

Learning Journey: Brix

This learning journey is a curated collection of educational resources, designed to help you acquire knowledge and skills on Brix measurement.

Brix and Pest Pressure

Shifting Perspectives

Often in regenerative organic agriculture, we have to shift our thinking from how we grew up and how our experiences built our mindsets. We often look at pests as creatures that serve no purpose other than to destroy our food sources. One of the hardest things we must do is understand the rhythm of life and our role within it. In this document, we will explore the role that measuring Brix takes on in the relationship between pests and plants.

“Insects only feed upon food that is considered unfit, nutritionally poor, dead or dying.” - Dr. Thomas Dykstra

What Do Insects Do?

As stated above by Dr. Dykstra, the plant feeding insects that we often consider pests perform an important function in nature – to remove weak plants from the gene pool. Healthy plants are unpalatable to these insects while unhealthy plants are much more palatable. Not only are unhealthy plants tastier to pests, they also often (unintentionally) send out chemical cues into the environment that draw more “pest” insects to them. If this is the case, how can we determine if our plants are healthy? The quickest way to get a good idea of whether the plant is healthy or not is by testing the sap for its sugar content using Brix.

How to Measure Brix

We can measure the Brix value by using a refractometer. The process is very simple:

- The sap is extracted by crushing plant material in a garlic press or similar device.
- The sap is placed on the refractometer’s prism surface using a pipette, and then the refractometer lens is laid overtop of the prism surface to spread the sap.
- Hold the refractometer up to the light and look through the eyepiece.
- Inside the refractometer, you will see a little “ruler”. As the light passes through the sap, it creates a color change along the ruler which will tell you the Brix value of the plant.

When Should You Take Brix Measurements?

Brix readings will change throughout the day and with changes in weather. You can expect your highest numbers during or right after peak photosynthesis times when sugar production is at its max in the plant (afternoon or sunny days).

Here Are Some General Brix Value Markers:

- 1-2 Brix: Unhealthy plants that require force feeding to survive.
- 3-7 Brix: Plants have a fighting chance but are not doing great.
- 8-12 Brix: Plants can now protect themselves. Water retention abilities increased.
- 12+ Brix: Objectively healthy plants. High nutrient density and basically pest free.

At What Brix Value Do Insects Lose Interest?

- Aphid Group: 6-8 Brix
- Sucking Insects: 7-9 Brix
- Chewing Insects: 9-11 Brix
- Grasshopper Group: 10-12+ Brix

What Factors Increase or Decrease Brix Measurements?

Increase:

- Sunshine: Photosynthesis is key, as well as plant density that doesn't shadow crops.
- Water: Enough for life to flow and not drown.
- Air: Soil that is not compacted will allow good air circulation.
- Nutrients: Good microbial activity is key.

Decrease:

- Herbicides, Fungicides, Insecticides: These chemicals all kill microbes in the soil which will lower the Brix.
- High Salt Fertilizers: Force feeding plants with fertilizers will result in lower Brix.

To Conclude:

Brix is a good starting point to determine the health of plants. If you discover that there are still issues after finding a high Brix value, a foliar sample to a lab may be in order. There is a great deal of information available on the topic and if you find yourself wanting to learn more, we encourage further study. Changing the way we look at agriculture can be incredibly daunting, but it is worth the effort. Not only is it good for our planet - it benefits future generations.

Brix Measurement

Ecological Process:

The ecological process involved with this plant metric is energy flow, specifically focusing on photosynthesis. Measuring the Brix level of plant sap allows us to monitor how well plants are photosynthesizing. Photosynthesis is the process by which plants convert sunlight into chemical energy, producing sugars that are vital for plant growth and health. Higher Brix values indicate more efficient photosynthesis and healthier plants.

Why Perform This Test:

Measuring Brix gives us a snapshot look at the amount of sugar/dissolved solids in the plant sap. These levels represent the plant's current capacity to convert sunlight into food for themselves and exudates for soil microbes. High Brix levels in plants also deter feeding by many pest species thereby reducing pest pressure. Although Brix levels do fluctuate with time of day and weather conditions, they can provide insight into the status of crops and let us address potential weak areas.

