Kikuyu Grass and Animal Health: Positives and Negatives

Northland Kikuyu Action Group

Early observations

Veterinarian Hugh Black, then superintendent of the MAF animal health laboratory in Whangarei, told the Whangarei kikuyu grass forum in 1985 that kikuyu grass pastures have both positive and negative implications for livestock health.

He spoke about nutritional and metabolic diseases and kikuyu grass poisoning. Reports indicated that digestible energy and specific nutrients, such as calcium and phosphorus, may limit production or cause disease in some circumstances. Trace element deficiencies could also be added to the list on some properties. However, similar nutritional limitations also apply to all other pasture species and may be altered by seasonal factors or by management such as stocking or fertiliser rates. The extent of deficiencies can be assessed by analyses of animal tissues or herbage. More significant is the finding that both intake and dry matter digestibility of kikuyu grass by dairy cows is lower than for temperate grasses.

Dairy cows will do well on kikuyu pastures, if they are kept short and leafy. Old kikuyu can lead to compaction problems in cattle and sheep.

Black said kikuyu poisoning was common in Northland until 1972, but since then had become rare. Severe outbreaks of acute disease and deaths of cattle grazing kikuyu grass pastures have been recorded and sheep, goats, deer and possibly horses were also susceptible. The disease is due to toxic injury to the fore-stomach mucosa, particularly in the omasum, and death due to severe disturbance of the fluid balance and shock. Black said these criteria must be present before outbreaks occurred:

- Livestock grazing on lush kikuyu grass which had previously been damaged, usually by armyworm.
- Sheltered, north-facing paddocks.
- A drought period followed by rain.
- Daily grass minimum temperatures greater than 12°C.

He thought that the biocontrol of the armyworm by the introduced parasitic wasp may have improved the position for that first conditioning factor, and thus reduced the disease incidence.

In his booklet Kikuyu Grass Farming for High Production, published by Northland Pasture of Whangarei in 1991 (ISBN 0-473-01427-0), researcher and author Graeme Piggot summarised the main aspects of the grass on animal health.

1. Facial eczema. Kikuyu grass pastures offer "safe" grazing, although the causes of this effect are unclear.
2. Poisoning. Kikuyu grass poisoning is a toxic injury to the ruminants' stomachs, particularly the omasum. Death occurs from shock and severe disturbance of fluid balance. The outbreaks of the disease are rare and have occurred during warm and wet conditions following droughts and where cosmopolitan army worm damage to pasture has occurred. The cause of the disease is unknown.
3. Reduced intestinal worm burdens. This supposition is based on theoretical analysis and not controlled experimentation.
4. Avoidance of toxicities associated with temperate pasture species such as ryegrass staggers and bloat.

Kikuyu is a natrophobe, or salt-hating plant. Cattle should be provided with salt licks, even when grazed near the sea.

Kikuyu toxicity

Hugh Black, now on-farm services veterinarian for AgriQuality in Whangarei, and Wayne Andrewes, kikuyu researcher and farm consultant, presented a paper at the 2007 conference of the Northland Pastoral Farming Development Group, at Waitangi, which re-opened discussion on the toxicity of kikuyu grass, particularly the role of insect damage, the nature of the toxin and the syndrome of stolon impaction.

They said that the symptoms of acute toxicity in cattle (and probably goats, deer, camelids and possibly horses) are severe depression within 24 to 48 hours of access to toxic pasture, which may or may not show signs of recent insect damage, usually by the cosmopolitan army worm during rapid growth in warm, wet conditions.

"There have been many observations of kikuyu toxicity without army worm being present in the pasture being grazed at the time, although army worm was present in the district," the authors said.

"It could be that weather triggers toxicity, or that kikuyu can detect the presence of insect attack from a distance."

Cattle are dehydrated, with sunken eyes and hair which stands on end. They stand by water "sham drinking", depressed and drooling saliva, sometimes with licking movements of the tongue. They are constipated and show evidence of abdominal pain such as aimless wandering, with an uncoordinated gait, getting up and lying down, grunting, and repeated turning of the head towards the flanks, before recumbency and death.

Black said that due to the excellent biological control of army worm by the parasitic wasp, *Apantales ruficrus*, acute toxicity has been greatly reduced and is now almost a disease of history. When kikuyu toxicity has occurred in the past, death occurred quickly. As many as 40 to 100 cattle have died at a time. In recent years, few deaths have been recorded.

The nature of the kikuyu toxin is not known, but unlikely to be a mycotoxin, said Black and Andrewes. It is probably a plant response to insect or possibly other damage.

Chronic kikuyu stolon impaction of cattle

Stolon impaction of the rumen of cattle occurs in late autumn, winter or spring, usually in non-lactating but pregnant dairy cattle that are fed large quantities of kikuyu pasture with high stolon content. The cattle lose condition as the nutritive value of the pasture is low, of the order of 7 MJME/kg DM, and because they are incapable of sufficient intake of the indigestible kikuyu dry matter. The stolon fibre also has a rate of throughput which is too slow to meet the demand of advancing pregnancy. The cows have distended abdomens due to ruminal engorgement with kikuyu, their faeces are firm and fibrous, later becoming scant or absent as rumen stasis (inactivity) probably ensues. When their body condition score drops below 3 at the lower end of the Dexcel scale, they become weak and often recumbent, sometimes in boggy places, are unable to rise and death ensues within a few days if they are not put down. Secondary conditions, like the blindness of thiamine deficiency may occur due to the alteration of rumen flora, and complicate the case presentation. Unlike acute kikuyu toxicity, where death occurs quickly, the effect of kikuyu impaction takes much longer to develop. The process takes weeks or even months.

