

## CHICKEN LITTER FOR CATTLE FEEDING; THE EFFECTS OF DIFFERENT SUPPLEMENTS

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The following treatments were compared over 84 days using a basic diet of molasses with and without urea and 1.5 kg of chicken litter/animal: 1) without supplementation; 2) with wheat bran 1kg/animal/d; 3) fresh sweet potato forage, 5% of animal liveweight and 4) wheat bran and sweet potato forage together in the proportions described above. A factorial design (2 x 2 x 2 with 2 replicates) was used. 32 crossbred Zebu bulls were used, with initial weight of between 164 and 253 kg, arranged in groups of 2 in pens with slatted floors. Liveweight gains were calculated by regression of liveweight against time and were, for the treatments with and without urea respectively: 1) control group 234 and 55 g/d; 2) with 1 kg of wheat bran, 643 and 368 g/d; 3) with sweet potato forage (*Ipomoea batata*) 774 and 557 g/d; and 4) with wheat bran and sweet potato forage 1034 and 855 g/d ( $P < 0.002$ )

Key words: fattening bulls, molasses, urea, chicken litter, wheat bran, sweet potato forage, live weight gain

This work forms part of a series on the use of chicken litter in cattle feeding. The supplements used were selected because they are products and by-products available in the country and are of low cost. Sweet potato forage is adapted to tropical conditions and is of high productivity. This study was also designed to determine the importance of urea in rations which include chicken litter, and to see if the non-protein-nitrogen present in the chicken litter is sufficient for the animals' requirements. The ability of the supplements to supply the level of fermentable nitrogen and by-pass nutrients was evaluated by their effect on liveweight gain.

### Materials and Methods

*Treatments and design:* Treatments were compared on a basic diet of molasses with and without urea and 1.5 kg of chicken litter/animal/d, with the following supplements: 1) control group without supplements; 2) with wheat bran; 3) with sweet potato forage and 4) with wheat bran and sweet potato forage. These eight treatments were studied using a factorial arrangement, 2 x 2 x 2 with 2 replicates.

*Animal and housing:* 32 young Zebu bulls aged 18 months to 2 years, and with an initial weight of between 164 and 253 kg were used. They were housed in groups of 2 in 16 pens with slatted floors. The building was roofed but open on both sides.

*Diets:* The characteristics of the various components of the diets used were as follows: Molasses was either given pure or as a mixture of molasses/urea at 2.5%. The chicken litter for the first part of the trial was based on a litter of rice straw and later on a base of sugar cane bagasse. The mean dry matter of the chicken litter was 84% and crude protein was  $14.2\% \pm 0.39$ ; this chicken litter came from broiler houses. The wheat bran maintained a mean dry matter of 86% and a crude protein level of  $14 \pm 0.47\%$ . Sweet potato forage had a mean dry matter of 15% and crude protein of  $11\% \pm 0.15$ . All crude protein figures quoted are on a

dry matter basis.

*Procedure:* Each morning all animals received 1.5 kg of chicken litter, 70 g of a complete mineral mix and the supplement required to complete treatment ration i.e. 1) without supplement; 2) wheat bran 1 kg/animal/d; 3) fresh sweet potato forage that has been cut in the field, chopped and given the same day, at 5% of body weight, and 4) wheat bran and sweet potato forage in the proportions described above. All animals had free access to molasses with or without urea, depending on the treatment, in a separate trough.

*Measurements:* The initial weights of the individual animals were determined; the animals were then weighed every 2 weeks and the daily liveweight gain was calculated by regression analysis of liveweight against time. The consumption of fresh matter of each component of the diet was measured as were the dry matter and crude protein contents of these components.

### Results

The mean values for voluntary consumption and total dry matter consumption of the different feed components with and without urea are summarised in Tables 1 and 2.

Table 1:

*Mean voluntary intake of the dietary components*

	With urea			
	Control	Wheat bran	Sweet potato	Wheat bran & sweet potato
Consumption, kg/d				
Chicken litter	1.00	0.97	1.49	1.48
Wheat bran	-	0.95	-	1.00
Sweet potato	-	-	12.01	12.00
Molasses	4.92	4.80	5.01	6.32
Urea	0.13	0.13	0.13	0.17
Minerals	0.07	0.07	0.07	0.07
Total DM	4.83	5.53	7.11	8.99

*Voluntary consumption:* The consumption of total dry matter was increased in the presence of urea, there being a response to the presence of urea even in the control treatment; however the improvement in the total dry matter consumption was more significant both in the absence and the presence of urea when the basic diet was supplemented with wheat bran or sweet potato forage, and the maximum response was obtained when the combination of both the supplements was given in the presence of urea.

