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WOOD MOLASSES IN THE NUTRITION OF RUMINANTS

I. ZELENÁK, K. BODA, J. BUCKO*, D. JALC, T. WALKO and I. BESEDA

Institute of Animal Physiology of the Slovak Academy of Sciences, Kosice, Czechoslovakia
** College of Forestry and Wood Processing, Zvolen, Czechoslovakia*

Recently, due to a deficient food and fodder balance, there have been intensive investigations on how to turn waste materials into sources of food energy.

Regarding waste, wood processing by products seem to be a practically inexhaustible source of energy food, as their chemical composition is close to that of some traditional feeds. The solid wood wastes (sawdust, shaving and splinters) which contain a high percent of cellulose and hemicellulose, may be fed to ruminants as roughage after processing and the liquid effluents which have easily hydrolysable sugars, may be used either to produce microbial protein or may be directly used as energy feed (Baker *et al.*, 1975 ; Pigen, 1977 ; Linko, 1977).

In our experiment, we tested wood molasses gained from waste water from fibre board production used instead of beet molasses in the feed of sheep.

Material and Methods.

Experimental procedure.

In the experiment, 20 lambs of about 25 kg, divided into 4 groups, were used to investigate the feasibility of wood molasses instead of beet molasses in the feed rations. The first group, the control, was fed on meadow hay (51 %), ground barley (35 %), beet molasses

(12 %), urea (0.8 %), mineral mix (0.9 %), hexamethaphosphate (0.2 %) and vitamins A + D. In the second group, 33 %, in the third, 66 %, and in the fourth, 100 % of the beet molasses was replaced with wood molasses. All four diets were fed in granulated form *ad libitum*. The lambs were allowed 4 weeks to adapt to the diet. The experiment lasted 6 months. All the animals were subjected to a 10-day-balance-experiment, during which they received 1 kg/day of food.

Waste water from the wet manufacturing process of fibre board production from coniferous wood (mainly spruce and pine) was collected before the addition of chemicals. Wood molasses was prepared by vacuum, in a concentration of 40-50 % dry matter to waste water at 55-65° C. The carbohydrate content of the wood molasses is given in table 1.

Analytical procedure.

The dry matter, nitrogen, fat, fibre, nitrogen free extract (NFE), organic matter and ashes were determined according to Czech norms CSN 46 7007. The gross and digestible energy were calculated on the basis of digestible nutrients by regression equations (Nehring and Haenlein, 1973) and, from the obtained values, the digestibility coefficients of energy were calculated. The volatile fatty acids (VFA) were determined by steam distillation and gas chromatography (Mahadevan and Stenroos,

1967). In addition, the NH_3 concentration in the rumen content (using the Conway method), the VFA, the pH and the blood urea were followed 0, 1, 3, 5 and 7 hours after feeding.

Results

After a 4-week adaptation period, the intake of the granulated food with wood molasses was as good as that of the control group. No significant differences were found in the daily mean weight gain or the food consumption per kg weight gain between the individual groups. The nitrogen balance values ranged between +2.02 and +2.62 g N/head/day, but the differences were not significant (table 2).

The differences in the digestibility of nutrients between the control diet and experimental diets were not significant either (table 3).

In every group a significant drop was observed in the pH of the rumen content one hour after feeding ($P < 0.001$), followed by an increase in the next few hours.

The dynamics of the VFA concentration in the rumen content showed an opposite trend. Its concentration significantly increased in the first hour after feeding compared with the value before feeding ($P < 0.001$). Later the VFA concentration decreased. There was no significant difference between the individual groups.

In the molar percentage M % of VFA (fig. 1) there was a tendency for the M % values of acetic acid in diet 4 to increase; they were significant 5 hours after feeding ($P < 0.01$). The M % of propionic acid was lower in the diets containing wood molasses than in the control diet. There was an increase in the M % propionic acid in every diet in the first hour after feeding, the greatest being in the control diet ($P < 0.02$), the lesser in the diets

Table 1. — Carbohydrate content in wood molasses

Carbohydrates	% on basis of DM
D-galactose	8.58
D-glucose	15.61
D-mannose	19.33
L-arabinose	8.79
D-xylose	6.42
Total carbohydrates	58.73

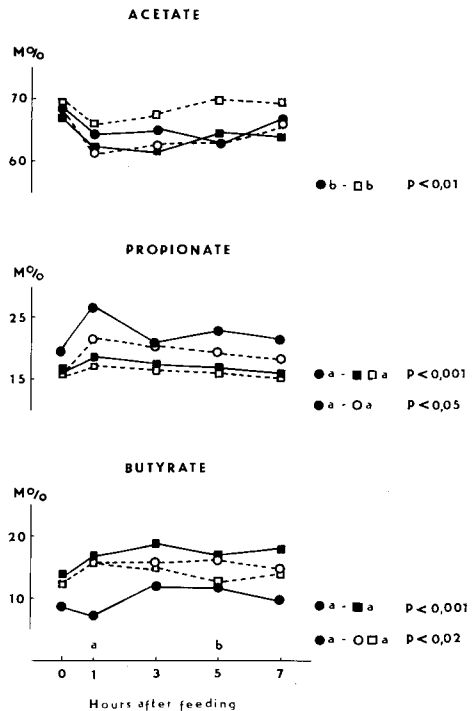


Fig. 1. — Molar percentage of ruminal VFA in lambs fed diets. 1 (●); 2 (○); 3 (■) and 4 (□)

Table 2. — Performance of lambs fed with beet and wood molasses.

Item	Diets			
	1	2	3	4
Average daily gain (g)	144	134	132	146
Kg feed/kg gain	8.15	9.06	8.89	8.47
Daily N-balance (g)	+ 2.62	+ 2.30	+ 2.02	+ 2.58

Table 3. — Digestibility coefficients of lambs fed with beet and wood molasses.

Item	Diets			
	1	2	3	4
Dry matter	60.0	63.5	60.0	61.4
Crude protein	66.2	64.0	63.1	70.5
Crude fibre	30.4	35.3	28.9	41.3
Ether extract	59.2	54.4	53.8	61.8
NFE	71.7	74.0	70.9	69.2
Organic matter	61.0	64.1	60.3	61.5
Energy	62.7	64.1	60.0	64.1

containing wood molasses ($P < 0.05$). The difference in the M % of propionic acid between the control diet and the experimental ones is significant in the first hour after feeding (diets 2 and 3, $P < 0.05$; diet 4, $P < 0.001$). The M % of butyric acid moderately decreased in the control diet, while in diets 2, 3 and 4 it moderately increased. The differences between the control and experimental diets in the first hour after feeding were significant (diet 2, $P < 0.02$; diets 3 and 4, $P < 0.001$).

The NH_3 concentration in the rumen followed a similar course to the concentration of VFA with the maximum increase in the first hour feeding ($P < 0.001$). There was no significant difference between the individual diets.

The blood urea concentration was higher in diet 2 ($P < 0.001$) and lower in diet 4 ($P < 0.001$) than in the control diet.

Conclusion

Wood molasses did not have a negative effect on the weight gain, the food intake, the nitrogen balance or on the digestibility of the nutrients in lambs. Wood molasses did not effect pH concentration, the total VFA concentration or the ammonia of the rumen content. VFA composition was affected by wood molasses: the M % of acetic acid and butyric acid increased and the M % of the propionic acid decreased. The blood urea concentration was lower in the diet with full wood molasses content than in the control one.

From the results, it follows that wood molasses is a good substitute for best molasses in the food of ruminants.

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