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PROVINCE OF KWAZULU-NATAL

DAIRYING IN KWAZULU-NATAL

Characteristics of Common Roughages for Dairy Cows in KZN

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There are numerous feeds, or combinations of feeds, suitable for dairying in KwaZulu-Natal. Each farm, and each farmer, is unique, requiring a unique fodder flow adapted to both the natural resources of the farm and the managerial style of the farmer. In this leaflet, the basic characteristics of the most common roughages used in KwaZulu-Natal are discussed. Roughages are bulky feeds with a relatively high fibre content, and are required to stimulate ruminal digestion.

KIKUYU

Kikuyu is the most widely grown perennial pasture in KwaZulu-Natal. In the KwaZulu-Natal Midlands, the growing season extends from mid-October to the end of April, with marked peaks of growth in November and February.

Grazing

The daily milk-production potential for 500 kg cows grazing kikuyu, without any supplementation, is of the order of 12 litres in spring, declining to between 6 and 8 litres in autumn. This decline in autumn is probably associated with a decline in palatability. Yearling Holstein-Friesland heifers have recorded a growth of 0,50 to 0,55 kg/day on kikuyu pastures.

In the KwaZulu-Natal mistbelt, kikuyu pasture can carry 3 to 3,5 lactating cows, or 2,5 to 3 lactating cows plus followers, per ha over the growing season. Examples of the grazing areas required to suit most of the climatic areas of KwaZulu-Natal are given in KwaZulu-Natal Dairy Leaflet 5.10. Research data from the Cedara and Bathurst Agricultural Research Stations, as well as from Australia, indicate that, for ruminal fermentation the nutritional value of kikuyu is optimal between 28 and 35 days regrowth, depending upon climatic factors. After grazing with dairy cows, the pastures should be heavily grazed with follower animals to prevent a matt of pasture building up. If replacement heifers are to be used as followers, the required target growth rates must still be achieved. One should follow the heifers with dry cows, but should not graze a particular camp for more than three days continuously. Under rotational grazing, new pasture should be allocated every day, since milk yield tends to decline with longer periods of stay.

Kikuyu is characterized by low calcium levels relative to phosphate content, as well as by high potassium levels, resulting from a build-up of potassium in the soil over time, and low sodium levels. The fertility of cows grazing kikuyu has been improved by correcting the Ca:P ratio, through Ca supplementation (see mineral mixtures for kikuyu in KwaZulu-Natal Dairy leaflet 5.3) from less than 1:1 to approximately 1,3:1. Supplementation with 4 to 5 g Mg per cow per day will help to correct the ratio of potassium to calcium + magnesium

i.e. $\frac{K}{Ca + Mg}$ *in the herbage.*

Bloat can also become a problem on well-fertilized kikuyu, owing to either excessive nitrogen levels (25 to 30% CP) in the herbage, or mineral imbalances. Low Na:K ratios have been implicated in bloat on kikuyu pastures. Additional salt supplementation, relative to other pastures, is therefore essential on kikuyu pastures (see mineral mixtures for kikuyu in KwaZulu-Natal Dairy leaflet 5.3).

Certain management practices can aggravate the mineral imbalances in kikuyu. Cows receiving high levels of concentrates become nett importers of P and K onto the pasture, because more P and K is excreted *via* the faeces than is excreted *via* the milk. Injudicious applications of fertilizer and slurry, the practice of feeding maize silage on a particular kikuyu pasture, or the use of a nightcamp, accelerate the mineral build up and, consequently, the resultant imbalances.

Silage

Making silage with surplus kikuyu pasture, which often builds up in late summer, appears to be the ideal solution for the problem of surpluses in the wet summer months.

Generally, silage made from tropical pasture species does not compare favourably with that made from temperate species. Low levels of soluble carbohydrate, typical of tropical species generally, result in unsatisfactory silage. Molasses can be used to inhibit anaerobic decomposition during the silage fermentation, thus enhancing the production of good lactic acid silage. Kikuyu has an inherently low nutritive value, relative to the temperate, and even some tropical, species and fermentation changes during ensiling reduce the nutritive value even further. This results in a product which often is adequate only for the maintenance of older livestock, but is unsuitable for younger animals. Supplementation of steers with fish meal markedly improved the daily gains, indicating a shortage of quality protein in the silage. Supplementing yearling steers with either maize meal or the maize meal plus fish meal improved daily gains from sub-maintenance off kikuyu silage alone, to 0,3 kg/day with maize meal (3 kg) and 0,6 kg/day for the maize meal (1,25 kg) plus fish meal (0,25 kg) supplemented groups.