Tools and Materials:

- Soft flannelette cloth
- Distilled water
- Coin (for garlic crusher)
- Garlic crusher
- Refractometer
- Paper/datasheet
- Pencil/pen
- Clipboard
- Bucket/Tote
- Knife

Selecting Samples:

What To Sample

- Which plants you choose to sample depend on the question you're trying to answer. If you'd like to get a feel for average Brix in your crop - choose the first fully developed leaves from healthy, representative plants around the growing area.
- You may also be interested in seeing if Brix is lower in apparently stressed or insect-attacked plants.
- It's also interesting to look at the Brix levels across different species in the same field. This can include looking at the various species of your multi-species cover crop or inter-crop, or comparing Brix in your cash crop to the Brix of nearby "weeds".

How to Sample

- Ideally, conduct Brix measurements at the same time of day, preferably after at least two hours of sunshine in the morning.
- Conduct measurements immediately in the field. Do not let samples dry out.
- Use a garlic crusher to extract sap from the selected leaves. Twist the leaves and place them in the well of the crusher. If plant material passes through the holes in the crusher, place a coin in the bottom of the well to partly cover some of the holes and create a better crushing surface.
- Roll the samples between your hands or on a hard clean surface for 30 seconds before squeezing to help extract more sap from the leaves.
- Put 2-3 drops of sap on the refractometer prism surface, cover the daylight plate slowly, and eliminate air bubbles.
- Turn the refractometer towards a light source and adjust the focus to read the Brix value.
- Brix is read at the line where color shifts to white along the internal measuring scale.
- A slightly fuzzy line between brightness and darkness indicates better plant health.
- Record the Brix readings on the datasheet provided.
- Note the time of day and environmental conditions during sampling.
- Include observations about the plant's health, any signs of stress, and the specific part of the plant sampled.

Where to Sample

- Repeat your measurement at a few locations within the growing area to account for potential variability in soil type, moisture, and fertility.
- Avoid areas with excessive dust (e.g., beside roads). If necessary, wash dust off with distilled water. Make sure to allow the sample to remove extra moisture from sample surfaces to avoid "watering down" your reading.
- Include samples from different areas to compare the effects of field condition, management practice etc.
- Ensure all data is accurately recorded on your datasheet. Don't forget to include the date, time and weather conditions.

Interpreting Your Results

Brix can become a strong tool for pest management in your fields.

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Brix is a measurement of the dissolved solids, including sugars, in your plants and hence is directly related to photosynthetic output. That means that regardless of the condition of your plant the more that plant is photosynthesizing, the higher the brix reading will be. This means that weather conditions and time of day will both affect brix levels and you should take note of both. Expect your highest readings to occur during sunny afternoons and your lowest readings to occur during hazy or cloudy mornings.

Plants that are undergoing water stress may also have skewed results. That being said, very healthy plants will still have consistently higher brix readings than very unhealthy plants. This tool is especially useful in side by side comparisons of different treatments on the same crop and for gaining a general understanding of how your plants are doing.

Brix also has a big effect on the plants palatability to insects (i.e., whether they think it's a good food source or not). High sugar content can be hard for insects to digest causing pests to leave your crops alone.

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Learn More With These Related Links

- [How Plants Repel Insects – an Observation of Monarchs, Brix and Nutrient Dense Plants](#) (Article)
- [How Brix Levels Impact Insect Pressure on Plants](#) (Video)
- [Crop Health Transitions](#) (Article)

Find Out More. Give Us Your Feedback. Get Involved.

Thank you for participating in this Learning Journey on Canadian Organic Growers' Regenerative Organic Hub. We hope you were inspired and found practical information and tools that will support you on your regenerative organic journey.

We invite you to click below and use our contact form to ask us any questions you may have, or comment on your Hub experience. This form is also the place to let us know if you would like to get involved with COG, including as part of our next cohort of [Regenerative Organic Oats \(ROO\)](#) program participants.