NUTRiSCAN™

LEAF TISSUE TESTING GUIDE

ATP
RESTORE THE BALANCE

Restore the **Balance**

At ATP, we believe a proactive, science-based approach to restore the balance between plant and soil health is the single most effective way to deliver the genetic potential of the crop. We challenge the status quo by utilizing agtech to monitor and drive productivity.

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Getting Started with **Leaf Tissue Testing**

There are several considerations on the method used to sample a field.

"Benchmark" sampling technique:

Sample a known production area of the field with a 'benchmarked' geo-referenced location.

"Production Zone" sampling technique:

Sample the field based off production zones or areas. Most fields will generally have 2 or more different zones. It is best to sample each production zone separately.

"Diagnostic or Comparative" sampling technique:

Sample both good and poor production areas of the field. This technique may have potential limitations. For example, the poor area of the field could have a leaf concentration which may cause misleading analytic values.

When using any of the leaf tissue analysis sampling techniques, it is recommended to also conduct a NutriScan soil test at the same time. The NutriScan soil analysis will be a beneficial cross-reference with the leaf tissue analysis results. A soil test indicates what the soil can supply for nutrients in the future, whereas a leaf test indicates how well the plant has taken up nutrients.

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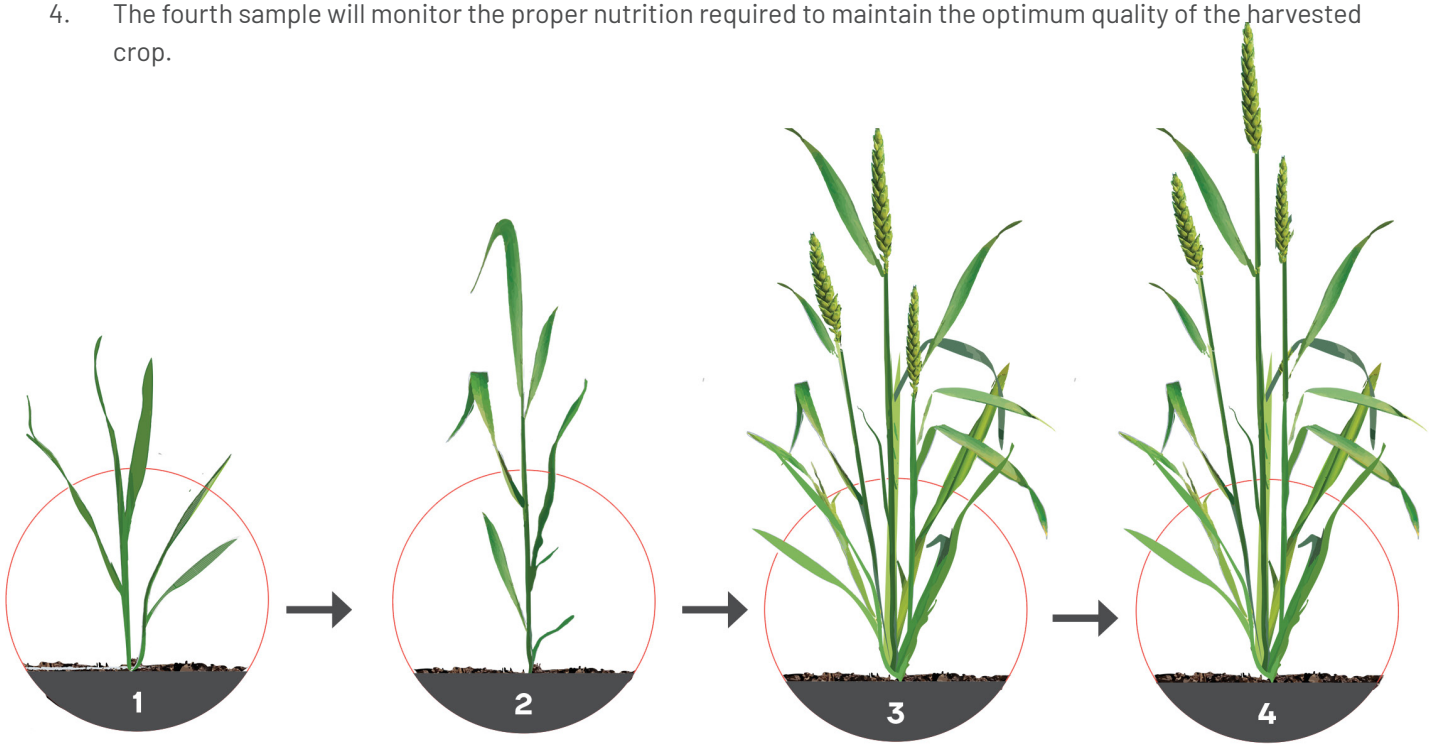
Frequency of **Sampling**

Ideally, leaf tissue sampling should be conducted on a weekly basis, starting at the early vegetative stage and continuing into the late reproductive stage. This sampling frequency may not be logistically practical, so at a minimum, sample once every 14 days (2 weeks).