Figure 1 and Table 3 show the regressed daily liveweight gains in g/d and

Table 2:  
Mean voluntary intake of the dietary components

	Without urea			
	Control	Wheat bran	Sweet potato potato	Wheat bran & Sweet potato
Consumption, kg/d				
Chicken litter	1.26	1.34	1.49	1.49
Wheat bran	-	0.960	-	1.00
Sweet potato	-	-	10.032	11.61
Molasses	3.49	3.20	4.29	4.36
Urea	-	-	-	-
Minerals	0.07	0.07	0.07	0.07
Total DM	3.82	4.48	6.13	7.27

Figure 1:  
Liveweight gain (g/d)

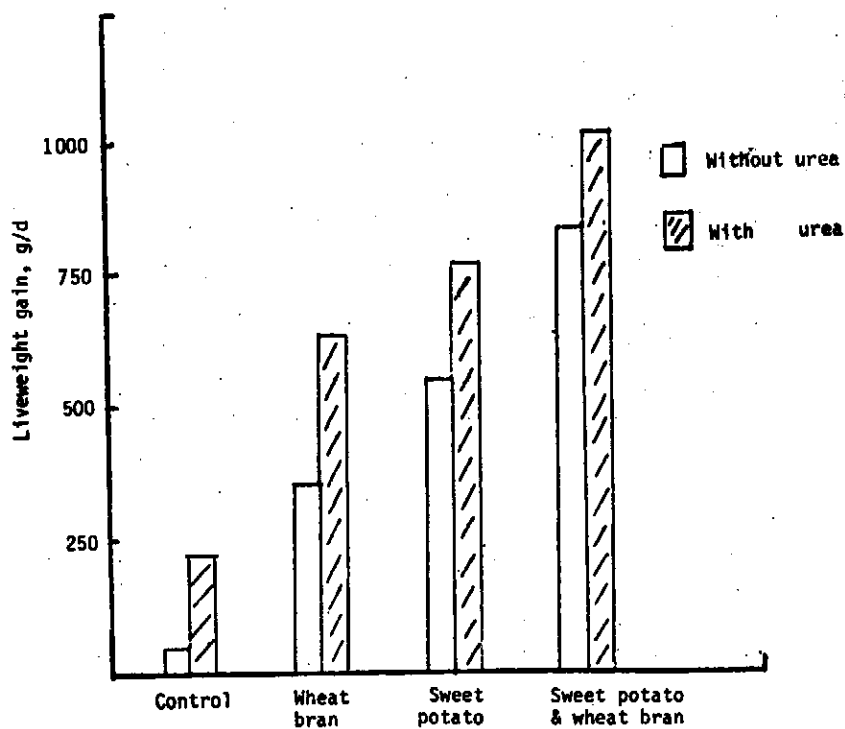


Table 3:  
Mean daily liveweight gain (g/d)

Treatment	Without urea	With urea	Means
Control	55	234	145
Wheat bran	368 ± 140 P<.002	643	506 ± 99 P<.001
Sweet potato	557	774	665
Sweet potato + wheat bran	855	1034	944
Means	459 ± 70	671	

their relationship to the presence or absence of urea and to the different supplements.

*Liveweight gains:* Liveweight gain was increased in general terms in the presence of urea, even in the control diet; there was also an effect of the supplements when they were employed separately, both with and without urea, the sweet potato forage being superior to the wheat bran. The highest liveweight gain was obtained from a combination of both supplements and the basic diet both in the absence as well as in the presence of urea, the highest response coming from the latter treatment.

### Discussion

We believe that the advantage that sweet potato shows over wheat bran is due to its faster rate of degradation in the rumen which increases rumen motility, thus affecting the rate of turnover of the rumen digesta and the flow rate within the rumen, these conditions giving rise to a greater flow of microbial protein to the duodenum. On the other hand it is understood that the effect of the wheat bran is based on its ability to supply protected protein which escapes rumen fermentation. Finally the highest level of liveweight gain was obtained from a combination of both supplements in the presence of urea and it is considered that this is nothing more than a consequence of the fact that here we have a combination of all the factors necessary for an efficient rumen function i.e. forage characteristics, by-pass protein and energy and fermentable nitrogen.

It is interesting to compare these results with those obtained by Ffoulkes and Preston (1978) (Table 4) in which a basic diet of molasses and urea was supplemented with sweet potato forage alone or sweet potato and a protein supplement. The highest response was obtained from the latter named treatment. Their liveweight gains were much lower than those of the present work and it should be noted that the only difference between the rations in the two trials was the presence of chicken litter in the present work. Taking into account the fact that these are two distinct pieces of work carried out at different times under different conditions, the observation is made to

Table 4:  
 Mean daily liveweight gains (g/d) of animals in this trial compared with those reported by Ffoulkes and Preston (1978) of animals consuming similar diets.

Basic diet	Sweet potato	Sweet potato + supplements	Authors
Molasses/urea	570	784	Ffoulkes & Preston (1978)
Molasses/urea + Chicken litter	774	1034	This work

show that the good liveweight gain is not just an effect of the sweet potato, whose function we have just explained, but could also be attributed to some factor present in the chicken litter. It is suggested that this factor requires more detailed study.

### Conclusions

1. The presence of urea is necessary for good animal response.
2. Both wheat bran and sweet potato forage give good results in the presence of urea.
3. A combination of both these supplements on a basic diet of 1.5 kg chicken litter and molasses/urea give rise to those requirements necessary to allow full expression of the potential nutritive value of the ration.

### References

- Ffoulkes D & Preston T R 1978 Cassava or sweet potato forage as combined sources of protein and roughage in molasses based diets; effect of supplementation with soybean meal  
*Tropical Animal Production* 3:186-192

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