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FEEDING UREA TO DAIRY COWS

By R. A. BETTENAY

IT has been known for some years that the ruminant animal, through the agency of microflora in the rumen, has the ability to use urea as a source of nitrogen, and to convert some of this to protein.

Most early experimental work was done with sheep, particularly on poor quality dry feed low in protein, but more recently work has been done with lactating dairy cows. As a result of this work, urea can be recommended for feeding to dairy cows under certain conditions. However, great care must be taken in feeding urea, as too much taken in too short a period can result in a high mortality.

Protein requirements of lactating cows

Cows in production not only need more protein than dry cows but also require a higher proportion of digestible protein in the diet. The term "nutritive ratio" is used to express the amount of digestible protein in the diet as a proportion of the amount of other digestible nutrients, a narrow nutritive ratio being one high in protein and a wide ratio being one with a smaller proportion of protein.

Dry cows can do well on a ration with a nutritive ratio (N.R.) of 1 : 8 whereas a cow producing 2 gallons a day requires an N.R. of about 1 : 6 and a cow producing 4 gallons per day requires an N.R. of 1 : 5.

Ability of pasture to supply sufficient protein

Not enough is known about the digestible protein and total digestible nutrient content of various pasture mixtures, at various stages of growth and soil fertility level, to permit the making of dogmatic statements regarding the ability of a pasture to supply the cow's requirements. It is known that vigorously growing young pasture supplies more than enough protein and any excess is used by the cow as a source of energy. As they become more mature, pastures, and particularly grasses, drop rapidly in protein content. Beyond the hay stage, typical pastures do not supply a high enough proportion of protein for high-producing cows. At the same time digestibility of both protein and carbohydrate drops so that additional energy foods will also be required for maximum production.

Protein content of annual pastures allowed to mature in the paddock falls to very low levels, whilst there is some evidence that even many irrigation pastures are short of protein by March, when growth has slowed down appreciably.

Hay and silage as sources of protein

Because it is usually cut a couple of weeks earlier than hay, silage can be expected to be a better source of crude protein and so presumably of digestible or available protein. Even so, most silages sampled in recent years have been within the range 12 to 16 per cent. crude protein and so are barely balanced of themselves to supply the cow's protein needs—that is they contain no surplus protein to balance the wide nutritive ratio dry feed available in the paddock over the summer months.

Hay can vary considerably in protein content and digestibility depending not only on species but also on stage of maturity when cut. Good quality hay is about equivalent to good silage in crude protein content, but over-mature, grassy hay can often contain as little as 6 to 8 per cent. crude protein of low digestibility. It requires an additional supply from some other source to narrow the nutritive ratio.
Concentrates as sources of protein

Grains, including wheat, oats and barley, are good sources of digestible carbohydrate but do little if anything to narrow the nutritive ratio of the overall diet. All three have a nutritive ratio somewhere in the order of 1 : 6.5.

Linseed meal (N.R. 1 : 1.6), meatmeal (N.R. 1 : 0.5) and dried brewers grain (N.R. 1 : 2.0 to 1 : 2.5) are much better sources of protein and are used to some extent to help balance the ration. Of these, linseed meal is the most popular but cost and availability are such that it is seldom that enough is used to balance the ration. Meatmeal, by far the most concentrated source of protein, is used sparingly or not at all by most dairy farmers but deserves more attention. Most herds of cows can be conditioned to accept it, if small quantities are fed for a start and the quantity is gradually increased.

Urea as a protein substitute

Urea is a simple nitrogen-containing compound which occurs in nature as the main waste product in the urine of most mammals and which is now made commercially from the nitrogen in the air. It contains 46 per cent. nitrogen and so one pound contains enough nitrogen to produce 2½ to 3 lb. of protein, if conversion is complete. When a ration low in protein contains sufficient readily-available carbohydrate, rumen bacteria can convert urea more or less completely into protein which can then be used by the ruminant. Conversion is less efficient in the absence of sufficient readily available carbohydrate or when the ration is already fairly high in protein.

Urea used in moderation under controlled conditions can probably be very useful in Western Australia, where protein is deficient in the pastures for much of the year. However, great care must be taken to limit the intake and to ensure thorough mixing.

PRECAUTIONS FOR USING UREA

1. Mix thoroughly with other feeds
   The addition of urea to a grain mixture can only be recommended when a mechanical mixer is available to ensure thorough mixing. Only dry, free-flowing urea, without lumps, should be used.

2. Limit the percentage carefully and introduce urea gradually
   It is now accepted that urea can be fed up to a maximum of 2 per cent. of the concentrate mixture, without risk of mortality, if it is thoroughly mixed. However, much smaller percentages should be incorporated for a start, and the amount increased gradually over a period of three to four weeks. The National Research Council of the U.S.A. suggests that urea can be used to replace up to 35 per cent. of the protein in the grain ration and, in this State, some stock food companies are supplying up to one third of the crude protein in the form of urea.

3. Limit total urea intake
   Urea is sometimes added to silage during making or to hay and chaff. This practice is viewed with reserve because of the difficulty of thorough mixing. It is also available in various mixes in block form. Where it is being fed to cows from more than one source, total intake of urea per day should not be more than 3½ oz. per head.

4. Feed with a complete ration
   Be sure that the ration is adequate with respect to energy, minerals and vitamins.

5. Feed to ruminants only
   Urea has no value as a supplement for pigs or poultry.

If all of these precautions are taken, there is reason to believe that urea can be of great assistance as a source of protein to the dairy industry of Western Australia, where most cows suffer from a deficiency for probably at least six months of the year.
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