

SUGAR ANALYSIS OF HAY AND GRASS: A QUICK AND EASY GUIDE

Method by Elke Malenke



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THE SUGAR CONTENT IN FORAGE – CRUCIAL FOR THE HORSE'S HEALTH



The sugar levels in hay and grass play a vital role in maintaining your horse's health. Understanding and managing these levels is essential to prevent metabolic disorders and ensure your horse's overall well-being.

It is increasingly recognized among horse owners and stable managers that the sugar content in forage is a critical factor in horse feeding. But how can you determine how much sugar is in your hay or the vegetation of your pasture? This is especially important during the grazing season, as high sugar levels in grass significantly increase the risk of laminitis, particularly in horses with undiagnosed insulin dysregulation.

Typically, to determine the sugar content in feed, samples are sent to agricultural laboratories for analysis. Depending on

their workload, it usually takes one to two weeks to receive the results. However, during this time, the sugar content in your pasture's plants can change significantly. These fluctuations are influenced not only by growth but also by daily cycles, weather conditions, and other day-to-day variations.

As a result, the sugar level two weeks later may differ significantly from the day the sample was taken. This delay is often also too long when deciding whether to purchase hay, as the farmer may have already sold it to someone else in the meantime.

Elke Malenke has developed a simple yet ingenious method to determine the sugar content of hay using a standard refractometer. We've prepared instructions so that any horse owner or stable manager can easily perform the test themselves.

Determining the sugar content in grass is even simpler: just cut some fresh grass, weigh it, squeeze out the juice, and place a few drops directly on the refractometer. This provides a rough estimate of the sugar content in your pasture.

It's important to note that sugar content values in scientific literature are always given on a dry matter basis. For hay, the refractometer measurement is relatively close to the actual dry matter value (with a potential variation of 1–2%), as verified by multiple tests across different hay batches.

For grass, however, the higher moisture content requires adjustment. As a general rule, 100g of fresh grass will dry to about 20–25g of hay. To calculate the sugar content in dry matter, you must multiply the measured value by 4 or 5, depending on the moisture level ('juicier' grass $\times$ 5, 'drier' grass $\times$ 4).



Example Calculation:

100g of fresh, juicy grass has a sugar content of 8%, which corresponds to 80g per kilo of fresh grass. After drying, 1,000g of this grass yields about 200g of hay. Multiplying the measured value (80g) by 5 gives 400g of sugar per kilo of dry matter.

Horses typically graze 40–50kg of fresh grass daily, equivalent to about 10kg of hay. With a sugar content of 8% (80g/kg), this amounts to 3,200–4,000g of sugar consumed in 24 hours. Research shows that only about 25% of this sugar is present as mono- and disaccharides—simple or double sugars absorbed directly into the bloodstream via the small intestine.

The remaining sugar is often in forms like fructan, which, while not beneficial to the horse, does not directly affect blood sugar levels. In our example, 25% of the measured sugar (about 1kg over 24 hours) enters the bloodstream. This is roughly the equivalent of a package of household sugar.

For hay, the recommended sugar content is <10%, or <6% for easy keepers and horses with metabolic issues. For a 10kg hay ration, this means a maximum of 1kg or 600g of sugar. In our example, the calculated sugar intake is already at the limit.

This issue is compounded when horses graze hastily during short turnout periods, potentially increasing their intake to 8kg of grass in just one hour—four times the usual rate. In this scenario, sugar consumption could reach 640g of sugar compounds, with 160g (25%) entering the bloodstream within just one hour! For perspective, one sugar cube contains about 3g of sugar, meaning the horse consumes over 50 sugar cubes per hour.

Testing both hay and pasture grass for sugar content is therefore highly beneficial. Lower sugar levels are much healthier for horses. Pastures with coarse grasses and many herbs often have sugar levels as low as 2–3%, offering a significant advantage over pastures with high-sugar grasses like ryegrass, which can contain up to 36% sugar.

The next time you buy hay, use a refractometer to quickly determine the approximate sugar content. This will help you decide if the batch is suitable for your horses, particularly if they are prone to obesity or metabolic disorders.

YOU WILL NEED:

- 50 to 100g of hay per sample to be tested
- Digital kitchen scales with an accuracy of +/- 1g
- One 3-litre freezer bag (per sample)
- A wine refractometer with a 0–32 Brix measurement range ('Brix' refers to the estimated sugar content; various refractometers can be found on Amazon, using "wine refractometer" as keywords)
- A strong garlic press (e.g., IKEA garlic press)
- A clean plate or bowl
- Pipette (usually included with the refractometer, for transferring liquid)

NOTE:

To obtain an average value for meadow hay, take samples from several bales across different areas of the meadow, measure them individually, and calculate the average value at the end.

PREPARATION:

1.

Remove hay from various parts of the bale and mix it thoroughly. Place the freezer bag on the scales and press "tare" (to zero the scales). If there is no specific "tare" button, the on/off switch often performs this function. This ensures the weight of the bag is excluded from the measurement. Alternatively, note the bag's weight and subtract it later. Weigh 50–100g of hay into the freezer bag.

2.

Add an equal amount of tap water to the bag as the weight of the hay (e.g., 50ml of water for 50g of hay). Ensure all the hay is moistened when adding the water. Once sealed, you can gently knead the bag to distribute the water evenly, but avoid spilling or damaging the bag. Do not knead the hay vigorously, since this will lead to false results.

3.

Spread the hay evenly inside the bag, removing as much air as possible before sealing it. Place a weight, like a book, on the bag and let it sit for one hour. Turn the bag halfway through, knead again if needed, and redistribute the hay before reapplying the weight for the remaining 30 minutes. Alternatively, the bag can be frozen for measurement later. If freezing, ensure the bag is still weighted so the water saturates the hay evenly.



MEASURING:

4.

After one hour (if the hay was frozen, allow it to thaw for about 45 minutes), place a small portion of hay into the garlic press and squeeze the liquid onto the clean plate or bowl.

5.

Use the pipette to apply 2–3 drops of the liquid onto the refractometer. Close the lid and read the sugar content on the scale.

6.

Repeat steps 4 and 5 multiple times to calculate an average value. Ensure the refractometer and plate are wiped clean with a soft cloth between measurements to avoid cross-contamination. Additionally, ensure the pipette is free of residual liquid between samples; rinse it with tap water if necessary and remove excess water before proceeding.

NOTE:

If only 1–2 drops can be extracted, they can be applied directly to the refractometer. If several drops are collected, place them on a small plate, mix them with a Pasteur pipette, and then apply 2–3 drops of the mixture to the refractometer.



4.



5.-6.