The ensiling of kikuyu does have a further advantage. It removes significant quantities of K from the pasture.

Foggage

If the kikuyu pasture is not required for grazing again after the late summer surplus, it can be successfully utilized as a foggage (standing hay) during the winter months. Yearling Holstein-Friesland heifers on kikuyu foggage have been reported to grow at 0,2 to 0,3 kg/day, and even up to 0,5 kg/day with a suitable protein and energy supplement. Strip grazing of the foggage, using an electric fence, is recommended in preference to a continuous grazing system.

RYEGRASS & RYEGRASS/CLOVER

Annual ryegrass is the grass most commonly used for irrigated pasture in KwaZulu-Natal. On average, in the KwaZulu-Natal Midlands, ryegrass is available for grazing from the end of March through to the end of November. Annual ryegrass pastures have one of the highest nutritive values of all the pastures available to KwaZulu-Natal dairy farmers.

Grazing

Milk yields of 16 to 17 litres have been recorded for 500 kg Holstein-Friesland cows grazing ryegrass pastures at Cedara. Ryegrass can carry 2,5 to 3 lactating cows per ha over the growing season in the misbelt of KwaZulu-Natal. Examples of the grazing areas required to suit most of the climatic areas of KwaZulu-Natal are given in KwaZulu-Natal Dairy Leaflet 5.10. Weaner heifers on ryegrass have recorded gains in excess of 1 kg/day on ryegrass pastures at light stocking rates, where pasture intake is not limiting.

Well-fertilized ryegrass usually has high levels of CP, and injudicious nitrogen fertilization can easily result in excessive CP (>25% of the DM) and nitrate levels in the herbage, causing bloat, as well as fertility and health problems. Ryegrass is an active accumulator of K, and high levels are generally encountered, resulting in poor magnesium absorption from the herbage. The routine supplementation of Mg, in the order of 5g Mg/cow/day, is therefore recommended.

The high CP content (20 to 30 %) of ryegrass can result in large savings in the use of protein supplements as shown in Table 1. But, high CP levels can cause metabolic problems in cows receiving unbalanced, or low levels of concentrates, resulting in a loss of production and lowered fertility.

Table 1. Daily feed requirements of a 100 cow Holstein-Friesland herd averaging 20 litres milk per cow per day, using either ryegrass or maize silage as the roughage

Feed	Ryegrass herd	Silage herd
Ryegrass (kg DM)	1075	-
Maize silage (kg DM)	-	850

Maize meal (kg)	620	520
HPC (38% CP)	20	248

Annual ryegrass/clover pastures

Clover has a nutritive value 20% higher than ryegrass in terms of animal production. For this reason inclusion of white clover in ryegrass pastures, is recommended, primarily for the extra quality, and also to extend the grazing season, and not to save on nitrogen fertilization, although reduced N fertilization could be an option later in the season. Increased daily milk yields, of the order of a litre per cow over the herd, are reported when clover is incorporated in a ryegrass pasture.

Bloat will not be a problem, provided that there is a good grass component in the pasture, and the following precautions are taken (for any well fertilized pasture):

- Do not put hungry animals onto the pasture, because they will devour too much succulent pasture in too short a period of time. (N.B. The best cows will be the hungriest).
- It is advisable to graze some other pasture, feed silage or hay, if the cows are hungry, prior to entering a potentially hazardous pasture.
- Make hay or other dry roughages available to the cows.
- Avoid grazing legume pastures when there is still a heavy dew on the pasture. Legume pastures are particularly hazardous when moist, after light rain or dew.
- Whenever there is a likelihood of bloat, *i.e.* more than 50% legume in the pasture, the cows should be constantly observed, and bottles of a bloat remedy (commercially available) should be available for immediate use. Walk bloated animals uphill if possible, to assist in eructing (belching) the gasses from mild cases of bloat. Bloat preventatives, commercially available or 30 to 60 ml of tallow or a vegetable oil, can also be routinely dosed, or fed, at milking.

