

Managing Prussic Acid levels

What is Prussic Acid?

Cyanogenic glucosides are a natural component of the plant which, when eaten by stock, are converted to hydrogen cyanide (HCN). In sufficient quantities this can lead to hydrogen cyanide poisoning or, as it is commonly referred to, prussic acid poisoning.

When animals consume forage sorghum containing cyanogenic glucosides, prussic acid is released and may be absorbed into the blood and carried to body tissue where it interferes with oxygen utilisation by the cells. Prussic acid poisoning is not a major problem provided sensible grazing management is adhered to.

Once stock have settled into a sorghum paddock, a portion of the forage they consume is high in prussic acid causing compounds (e.g. young growth, old stressed plants) but this has no effect because the toxic plants are only part of the diet and the animal is in a steady, rather than rapid intake, grazing pattern. However, environmental conditions can change which can result in a change in the level of these compounds in the plant, and this can in turn affect animal production.

Symptoms of prussic acid poisoning

Symptoms include muscle trembling, staggers, deep and rapid breathing, frothing at the mouth and gasping respiration. Collapse, coma and death may occur in extreme cases.

Factors influencing prussic acid levels

1) Stress (the most important influence)

A plant which is under stress - particularly moisture stress - will have a higher level of prussic acid causing compounds than a plant not under stress, especially if the plant is in the young stage and less than 0.5m to 1m tall.

2) Stage of growth

The level of prussic acid decreases as the plant gets older and it is generally considered that once a healthy plant reaches 80cm to 1m tall the level of prussic acid is below a dangerous stage.

3) Sorghum type (genotype)

The sudan grasses, e.g. Superdan 2, are considered to be generally low in prussic acid whereas the

sweet sorghum and grain sorghums are considered to be high. There is a third group which comprises the majority of the forage sorghums and these are sorghum x sudan grass crosses which have a moderate level of prussic acid.

However, within each genotype or group there can be significant variations which have been identified by breeders and used in breeding programs. So, depending on individual parents, there is a difference in prussic acid levels between varieties.

Irrespective of varietal differences, caution should always be exercised, as even the varieties traditionally low in prussic acid can reach dangerous levels under severe stress.

4) Nutrient balance

High nitrogen levels in a plant can increase the prussic acid content, as can low soil phosphorus levels.

Recommended grazing management

1) Height - The plant should be healthy and preferably 80cm to 1m tall.

2) Stock condition - Starving stock should not be introduced to forage sorghum, particularly if the forage sorghum is young or showing any signs of stress.

3) Sulphur - Sulphur blocks are always highly recommended when grazing forage sorghums. When stock only have forage sorghum in their diet, they will become sulphur deficient, as forage sorghum is always low in sulphur. Therefore the significant effects of prussic acid in forage sorghum are not the infrequent fatal poisoning of animals, but the less obvious consequences. These include a depression in voluntary feed intake, sulphur deficiency and a decrease in growth rates.

The sulphur deficiency is increased when the forage has a high prussic acid level. This is because sulphur is used in a detoxification reaction within the animal which converts prussic acid to the nontoxic thiocyanate. Animals have this ability to break down the prussic acid as long as they have enough sulphur.

Sulphur deficiency causes a reduction in appetite which in turn leads to a decline in average daily weight gains or milk production.

As well as intake declining, there may be certain amino acids which become limiting factors to production. When this occurs, tissue synthesis and the ability to increase live weight in the animal decreases.

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4) Salt - All forage sorghum varieties are low in salt and animals fed salt licks will show better performance.

Conserving forage sorghum high in prussic acid

1) Hay - Making hay from this material will decrease the prussic acid content to some extent, however as the moisture is reduced stock can consume the remaining dry matter (therefore prussic acid) more quickly, which increases the poisoning potential. Standing forage that has a high prussic acid potential will also have a high prussic acid potential as hay.

2) Silage - It is widely reported that the silage process results in a decrease in the prussic acid content.

What to do with a stressed crop

When a crop is less than 1m tall and stressed, particularly drought stressed, there are two options:

a) The preferred option is to wait for rain to freshen up the crop to reduce the prussic acid, as it really is considered too risky to graze.

b) If the farmer is in a position where feed is extremely short and he wants to utilise the available sorghum, the following precautions should be taken:

1. If possible send samples of forage sorghum away for laboratory testing. A reading in excess of 600ppm is considered unsafe and 1000ppm is lethal. Hungry livestock are at high risk and can show symptoms within five minutes of eating plants with a high level of HCN (hydrogen cyanide), and may die within 15 minutes.

2. Give the stock a good feed of hay or straw etc so when they are introduced onto the sorghum paddock they are full and will commence grazing in a slow manner. When an animal consumes a large quantity of toxic forage rapidly, its body cannot neutralise the prussic acid at the rate of intake and poisoning occurs.

3. Introduce sulphur blocks to cattle well before they go into the sorghum paddock so they have sulphur in their system and have become familiar with their use.

4. Closely monitor the stock and if there is any indication of any toxic reaction occurring within the cattle, remove them immediately.

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MILLET AND SORGHUM TYPES AND THEIR POTENTIAL CYANIDE ACCUMULATIONS

Millet or Sorghum types	Cyanide potential
Pearl and foxtail millet	very low
Sudangrass varieties	low to intermediate
Sorghum-sudangrass hybrids	intermediate to high
Sweet sorghums	intermediate to high
Johnson grass	high to very high
Grain sorghums	high to very high

Preventing prussic acid poisoning

- Do not graze any of the plants (sorghums) that have been subject to drought or injury, unless they are tested for hydrocyanic acid.
- If plants have been damaged by herbicides defer grazing until they are either well recovered from injury or cut for hay and the plants have been allowed to dry.
- Do not graze plants until they have reached a minimum of 0.8m in height for sudan grasses or 1m for sorghums.
- Graze re-growth sorghum with caution if growing conditions are poor.
- Remove all livestock from the feed source when an animal is found to have died suddenly after grazing forages under poor growing conditions.
- Prevent animals from grazing wilted plants or those with young tillers.
- After plants have grown rapidly, such as shortly after a rain or irrigation on previously drought stressed paddocks, wait at least two weeks after plants begin to grow before grazing.
- Provide sulphur supplement where possible to assist with the detoxification of prussic acid and toxins.



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