



## Measuring concentration of glucose in grass – Silage on the Farm

**Aim:** To investigate the effect of time of day on sugar content of grass.

This investigation was developed following a conversation with a teacher at Bell Baxter High School, who had an AH Biology pupil interested in understanding the sugar content of grass and how that relates to the production of silage.

Implementing such protocols can help farmers understand the optimal time of day / year to cut grass for the production of a quality silage to feed livestock through the winter.

Research suggests that midday is the best time of day to cut grass for this purpose. Can we replicate this finding? What is the best month of the year in Scotland? Does the weather affect sugar content? Does the exposure of light in a field affect sugar content of grass? Does soil moisture levels affect sugar content? All these questions can be addressed using this simple protocol, and potentially link to changing conditions with climate change.

### **Materials (per pair):**

0-10% BRIX scale refractometer	small plastic beaker
Garlic press	Scissors
Random number generator	Pipette
Trundle wheel	Long tape measure
Small collection pot for grass squeeze	Blue roll
Bijou of 3 cm <sup>3</sup> water	

### **Method:**

The basic method requires a suitable open field and selecting 10 representative sample sites. The sample sites should be determined using a random sampling protocol. Small samples of grass should be “harvested” from each location, using the scissors, added to the plastic jug. The samples should be well mixed and then a sample squeezed to collect a liquid sample that can be added to the refractometer.

1. Use a random number generator to determine an X/Y coordinate within a 20 m x 20 m sampling site (see table right).

X (m)	Y (m)
18	13
17	17
3	15
10	16
12	10
10	17
13	18
6	9

2. Using scissors, harvest a sample of grass and add it to the collection pot. Mix the grass with the water in the bijou.
3. Squeeze the sample of grass through the garlic press, collecting liquid passing through the garlic press into the plastic beaker.
4. Use a plastic pipette to transfer a sample of the grass liquid onto the refractometer. Record the sugar content of the grass sample.

### **BRIX scale**

Refractometers are pieces of apparatus that provides a measure of concentration based on refraction. As light enters the liquid at an angle, it changes direction, the angle of which is correlated with concentration of solute in a liquid. 1% Brix is equivalent to 1 g of sucrose in 100 g of solvent. Digital refractometers are available, and might be accessible from a local college or university.

### **Results**

*Independent Variable* - Time of day: \_\_\_\_\_

Sample site	Glucose concentration (BRIX scale %)
1	
2	
3	
4	
5	
6	

7	
8	
9	
10	