Perennial ryegrass/clover pastures

It is recommended that perennial ryegrass pasture should have clover incorporated as a standard practice. These pastures are comparable to annual ryegrass in their first season of production, but winter growth is diminished in the second and subsequent seasons. The clover component tends to become more dominant in the second and subsequent seasons, although this is influenced by soil acid saturation levels, nitrogen fertilization and grazing practices. Strategic applications of nitrogen fertilizer in the autumn (March to April) and early winter period are generally recommended to increase winter production.

Dairy herds grazing perennial ryegrass/clover pastures typically have high yields, especially in the summer, due to their improved nutritive status relative to cows on kikuyu or other summer pastures.

Ryegrass silage

Ryegrass should contain adequate levels of soluble carbohydrates (> 20% of the DM) to make successful silage. However, owing to losses during fermentation, a lower nutritive value must be expected. The stage of harvesting will also affect the nutritive value of the silage. The practice that is common in South Africa, is to ensile the ryegrass in spring, often when the grass is setting seed, this stage will not compare with first-cut (of the season) silage, as is made overseas.

Ryegrass silage is usually highly palatable, although in a high-moisture silage, the products of poor fermentation can severely inhibit dry matter intake.

FESCUE

Tall fescue is a perennial, cool season pasture, with high production in the autumn and spring. It is the second most common irrigated pasture species in KwaZulu-Natal, although dryland plantings on wet sites are increasing. Fescue has a relatively high nutritive value, slightly lower than ryegrass, but superior to kikuyu.

Grazing

On Cedara, Holstein-Friesland cows (550 kg bodymass) grazing tall fescue on Cedara have been shown to produce 15 to 15,5 litres, in both spring and autumn. The response to concentrate feeding was 0,8 litre per kg of concentrates (11,1 MJ ME/kg as-fed).

Poor palatability is often given as a reason for the poor performance of animals on fescue pastures, although this performance is probably an indication of excessive nitrogen fertilization in mid-summer. Many problems in animal performance have been associated with tall fescue, including fescue foot, fat necrosis and fescue toxicoses. Both endophytes and alkaloids have been implicated in these conditions but, except for an isolated occurence of endophyte, have yet to manifest themselves in South Africa.

The high fibre content of fescue assists in maintaining butterfat levels in the grazing cow, especially when it is grazed in conjunction with lush ryegrass in autumn (and spring, to a lesser extent).

It is generally recommended that fescue be planted in combination with clovers as a standard practice, especially under irrigation.

Silage

As with other temperate species, fescue can be successfully made into a good quality silage.

Hay

Fescue makes a highly palatable hay, although drying can be a problem. The production of fescue hay in the spring, when ryegrass is usually plentiful, should be considered. Hay made when fescue is less palatable for grazing, is very palatable.

Foggage

Fescue comes into its own as a foggage of good quality and high palatability. Beef weaners on fescue have been recorded as gaining up to 0,6 to 0,7 kg/day on fescue foggage for 3½ months in the winter period at a stocking rate of 4 to 5 animals/ha.

ERAGROSTIS CURVULA

Eragrostis curvula is the most common hay pasture in KwaZulu-Natal. It is a long-lived, tufted perennial species indigenous to South Africa.

Grazing

In certain parts of South Africa, the grazing of Eragrostis in the early spring is a common practice. However, the suitability of Eragrostis for grazing diminishes rapidly as the season progresses. A grazing height of 200 to 300 mm, in a leafy stage before the start of flowering, is recommended. Grazing livestock, especially dairy cows, should not be pressured to graze clean, because intake and quality decline as the grazing period progresses. A short grazing period with the use of followers is recommended. Following the early season grazing, Eragrostis is generally set aside for hay making.

