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# INFLUENCE OF VARYING LEVELS OF TOASTED GUAR MEAL ON THE DIGESTIBILITY OF MIXED RATION FOR DRY SAHIWAL COWS

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## INTRODUCTION

During the dry period, cows are usually fed on poor pasture or roughage, which can hardly meet their maintenance requirements. This practice generally results in poor yield in the subsequent lactation. Under such conditions, the use of some cheaper and efficient supplement is of great importance. Guar meal (Cyamopsis psoraloides) is a low price protein supplement which is available in West Pakistan in large amounts viz. 45,000 tons annually (3). Sidaway (7) reported that the average digestibility of crude protein of guar grains was 85.3 per cent. However, the feed consumption was observed to be less, perhaps due to its poor palatability. Allauddin *et al.* (1) compared guar meal and undecorticated cottonseed cake at different levels viz. 0, 16, 24, 32 and 40 per cent in old bullocks fattening trials and found non-significant differences in weight gain and feed efficiency. In sheep fattening experiment, Irshad *et al.* (4) used guar meal by replacing equal amount of cottonseed cake at 0, 10, 20 and 30 per cent levels. It was found that guar meal gave better results than cottonseed cake as regards weight gain and feed efficiency. They further concluded that the digestibility of protein increased with the icrease in protein content of the ration. Islam *et al.* (5) found statistically non-significant differences between treated and untreated guar meal at 14 per cent level in digestibility trials, conducted with Sahiwal cows. The digestion co-efficient of crude protein and total digestible nutrients of the two types of the meal was 37.2, 37.9 and 68.3, 70.9 per cent, respectively. The results of the study also indicated that nitrogen balance was negative in cows, fed on basal ration, a typical ration in Pakistan. This indicated that such a ration does not provide enough protein for maintenance. The guar meal being low cost protein supplement, when used at higher level in livestock rations, would make them economical. It is, therefore, of great significance to establish an optimum level of such a cheaper and high protein source in dry cows rations. The study under report was conducted to determine the effect of varying levels of toasted guar meal on the digestibility of different nutrients of the mixed ration for dry cows.

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## MATERIALS AND METHODS

Four digestion trials were conducted on four dry Sahiwal cows of approximately same age and body weight. Four rations were formulated (Table I) and were randomly alloted to the experimental animals. They were fed according to the maintenance requirements of the cows, as fixed by Morrison (6). The basal ration was a conventional ration and was designated as control (Ration A). Toasted guar meal was added to the basal ration at the cost of green roughage at 15, 20 and 25 per cent levels (Rations B, C and D, respectively). The experiment was designed as 4x4 latin square. The rations were changed in a cyclic order so that each ration was fed to each cow once in each trial. Fresh and clean water was provided to the animals at all times. Common salt was available to all the cows in lumps for free choice licking. The animals were also given a light exercise daily. The cows were weighed at the start of each trial and then every day, thereafter, in the morning at the same time during the collection period.

TABLE I

*Composition of Experimental Rations*

| Ingredients | Rations | | | |
|---|---|---|---|---|
| | A | B | C | D |
| Berseem green (%) | 75 | 60 | 55 | 50 |
| Wheat straw (%) | 25 | 25 | 25 | 25 |
| Toasted Guar meal (%) | — | 15 | 20 | 25 |
| Total | 100 | 100 | 100 | 100 |

Each trial was divided into preliminary and collection periods of seven and three days, respectively. During the preliminary period the animals were fed on weighed amount of allotted rations and quantity of daily feed consumed was recorded. During the collection period the faeces were collected from each animal manually, immediately after being voided, and were kept separately in galvanised iron cans. Total faeces voided, during 24 hours by each cow were recorded. Representative samples of feed and faeces were drawn. The composite faecal samples of each animal were analysed for dry matter, crude protein, ether extract, crude fibre and total ash, according to A.O.A.C. Standard Methods (2), during each trial. The digestion coefficients of crude protein, ether extract, crude fibre and nitrogen-free-extract were calculated and were statistically analysed using Analysis of Variance and the results were compared by Duncan's Multiple Range Test (8).

## RESULTS AND DISCUSSION

The data on the digestibility coefficients of different nutrients i.e. crude protein (C.P.), ether extract (E.E), crude fibre (C.F) and nitrogen-free-extract (N.F.E) are summarized in Table II.

