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High Oleic Soybeans

And Why It Can Have Direct Benefits on Your Milk Check

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All lactating dairy cow diets contain fat, and this fat is comprised of fatty acids originating from forages, grains, grain byproducts, and any fat supplements contained within the diet. Feeding fat has benefits for dairy cows such as improving milk yield, milk fat yield, energy balance, growth, and reproduction. We have also learned over the years that individual fatty acids matter and can have significant effects on metabolism and production.

One significant finding has been that dietary unsaturated fatty acids are undesirable and toxic to rumen microbes (*see Table 1*). The degree of unsaturation relates to how toxic or negative the effects are on the rumen microbes, with more unsaturation being more toxic. Corn and soybean-based feeds contain significant amounts of unsaturated linoleic (C18:2) fatty acid as a proportion of their fat content. If the rumen's ability to convert these unsaturated fatty acids to saturated, termed biohydrogenation, is hindered or overwhelmed, milk fat depression will occur. This milk fat depression can result in a small to significant drop in milk fat percentage and yield and no change in milk yield. This is quite costly as we aren't typically paid for milk volume, but pounds of fat, protein, and other solids in our bulk tank.

Table 1 List of the predominant fatty acids fed to dairy cows. Unsaturated sources have negative effects on the rumen microbes, with degree of unsaturation relating to how negative the effect is (C18:3 has the most potent negative effect).

Fatty Acid	Nomenclature	Saturation	Sources
Palmitic	C16:0	Saturated	Palm fat / NovaFat 80
Stearic	C18:0	Saturated	Rumen biohydrogenation, EB-100
Oleic	C18:1	Unsaturated	High Oleic soybeans, Energy Balancer
Linoleic	C18:2	Unsaturated	Corn silage, DDGS, soybeans
Linolenic	C18:3	Unsaturated	Haylage, Alfalfa, grass hay

Typically, lower milk fat or milk fat depression occurs from multiple factors interacting, such as dietary unsaturated fatty acids, fermentable starch, slug-feeding, etc., which your nutritionist manages when formulating your diet.

Soybeans generally contain ~20% fat on a DM basis and can be an economical source of energy at times in addition to a protein source. However, of this fat, ~22% is oleic (C18:1), ~55% is linoleic (C18:2) and ~8% is linolenic (C18:3). Roasted soybeans, if fed at high enough levels, and depending on oil exposure in the bean (ground vs. quartered vs. whole) can cause significant depression on milk fat. Recently, high oleic soybeans have been introduced to the market and represent a genetically engineered soybean that contains a differing fatty acid profile. High oleic soybean in contrast to a typical soybean contain ~75% oleic (C18:1), ~7% as linoleic (C18:2) and ~3% as linolenic (C18:3). This is a substantial difference in fatty acid profile and changes how we can feed roasted beans.

Research at Penn State University and University of Wisconsin has shown significant benefits in milk fat yield with high oleic roasted soybeans compared to conventional roasted soybeans. Ground high oleic soybeans increased milk fat 0.41 percentage units and yield by 150 g/d compared

to ground conventional soybeans (*Weld and Armentano, 2018*). In the Penn State study, high oleic soybeans versus conventional soybeans increased milk fat by 0.17 percentage units and milk fat yield by 89 g/d (*Bomberger et al., 2019*). Using July 2021 FMMO milk fat prices, that represents an increase in milk revenue of $0.63 and $0.37 per cow per day simply from using high oleic soybeans over conventional soybeans. Additionally, research at Penn State has demonstrated that feeding up to 5, 10, or 15% of the diet has no negative effects on milk fat yield or percent in lactating dairy cows, further demonstrating that high oleic soybeans can be used safely as an energy source without negatively affecting milk fat (*Khonkhaeng et al., 2021*).

Feeding fat supplements such as highly enriched palmitic (C16:0) supplements has been widely adopted by farms for increasing milk fat. In 2021, the cost of most fat supplements has increased substantially in price (~50% or more). **Utilizing high oleic soybeans if available may result in substantial ration cost savings for supplementing fat to your cows.** Additionally, feeding high oleic soybeans may help increase dietary fat digestibility. Research has identified that increasing supplies of digestible oleic fatty acid helps to emulsify and improve fat digestibility (+5.7 percentage units from 20 g/d of oleic acid, (*Prom and Lock, 2018*). Improving fatty acid digestibility will improve energy supplies which may result in greater energy corrected milk yield or body weight gain.

AminOleic contains high oleic soybeans and can be utilized to replace conventional roasted soybeans to improve milk fat yield. It can also be used as an economical fat source in place of commercial fat supplements such as calcium salts and stearic based fatty acid products. AminOleic also contains highly digestible blood meal to provide limiting essential amino acids that will support greater milk protein yield. Altogether, AminOleic can be utilized to drive greater milk components. As seen in Table 2, improving milk fat and protein concentrations and yields in a herd milking 85 lbs per day can increase milk income by $0.54 per cow per day using July 2021 FMMO milk component prices.

Table 2 Economic value of increasing milk fat and milk protein basis July 2021 FMMO milk component prices

		More Fat	More Fat & Protein
Milk, lb/d	85	85	85
Fat %	3.8	4.0	4.0
Protein %	3.0	3.0	3.1
Milk Income, cow/d[1]	$12.50	$12.82	$13.03
Marginal Milk Income, cow/d		$0.32	$0.54

[1]Milk income is calculated as value of milk fat and milk protein and pricing is based on July 2021 FMMO milk component values.

In conclusion, sourcing high oleic soybeans to feed to your cows may be of particular interest to improve milk components in a cost-effective manner given the high cost of commercial fat supplements. Strategically targeting greater milk fat and milk protein yields on your herd is usually a profitable venture, and high oleic soybeans represents a tool that in most cases can help improve milk fat content in your bulk tank.

References:

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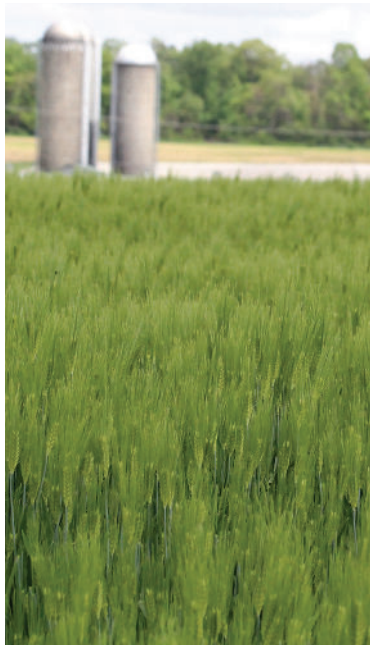

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