

Production of TVFA increased with Urea and tapioca additions and the similar increase was observed by Mishra (1969) with bajra straw. Ichhponani *et al.* (1971) also observed increased TVFA production from wheat straw on addition of urea to incubation media.

The over all results revealed that the improvement in nutritive value of wheat straw can be brought about by the supplementation with urea and tapioca.

or easily available carbohydrate source. From the results it can be seen that addition of 2 per cent urea and 10 per cent tapioca was found to be beneficial.

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