TABLE II

*Digestibility Coefficient Data*
(Average of four trials)

| Ration | Guar meal (%) | C.P. | E.E. | C.F. | N.F.C. |
|---|---|---|---|---|---|
| A | 0 | 39.5 | 66.2 | 53.3 | 61.3 |
| B | 15 | 61.0 | 59.8 | 46.4 | 55.2 |
| C | 20 | 59.8 | 71.9 | 54.1 | 65.5 |
| D | 25 | 74.2 | 68.8 | 42.5 | 50.1 |

The digestibility of crude protein of the basal ration was 39.5 per cent which was significantly lower than the digestibility of rations when guar meal was substituted at the cost of green roughage at 15, 20 and 25 per cent levels. The maximum digestibility of crude protein (74.2 per cent) was observed in case of ration containing 25 per cent guar meal. The digestibility of ether extract in case of ration containing 20 per cent guar meal was 71.9 per cent. But the ration containing 25 per cent guar meal had lower digestibility of ether extract, which was still higher than that of control ration. The ration containing 15 per cent guar meal exhibited poor digestibility of ether extract. The differences in the digestibility of ether extract of different rations were, however, statistically non-significant.

The digestibility of crude fibre of the control ration was 53.3 per cent. The addition of 15 per cent guar meal depressed the crude fibre digestibility (46.4 per cent); but it was observed to be 54.1 per cent at 20 per cent guar meal level. The addition of 25 per cent guar meal again depressed the crude fibre digestibility which was lower than the control ration. The differences among the crude fibre digestibility were, however, statistically non-significant. The digestibility coefficient of nitrogen-free-extract of the control ration was 61.3. The addition of 15 per cent guar meal depressed the nitrogen-free-extract digestibility (55.2 per cent) but it was observed to be 65.5 per cent at 20 per cent guar meal level. The addition of 25 per cent guar meal again depressed the nitrogen-free-extract digestibility which was lower than the control ration. The differenes were, however, statistically non-significant.

The results indicated that guar meal can be used up to 25 per cent in the ration of dry cows without any ill-effect on the digestibility of different nutrients. The results further revealed that the digestibility of crude protein of the sole roughage ration can be

improved by the addition of guar meal and the increase in the level of guar meal promoted a corresponding increase in the crude protein digestibility.

## SUMMARY

Four digestion trials were conducted on dry Sahiwal cows to determine the effect of varying levels of toasted guar meal on the digestibility. The results indicated that the digestibility of crude protein was improved significantly by the addition of 15, 20 and 25 per cent guar meal to the sole roughage ration. The digestibility of ether extract, crude fibre and nitrogen free extract was, however, not affected significantly.

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# NUTRITION et SYSTEMES d'ALIMENTATION de la CHEVRE

## *NUTRITION and SYSTEMS of GOAT FEEDING*

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# EFFECT OF DIETARY UREA ON FEED INTAKE, DIGESTIBILITY AND MILK YIELD IN BEETAL GOATS

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## INTRODUCTION

Growing scarcity and cost of conventional protein supplements i.e. cereals and oil cakes has necessitated exploration of economical protein substitutes. Non-protein nitrogen from various sources in general and from urea in particular has been successfully used in many ruminants rations. The present project was planned to study the possibility of stall feeding of milking goats with urea rations.

## MATERIALS AND METHODS

Eighty goats of similar age and body weights were divided into four groups of 20 each. Each group was given a concentrate ration containing 0, 1, 2 and 3 % urea. Besides they were also offered chopped green berseem (Trifolium alexandrium). The experiment lasted for 15 days, preliminary period followed by a 63 days feeding and milking period. Daily records for feed consumption and milk yield were maintained. Composition of the concentrate ration is shown in table 1.

For digestibility trials six animals from each group were randomly selected and put in individual pens. They were fed respective rations for 15 days, during which period their daily total faeces were collected in plastic containers. The 24 hours faeces were weighed and homogenised and a 200 g sample was collected and dried at 105° C for further analysis.

Proximate analysis of feed and faeces and Babcock's centrifugal test for milk fat were performed according to A.O.A.C. (1971). The results were statistically analysed by analysis of variance.

## RESULTS AND DISCUSSION

The mean intake and percent digestibility of various nutrients is shown in table 2. The intake of concentrate ration, green fodder and total dry matter was decreased ($P<0.05$) with 3 % urea supplemented ration as compared with control or lower levels of urea rations. The TDN intake with 3 % urea supplemented ration declined 30 % but increased by 12.6 % with 1 % urea supplemented ration as compared to that of the control ration.

Apparent digestibility of most of the nutrients was not changed by urea supplementation. However the digestibility of NFE was maximum with ration containing 1 % urea. Though not statistically significant still the digestibility of other nutrients also tended to be higher with 1 % urea supplementation and depressed when urea level was raised to 3 %.

