



agriculture & rural development

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PROVINCE OF KWAZULU-NATAL

DAIRYING IN KWAZULU-NATAL

Concentrates for Dairy Cattle

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INTRODUCTION

There is a great variety of concentrates suitable for feeding to dairy cattle, ranging from the individual ingredients which can be used on the farm to mix rations, to the ready-mixed commercial compound feeds. No one concentrate is suitable for feeding on its own. Different concentrates contain different levels of major nutrients such as protein, energy and minerals. A mixture must be formulated to balance the nutrients to form part of the animal's total diet and tailored to suit its particular requirements relative to the kinds of forage that are available.

The balancing of rations for dairy animals is covered in another leaflet (KwaZulu-Natal Dairy Leaflet 5.5), so will not be dealt with here. The objective of this leaflet is to give some pointers regarding the practical use of the more commonly-encountered concentrates. It is important to appreciate that each farm has its own peculiar circumstances and available forages, and that no concentrate "recipe" can guarantee success on every farm. The information here is intended as a guide. If you are in any doubt about what is best for your circumstances, please contact a competent nutritionist or feed advisor.

Each concentrate is listed in alphabetical order and is briefly described. Physical appearance, inclusion levels, possible problems and other pertinent information are provided. The symbols P, E or M indicate whether the concentrate described provides mainly protein (P), energy (E) or minerals (M). The term "bypass protein" refers to protein which is relatively undegradable in the rumen. The idea is to provide the dairy farmer with a "ready reference" for use in the field.

Blood meal (P)

The nutritive value is good with a high "bypass protein" content but its low palatability is a problem in cattle feeding, especially if included with carcass meal. Inclusion rates of 1 to 2% may be acceptable to dairy cattle, and it may be considered as an "extender" of fish meal. Processing is by heating and occasionally the product is burnt, rendering it of little value and even less palatable. Look for small burnt granules and a burnt smell.

Bone meal (M)

Cooked, dried milled bone is fed primarily as a source of calcium and phosphorus. On average it contains 24% Ca and 10% P, some protein and is a good source of trace minerals.

Bran

- See "wheaten bran"

Brewers' grain, barley (P)

This is the residue, after the brewing of lagers and ales, comprising a mixture of barley, maize and brewers' yeast from which most of the starch and sugars have been extracted. The product therefore has only an intermediate energy value and usually 22% to 26% crude protein on a dry matter basis, about half of which is "bypass protein". Palatability is not usually a problem and the product is safe even if fed in a pure form.

Brewer's grain sorghum (P)

This is a by-product of sorghum beer brewing, consisting of sorghum residue from which a large proportion of the starch and sugars have been extracted. The product has a higher energy value than does barley brewer's grain and usually a higher protein content, although this is variable, depending on the source. It is palatable and safe to feed at any level. However, inclusion levels exceeding 25 % of the ration dry matter are not recommended in dairy rations.

Carcass meal (P)

The nutritive value is good with a high "bypass protein" content, but palatability is a problem in cattle feeding, especially if included with blood meal. Inclusion rates of 1 to 2% may be acceptable to dairy cattle, and it may be considered as an "extender" of fish meal. Processing is by heating and occasionally the product is burnt, rendering it of little value and even less palatable. Look for small burnt granules and a burnt smell.

Chicken litter

- See "poultry manure"

Citrus pulp (E)

This is the residue of citrus after the extraction of the juice. Low protein, intermediate to relatively high energy and good (2%) calcium contents are characteristic. It is extremely palatable, which is a problem when its inclusion in a ration is stopped, because the resulting ration without pulp is then "unpalatable" to the cattle that are accustomed to pulp. This problem is compounded by the seasonal availability of citrus pulp. Inclusion levels exceeding 20 % of the ration dry matter are not recommended.

Corn & cob (E)

This has an energy level intermediate between maize grain and "snapped corn". It is a useful energy supplement for medium- to lower-yielding cows and growing animals. Although highly palatable, it may cause acidosis at high levels.

