Digestibility of Mint Silage and Corn Cannery Waste Silage

D. C. CHURCH

The utilization of various agricultural by-products and waste feeds has been forced onto the livestock producer because of the cost-price squeeze in recent years and, recently, the need to dispose of crop residues that may otherwise pollute the environment. As a consequence, a variety of feedstuffs are being utilized now that were fed only as a last resort in previous years. Examples include screenings from the grass seed industry and mint silage. Corn cannery waste silage has been fed by dairymen for some time, but its value in specific feeding programs is relatively unknown.

As a consequence of these facts, digestibility trials were conducted with lambs to provide more information on the value of mint silage and corn cannery waste silage as compared to corn silage, on which more data are available.

Procedure

The mint silage was obtained from a trench silo on a ranch in Jefferson County. The silage was about a year old. It was transported to Corvallis in steel drums sealed with plastic. The corn cannery waste silage and the corn silage were obtained from a supply provided by a producer to be fed to dairy cows at the University. The alfalfa pellets and the finishing ration were produced at the University feed mill. The finishing ration was one that had been fed to steers with excellent results.

The silages were freeze-dried before analysis as a means of reducing the loss of volatile acids normally found in silages. Other laboratory procedures were routine ones utilized in our laboratories for feedstuff analyses. The acid detergent fiber method was used rather than the crude fiber method. This procedure results in higher fiber values for some feedstuffs and in correspondingly lower NFE (remaining carbohydrates) values.

Digestibility trials were carried out with yearling wethers confined to metabolism crates. Data were obtained on the alfalfa pellets and the finishing ration by using them as the only feeds. Following this, the various silages were fed in mixtures with alfalfa pellets and with the finishing ration. This was done because it is not a normal practice to use silages as the only feed; also, because digestibility of individual feedstuffs may differ considerably when fed in different mixtures.

AUTHOR: D. C. Church is an associate professor of animal nutrition, Oregon State University.

Results

We intended to feed about 50% of the probable dry matter intake as silage when the mixtures of silage and alfalfa or the finishing ration were fed. This aim was not quite achieved, as most of the combinations came out at about 40 to 45% dry matter from silage.

There are problems when carrying out digestion studies with mixtures of this sort. Some of the sheep may be quite selective, with the result that one sheep may leave stems and other coarse particles, the next sheep may leave fine particles, and the next may consume all of its ration. The result is that one animal consumes only the more digestible parts as opposed to the sheep that consumes all of its ration. This, obviously, may affect the digestion coefficients derived from the data. Consequently, estimated digestibility of mixtures of this type are less reliable than those obtained on alfalfa pellets or other uniform feeds.

Feed analyses

Chemical analyses of the feedstuffs studied in this experiment are shown in Table 1. Of particular interest here are the data on the silages. Note that the mint silage has a crude protein content slightly higher than that of the alfalfa pellets. The fiber level is high and the remaining carbohydrates are low. The corn silage also had a very good level of protein, almost twice that of the corn cannery silage. Corn silage was considerably lower in fiber than cannery silage also. As a general rule, roughages can be ranked on the basis of their crude protein content; however, this rule of thumb does not apply to these silages as will be shown later.

Digestibility data

Coefficients of digestibility of the alfalfa pellets, the finishing ration, and the mixtures are shown in the top half of Table 2. Those for the alfalfa pellets are fairly typical of values in the literature, except for the fiber,

Special Report 282 **October 1969**
Agricultural Experiment Station / **Oregon State University** / **Corvallis**

Table 1. ANALYTICAL VALUES FOR VARIOUS FEEDSTUFFS

Feed	Dry matter (percent)	Composition of dry matter (percent)				
		Organic matter	Crude protein	Fats	Fiber	Other carbohydrates
Alfalfa pellets	90.5	94.3	16.0	2.4	23.8	52.1
Finishing ration	88.0	95.3	15.9	3.2	14.0	62.2
Mint silage	27.5	87.3	16.4	3.8	37.3	29.8
Corn silage	28.2	95.9	11.6	8.0	30.5	45.8
Corn cannery waste silage	25.9	96.5	6.5	5.2	44.2	40.5

Table 2. DIGESTIBILITY OF VARIOUS MIXTURES AND CALCULATED VALUES FOR THE SILAGES

Feed	Percent of dry matter intake	Digestibility (percent)[a]						
		DM	OM	CP	Fat	Fiber	NFE	TDN
Alfalfa pellets	100	56	57	71	35	7	76	55
Finishing ration	100	75	77	73	81	49	83	78
Mixtures:								
Alfalfa	63							
and mint silage	37	56	59	54	58	19	83	55
Finishing ration	59							
and mint silage	41	64	67	55	78	29	86	66
Alfalfa	55							
and corn silage	45	66	68	73	80	44	77	69
Finishing ration	55							
and corn silage	45	68	70	69	82	47	78	72
Alfalfa	63							
and corn cannery waste silage	37	64	66	67	73	53	75	66
Finishing ration	60							
and corn cannery waste silage	40	69	71	70	75	59	77	72
Estimated values for silages:								
Mint silage when fed with:								
Alfalfa		56	64	27	80	32	102	55
Finishing ration		46	49	27	71	16	98	46
Average		51	56	27	75	24	100	51
Corn silage when fed with:								
Alfalfa		78	80	75	96	80	79	86
Finishing ration		60	61	62	82	45	68	67
Average		69	71	69	89	62	74	76
Corn cannery waste silage when fed with:								
Alfalfa		81	84	51	103	97	69	88
Finishing ration		61	64	55	68	65	64	67
Average		71	74	53	85	81	67	77

