Calf Starter Research
Grain Processing and Energy Sources for Calf Starters

Grain processing

Abdelgadir et al. (1996b) demonstrated that roasting corn increased starch gelatinization 3-fold and tended to improve calf performance when combined with soybean meal but not roasted soybeans (suggesting a synchrony of rumen carbohydrate and protein effect). Abdelgadir et al. (1996a) observed conglomerating corn (grind corn, add water, pellet, and then roast) increased starch geletinazation 5-fold, but when mixed with combinations of urea, soybean meal, and roasted soybeans did not alter calf performance. Abdelgadir and Morrill (1995) observed calves fed roasted sorghum grain to have 5% better feed efficiency than calves fed raw sorghum. Also, they observed a 20% lower dry feed intake and 11% better efficiency, and a trend for reduced gains in calves fed conglomerated vs. raw sorghum.

Work from the lab of Dr. Jud Heinrichs at The Penn State University compared whole, dry rolled, roasted-rolled, and steam flaked corn (33% inclusion) in textured starters fed to calves weaned at 28 days but maintained on the starter until 42 days (Lesmeister, 2003; Table 1). Gains did not differ pre-weaning, but favored calves fed whole or dry-rolled corn post-weaning (29 to 42 days). Similarly, dry feed intake was greater and feed efficiency tended to be better for the calves fed whole and dry-rolled corn post-weaning, but did not differ pre-weaning. Lesmeister (2003) observed a tendency for calves fed roasted, rolled and steam-flaked corn to have greater total VFA concentrations than calves fed the whole or dry, rolled corn.

It seems logical to think that processing to make the starch more digestible would improve its utilization by calves and thus calf performance; however, the available research does not show a clear benefit to processing with heat.

Molasses, sugar, and whey

When we fed textured dry feeds with different levels of total sugar we observed a trend for the higher (8% added) sugar diets (from cane molasses or molasses plus sucrose) to support 5 to 7% less gain and starter intake, and have less firm feces post-weaning vs. calves fed the lower (4% added) sugar diets (Table 2). Low intakes post-weaning typically yield a firm fecal output and the observed fecal scores may indicate too much total sugar in the diet creating an osmotic scour. Lesmeister (2003) fed textured diets with 5% and 12% cane molasses (DM basis) and observed a trend for greater gains, greater dry feed intake, and a trend for less scouring in calves fed the 5% molasses treatment (Table 3). However, calves fed the 12% molasses diet had greater blood concentrates of total VFA plus longer and a trend for wider rumen papillae than calves fed the 5% molasses diet.

We saw no differences in calves fed a control diet or one with 5% sweet whey (Table 4). The control diet and the diet with whey both contained 5% molasses. Maiga et al. (1994) compared diets with corn, barley, and whey and observed the best gains with corn.

Fiber sources

Low inclusion (12 to 20% of the diet) of beet pulp, cottonseed hulls, and whole fuzzy cottonseed have resulted in a loss of feed efficiency when replacing corn, indicating they are not digested as well as corn (Table 5). Gains were not different and intake tended to be greater in calves fed the fibrous feeds. However, a diet containing 50% soybean hulls supported 6% slower gains, and had a 4% poorer feed efficiency than a control diet based on 62% corn (Table 6). This depressed performance was surprisingly good and suggested than there is a great deal of rumen fermentation in calves less than 8 weeks of age as reported in the literature (Quigley et al., 1991; Vazquez-Anon et al., 1993; Holtshausen and Cruywagen, 2000). Williams et al. (1987) observed similar gains when a beet/citrus pulp combination replaced barley, but intake was greater, and efficiency was poorer. Hill et al. (2003a) observed greater starter intake and gain, but worse feed efficiency when starters containing 15% cottonseed hulls were fed the Holstein calves vs. starters without cottonseed hulls. However, they saw no differences when the same starters were fed to Jersey calves (Hill et al., 2003b).

Fat

Fallon et al. (1986) fed 0, 5, 10, and 20% fat from Ca-soaps and observed depressed intake and gains when adding fat. Caffrey et al. (1988) observed 3.5% fat addition to barley-based diets to depress intake. Doppenberg and Palmquist (1991) observed 10% added fat to depress intake and gain. Kuehn, et al. (1994) replaced soybean meal with roasted soybeans and observed starter intake to be 10% lower post-weaning and gains to be 8% slower pre-weaning and 12% slower post-weaning (fat and protein source were confounded). Kuehn et al. (1994) cited a study from 1959 using 10 and 20% fat addition that observed reductions in intake and gain. Bunting et al. (1996) observed no response to adding 5% hydrolyzed tallow. McCoy et al. (2003) replaced soybean meal with a high fat, extruded cottonseed-soybean product and observed starter intake to decrease 34% and gain to decrease 4% (fat and protein source were confounded).

Conclusions

Dry-processed grain with no more than 5% added sugar (molasses) appears optimum. Calf performance is not improved when whey replaces corn. If the starter is going to be fed from birth to approximately 2 months of age, use limited amounts of fiber sources in the starter to maximize gain and efficiency, unless grains are cost-prohibitive or unavailable. If the feed were to be fed considerably longer than the first 2 months, fiber sources would have more merit. Limit the amount of fat in a starter to avoid depressing starter intake and calf gain. Adding heat processed grains, molasses, whey, and fat most always increases the ingredient cost of a starter with no firm data to support improved calf performance.

Table 1. Effect of corn processing on calf performance from 0-42 days

	Whole	Dry rolled	Roasted rolled	Steam Flaked
Gain, lb/day	1.03	1.04	1.00	.95
Starter intake, lb/day	1.21	1.30	1.11	1.06

Source: Lesmeister, 2003

Table 2. Effect of molasses and sugar level on calf performance from 0-42 days

	Pellet 5% Molasses	Textured 5% Molasses	Textured 10% Molasses	Textured 5% Molasses + 5% Sugar
Gain, lb/day	1.03[a]	1.03[a]	.96[b]	.93[b]
Starter Intake, lb/day	1.05[a]	.98[a]	.84[b]	.86[b]

[a, b] Means with different superscripts differ (P < .05)

Source: Akey, 2000

Table 3. Effect of molasses level on calf performance from 0-42 days

	5% Molasses	12% Molasses
Gain, lb/day	.79	.64
Starter Intake, lb/day	1.12[a]	.87[b]

[a, b] Means with different superscripts differ (P < .05)

Source: Lesmeister, 2003

Table 4. Effect of added whey on calf performance from 0-56 days

	0% Whey	5% Whey
Gain, lb/day	1.01	1.04
Starter Intake, lb/day	1.58	1.45

Source: Akey, 2002

Table 5. Effect of fiber source on feed efficiency from 0-56 days

	No added fiber	Beet Pulp	Whole Cottonseed	Cottonseed hulls
Efficiency, gain/feed	.532[a]	.485[b]	.492[b]	.480[b]

[a, b] Means with different superscripts differ (P < .05)

Source: Akey, 2002

Table 6. Effect of corn vs. soy hulls on calf performance from 0-56 days

	62% Corn	50% Soy hulls
Gain, lb/day	.97[a]	.91[b]
Efficiency, gain/feed	.47[a]	.45[b]

[a, b] Means with different superscripts differ (P < .05)

Source: Akey, 2003

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