Influence of concentrated separator by-product (CSB) on intake, digestion, and nitrogen balance in wether lambs

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The northern Great Plains has growing conditions that support production of sugar beets. Molasses, one of the by-products of sugar beets known to stimulate intake in some animal diets, can now be further processed into a product of higher crude protein and ash. This product, known as concentrated separator by-product (CSB) results from the extraction of much of the remaining sugar present in molasses prior to the separation process. Concentrated separator by-product may increase feed consumption in ruminants and may be a valuable protein supplement in livestock feeds. Additionally, protein may be the first limiting nutrient in low quality forages, in which case, supplementation is needed. This trial was designed to compare feed intake, digestibility, and N balance in wether lambs fed CSB mixed with a basal hay diet or offered separately.

SUMMARY

An experiment was conducted to evaluate how sheep consuming low quality forage responded to CSB when mixed with forage or offered separately. Experimental design was a 5x5 Latin square where every wether received each of the five diets once. Dietary treatments were 0, 10, or 20% CSB mixed with hay as a proportion of diet dry matter (DM). Concentrated separator by-product was offered separate from hay in equal amounts with the 10% CSB mixed diet for the fourth treatment (10% separate) and urea was added to forage with N equivalent to the 10% CSB mixed diet as a positive control (fifth treatment). Dietary intake was greater in lambs fed CSB added diets ($P = .01$) compared with non-supplemented or urea-supplemented hay. Dry matter digestion increased with CSB ($P = .01$).

Five wether lambs (97.0 3.3 lb initial weight) were used to evaluate the effects of CSB on intake, digestion, and N balance. Lambs were housed in individual pens and placed in metabolism crates during collection periods. Feed and water intake were measured daily at 0700 for each animal and urine and feces were collected. At the end of each collection period, lambs were weighed and transferred to prior pens. Lambs had access to trace-mineralized salt during the trial and were offered ad libitum access to feed and water. Concentrated separator by-product for the fourth treatment was offered with fresh hay daily. The diet containing urea was similar in N content to the 10% CSB hay and was mixed with hay as a solution using a compression sprayer. Basal forage was 7.7% CP.

Dry matter intake increased when CSB increased but forage dry matter intake between 0% and 10% CSB offered separate remained similar. Nitrogen balance as a percent of N digested and as a percent of N consumed increased linearly with CSB ($P < .03$). Additionally, N balance was greater when 10% CSB was offered separately compared with 10% and 20% CSB mixed diets ($P < .05$). Although lambs fed CSB separately had improved N balance compared with CSB mixed diets, DM and OM digestibility were greater when CSB was mixed with forage (P < .02). Digestion of NDF and ADF were similar among all treatments. Compared with molasses, CSB is higher in crude protein and may be considered a valuable supplement in less palatable feeds.

Data supports that CSB, either mixed or offered separately, stimulates intake and increases DM, OM, and N digestion when offered to lambs fed mature grass hay. When CSB is added to forage above 10%, fiber digestion may be reduced. The effects of CSB on intake and digestion are not completely explained by N addition, but when added in moderate proportions, CSB improves intake and N balance.

Table 1. Effect of CSB on Intake and N digestion

	Treatment					
	% CSB					
Item	0	10	20	10 separate	Urea	SEM
Intake						
Total DM, lb/day	1.8[a]	2.4[b]	2.8[c]	2.1[d]	1.9[ad]	38.0
Forage DM, lb/day	1.8[a]	2.2[b]	2.2[b]	1.9[a]	1.9[a]	37.4
Water, lb/day	4.2[a]	7.0[b]	9.0[c]	6.4[b]	4.3[a]	144
Digestion, %						
DM	50.8[ac]	52.3[ac]	58.7[b]	52.9[a]	48.9[c]	1.5
OM	52.4[ab]	54.3[b]	59.7[c]	50.6[ab]	49.3[a]	1.9
N	35.1[b]	38.6[b]	49.8[a]	50.0[a]	36.5[b]	2.4
NDF	56.3	57.6	60.3	58.1	54.8	1.9
ADF	52.0	52.1	55.3	54.5	50.5	1.6
N balance, % of						
N intake	3.2[ab]	2.7[ab]	12.6[b]	17.1[c]	-2.6[a]	3.4
N digested	0.7[ab]	6.4[ab]	24.5[bc]	34.4[c]	-8.0[a]	8.8

[a,b,c,d] Means within a row with different superscripts differ (P<.10).