Autopsy findings include wasted skeletal musculature and low body fat reserves, in the anomalous presence of a rumen greatly distended with "food". The rumen contents are light green in colour and consist of poorly digested, fibrous stolon material. The omasum may also be impacted. Beyond the forestomachs, the gastrointestinal contents are scant or absent in the

Kikuyu provides a boost for cattle in Northland in autumn, when ryegrass can't tolerate lack of moisture and heat.

abomasums, small and large intestines, with little or no evidence of faces in or around the recumbent animal.
This condition has not been investigated scientifically and Black continues to look for incidents to study. The Hine Rangi Trust has generously allocated money for a thorough case work-up and report in the peer-reviewed scientific literature.

Inter-linked problems?

"A question that remains to be answered is whether kikuyu toxicity is involved in the chronic impaction syndrome, or whether it is simply the inability to digest the poor, fibrous diet," said Black and Andrewes. "Ruminal impaction, except in toxic episodes involving rumen stasis, such as lactic acidosis due to carbohydrate overload, is rare or non-existent. It is unusual for toxic substances in the rumen to impair the muscular activity of the walls and produce the stasis as a necessary prerequisite for impaction.
"It seems possible that acute kikuyu toxicity and stolon impaction may be the two ends of spectrum which includes sub-acute toxicity, sub-clinical production loss and recovery in between."

Other animal health issues

MAF soil scientist Ian Cornforth, from Ruakura, looked at mineral nutrients in different pastures species and reported his findings to the NZ Society of Animal Production in 1984. He included kikuyu in the pasture species cited for "conditions of greatest risk for trace element deficiencies" with reference to low selenium in conditions of rapid pasture growth during late spring through to autumn when young stock are grazing.
He included the Northland podzols among the soil types on which this deficiency could occur. He concluded:
"While plant composition alone is of limited value in predicting or diagnosing animal mineral status, it is one of a series of clues, when assessed together, improve our ability to identify mineral deficiencies.
"These clues include all the soil, plant, seasonal and management factors which influence the composition of plants and the availability of plant minerals to animals."
At the 2007 Northland Pastoral Farming Development Group conference at Waitangi, Bay of Islands, AgResearch Grasslands scientist Neville Grace said selenium and copper were the most important trace element deficiencies in dairy cattle. Selenium has antioxidant properties that maintain the structure of cell membranes, influences the function of the thyroid and maintains the integrity of the immune system. A deficiency of selenium results in white muscle disease, which is a non-inflammatory degeneration of the skeletal and heart muscle.
Pastures containing 0.03mg Se/kg DM will provide an adequate selenium intake to grazing dairy cows, because their daily intakes would be 0.48 to 0.54mg/day.
To remedy deficiencies, which could be diagnosed by blood tests, Grace recommended selenium injections to cows mid-pregnancy, as the selenium is transferred to the developing foetus, or top-dressing with selenium prills (1kg prills/ha) in the fertiliser during autumn or spring to increase the selenium status of the herd for one year.

Kikuyu is among the pasture plants which provide "conditions of the greatest risk for trace element deficiencies", namely selenium, which is essential for newborn animals.

Sodium (salt) supplementation

Sodium (Na) is essential for the healthy development of stock, but appears to play a much less important role in plant health. The coastal situation of some New Zealand's farms means that salt-laden air supplies sufficient Na to meet the daily requirements of most stock. However, in inland areas Na deficiencies can arise. High application rates of potassium fertilisers can also depress herbage Na levels. Species composition influences the Na content of pasture. Pasture plants such as brown top, tall fescue, timothy, kikuyu and red clover are natrophobic, or sodium-hating. They transport very little Na to their leaves, restricting it mainly to the roots and lower stems. In contrast, natrophiles like ryegrass, cocksfoot, Yorkshire fog and white clover readily absorb Na and transport it into their leaves, where it is available for consumption by stock.
A number of reports have indicated that Na supplementation for sheep with otherwise Na-deficient diets leads to an increase in liveweight gain, according to advice to farmers contained on the Ballance Agri-Nutrients website (www.ballance.co.nz).
Animals need direct supplementation with sodium (salt licks) when grazing on natrophobes. An important feature of natrophobes is that they are incapable of providing enough sodium for grazing animals even when the soil in which they grow is not deficit or when fertilisers containing sodium have been applied.

Northland veterinarian Hugh Black

Lifelong veterinary interest

Hugh Black is a Northland-based veterinarian with an interest in the effects of kikuyu grass in the pasture intake of farm animals. He is currently on farm services veterinarian in Northland for AsureQuality, which is the national animal disease surveillance and auditing agency. He has expertise in state veterinary medicine and pathology with personal interests in epidemiology, rural animal health service delivery, disease surveillance systems, animal behaviour and welfare.

Hugh moved to Whangarei in 1971 as a MAF district veterinarian and soon saw disease incidents of kikuyu poisoning and impaction in cattle and sheep which are confined to the Northland region. The diseases were being described in papers by Dick Martinovich, Animal Health Laboratory, Whangarei, and others.

As a resident state vet, he was required to understand the animal health issues with kikuyu in order for MAF to be able to advise farmers on its use as a pasture plant and avoidance of animal health problems.

"Dick had a knowledge and love of the (veterinary) scientific literature and encouraged his colleagues to write up observations they made that had not previously been through peer review," Hugh said.

In recent times Hugh has been a committee member of the Kikuyu Action Group and given several papers, usually in collaboration with Wayne Andrews (chapter 1) to conferences of farmers on the pluses and minuses of farming with kikuyu grass.

Hugh Black, farm services veterinarian for AsureQuality, Northland. Photo: Hugh Black.

In 2007 Hugh reached 45 years service with AsureQuality and its predecessors, AgriQuality, Ministry of Agriculture and Forestry, and Department of Agriculture.

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