Cotton seed, whole (P+E)

A good protein and energy supplement for lactating cows when fed whole. It should not be fed at more than 3 kg per cow per day. The presence of cotton fluff on the seed makes it difficult to handle in mixtures and this, combined with lightness, makes it almost impossible to mill. Its bulkiness makes for high transport costs.

Cotton seed oilcake meal (P)

This is the residue of the dehulled cotton seed after the oil has been extracted. It is a reasonably good source of "bypass protein". Periodical palatability problems have been experienced. It contains a toxin called gossypol which may be detrimental to animals, especially to young stock. Normally it is not advisable to feed cotton seed oilcake meal to calves under 6 months of age. Older cattle seem to be little affected by gossypol.

Dicalcium-phosphate (M)

This contains and provides significant quantities of calcium and phosphorus only, in the ratio of about 1,5 calcium: 1 phosphorus. It is used to balance these two minerals in a feed mixture.

Fats (E)

Fats, on average, have energy values about three times those of grains, and are available in different forms. It is not advisable to feed liquid (at room temperature) fats or oils because these tend to have a depressing effect on ruminal microbes, causing a drop in the butterfat and the protein percentage in milk.

Solid or prilled fats are preferred, and can help to improve yields and butterfat percentages. There is however, a danger of decreased milk protein percentage. Palatability is sometimes a problem at inclusion levels above 2%. Inclusion levels exceeding 1 kg/cow/day are not recommended.

Fish meal (P)

Fish meal is the best source of "good quality" protein available in South Africa, with a high "bypass" fraction (60% of the crude protein content). Palatability can be a problem, especially with animals not used to eating fish meal. In this case, inclusion rates should be increased gradually to the desired level over a period of a week or two. The value of inclusion levels of less than 2% in concentrate mixes is questionable and palatability problems are more commonly experienced at inclusion rates above 5% of the ration.

Germ meal

- See "maize germ meal"

Groundnuts (P+E)

Groundnuts have a very high oil content (over 40% in the dehulled product) and therefore must be used within a day or two of milling. Diarrhoea, lowered butterfat and milk protein percentages may occur depending on the levels of inclusion in the diet. If the hulls are to be included in the feed, it should be borne in mind that they often have sand clinging to them. This sand can be abrasive on milling equipment, and cause problems in the animal if significant amounts are ingested.

Groundnut hulls

These can be a useful source of fibre in some concentrate mixes and complete feeds because they are easy to handle. A high sand content is abrasive on machinery and can be detrimental to animals. Not generally recommended for feeding.

Groundnut oilcake meal (P)

This is the residue after the hulls have been removed and the oil has been extracted. Typically, the protein content is above 45% with less than 2% oil. The "bypass protein" content is low. Palatability is not normally a problem, but there is a high risk of aflatoxins, a toxin produced by moulds.

Hominy chop, maize (E)

A by-product of white maize milling, containing germ and maize husks (maize bran) with a little endosperm. Quality varies according to the milling process. A good quality hominy chop should contain about 9% fat and have a slightly oily feel when squeezed in the hand. Most of the energy comes from the oil, with a little starch making up the balance. The energy value of a good quality (high oil) product can be higher than that of maize. It is not suitable as a total maize replacement in high energy rations. Beware of rancidity in storage and ensure rapid stock turnover. High levels in a ration may cause depression in butterfat percentage in the milk.

High protein concentrate or HPC (P)

The name, as generally used, applies to commercially available blends including, usually, a variety of protein sources with or without urea. Minerals are usually included at levels which provide a balanced ration when mixed with maize according to the manufacturer's instructions on the label. When comparing different brands of HPC it is essential to check the protein content, the source, and whether or not they contain urea. Also, most HPC's contain salt so that it is often unnecessary to add salt to a mixture containing a commercial high protein concentrate.

