

Interpreting Water Analysis for Livestock Consumption

Provided by: Element Materials Technology

Farm animals can consume as much as two to five times water as dry matter. It is therefore important that the source of that water is pure and free from chemical contamination. A comprehensive water analysis will indicate its suitability for livestock use. This fact sheet contains explanations of some of the parameters commonly tested in livestock water and some interpretive guidelines.

TERMS USED ON LIVESTOCK WATER REPORTS

CONDUCTIVITY/TOTAL DISSOLVED SOLIDS (TDS)

Conductivity/TDS is used as a general measure of water quality. Water containing high levels of dissolved solids are said to be saline. Salinity should not be confused with hardness. Saline water can be very soft if it contains low levels of calcium and magnesium (See Table 1).

Table 1 - The Relationship of Conductivity or Total Dissolved Solids to Animal Response

| Conductivity (mmhos/cm) | TDS (mg/L) | Interpretations of Values |
|-------------------------|------------------|--|
| Less than 1.56 | Less than 1,000 | Should present no serious problems. |
| 1.56 to 4.7 | 1,000 to 3,000 | May cause temporary, mild diarrhea in livestock. |
| 4.7 to 7.8 | 3,000 to 5,000 | Will probably cause diarrhea and temporary refusal of feed. Not recommended for poultry. |
| 7.8 to 10.0 | 5,000 to 7,000 | May be used under some conditions. Not recommended for pregnant or lactating animals. |
| 10.9 to 15.6 | 7,000 to 10,000 | Unfit for swine and other animals subjected to heat stress or high water loss. |
| More than 15.6 | More than 10,000 | Not recommended for use by any livestock. |

CALCIUM-MAGNESIUM-SODIUM

Excessive calcium, magnesium and sodium when found in combination with bicarbonate, chloride and sulfate will have a detrimental effect on water quality (See Table 2).

CHLORIDE

Though chloride is seldom found at toxic levels in water, it influences conductivity and can produce a salty taste which may reduce water intake (See Table 2).

SULFATE

When an excessive sulfate level is found in combination with high sodium and/or high magnesium, a laxative effect may result. It may also produce an objectionable smell and taste (See Table 2).

NITRATE

Field runoff following a heavy spring rain may cause nitrate levels to rise and fall dramatically in farm ponds. High nitrate levels are potentially harmful to livestock (See Table 2).



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pH

Most water supplies have a pH value between 6.5 and 8.0. This is ideal for most livestock. However, a pH level below 6.0 may have an adverse effect on broiler performance and egg quality (See Table 2).

Table 2 - Threshold and Limiting Concentration Levels

| Term | Threshold Concentrations* | Limiting Concentrations** |
|----------------------------|---------------------------|---------------------------|
| Calcium (Ca) | 500 mg/L | 1,000 mg/L |
| Magnesium (Mg) | 250 mg/L | 250 mg/L |
| Sodium (Na) | 1,000 mg/L | 2,000 mg/L |
| Chloride (Cl) | 1,500 mg/L | 3,000 mg/L |
| Sulfate (SO ₄) | 500 mg/L | 1,000 mg/L |
| Nitrate (NO ₃) | 200 mg/L | 400 mg/L** |
| (TDS) | 2,500 mg/L | 5,000 mg/L |
| Conductivity | 3.9 mmhos/cm | 7.8 mmhos/cm |
| pH | <6.0 - >8.5 | <5.0 - >9.0 |

*Threshold values represent concentrations at which sows and other sensitive animals might show slight effects from prolonged use of such water.

**The limiting concentration levels can have detrimental or fatal effects on livestock. The limiting concentration of nitrate for chickens is only 20 mg/L.

TOXIC ELEMENTS

Certain elements, even at very low levels, may be toxic to livestock because of cumulative effects. Maximum allowable levels are shown in Table 3.

Table 3 - Maximum Test Levels for Elements

| Element | Max. Level mg/L | Element | Max. Level mg/L |
|---------------|-----------------|---------------|-----------------|
| Aluminum (Al) | 5.0 | Copper (Cu) | 0.5 |
| Arsenic (As) | 0.2 | Fluorine (F) | 2.0 |
| Boron (B) | 5.0 | Lead (Pb) | 0.1 |
| Cadmium (Cd) | 0.05 | Mercury (Hg) | 0.01 |
| Chromium (Cr) | 1.0 | Selenium (Se) | 0.05 |
| Cobalt (Co) | 1.0 | Zinc (Zn) | 25.0 |

ALGAE AND BACTERIA

Total coliform is an indicator of the sanitary condition of a water supply. Fecal coliform bacteria are a group of bacteria that are passed through the fecal of excrement of humans, livestock and wildlife. Bacteriological testing is often reported as colonies of the organism found in a unit of water (col/100 mL). Water with heavy algae growth, especially blue-green species, should be avoided. Maximum bacterial levels in water that should be observed are:

| | |
|------------------|---|
| Adult Animals | 1,000 colonies of fecal coliform/100 mL |
| Young Animals | 1 colony of fecal coliform/100 mL |
| Dairy wash water | 1 colony of total coliform/100 mL |

ORGANIC COMPOUNDS

The maximum levels of organic compounds for livestock pertain to both the toxicity of the compound as well as its potential to bio-accumulate in the food chain. Dietary, physiological and environmental factors are some parameters considered when establishing these levels. The complexity of these interactions is beyond the scope of this fact sheet.

SAMPLE PREPARATION

Use a clean, 16-oz glass or plastic container. Allow the water tap to run for at least five (5) minutes to clear the lines. Rinse the bottle before the sample is collected. Sterilize a glass container if purity, i.e. total coliform, is to be checked. Fill the container to the top and refrigerate. The sample should be received by our lab within 24 hours of collection.

Insulated water sample kits with sampling instructions are available from Element's Laboratories.



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