

Raw soya beans and soya bean crop residues: Pitfalls and opportunities

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Raw soya beans and soya bean residues can serve as an excellent source of feed for ruminants. However, judicious utilisation is necessary as the use of raw soya beans does have some potential pitfalls.

Soya beans are graded as SB soya beans or 'other'. Both SB and 'other' grades can be utilised in animal feeds, though certain risks require due consideration. Raw soya beans contain several anti-nutritional factors that make their inclusion in ruminant feeds and licks, or the grazing of crop residues, challenging.

These anti-nutritional factors are neutralised when raw soya beans are processed into full-fat soya beans and soya bean oilcake through heat and crushing processes. This article focusses on raw (unprocessed) soya beans.

Nutritional value of soya beans

Soya beans are an excellent source of protein and energy, and has a very high fat content. Soil fertilisation, nitrogen fixation and climate can influence the quality of plants. Drought-damaged soya beans, especially green-coloured ones, typically have a lower nutritional value in terms of crude protein and fat.

Early frost can also lower the nutritional value of a soya bean. Due to their high fat content, crushed soya beans can turn

rancid quickly, especially in hot and humid weather conditions.

Anti-nutritional factors

Trypsin inhibitors

Trypsin inhibitors are enzymes in raw soya beans that suppress protein digestion in the digestive tract. It is present in the soya plant from day 96, but mature beans, however, contain the highest concentration and activity.

This has a detrimental effect on especially non-ruminants (horses, pigs and chickens) and pre-ruminants (young calves and lambs). The effect is less prominent in mature ruminants, as trypsin inhibitors are partially inactivated during fermentation in the rumen. Because their rumens are still developing, the digestive process in young ruminants is less efficient.

Decreased protein digestibility limits growth in young ruminants. Sticky, thick colostrum and reduced milk production are some of the detrimental effects in adult ruminants, which in turn indirectly impairs the growth of pre-weaned lambs and calves.

Urease enzyme

Unique to ruminants is their ability to convert the nitrogen derived from urea into microbial crude protein. Some rumen microbes produce urease that rapidly degrades urea into ammonia. Other

micro-organisms utilise the ammonia, along with energy, to produce proteins for their growth.

Raw soya beans also contain urease, which is important if ruminants are given feed containing raw soya beans and urea. The urease in the raw soya beans increases the urease activity, which speeds up the degradation of urea into ammonia. As a result, the rumen microbes cannot utilise the ammonia fast enough, leading to excessive production and absorption into the blood.

This leads to reduced feed intake and production, impaired fertility and even ammonia poisoning. It is usually not recommended to combine raw soya beans and urea in ruminant feed and licks. Both can be used judiciously in combination, if urea levels are adjusted downward.

Urease enzyme activity in soya is ten times higher in the beans than in the stems, leaves or pods, thus making soya beans much more dangerous.

Fat content

Because of the high fat content in soya beans, their inclusion in feed should be limited. If the ration's fat levels are too high, it will suppress fibre digestion in the rumen, impair calcium, magnesium and vitamin A absorption, and cause fluctuating feed intake with subsequent diarrhoea.

Potassium

Soya beans, like other legumes, are relatively high in potassium. It is a key consideration in the nutrition of female animals during late gestation, as excessive potassium consumption during this period can cause milk fever.

Grinding of soya beans

The grinding of soya beans increases its digestibility and prevents the separation of feed components and selective feeding. Grinding soya beans, however, shortens its shelf life due to the fat that can easily turn rancid. Ground soya beans should be used within three weeks after processing and even sooner during hot, humid weather. For maximum utilisation by cattle, beans should preferably be ground.

Mycotoxins

Rain-damaged soya beans carry the risk of pathogen and mycotoxin contamination. Mycotoxins such as aflatoxin may be present, even if no mould is visible on the raw soya beans.

Raw soya beans in feed and licks

Not only are raw soya beans a good source of protein in the feed and licks of mature

ruminants, it also contributes to the energy value. Research shows that there are no adverse effects on animal performance and carcass quality when raw soya beans are used judiciously in a balanced finishing ration. However, a nutritionist should be consulted. Soya bean inclusion levels should be limited to a maximum of approximately 10% of the total ration in finishing feeds, grower feeds and licks.

Urea can be included with raw soya beans in ruminant feeds and licks. Safe urea inclusion levels will vary depending on the type of feed and lick. One condition is that the lick or feed must be high in starch. Starch normally leads to a slightly lower rumen pH. This suppresses urease activity, as urease works at its best when rumen pH is 7 and higher.

Residues or unharvested fields

Grazing of crop residues is more cost-effective than baling of residues. It also typically produces more nutrients, due to bean wastage during the baling process.

Grazing of soya bean crop residues during late autumn and early winter, when good quality grazing is limited, can bridge a vital gap until livestock can be switched

to maize crop residues. A good guideline is a carrying capacity of seven to eight ewes or one cow per hectare, for a period of two months. Sheep are usually better at utilising soya bean crop residues than cattle.

Soya beans' anti-nutritional factors also apply to the grazing of soya bean crop residues and must be managed by way of the correct lick supplement and adjustment programme. Licks may contain urea, but safe urea inclusion levels are crucial and depend on the type of lick, type of animal and stage of production.

Where unharvested soya bean fields are grazed, it is even more important for animals to be adapted and managed due to the larger number of raw soya beans available to them.

Raw soya beans, soya bean crop residues and unharvested soya bean fields can be successfully included in ruminant feeds, licks and fodder flow planning, provided that the necessary nutritional guidelines are followed. Consult a registered nutritionist in this regard. **SF**

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