HPC

- See "high-protein concentrate"

Limestone flour (M)

This is finely-milled limestone (calcium-carbonate) which commonly contains 36 to 38% calcium. The difference between "feed lime" and other sources of lime is the percentage of calcium and impurities that they contain. Forms of lime other than "feed lime" should not be used for feeding dairy cattle.

Lucerne meal (P)

This consists of finely-milled lucerne, with the better grades having a higher protein content, commonly between 16 and 18% crude protein. The energy content is low, and this is a disadvantage in rations for high-yielding lactating cows. At the right price it may be useful in rations for grazing stock or low producers.

Lupin seed (E+P)

This contains about 33% protein, with a low "bypass value", and 9% oil, with an intermediate energy level. There are both bitter and sweet lupin varieties available. The bitter varieties are not recommended, because they contain high levels of toxic alkaloids. Maximum inclusion levels recommended are, 15% in the concentrate.

Magnesium oxide (M)

Containing about 50% magnesium, this can be included as a buffer or as a source of magnesium for cows, especially when they are grazing rapidly-growing lush pastures. Follow the advice of a competent nutritionist in the use of this product.

Maize (E)

Both white and yellow maize are suitable for feeding to cattle. For practical purposes in South Africa, there is little difference in the nutritional value of first grade white and yellow maize although there may be a resistance to white maize in a diet if the animals were previously used to yellow maize. Second grade yellow usually has a lower energy value than second grade white due to a higher level of impurities such as stalk and pieces of cob. There is no limit to the percentage of maize in a mix but it is generally recommended, because of the high starch content, that no more than 6 kg be fed per mature lactating cow per day, especially if this is fed in only 2 feeds.

Maize bran

Normally the bran of white maize, this is a light material of intermediate energy value having a low protein content. It can be useful where rations need to be less dense - a "filler", at the right price.

Maize germ meal (E+P)

This product is rarely available locally, but the term occurs sometimes a misnomer for hominy chop. It is high in fat (about the same as hominy chop), and has a protein content of around 10%. The energy content, mostly from the oil, is about the same as that of maize. Beware of rancidity in storage, and rotate the stock regularly. High levels in

the ration may cause depression of milk fat levels. Sometimes "defatted germ meal" is available, from which the oil has been removed. The protein concentration is increased by defatting, but the energy value is reduced.

Maize gluten (E+P)

Maize gluten meal and maize gluten feed, a mixture of gluten meal and maize bran, are common protein supplements in dairy cow diets. Maize gluten meal is marketed as gluten 60 or gluten 20. Gluten 60 is an excellent source of "bypass protein", while the protein in gluten 20 is highly degradable. Gluten meal can be unpalatable and therefore is best best utilized when mixed with other grains or fed in a complete diet. It is generally recommended that not more than 2 kg gluten meal be fed to cows daily. Maize gluten feed contains about 25% protein and can be used at levels of up to 25 % in the total diet.

Mavova

- See "brewers' grains, barley" and "sorghum".

Middlings (E)

This is fine wheaten bran, with a relatively high proportion of wheat flour, and has an energy level slightly lower than that of maize. It contains highly digestible starch, beware of inclusions greater than 50% of the diet.

Mineral premix (M)

A variety of these are available. All are formulated to balance mineral requirements under different conditions. Follow the manufacturer's or your nutritionist's instructions carefully. Both too high a concentration of minerals, especially of some trace minerals, and too low a concentration can have serious effects.

Molasses (E)

Treacle

Usually available as "standardized molasses" in drums, this is not a particularly high-energy product. Its greatest advantages lie in its properties as a binder and its ability to improve feed palatability. It is very difficult to work with without dilution or heating, but it is nevertheless a good source of the mineral potassium.

Molasses

powder

This is a fine, relatively loose powder with much the same analysis as "standardized molasses". On farms, its advantage is that it is much easier to use than the treacle in mixtures. It is often used to improve ration palatability.

This is a mixture of bagasse and molasses with a lower energy level than either molasses treacle or molasses powder. It has good binding and palatability enhancing properties.