In earlier studies of digestibility and intake of nutrients from rations containing alkali-treated straw (Ali and Sorensen, 1979) or roughage based diets (Bhattacharya and Pervez, 1967) of sheep with different levels of urea did not change the digestibility or intake of nutrients. However when straw was the only food offered to ruminants (Campling et al., 1962 ; Winter and Pigden, 1971) the addition of urea

as a source of supplemental nitrogen resulted in increased digestibility of the dry matter and cellulose. This increased digestibility was probably based on the improvement of nitrogen status of the bacterial population of the rumen. Since in the present diet urea was not used to supplement the dietary nitrogen content but as a substitute of conventional protein, therefore, similarity in digestibility is understandable. The 19 % increase in digestibility of NFE with 1 % urea ration is probably due to proliferation of ureolytic bacteria due to availability of non-protein nitrogen and readily available energy from molasses. The ureolytic bacteria are also cellulolytic and this possibility is reflected in better digestibilities of dry matter, organic matter and crude fibre with 1 % urea containing rations.

The yield of FCM by the experimental goats fed 2 % and 3 % urea ration was significantly lower from goats fed the control or 1 % urea ration (table 3). However the FCM yield of the control and 1 % urea groups was not different. The goats fed 3 % urea ration yielded 35 % lesser FCM as compared to the control group however, they also consumed 30 % lesser TDN. The TDN conversion for FCM was best in the control group as compared to that of the urea supplemented goats ($P < 0.01$). From the results of present study it may be concluded that goats can efficiently utilize urea containing rations without any adverse effect on digestion, and intake of nutrients. Though rations containing 3 % urea had lesser intake still TDN conversion ratio for FCM was not different among urea rations. Apparently rations containing urea depress the conversion ratio of TDN and crude protein from 2 and 3 % urea rations for milk production. But if economics of using urea for conventional protein sources is taken into consideration then instead of maximum production with higher cost/kg of milk, optimum production with lower cost/kg of milk with urea ration will be more profitable for the producer.


## SUMMARY

### EFFECT OF DIETARY UREA ON FEED INTAKE, DIGESTIBILITY AND MILK YIELD IN BEETAL GOATS

Influence of urea supplementation on the intake and digestibility of various nutrients and their conversion efficiency for milk production by goats was investigated. Four groups of goats were fed experimental concentrate rations containing 0, 1, 2 and 3 % urea. Average daily intake of the total digestible nutrients by the four groups of goats were 879, 990, 913 and 618 grams. Intake of TDN was maximum with 1 % urea ration and minimum with 3 % urea ration. The supplementation of urea did not influence the digestibility of nutrients except that of the NFE which was depressed when the urea concentration was above 2 %. TDN conversion ratio for FCM was depressed with urea containing rations as compared to that of the control ration. The conversion efficiency of TDN for a kg of FCM was 586, 663, 689 and 649, respectively.

## RESUME

EFFET DE L'ADDITION D'UREE A LA RATION SUR L'INGESTIBILITE, LA DIGESTIBILITE ET LA PRODUCTION LAITIERE CHEZ DES CHEVRES BETALES

Cette étude porte sur l'influence d'une supplémentation en urée sur l'ingestion et la digestibilité de différents nutriments et sur leur efficacité de conversion pour la production laitière chez des chèvres. Quatre groupes de chèvres ont reçu des rations expérimentales contenant 0, 1, 2 et 3 % d'urée. L'ingestion moyenne des nutriments totalement digestibles (TDN) étaient, pour les quatre lots, de 879, 990, 913 et 618 grammes, respectivement. L'ingestion de TDN était maximum pour la ration contenant 1 % d'urée et minimum pour celle contenant 3 %. La supplémentation en urée n'influence pas la digestibilité des nutriments, exceptée celle de l'extractif non azoté qui est plus faible avec une concentration en urée supérieure à 2 %. Le taux de conversion des TDN pour la production laitière corrigée était plus bas avec les rations contenant de l'urée qu'avec la ration témoin. L'efficacité de conversion des TDN pour un kg de lait était respectivement de 586, 663, 689 et 649.


