



1. PURPOSE

The purpose of this standard operating procedure (SOP) is to determine the DM% of fresh herbage using a microwave oven.

Dry matter is usually expressed as a %, and is the quantity of sample remaining once all the moisture has been removed by drying. DM% is dependent on a variety of factors, including species, stage of maturity, ploidy, season and weather conditions.

Accurate determination of DM% is critical for balancing the diets of ruminants and analytical results are reported on DM basis to allow meaningful comparisons of feeds.

It is important to be cognisant that drying in a microwave may cause thermo-chemical degradation of the sample, which destroys or modify some plant components, such as amino acids. As a result microwave drying is only suitable for DM% calculations.

2. SCOPE

- This SOP is applicable to fresh herbage only.
- This SOP is applicable to all personnel determining the DM% of herbage samples using the microwave oven.

3. DEFINITIONS/ABBREVIATIONS

- SOP - Standard Operating Procedure.
- DM- Dry Matter
- Wt- weight
- %- Percentage

4. EQUIPMENT AND MATERIALS

Equipment

- Top loading Balance
- Microwave safe container, such as a Pyrex dish to hold grass
- Microwave safe glass/cup to hold water
- Dimplex 900W, turntable system microwave oven
- Labeled plastic bag to put sample into when collected
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Materials



- Herbage sample

5. PROCEDURE

- Using a Gardenia Shears [Refer to relevant SOP] take a well-mixed, sub sample (300g) from a representative area of the paddock, and place in a clearly labelled bag [Refer to the relevant field sampling SOP's and RA for greater detail regarding taking of individual samples].
- In the laboratory, no more than 1 hour after cutting, weigh 100g of this sample onto a balance, which has been previously tarred to zero with a Pyrex dish. Record the fresh weight onto the 'Microwave Oven Grass Dry Matter Datasheet' [see Appendix I] as 0mins. Fill in all necessary data including time and date.
- Disposed of the unused sample laboratory moiety in the dungstead [Refer to the relevant laboratory waste SOP].
- Ensure the sample is placed neatly within the Pyrex dish. Poorly stored samples are likely to fall from the Pyrex dish, and therefore affecting DM% results.
- Place the cup of water in the microwave with the grass. Throughout the process monitor the level of water in the container – ensure that the water does not go below ¼ of the container at any time.
- Turn on the microwave for 3 minutes on high.
- Using the necessary PPE, remove the sample and weigh. Place sample back in microwave and heat for another minute, remove and weigh. If this weight is equal to the first dry weight, the sample is dry. If the weight has changed, dry again for another 30 seconds. Continue this process until the sample is dry.
- DM results are usually expressed as a %. DM is the quantity of sample remaining once all the moisture has been removed by drying. Calculate the D% as follows;

$$DM\% = \frac{\text{Wt. of fresh sample (kg)} - \text{Wt. of dried sample (kg)}}{\text{Wt. of fresh sample}} * 100$$

$$DM\% * 10 = \text{gDM/kg grass}$$

- Weigh the sample and record into appropriate database.
- Dispose of the dried laboratory sample moiety in the dungstead.

CAUTION:

- Monitor the sample closely as it is drying.
- Do not over dry the sample, as it can cause the sample to ignite.
- Do not allow the water in the cup to drop below ¼ of the container capacity.
- If it begins to smoke, discontinue heating immediately to prevent the sample from bursting into flame. Douse the sample with water and discard. Begin again with a new sample.

NOTE:

- As you become more familiar with the procedure, drying times can be altered to lessen the amount of times that you have to repeatedly heat the sample. For example, if you are checking the dry matter of pastures (typically wet at 20% DM), the initial drying time may need to be increased to 7 or 8 minutes.



- Microwaves vary in their power. This procedure is only a guideline. Practice and experience with your oven will dictate drying times.

6. RESPONSIBILITY

- No individual may use the Grassland Laboratory Microwave oven without being authorised to do by the Grassland Laboratory manager.
- It is the responsibility of all personnel involved to assure that this SOP is performed as described
- It is the responsibility of the research officer to ensure appropriate training and instruction is given before this SOP is undertaken.
- It is the responsibility of all personnel to report any problems that may occur while performing this procedure to their supervisor.

7. ENVIRONMENTAL HEALTH AND SAFETY:

- Exert caution when using the oven.
- Please refer to Teagasc Laboratory Safety Manual for additional information.
- Please refer to Teagasc Bio-Safety Manual for additional information.

8. ASSOCIATED RISKS

- Burns
- Slip/trip/fall
- Electric shock

9. RECOMMENDED PPE

- Heat resistant gloves
- Laboratory coat
- Gloves



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10. HELPFUL LINKS AND PHONE NUMBERS

- Grassland Laboratory Manager: Michelle Liddane: michelle.liddane@teagasc.ie

Below are some links to other laboratories using similar techniques.

- <http://dairyone.com/wp-content/uploads/2014/01/Determining-Dry-Matter-with-a-Microwave-Oven1.pdf>
- http://www.foragetesting.org/lab_procedure/sectionB/2.1/part2.1.3.htm

Please contact Researcher in charge if you have any queries regarding this lab procedure

For further information please consult the manual of any equipment required and any other relevant SOP's!



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Appendix I

Microwave Oven Grass Dry Matter Datasheets

Trial Code: _____

Sample No. _____

Sampling Date: _____

Time of day sampled: _____

Weather: _____

Rotation No: _____

Rotation Length: _____

Nitrogen: _____

Cover: _____

Time (mins)	Weight (g)
0mins	

DM% Calculated _____