Monocalcium phosphate (M)

This product provides only calcium and phosphorus in significant quantities. The ratio in the most commonly available product is about 0,9 parts of calcium to 1 of phosphorus. It is used to balance calcium and phosphorus in a feed mixture.

Oats (E)

whole grain oats will not be fully utilized unless it is broken before feeding and, for this reason, rolled oats is preferable. whole grain is an extremely "safe" energy feed owing to its high fibre content. Rolled oats have been dehusked and therefore have a low fibre content. Feeding large quantities of rolled oats (in excess of 5 kg/day to a mature animal) may result in acidosis. It has excellent palatability.

Pollard (E)

Essentially, this is wheaten bran with a small percentage of wheat flour. Its energy value is higher than that of bran and less than that of middlings, but not as high as that of maize or wheat. There is a low percentage of starch which is rapidly digestible. Pollard is safe to feed at high inclusion levels. It has a high phosphorus content.

Poultry manure (P)

This product contains both true protein and non-protein-nitrogen in about equal quantities. The non-protein-nitrogen is largely in the form of uric acid, which is broken down slowly in the rumen and consequently does not carry a high risk of ammonia toxicity when fed in large quantities. However, the consumption of large quantities of poultry litter can result in liver damage. Intakes of 3 kg litter per day to mature cows resulted in liver damage.

Two types of poultry manure are available; one from layer operations and the other from broiler houses. Layer manure is usually concentrated manure, relatively free from extraneous material and with a higher protein content than broiler litter. Broiler litter is usually called litter because it includes the floor covering of sawdust, wood shavings, shredded paper or whatever. Consequently, broiler litter has a lower protein and higher fibre value than has layer manure. Either form of poultry manure provides a cheap source of protein (although in a highly degradable form and containing very little energy). It is suitable for inclusion in the diet of growing cattle. Generally, the younger the calf, the less likely it is to be able to utilize poultry manure fully. Feeding it to older animals presents no problems nutritionally as long as the ration has been suitably balanced for minerals and energy.

It is advisable to inoculate against botulism all animals receiving poultry manure. Because of their low energy levels, neither form of poultry manure is particularly suitable for feeding lactating cows, and in any case, should not exceed 20% of the ration fed to these animals.

NB. Unless sterilized, poultry manure is not accepted as a feedstuff under the Feedstuffs Act 36 of 1947.

Snapped corn (E)

This product has an intermediate energy value, with low protein and high fibre contents. It consists of maize grain, ears, cobs and sheaths. The energy provided by maize grain is diluted by the fibrous cobs and sheaths. Snapped corn is especially useful as an energy supplement for low-yielding cows and growing animals. It is highly palatable, and is unlikely to cause acidosis, but this is possible at high intakes.

Sorghum grain (E)

Sorghum has an energy value slightly lower than that of maize. The two main types are bird-proof or "bitter" sorghum and so-called "sweet" sorghum. The former has a dark reddish seedcoat with a high tannin content and tends to be less palatable than the "sweet" sorghum which has a whitish or light pink seedcoat. When fed to cows in large quantities, the high tannin content of the former is detrimental to protein absorption. Theoretically, sorghum can replace maize in dairy cow diets, but there are practical limitations. Being a very small grain, a very fine sieve is required on a hammer mill, and this tends to cause much of the product to be powdered. Cattle are not very fond of the finely powdered material. A roller mill gives a better product. For best results it is essential, at least, to break the grains.

Soyabeans (P+E)

Commonly, these are encountered as either raw beans or as beans processed by toasting or by extrusion. They are high in protein and their high energy value (greater than that of maize) is due largely to their oil content of, typically, about 18%. The high oil content may give rise to lowered butterfat and milk protein levels, as well as to varying degrees of diarrhoea, if included in a diet at levels exceeding about 15% of the dry matter.

