

Microwave Drying for Measurement of Forage Moisture ¹

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Determination of feedstuff moisture is essential for proper formulation of dairy cattle rations, especially if silage or wet by-products make up substantial portions of the ration. Here is an example of the potential economic loss that can occur in your lactating herd if moisture content of corn silage is unknown or has changed unexpectedly.

You want to feed a diet that has a crude protein content of 17% and a net energy content of 0.77 megacalories per pound of feed on a dry matter basis. When the silo was first opened, a sample of silage was mailed to a commercial laboratory for chemical analysis. The moisture of the silage came back at 72%. Based on the lab's results, you calculated that 68 pounds of corn silage and 32 pounds of concentrate would meet the crude protein and energy needs you were aiming for.

In a few weeks the water content of the corn silage changed to 64% without the manager being aware of it. The same amount of corn silage and concentrate would continue to be mixed but the resulting ration would no longer be at the desired nutrient concentrations. Instead the diet being fed would be 16% crude protein and 0.76 megacalories per pound of feed.

This unwelcome diet will support a minimum of 1.5 pounds less milk per cow per day. This is 750 pounds of milk for a 500-cow dairy, which translates into \$105 loss per day with milk at \$.14 per pound. It only takes 2 to 3 days of this to pay for a microwave oven, which can be used to follow moisture content of your feedstuffs.

Use the following technique to obtain a moisture reading that is very close to commercial laboratory results. Equipment needed includes a small scale, a paper dish (preferably with sides), a cup of water, and a microwave oven. A scale that weighs to 0.1 grams such as a dietetic scale will be most accurate. Most farm catalogue supply houses have very accurate, durable scales for about \$100.

1. Place the dish on the scale and record the weight.
2. Transfer a small sample of wet forage to the plate and weigh it. Working with exactly 100 grams of forage makes the calculations easier.
3. Place a glass three-quarters full of water in the back corner of the oven. According to the manufacturer, the presence of the water prevents damage to the oven magnetron during use. Maintain the water level throughout the drying process.

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4. Move the dish and silage into the microwave oven. Set the controls to 80-90% of the oven's maximum power.
5. Grass samples in the 50-80% moisture range should be dried initially for seven minutes. Corn and sorghum samples should be dried for 14 minutes. Reweigh the dish and forage and record the weight.
6. Stir the sample carefully to avoid spilling any forage, and return to the oven. Dry for an additional 2 minutes and reweigh.
7. Continue to stir and dry at 1 minute intervals until the change in weight is less than one gram. You may use this as your dry weight or continue the drying process until no change in weight between drying times occurs.
8. Avoid charring the sample. This may occur if the oven was set too high, the forage was dried too long, or all the water had evaporated out of the glass. The procedure must be rerun if the sample becomes charred. A fire is always possible so don't leave during the drying process.
9. See Equation 1 to calculate the percentage of moisture in the sample.

$$\text{Percent moisture} = \frac{(\text{wet weight} - \text{dish weight}) - (\text{dry weight} - \text{dish weight})}{(\text{wet weight} - \text{dish weight})} \times 100$$

Equation 1.

Be sure that the wet and dry weights you use in the calculation do not include the weight of the dish. Subtract the weight of the dish from both the wet and dry weights before calculating percent moisture.

Samples dried in this way should not be analyzed for chemical content as the fiber and protein concentrations will be altered.