Table 2. Effect of growth stage on the nutritive value of *Eragrostis curvula* hay (adapted from: Jacobsz & van Zyl, 1970; Rethman & Beukes, 1977)

Cutting stage	Pre-flower	Early flower	Full flower
Cuts per year	6	5	3
Yield: (ton/cutting) (ton/year)	1,8 10,6	2,40 12,0	4,6 13,0
Crude protein (%)	12,8	11,0	8,9
ME (MJ/kg DM)	9,4	8,8	8,0
Relative dry matter intake	100	91	78

Hay

Eragrostis curvula is most commonly used as hay. Under favourable weather conditions, it can be cut, dried and baled on the same day. The nutritive value of Eragrostis hay varies considerably, from good topoor

quality, depending upon fertilization, climate, rainfall and stage of growth when harvesting. Table 2 highlights the effect of growth stage on the quality of Eragrostis hay. is most commonly used as hay. Under favourable weather conditions, it can be cut, dried and baled on the same day. The nutritive value of Eragrostis hay varies considerably, from good topoor quality, depending upon fertilization, climate, rainfall and stage of growth when harvesting. Table 2 highlights the effect of growth stage on the quality of Eragrostis hay.

MAIZE

Maize silage forms an important part of the winter feed programme on many KwaZulu-Natal dairy farms. The main reasons for the popularity of maize for silage are the high yield obtained in a single harvest, the ease with which it can be ensiled, and its high energy value as a feed. However, its major shortcoming is its low protein content.

Silage

The best quality maize silage is that made from maize grown under the same condition as a high-yielding grain crop. By contrast with grass silage or hay, the nutritive value of maize silage improves with crop

maturity, to the point where the ears are fully developed. This is because of the contribution that the maize grain (or ears) makes to the nutritive value of the silage. One of the best estimates of the metabolizable energy value of maize silage is the grain-to-stalk ratio (see Table 3). The influence of the grain yield on the nutritive value of maize silage is shown in Table 4. The physiological stage at harvest is critical to the quality of the silage. Maize should be cut for silage when it is at the hard-dough stage, when the grain to leaf ratio is at its best, and the moisture level of 55 to 65 % gives the best lactic acid production during fermentation.

Maize silage (5 ton grain yield), fed to appetite, contains sufficient energy for the production of 16 litres of milk by a 500 kg cow, but only sufficient protein for 6 litres of milk. Various options are available for balancing the energy : protein ratio in maize silage. These are:

- Feeding a 21% CP concentrate to the dairy cows. The major disadvantage of this system is that Holstein-Friesland cows producing less than 16 litres milk per day will require the concentrate to satisfy only their protein requirements. This system therefore supplie energy these cows do not require.
- Feeding 2,5 kg HPC (36%) to all cows to balance the protein-to-energy ratio in the silage. A standard dairy production concentrate (12%) is then fed to cows producing more than 17 litres of milk per day. For Jersey cows, feed 2,3 kg HPC (36%) and production concentrates (12%) to cows producing more than 12 litres milk per day. This system ensures that excessive energy levels, relative to protein (resulting in fat cows), are not fed to cows in order to balance the protein in the diet.

- If ryegrass grazing is available, the protein and energy can be balanced by 3 to 4 hours ryegrass grazing per day. Production concentrates (12%) are then fed in excess of a 16 litre/day milk production for Holstein-Frieslands, and 11 litres for Jerseys.
- Feeding 25 kg of Japanese radish/cow/day will also help balance the energy : protein ratio in the diet.
- Urea can also be used to balance the energy:protein ratio in maize silage. Cedara trials showed that feeding urea (150 g/cow/day) on top of the silage decreased palatability, due to an NPN overload on the system, and consequently depressed milk yields. A viable alternative is to add urea at a rate of 5 kg urea per ton wet material (30 to 35% DM) at ensiling. Adding urea to silages with DM levels much lower than 30% results in much of the highly soluble urea being lost *via* seepage. Adding urea to high DM silages (40%) may depress silage palatability substantially, resulting in lower feed intake and milk yield. The advantage of adding urea at ensiling is that the ammonia generated acts as a preservative, both in the silo and during feeding, minimizing the degradation of protein to NPN in the silage. This practice, as opposed to the addition of urea at the time of feeding the silage, results in a lower total NPN load on the cow.

