



Feeding Soybeans to Beef Cattle

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Introduction

With the wet spring this year and the early frost there will be some crop damage to late planted soybeans. Depending upon the stage of development, these soybeans will have varying degrees of feed value. The following will briefly discuss the potential feeding value of soybeans for beef cattle in general and issues with immature beans.

Finishing Rations

Feeding soybeans to feedlot cattle is an optional protein and energy source for finishing cattle. Several research trials have investigated performance and carcass responses for cattle offered diets containing soybeans. Two trials in which crossbred beef steers were fed rations containing whole raw soybeans for either 58 or 72 days at levels of 0%, 8%, 16%, or 24% on a dry matter basis revealed that average daily gain, gain efficiency, and carcass traits were not significantly altered when soybeans were included at levels up to 24% while dry matter intake was observed to be reduced during the first 58 days when soybeans were added (Felton and Kerley, 2004). Feeding roasted soybeans at 19.5% of the diet dry matter was also found to significantly reduce dry matter intake for finishing cattle (Rumsey et al., 1999). This response in dry matter intake is commonly observed when supplemental fat is added to the ration and the above rations contained 3.2% ether extract, a measure of the amount of lipids, for the 0% level up to 10% ether extract. Researchers at Kansas State University (Marston et al., 1999) similarly did not observe detrimental effects in performance or gain efficiency when raw soybeans were included in the finishing ration for steers and heifers at a rate of 7.5% of dry matter. Feeding whole raw soybeans to yearling Holstein steers at an inclusion level of 13% of dry matter resulted in similar performance and feed conversion as a soybean meal and urea mixture (Schaefer et al., 2003). Both the Missouri and Kansas research revealed tendencies for increasing carcass quality grades when raw soybeans were included in the rations. The above research as well as others illustrates the ability to feed raw soybeans in finishing rations offered to cattle without detrimental impact on performance or carcass characteristics.

Growing Rations

Steers offered raw soybeans or cottonseed meal at 10% of the ration dry matter had similar performance while levels of 20% and 30% raw soybeans resulted in lowered performance compared to the controls. Mader (1988) observed acceptable performance when 540 lb steers were offered a corn silage diet supplemented with either soybean meal or raw soybeans with gains being slightly lower for raw soybeans in comparison to soybean meal and similar feed conversions. Researchers at the University of Kentucky reported a slight reduction in gain and feed conversion when raw, ground soybeans were supplemented to calves receiving corn silage in comparison to soybean meal and was believed to be associated with a decreased flow of amino acids to the small intestines due to a higher rate of ruminal degradation for raw, ground soybeans (Davenport et al., 1987).

Later research by the same investigators demonstrated a positive gain and feed conversion response when fishmeal was offered in combination with raw, ground soybeans to cattle consuming corn silage (Davenport et al., 1990).

Processing Soybeans

Feeding soybeans to growing Holstein steers (approximately 215 lb to 1200 lb) was reported to have increased average daily gain and feed conversion when offered as raw or roasted in comparison to urea while roasted and raw performance was similar (Fox and Ketchen, 1991). The same investigators observed roasting soybeans was not determined to significantly alter overall performance when Holstein steers were fed from approximately 275 lb to 1,200 lbs. Rumsey et al. (1999) did not observe any significant differences in performance for finishing cattle offered roasted soybeans in comparison to soybean meal. Kansas State University researchers reported that Holstein calves offered starter rations for eight weeks containing soybeans roasted at an exit temperature of 146 degrees Celsius had greater dry matter intakes and body weight gain than calves fed starter containing soybean meal (Abdelgadir et al., 1996) but no comparison was made for raw soybeans. Albro et al. (1993) reported similar gains for steers consuming low quality (<7% CP) grass hay supplemented with either soybean meal, raw soybeans or extruded soybeans in comparison to non-supplemented calves while feed conversion tended to be better for extruded beans in comparison to raw soybeans. Mader (1988) observed a slight reduction in gain and feed conversion when raw beans offered at 10% of the diet DM were rolled in comparison to whole. The Nebraska and previously mentioned Kentucky study would suggest that grinding or cracking raw soybeans may result in lower performance in comparison to raw soybeans whole. These and other data would suggest that the response to processing of beans may be dependent upon the class of cattle and the diet offered.

Immature Soybeans

A potential avenue for immature beans due to drought or frost is livestock feed. For beef cattle this is a viable option and a sample should be taken for nutrient analysis. Realize that frosted beans may be higher in moisture content and care should be taken for increasing the storage life. Reports on the direct comparisons of the feed value of immature and mature soybeans were not found at the time of writing this article. However, Oklahoma investigators found that small, immature beans fed whole resulted in lower performance compared to soybean meal and was believed to be related to a reduced digestibility due to the smaller particle size implying a need for grinding or cracking. Realize that the high unsaturated fat content of beans increases the risk of rancidity after processing during warm weather. Johnson and Rickert (1996) report that immature green soybeans may contain approximately 10% less energy than mature soybeans due to a 2-3% lower oil content.

General Considerations

Economics of feeding soybeans should always be studied. A Purdue publication suggests the following equation as a method to compare whole soybeans to soybean meal.

Whole soybean advantage = $(0.86 * 44\% \text{ SBM } \$/\text{ton}) + (0.17 * \text{Tallow/fat } \$/\text{ton}) - (\text{Soybeans } \$/\text{ton} (+ \text{roasting expense if used}))$

If the value is positive, feeding soybeans would be an economically advantageous. Others suggest an alternative approach based upon the corn and soybean meal prices and is as follows.

Whole Soybean $\$/\text{cwt} = (0.35 * \text{corn } \$/\text{cwt}) + (0.75 * \text{SBM } \$/\text{cwt})$

Realize that if one is considering replacing a commercial protein supplement that the macro- and micro-minerals, vitamins, and feed additives will have to come from a balancer pellet or some other form.

The urease activity of raw soybeans yields for caution when considering feeding urea. High levels of urea should not be included in the rations. Studies have fed low levels of urea with raw soybeans successfully, but roasting beans is recommended if a need exists for feeding higher levels of urea.

Soybeans can be offered to cows and developing heifers. Research at the University of Missouri has shown reproductive responses when soybeans were offered pre-partum for 50 days at a rate of 3.5 lbs/hd/d. Other recent research has not observed such responses in reproduction; however, no detrimental effects have been reported when offering raw soybeans to cows or heifers. Normal recommendations for feeding rates would be near or less than 2.0-2.5 lbs/day. Soybeans can also be supplemented to stocker cattle and a rate of approximately 0.3% of body weight is recommended as the upper limit.

Feeding roasted soybeans early in the finishing phase (first 80 days) resulted in a reduced response to an estrogenic growth promoting implant in comparison to steers and heifers offered soybean meal (Rumsey et al., 1999). Earlier research by the same group revealed that feeding roasted soybeans resulted in lower gains and decreased release of somatotropin and thyroid stimulating hormone while administration of an estrogenic growth promoting implant negated this effect (Rumsey et al., 1996 & 1997). These trials are inconsistent, but imply that there may be a reduced response observed from estrogenic implants during the early finishing phase when soybeans are offered in the ration which may be a result of lowered DM intakes.

Conclusion

Soybeans can be incorporated into beef rations as a source of protein and energy. As with any supplementation program, it is important to identify what nutrient are deficient and then identify feedstuffs that can be sourced to provide these nutrients. Consider the economics when looking at feedstuffs on a nutrient basis when comparing multiple sources. Additionally, consider the logistics of delivery, quantity, and labor required for different supplements.