[a] All values expressed on a dry basis; DM = dry matter; OM = organic matter; CP = crude protein; fiber is detergent fiber; NFE = all carbohydrates except fiber; TDN = total digestible nutrients.

which is considerably lower than is typical for alfalfa hay. This is probably a reflection of very rapid passage of the particles out of the rumen, the site of most of the fiber digestion. The values for the finishing ration are very typical of this type of ration and the TDN (total digestible nutrients) is very close to the calculated value. Likewise, the values shown for the various mixtures are about what we would expect for TDN and the other components.

Calculated values for the silages are shown in the bottom half of Table 2. The values are derived by assuming that digestibility of the alfalfa pellets or finishing ration was the same when fed in a mixture as when fed alone, although this is not necessarily so. However, this assumption must be made in order to calculate the values for the silages.

In the case of mint silage, note the differences in the coefficients when fed with alfalfa as compared to those when fed with the finishing ration. With alfalfa, all coefficients were higher except for crude protein. These two values are presented in order to give a more accurate base for valuing mint, since its value will depend on what it is fed with. This also applies to the other silages.

Considering that mint silage is rather stemmy, its digestibility was higher than anticipated, except for the crude protein. The reason for the low digestibility of the protein is unknown, but it is probably due to the heating that is required for distillation of mint oil. In the normal mint still the chopped mint is heated with steam to remove the oil. The material remaining after distillation, called slugs in the trade, is then dumped. It is hot and relatively dry at this point.

This is not an article on silage making, but it might be noted that the preparation of mint silage, as done by successful operators, is generally accomplished by dumping the slugs from the distillary trucks into a trench silo, packing it firmly, and applying lots of water—enough so that water will run out of the stack. A good quality of mint silage can be prepared in this manner.

With respect to the digestibility of mint silage, the only thing that would appear to be of particular concern to the feeder is the low digestibility of the crude protein, assuming that the silage is of a good quality. The feeder should be careful to supplement accordingly in order to obtain desired performance of his animals. It is also likely that the carotene content (pro-vitamin A) is negligible as a result of the heating; however, we do not have any data on this.

Digestibility of the corn silage resulted in average coefficients about as expected from the literature, although the values when fed with the finishing ration are more typical of the literature than those obtained by feeding with alfalfa. The TDN values of 67% (with finishing ration) are typical of literature values for corn silage with a good crop of ears.

Corn cannery silage, when compared with corn silage, differed primarily in that the digestibility of its crude protein was considerably lower as was the NFE (other carbohydrates); however, its fiber was much more digestible. The net result was that the TDN value for corn cannery silage was about the same as for corn silage (77% as compared to 76%). This is a higher value than one might anticipate from the composition and the appearance of corn cannery silage.

The high TDN values (and others, also) that were derived from feeding the silages with alfalfa pellets are an example of what is called the associative effect of feeds. The true digestibilities of the silages are probably lower than the calculated values; if this is the case, then the alfalfa must have been more completely digested when fed in the mixtures. In other words, we have a very compatible mixture when alfalfa is combined with any of these silages; another explanation may be that the coarse nature of the silages resulted in a longer retention of alfalfa particles in the rumen, thus allowing greater digestion.

Acceptability of the silages

The various silages were readily eaten by the experimental sheep when fed at a level of about 40 to 45% of total dry matter intake. The mint silage, by its nature, is relatively stemmy material, but it had a good odor and was consumed with relish by most of the animals, although some stems usually were not consumed. The corn silage and corn cannery silage were of excellent quality and were readily consumed. There was probably more wastage from the cannery silage, as some of the sheep objected to husks and cob residue. However, as a whole, all of the silages were very acceptable.

Conclusions

The digestibility of silages from distilled mint, corn, and corn cannery waste were determined with sheep. The silages were fed with alfalfa pellets or with a steer finishing ration.

Data obtained indicated that the digestibility of crude protein of mint silage was quite low, probably as a result of heating the mint during the distillation of mint oil. The TDN value of mint silage was calculated to be 46% of the dry matter when fed with a finishing ration and 55% when fed with alfalfa pellets.

Corn cannery waste silage had lower coefficients of digestibility of crude protein and NFE (other carbohydrates) but more digestible fiber than did corn silage. TDN values for corn cannery silage were 67% of the dry matter when fed with a finishing ration and 88% when fed with alfalfa pellets; the average value was 77%. Corn silage had comparable values of 67% and 86%.

The various silages were readily accepted by sheep, although some sorting may be expected. Digestibility values should be appropriate for use with cattle.