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TABLE 1 - *TABLEAU 1*

COMPOSITION OF THE EXPERIMENTAL CONCENTRATES

*COMPOSITION DES ALIMENTS CONCENTRES*

| INGREDIENTS *INGREDIENTS* | CONCENTRATES *CONCENTRES* | | | |
|---|---|---|---|---|
| | A | B | C | D |
| Cotton Seed Cake % (undecorticated) *Tourteau de coton non décortiqué* | 36.00 | 24.00 | 12.00 | - |
| Urea % *Urée* | - | 1.00 | 2.00 | 3.00 |
| Maize oil cake % *Tourteau de maïs* | 5.00 | 5.00 | 5.00 | 5.00 |
| Wheat Bran % *Son de blé* | 30.00 | 30.00 | 30.00 | 30.00 |
| Molasse % *Mélasse* | 5.00 | 16.00 | 27.00 | 38.00 |
| Rice Hush % *Enveloppes de riz* | 23.00 | 23.00 | 23.00 | 23.00 |
| Salt (NaCl) % *Sel (NaCl)* | 0.50 | 0.50 | 0.50 | 0.50 |
| Bone Meals % *Farine d'os* | 0.50 | 0.50 | 0.50 | 0.50 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 |

TABLE 2 - *TABLEAU 2*

THE MEAN DIGESTIBILITY AND INTAKE OF NUTRIENTS

*DIGESTIBILITE MOYENNE ET INGESTION DES NUTRIMENTS*

| Group *Lot* | A | B | C | D |
|---|---|---|---|---|
| Urea % *% urée* | 0 | 1 | 2 | 3 |
| Apparant digestibility % *Digestibilité apparente %* | | | | |
| Dry matter *Matière sèche* | 60.25 | 67.69 | 63.51 | 59.26 |
| Crude protein *Matières azotées brutes* | 61.17 | 70.27 | 66.22 | 59.27 |
| Ether extract *Extrait éthéré* | 88.39 | 91.07 | 90.87 | 87.58 |
| Crude fibre *Cellulose brute* | 60.90 | 63.78 | 59.85 | 57.64 |
| N.F.E. *E.N.A.* | 59.83$^{a}$ | 71.22$^{c}$ | 68.11$^{bc}$ | 62.74$^{ab}$ |
| Organic matter *Matière organique* | 58.20 | 62.66 | 63.55 | 60.19 |
| Intake (kg/d) *Ingestion (kg/j)* | | | | |
| Concentrate *Concentré* | 1.079$^{a}$ | 1.085$^{a}$ | 1.046$^{a}$ | 0.778$^{b}$ |
| Green Fodder *Fourrage vert* | 2.172$^{a}$ | 1.204$^{a}$ | 2.235$^{a}$ | 1.865$^{b}$ |
| Dry matter *Matière sèche* | 1.378$^{a}$ | 1.405$^{a}$ | 1.358$^{a}$ | 1.021$^{b}$ |
| Crude protein *Matières azotées Brutes* | 0.130$^{a}$ | 0.155$^{a}$ | 0.146$^{a}$ | 0.103$^{b}$ |
| Total Digestible Nutrients *T.D.N.* | 0.879$^{a}$ | 0.990$^{b}$ | 0.913$^{a}$ | 0.616$^{c}$ |

1. Figures, for each parameter, bearing different superscripts are statistically different from each other.

1. *Pour chaque paramètre considéré, les valeurs ayant des lettres différentes sont statistiquement différentes entre elles.*

TABLE 3 - *TABLEAU 3*

AVERAGE DAILY MILK YIELD AND CONVERSION EFFICIENCY OF SOME NUTRIENTS

*PRODUCTION LAITIERE MOYENNE ET EFFICACITE DE CONVERSION DE CERTAINS NUTRIMENTS.*

| Group *Lot* | Urea level of concentrate ration (%) *Niveau d'urée dans le concentré (%)* | Fat corrected milk g/d *Production laitière corrigée g/j* | Conversion efficiency for one kg of FMC *Efficacité de conversion pour 1 kg de lait corrigé* | | |
|---|---|---|---|---|---|
| | | | Dry matter *Matière sèche (g)* | Crude protein *Protéines brutes (g)* | T.D.N. *T.D.N. (g)* |
| A | 0 | $1512^{a}$ | $915^{a}$ | $142^{a}$ | $586^{a}$ |
| B | 1 | $1505^{a}$ | $941^{a}$ | $149^{a}$ | $663^{a}$ |
| C | 2 | $1340^{b}$ | $1025^{b}$ | $166^{b}$ | $689^{b}$ |
| D | 3 | $977^{c}$ | $1074^{b}$ | $183^{c}$ | $649^{b}$ |
| F | Value for group *Valeur* | $25.20^{xx}$ | $7.79^{xx}$ | $17.50^{xx}$ | $6.50^{xx}$ |

1. Figures, for each parameter, bearing different superscripts are statistically different from each other.

*1. Pour chaque paramètre considéré, les valeurs ayant des lettres différentes sont statistiquement différentes entre elles.*