Raw

soyabeans

- may be milled before feeding but breaking the beans frees some of the oil, which is inclined to go rancid in storage. Therefore mill only enough to use within two to three days and store in cool conditions. The raw beans contain substances which inhibit protein digestion, particularly in monogastric animals. For this reason, it is not, therefore, advisable to feed raw soyabeans as the major source of protein to calves. The raw beans also contain urease, which breaks down urea to ammonia. Therefore feeding raw soyabeans and urea in the same diet should be avoided. Palatability can be a problem at inclusions of above about 15% in a ration.

Heated

soyabeans

Soyabeans are heated either by toasting or by extrusion. Both processes destroy the protein digestion inhibitors and the urease activity, making the resultant product much more suitable for feeding to all classes of cattle. Palatability is not usually a problem with the heated products, and the fraction of "bypass protein" is improved by heating. Heating retards rancidity so that milled

beans can be stored for longer periods but, as a safety measure, their storage period should not exceed one month.

Soyabean oilcake meal (P)

This is the residue after the oil has been extracted from the milled soyabeans. The oil content is about 1% but the protein content is commonly 45% or more (compared with about 38% in the whole bean). The meal is unlikely to deteriorate rapidly when stored correctly in a cool dry area. Palatability is sometimes a problem at inclusions exceeding 20% of a ration.

Sunflower seeds (E)

The seeds have a high energy potential owing to their high oil content (over 30%) but the protein content is relatively low at 16 to 19%. They must be milled for best utilization by animals, but there is a high risk of rancidity. Therefore sunflower seed should be fed within two to three days of milling. Sunflower seed can cause depressed butterfat and milk protein levels, and diarrhoea, due to high oil content. Inclusion levels exceeding 10 % of the dietary dry matter are not recommended.

Sunflower hulls

These are a useful source of fibre in some concentrate mixes and complete feeds, because they are easy to handle. The fibre is relatively undigestible and very short, contributing almost no nutrients to a ration.

Sunflower oilcake meal (P)

The residue of the dehulled seeds after extraction of the oil is known as oilcake meal. Usually two main types are available, namely "standard" (or "high protein") and "high fibre" (or "low protein"). The former has a higher protein (38 to 42% crude protein) and lower fibre (11 to 16% crude fibre) than the latter. The "high fibre" product may have a crude protein content as low as 28%. Palatability problems are sometimes experienced. The meal is relatively low in "bypass protein" content.

Urea ("P")

Not really a source of protein but a concentrated source of nitrogen which is needed by the ruminal micro-organisms to manufacture protein. It should normally not exceed about 1% of the concentrate, or about 0,5% of the total diet fed in a 24 hour period. As a rule, animals should not take in more than about 110 g urea per day, although higher levels have been fed without detrimental effects. Urea is rapidly broken down in the rumen, and is absorbed into the bloodstream as ammonia. Too much urea in the diet results in the absorption of too much ammonia which becomes toxic to the animal. This may lead to rapid death following nervous symptoms. Urea- containing rations should contain a generous amount of maize or wheat (about 40% or more) because the ruminal micro-organisms need energy in this form to make best use of the nitrogen supplied by urea. The feeding of urea to high-producing

cows on pasture is not normally recommended, and should be discussed with a competent nutritionist beforehand.

wheaten bran

A relatively low energy value and an intermediate protein content of about 14% is characteristic of wheaten bran. It is useful as an extender (or "filler") for making concentrate rations more bulky ("fluffier" or "lighter"). The bran has a very high phosphorus content. There is normally no problem with palatability. See also "pollard" and "middlings".

wheat grain (E)

The energy value is slightly lower than that of maize, containing approximately 60% starch. Starch is highly digestible, therefore replacement of maize with wheat in a ration, if at high levels, carries a greater risk of causing acidosis. wheat should be coarsely ground, cracked or rolled, because finely ground wheat becomes gummy and unpalatable. Palatability is not usually a problem unless there is a dramatic change from maize to wheat in the diet - make the change gradually.

wheaten middlings

- See "middlings"

wheaten pollard

- See "pollard"