Table 3. The ME content of silage DM, predicted from either the grain yield or the proportion of grain in the silage DM

Grain yield (air dried) tons/ha	Grain fraction in the silage DM	ME (MJ/kg DM)
1	0,16	8,5
2	0,20	8,7
3	0,26	9,0
4	0,31	9,3
5	0,38	9,7
6	0,44	10,0
7	0,52	10,4

Table 4. The effect of grain or ear yield on the nutritive value of maize silage (adapted from Kaiser, Lishman & Hulme, 1971)

Plant population	Normal	High	Very high
Silage yield : (tons DM/ha)	9,40	11,20	10,80
ears (ton/ha)	3,40	2,80	1,20
leaf and stalk (ton/ha)	6,00	8,40	9,60
Crude protein (%DM)	7,60	6,30	5,70
Percentage ear in crop	36,00	25,00	11,00
Grain yield (ton/ha)	3,10	2,60	1,10
Fed to beef steers:*	5,80	5,20	4,80
DM intake (kg/day)	0,82	0,59	0,50
ADG (kg/day)			

* protein was balanced by feeding 0,7 kg lucerne hay.

Maize-legume silage mixtures

The use of silage mixtures, containing either dolichos beans or soyabeans grown together with maize, to improve the protein levels in the silage, was tested at Cedara. Dolichos beans grown at 36 000 plants/ha proved to be the most successful, raising the CP content of the silage mixture to almost 11% CP in the DM. Soyabeans planted at a population of 143 000 plants/ha increased the CP levels to almost 10% CP in the DM. Neither legume improved the dry matter yields of the combined crops, and both depressed ear yields of maize, when planted together with on optimim population of 54 000 maize plants per ha. Dolichos beans were included in the same rows as the maize, but soyabeans were planted in separate rows, to minimize shading. The inclusion of either dolichos beans or soyabeans did not depress the voluntary intake of silage by steers.

Practical problems encountered are arranging the time of planting of each crop, so that both reach the optimum stage for ensiling at the same time. The twining nature of the tropical dolichos bean can also be a problem when harvesting.

An alternative to mixed plantings is the planting of alternative strips, in which the production for the specific crop can be optimized. These strips can then be mixed at the harvesting/ensilng stage. In practice, mixing would mean cutting a row of maize and then 1 to 2 rows of soyas, depending on the ratio required in the mixture.

FORAGE SORGHUMS/MILLET

These are fast growing annual species which can flower 60 to 65 days after planting.

Grazing

Grazing can usually commence 30 to 40 days after establishment. The optimim height for grazing is considered to be 500 to 600 mm in order to ensure good intakes of quality herbage, and to encourage regrowth after grazing. However, the crop should not be allowed it to grow too tall before grazing. It is recommended that grazing commence at a height of 200 mm, and that planting is staggered, to ensure that the crop does not "get away" before the grazing cycle is completed. Prussic acid poisoning can occur when the plant is stressed by lack of moisture (wilting) or frost, and excessive nitrogen fertilization. It should not be grazing under these conditions.

Silage

Sorghum silage which contains a high proportion of grain will almost match maize silage for quality. Generally, sorghum silage will have a lower nutritive value than maize silage, because cattle do not digest the grain in sorghum fodder, or silage, as well as they digest the grain in maize silage. This is because the sorghum grain is much smaller in size than the maize grain, and as a result, more of the grain escapes chewing and passes through the digestive tract intact.

GREENCHOPPING FORAGES

On many farms fresh green forage is harvested and fed to the lactating cows for short periods during the year.

Feeding freshly-chopped green forage has some important advantages and some serious disadvantages. It avoids the wastage through trampling, fouling and selective grazing that goes with grazing. Feeding forages as a greenchop reduces the probability of bloat associated with some grazed pastures. Feeding freshly chopped, green forage, however, presents problems such as harvesting in inclement weather, apart from the cost of harvesting and the additional cost of feeding facilities.

If freshly-chopped, green forage, stays on a trailer, or in a feed trough, for any length of time, respiration and fermentation begin the initial stages of silage fermentation, resulting in nutrient losses and poor alatability. As the forage heats it becomes unpalatable, and cows will not consume an adequate amount.

The feeding value of greenchop should be quivalent to that of the standing crop if no respiration and fermentation losses take place.

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