DYNAMIC AG CONSULTANCY
Livestock Nutrition, Health & Management

PO BOX 180 Hamilton 3300
email: s.cotton@dynamicag.com.au
Tel: (03) 5571 1760

Determining plant dry matter (DM) & Moisture

Determination of dry matter is important, particularly when trying to cure hay ready for baling. There are a number of subjective assessments that will be reviewed as well as an objective 'benchmark' gold standard that is the most accurate determinate of dry matter – the oven or microwave test.

1. The node test

The 'node test' involves taking a sample of stem, locating an intact node and placing your thumb nail in the middle of the node, with the stem sideways. When you bend the stem over your thumb nail and it splits cleanly in half on both sides, it is fully cured. If only half the stem splits and/or bends, the sample is not fully dry. This is a quick and simple test that can be performed in the paddock, and usually, the node is the last part of the plant to cure so gives a very good indication of how close the sample is to baling. Usually, if the node splits cleanly in half, the moisture levels are good enough to commence baling.

SOURCE: http://www.bcg.org.au/resources/Curing_hay_Factsheets.pdf
Estimating moisture in windrowed plants prior to baling using the 'node test'

2. The bull bar test

The 'bull bar test' involves placing the plant sample on a flat surface (bull bar or tray of the ute) and hitting a node (or head) with a hammer. If there is any sign of moisture on the hammer or the surface of the bull bar, then the sample is not cured. Drought affected crops can pass this test even though they may not be ready for baling, possible due to high sugar levels that can 'clog' the bale shoot.

SOURCE: http://www.bcg.org.au/resources/Curing_hay_Factsheets.pdf
Estimating moisture in windrowed plants prior to baling using the 'bull bar method'

3. The crank test for legumes

The 'crank test' involves grabbing a handful of windrowed pasture and rolling the sample up to resemble a rolled newspaper. Hold the sample in both hands with a gap of a hand length in between. Try to break the sample by rolling the hay as if you are peddling a bike with your hands. If after two revolutions the roll does not break completely in two, then that sample is not cured.

SOURCE: http://www.bcg.org.au/resources/Curing_hay_Factsheets.pdf
Estimating moisture in plants prior to baling using the 'crank test'

It should be noted that each of methods described above should be used with caution and are not a failsafe method determining moisture. For more information on the methods listed above, visit the Australian Fodder Industry Association (AFIA) website.

Determining Dry Matter using the microwave method

Firstly, select a sample that is representative of the material you are analysing. Chop the sample down into 3-4cm pieces using scissors or secateurs, so that you have around 100g of "wet" material. Mix the material together to reduce variation, subdivide and subsample for analysis.

Place an empty plastic Chinese takeaway container on the scales, allow to settle until the weight appears on the display. Hit the 'tare' or 'zero' button and record the weight (A). Next, put your chopped up sample into the container and then record the weight on the scales (B). Place the sample into the microwave together with a small cup of water (helps absorb the microwaves as the sample dries out and avoids fires!).

Estimating moisture in a hay sample using the microwave method

Depending on sample volume, water content and microwave wattage, initial drying times can take up to 5 minutes. If using a 1000W microwave, it is better to start with shorter drying times (i.e 2 minutes initially).

Once finished, pull the sample out of the microwave and weigh and record weight. Stir the sample around and place sample back into the microwave for another 1-3 minutes and re-weigh and record weight. Repeat this process until the weight matches the previous sample or is within 1g of previous sample and record this weight (C). This indicates that the sample has no more moisture to loose and is at a constant weight.

To calculate Dry matter (DM):

(C - A) / (B – A) x 100

Empty container (A) = 10.2g
Container + wet sample (B) = 74.5g
Container + dry sample (C) = 42.9g

DM = (42.9 – 10.2) / (74.5 – 10.2) x 100
= (32.7) / (64.3) x 100
= 0.5085 x 100
= 50.85% DM

To calculate moisture:
= 100 – DM
= 100 – 50.85
= 49.15% Moisture

Hints

1. If using the microwave method to determine DM or Moisture at home, the sample cannot be used at the lab for quality assessment since the heat of the microwave will denature (break down) the protein in the sample. Similarly, with silage samples, heating the sample can remove volatile compounds containing energy.
2. This method works well for silages and green pastures but is less accurate for hays or drier samples with dry matter > 80%.
3. Do not collect samples on a wet day or samples that contain dew as this will add bias to the initial wet weight. Wait until the afternoon when samples are dry or collect sample the next day.
4. Complete the microwave method as soon as possible after harvesting the material. If you get it home and notice condensation inside the bag, your plants are respiring and loosing moisture so you will not get an accurate DM determination. If you will not be analysing for some time, place the sample in an airtight container in the fridge.
5. The microwave method needs to be adapted for use based on type of microwave and sample to be analysed. Start with lower cycle times and build up drying times as you become more experienced.

Using a conventional fan forced oven determine FOO and dry matter

Procedure for this method is identical to the above method for determining FOO or dry matter however; a conventional fan forced oven replaces the microwave. Set the oven to 100^0C. This method can take several hours to complete, up to 24hrs for wet silages and green pasture samples. In this instance, the microwave method is preferable.