

A PRECISE METHOD OF DRY MATTER DETERMINATION FOR FIELD USE

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SUMMARY

The determination of forage yield from plot areas can lead to large variations in dry matter (DM) yield for the same replicated treatment collected at different times of day. A modified method of DM determination for field use was analyzed for its precision. Samples of freshly cut Coastal bermudagrass [*Cynodon dactylon* (L.) Pers.] from morning and afternoon harvests were handled for DM determination by three methods. Approximately 200 g of fresh forage was placed in brown paper sacks, weighed immediately, and again at 1, 2, 3, 4, and 6 h post harvest. After 6 h weighing each sample was cooled (6°C), and weighed 24 h post harvest before drying. Sample handling methods, with 5 replicates, consisted of placement in: (1) direct sunlight (check), (2) resealable zipper-type plastic bags in direct sunlight (plastic bag), and (3) a ventilated cooler (cooler). The samples were dried to a constant weight (55°C) and sample dry weights were used to calculate DM for each of the post harvest time increments. The treatment $\bar{x} \pm SE$ for the morning observations gave DM percentages of 33.7 ± 5.02 , 27.6 ± 0.09 , and 27.8 ± 1.73 for the check, plastic bag, and cooler samples, respectively. Bagged forage samples placed in plastic bags was determined to be the only precise estimate for DM determinations under field conditions of those tested.

INTRODUCTION

The determination of dry matter (DM) yield on plot areas is a simple calculation. Biomass from a delineated area is removed, weighed, and a representative subsample taken. The fresh subsample is weighed, dried to remove all moisture, and reweighed to determine percent DM according to the equation: $((1.0 - ((\text{wet wt} - \text{dry wt}) / \text{wet wt})) \times 100)$. Percent DM and whole plot wet weight are used to calculate DM yield of the plot (Grassland Research Inst. 1961).

Because of the inconvenience of weighing samples under field conditions a method was devised that entailed placing the subsamples contained in brown paper sacks into resealable zipper-type plastic bags. This procedure was tested to determine its precision in predicting DM yield.

PROCEDURES

Fifteen samples of Coastal bermudagrass from both a morning and afternoon harvest were handled by one of three methods. Freshly cut forage from uniform swards was placed in paper sacks, weighed immediately, and at 1, 2, 3, 4, and 6 h post harvest. Samples were placed in a walk-in cooler (6°C) after the 6 h weighing and weighed again at 24 h postharvest before drying. For the initial 6 h period, one treatment consisting of five replicated samples was placed in direct sunlight (check). Treatment 2 consisted of five samples sealed in zipper-type plastic bags placed in sunlight (plastic bag). A third treatment of 5 samples was placed in a cooler with ice (cooler) which was vented to allow for air exchange. Analysis of variance was used to determine the statistical significance of DM percent relative to treatment method for each harvest (Lund,1986).

RESULTS

For the morning harvest, the check, plastic bag, and cooler samples produced average DM percentages of 28.1 ± 1.10 , 27.5 ± 0.83 , and 26.5 ± 1.35 , respectively, for the immediate weigh period (0 h) (Table 1). The check samples after 1 h had increased by 1.3 units DM. Check sample DM increased with each weigh period such that 24 h post harvest DM was 52.6% higher (14.8 units) than the initial value. The plastic bag DM values were uniform over the 24 h period with only 1.09% (0.3 unit) fluctuation (Table 1). For the cooler samples, DM values held fairly constant to 3 h post harvest but increased at later weigh periods. Dry matter values for samples placed in the cooler increased 14.0% (3.7 units) for the 24 h period (Table 1).

The afternoon harvest for the check, plastic bag, and cooler samples for the initial weigh period (Table 2), gave DM values of 32.4 ± 1.21 , 25.6 ± 1.41 , and 33.1 ± 1.41 , respectively. A greater variation of these values is noted when compared to the morning harvest (Table 1). The temperature at initiation of the morning harvest was 25.5°C, with 74% relative humidity and dew. At initiation of the afternoon harvest the temperature was 30.5°C with 42% relative humidity. Samples in paper sacks which were not immediately placed in plastic bags may have lost a significant amount of moisture via stomatal-cuticular transpiration (Meyer et al., 1960).

For the afternoon harvest (Table 2), DM in the plastic bag samples remained unchanged over the 24 h period. The check sample DM increased 31.5% (10.2 units) and DM in the cooler samples increased 12.4% (4.1 units).

With high temperatures and low humidity, forages lose large amounts of moisture via transpiration. After harvesting, respiration continues at the cellular level for considerable lengths of time dependent on environmental factors. Transpiration losses can greatly influence DM values in a field harvest situation. The advantage of this method of DM determination is that plastic bag-paper sack samples can lie in the sun and not lose significant moisture. The use of resealable zipper-type plastic bags to contain paper sacked forage samples until wet weight was determined, greatly increased the precision of field measurements.

REFERENCES

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TABLE 1. FORAGE PERCENT DRY MATTER OF COASTAL BERMUDAGRASS
AVERAGED BY TIME PERIOD FOR FIVE SAMPLES
COLLECTED IN MORNING

Hours post harvest	Percent Dry Matter†		
	Check	Plastic bag	Cooler
0	28.1 ± 1.10	27.5 ± 0.83	26.5 ± 1.35
1	29.4 ± 1.02	27.4 ± 0.88	26.5 ± 1.35
2	30.7 ± 0.85	27.5 ± 0.83	26.9 ± 1.33
3	32.6 ± 0.98	27.7 ± 0.83	27.3 ± 1.31
4	34.3 ± 0.93	27.6 ± 0.84	27.8 ± 1.14
6	38.0 ± 1.19	27.7 ± 0.86	28.0 ± 1.18
24	42.9 ± 1.61	27.6 ± 0.84	30.2 ± 1.44
Treatment x ± SE	33.7 ± 5.02 A‡	27.6 ± 0.09 B	27.8 ± 1.73 B

†x ± SD for 5 replicated samples.

‡x within row followed by the same letter are not significantly different by Newman-Keuls mean comparisons at $\alpha = 0.01$ confidence level.

TABLE 2. FORAGE PERCENT DRY MATTER OF COASTAL BERMUDAGRASS
AVERAGED BY TIME PERIOD FOR FIVE SAMPLES
COLLECTED IN AFTERNOON.

Hours post harvest	Percent Dry Matter†		
	Check	Plastic bag	Cooler
0	32.4 ± 1.21	25.6 ± 1.41	33.1 ± 1.43
1	34.1 ± 1.51	25.6 ± 1.49	33.8 ± 1.64
2	35.2 ± 1.76	25.6 ± 1.52	33.9 ± 1.71
3	37.1 ± 1.84	25.7 ± 1.62	34.2 ± 1.62
4	38.8 ± 2.26	25.5 ± 1.62	34.5 ± 1.74
6	41.1 ± 2.90	25.6 ± 1.58	34.7 ± 1.73
24	42.6 ± 3.08	25.5 ± 1.62	37.2 ± 2.11
Treatment x ± SE	37.7 ± 4.32 A‡	25.6 ± 0.16 B	34.6 ± 2.20 C

†x ± SD for 5 replicated samples.

‡x within row followed by the same letter are not significantly different by Newman-Keuls mean comparisons at $\alpha = 0.01$ confidence level.