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6-1-2002

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Recommended Citation

Twidwell, Edward K.; Wagner, John J.; and Thiex, Nancy J., "Use a Microwave Oven to Determine Moisture Content of Forages" (2002). *Extension Extra*. Paper 282.
http://openprairie.sdstate.edu/extension_extra/282

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Extension Extra

ExEx 8077
Updated June 2002
F&F 1.4-5.2

COLLEGE OF AGRICULTURE & BIOLOGICAL SCIENCES / SOUTH DAKOTA STATE UNIVERSITY / USDA

Use a Microwave Oven to Determine Moisture Content of Forages

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Knowing the moisture content of forages at the time of harvest and storage is essential for making and preserving high-quality hay and silage. Knowing the moisture content of stored forages is important for accurate ration formulation.

A squeeze test, which involves squeezing forage into a ball and then guessing the moisture content, is a common method of determination. This method is rapid, but it lacks precision. Resistance-type moisture testers estimate moisture as a measure of electrical resistance. These devices provide estimates rapidly, but they usually are expensive (about \$100 to \$150) and vary in accuracy. A portable, electric drying unit also is available and is fairly accurate, but it requires at least 30 minutes before readings can be taken.

Using a microwave oven to determine moisture content is advantageous because it dries forage in a minimum amount of time and can provide accurate results. The following procedure describes how to use a microwave oven for moisture determination. This is a good option for producers who do not want to purchase expensive moisture testers.

Obtaining Representative Samples

Proper sampling of forage is essential if an accurate moisture determination is to be obtained.

FORAGE IN WINDROW (hay making):

With a sharp shears, cut 6-inch sections from several locations in the windrow. If the windrow is dry, take extreme care to avoid losing leaves. Cut the sections into pieces about 1 inch long and mix samples in a clean container, such as a pail.

FORAGE IN WINDROW (silage making) OR STANDING CROP:

If forage in the windrow or standing corn or sorghum is to be harvested with a forage chopper, several rounds can be chopped from a representative part of the field. Collect small samples

from various locations in the forage wagon, and mix thoroughly in a clean container.

HAY BALES:

Use a hay probe to collect samples. Follow the guidelines given in Extension Extra 4001, "Take An Accurate Forage Sample."

SILAGE:

The method of sampling for moisture content will depend on the type of silo being used. In vertical or horizontal silos, collect about 2 gallons of silage by taking handfuls at random from about 10 different locations and mix them in a clean container. The silage unloader also may be used to collect a sample. Pass a container beneath the chute several times, collecting 1 or 2 quarts at each pass until a 2-gallon sample is collected. Then mix the sample thoroughly in a clean container.

Procedure for Determining Moisture

The equipment needed for this procedure includes a small scale, paper plate, a glass of water, and a microwave oven. The accuracy of the results depends on the type of scale used. A dietician's scale measuring in grams will give reasonably good results. These balances are available at many general supply stores and can be purchased economically. Avoid scales that are designed to weigh heavy objects and weigh only to the nearest 1/4 or 1/2 pound.

The procedure for determination of moisture content with the microwave oven is as follows:

1. Dry a paper plate on high power for 1 1/2 to 2 minutes. Immediately weigh the dry plate.
2. Weigh about 100 grams of the forage sample and spread evenly on the plate.

3. Place an 8 ounce glass, three-fourths full of water, in the back corner of the microwave oven. This will protect the oven magnetron when sample moisture is low.

4. For dry legume or grass samples, dry initially for about two minutes at 50% power. Then weigh and record sample weight. Gently stir the sample and place it in the oven for another two minutes at 50% power. Again remove and weigh the sample. If the weight has not changed more than 2 grams, use this value. If the change is greater than 2 grams, continue drying using additional one-minute intervals at 50% power until the weight change is less than 2 grams.

5. Haylage or silage samples require a much longer time (about 45 minutes) for the drying process to be completed. Initially dry samples for about 5 minutes at 50% power. This step may need to be repeated several times. Once the sample dries substantially, then drying periods can be shortened to 2 minute intervals. The sample is considered dry if the weight change between dryings is less than 2 grams.

6. Be careful not to char the sample. If this occurs, it means that the oven was set too high, the drying time was too long, or both. Discard the charred sample and repeat the test. Experience will tell you how much drying time your samples require.

7. Use the following equation to calculate the moisture content.

Example calculation:

(A) Paper plate weight = 10 grams

(B) Wet sample weight + paper plate = 110 grams

(C) Dry sample weight + paper plate = 80 grams

Percent moisture = $\frac{\text{moisture lost}}{\text{sample weight}} \times 100\% = \frac{B - C}{B - A} \times 100\%$

= $\frac{110 \text{ grams} - 80 \text{ grams}}{110 \text{ grams} - 10 \text{ grams}} \times 100\%$

= $\frac{30 \text{ grams}}{100 \text{ grams}} \times 100\%$

= 30%

Percent dry matter = 100% - 30% = 70%

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ExEx 8077- pdf by CES. June 1992; updated April 2002.