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The Prussic Acid Problem

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UNDER CERTAIN CONDITIONS, summer annuals (sorghums, sudans, and their hybrids) can contain enough prussic acid to be potentially fatal to livestock. The prussic acid content in plants can be affected by climate, soil fertility, and plant maturity. The presence of prussic acid should not deter producers from realizing the potential value of these forage crops, however.

In general, the ruminants (cattle and sheep) are most susceptible to prussic acid poisoning. Horses and pigs are apparently less affected, if at all, by the prussic acid found in summer annuals.

Prussic acid does not occur in dangerous quantities in living plants. While alive, plant cells containing the glucoside (dhurrin) and enzyme (emulsin) apparently keep the constituents separated. When plant cells are crushed or damaged by freezing, the dhurrin and enzyme come together to form hydrocyanic acid, commonly called prussic acid. The acid may then metabolize into cyanide that prevents the tissue from using oxygen by interfering with the cytochrome system. The cytochrome system (electron transport oxygen) normally enables the cells to use oxygen through a series of electron exchanges. In effect, the cyanide molecules turn off the switch, the energy transfer system stops, and the cells die quickly.

In cases of prussic acid poisoning, animals often die quickly in the field. Examination will show that the blood and mucous membranes are red. When nitrogen poisoning affects the hemoglobin, however, the blood and mucous membranes are chocolate brown.

Although animals can consume low levels of prussic acid and expel it through the urine, when large amounts are consumed in a short period the dosage can become lethal. Growers are cautioned not to allow grazing of summer annuals soon after a frost, because a crop that was high in prussic acid before the frost will release a large quantity of prussic acid in a short time after being frosted. The evidence indicates that summer annuals may be safely grazed after a frost only if the plant tissue has dried thoroughly and if the crop was safe to graze before the frost.

Another problem with freshly-frosted summer annuals occurs when warm weather follows the first frost of the season and the sudan grasses and sorghums initiate new growth. Prussic acid

is highest in fresh or new growing tissue. Thus, recovery growth may have a particularly high level of prussic acid. When warm weather follows the first frost, growers should observe recovery growth carefully to determine whether there is new tiller growth occurring. Where there is new tiller growth, cattle should be moved until it has reached the 18- to 24-inch height.

Safe grazing of sudans and sorghum-sudans is related to the general height of the plant. Sudangrass varieties are normally low in prussic acid potential. Because these plants are low in their potential for poisoning, they can be grazed at shorter heights than can the sorghum-sudan hybrids that have higher prussic acid potential.

It is suggested that sudangrass be at least 18 inches tall before grazing is started and sorghum-sudans be at least 24 inches tall before grazing. The best grazing practice is to graze off the crop within 5 to 7 days and then allow the entire crop to recover until it has reached the prescribed height again.

Frosted sudans and sorghums can be used as feed after the plant material has dried thoroughly. The safest way to use frosted sudans and sorghums is to ensile them. A second method is to green-chop, which will mix stems and leaves and thereby dilute the concentration. *Don't* green-chop for two days after a frost because the prussic acid level rises during this period.

The least desirable method of using questionable sudans and sorghums is as pasture because when cattle are grazing they select the lush green tips and shoots that are high in prussic acid.

Some other factors can also cause a change in prussic acid potential, including: (1) availability of nitrogen; (2) nitrogen-to-phosphorus ratios; and (3) weather. Increased levels of available nitrogen have been associated with higher levels of prussic acid releases. Plants grown on soils having unbalanced nitrogen-to-phosphorus ratios also tend to release higher levels of prussic acid. Drought and cold weather usually cause higher prussic acid release levels, as well.

In addition, some external factors can be cited, including: (1) photosynthetic rate; (2) heredity; and (3) part of plant involved. Researchers have reported that during periods of high photoactivity (between 8:00 and 10:00 a.m.), plants have increased prussic acid release. There are wide differences of prussic acid release among varieties of sudangrass, sorghum, sorghum-sudangrass crosses, and their hybrids. Leaves demonstrate at least two times the prussic acid release potential shown by stems.

When feeding sudangrass or sorghums that may have a toxic level of prussic acid, combine them with a feed that is low in prussic acid. This will dilute the total amount of prussic acid ingested by the animal. Animals can ingest low quantities of prussic acid without endangering their health and this dilution enables the use of questionable material. Do not turn animals out into questionable pasture if they are quite hungry. Feed dry hay that does not have prussic acid before allowing the animals to graze the sudans. This will reduce the intake of plant material with a relatively high level of prussic acid.

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