

## ROASTED FULL-FAT SOYBEANS FOR DAIRY DIETS

Recent research and positive field responses have stimulated interest by dairymen in roasted full-fat soybeans as a popular dairy feed ingredient. The main reason for roasting whole soybeans for dairy cattle is to provide a higher percentage of rumen by-pass protein.

Roasted Full-Fat Soybeans are (1) an ideal source of rumen by-pass protein, containing protein quality, energy density, and palatability, and (2) an excellent controlled release mechanism for fat addition to the rumen, minimizing the problems associated with fat/rumen fermentation interactions. Typical nutrient analysis of roasted full-fat soybeans is:

- 42% Crude protein
- 20% Crude fat
- 7% Crude fiber
- 50% Rumen by-pass protein (raw soybeans = 25%)
- 2.5% Lysine

Rumen by-pass protein can be increased even further by holding roasted soybeans at an elevated temperature for a period of time before cooling (steeping). Testing has shown:

- 25% average rumen by-pass protein for raw soybeans
- 48% average rumen by-pass protein for roasted/cooled soybeans
- 66% average rumen by-pass protein for roasted/steeped soybeans

The following table shows roasted soybeans (45%) tend to be higher in undegradable protein than alfalfa silage (23%), alfalfa hay (28%), corn silage (31%), and soybean meal (35%). Roasted soybeans that have been steeped tend to be very high in undegradable protein (65%), surpassed only by blood meal.

### RUMENRETICULAR UNDEGRADABILITY OF PROTEIN IN SELECT INGREDIENTS

<u>Ingredient</u>	<u>%</u>	<u>Ingredient</u>	<u>%</u>
Urea	0	Soybeans, raw	26
Wheat midds	21	Alfalfa hay	28
Alfalfa silage	23	Rapeseed meal	28

Ingredient	%	Ingredient	%
Corn silage	31	Corn	52
Soybean meal	35	Corn gluten meal	55
Bromegrass	44	Fish meal	60
Soybeans, roasted*	45	Soybeans, roasted/steeped*	65
Meat and bone meal	49	Blood meal	82

NRC Dairy (1989), \*Faldet (1989)

One study has shown an apparent optimum heat treatment for soybeans (for dairy feed) to be:

- Roasted to 284°F. and steeped for 120 minutes, or
- Roasted to 302°F. and steeped for 60 minutes, or
- Roasted to 320°F. and steeped for 30 minutes.

Estimates of post-ruminal available lysine content have been shown to be highest for soybeans roasted and held near their roasting temperature for 30 minutes.

University studies have shown:

- 1) Feeding roasted full-fat soybeans, compared to solvent extracted soybean meal, has increased (a) milk production by 2.0 kg per day; (b) 4% fat corrected milk by 4.6 kg per day; (c) milkfat by .23 kg per day.
- 2) Cows fed roasted soybeans continued to increase milk production to 70 days into lactation. Cows supplemented with soybean meal reached maximum milk production at about 40 days.
- 3) First-calf cows do not respond as well as multi-calf cows to feeding of roasted soybeans. This might be expected in view of other evidence indicating that primiparous cows do not respond as much as multiparous cows to protein supplementation in early lactation.
- 4) Dry matter intake tends to decrease for cows receiving heat treated soybean supplements when compared to cows fed the soybean meal supplemented diets. This is possibly due to the oil content of the whole soybean, which increases the energy density of the ration, allowing the dairy cow to meet her energy needs with less dry matter.
- 5) Roasted full-fat soybeans must be fed at more than 10% of the diet dry matter to have a significant influence on the performance of lactating dairy cows. Lactation performance can be enhanced by feeding roasted full-fat soybeans at concentrations higher than the 18% commonly recommended.
- 6) Very coarse ground or milled roasted soybeans are preferred to whole soybeans. They can be stored for several days or even weeks with no detection of rancidity.
- 7) Milk production levels appear to determine the presence and magnitude of response to by-pass proteins. Higher producing cows show a greater response.
- 8) It is suggested that dairymen get the advice of a professional nutritionist before making any changes in cow diets.

#### REFERENCES

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