Four critical stages of leaf tissue sampling:

1. The first sample should be at about the 3-5 leaf stage (just prior to herbicide timing). This sample is a report card of your starter soil fertility program. Nutrient imbalances can be corrected prior to any loss in the crops yield potential.
2. The second leaf sample should be at the end of the vegetative stage and prior to reproduction. This will facilitate addressing the critical nutrients for optimum flowering, pollen viability and pollination.
3. The third sample should be taken at 10% flowering to ensure the proper nutrients are present to help with pollination, seed set and grain filling.
4. The fourth sample will monitor the proper nutrition required to maintain the optimum quality of the harvested crop.



BBCH 13-15
3-5 Leaf Stage
(Prior to herbicide timing)

BBCH 39-45
End of Vegetative Stage

BBCH 60-62
10% Flowering

BBCH 73-85
Maturing Plant

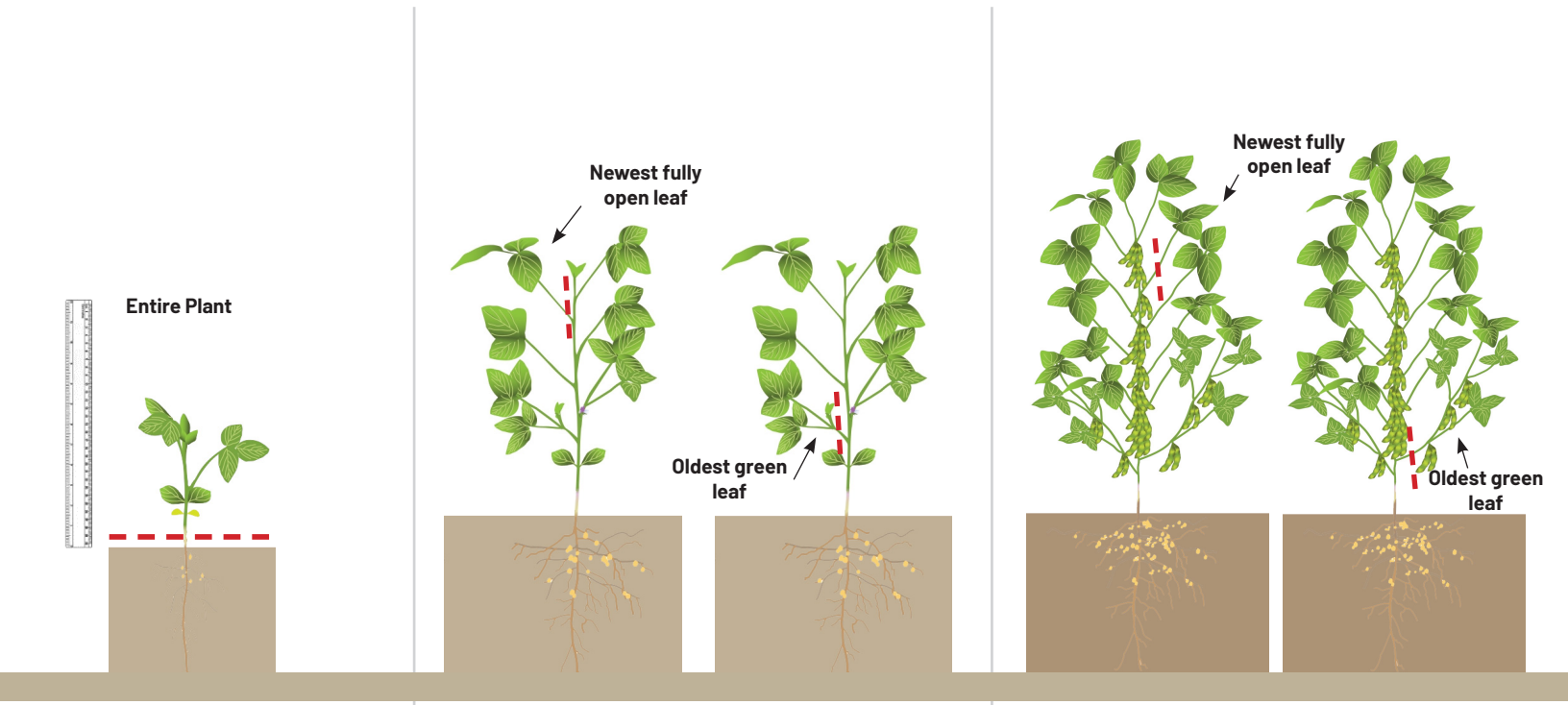
Leaf Tissue Collection Techniques by **Crop Type**

It is important to collect the correct leaf or plant part as the nutrient content can vary based off the age of the leaf.

Plant Part to Sample

- At the **earlier vegetative stage**, sample the entire plant which is cut just above the base of the plant
- At the **late vegetative stage** take separate samples from 2 different plant parts. The first being the oldest green leaf (that is not already necrotic or dying). The second, separate sample, should be from the youngest fully developed leaf.
- At the **flowering stage**, follow the same steps as above and take separate samples from 2 different plant parts. The first being the oldest green leaf (that is not already necrotic or dying). The second, separate sample, should be from the youngest fully develop leaf.

Leaf Tissue Collection for **Soybeans**



3rd to 6th Trifoliate
V3-V6

Collect **all of the above ground portion** about 1 inch above ground level.

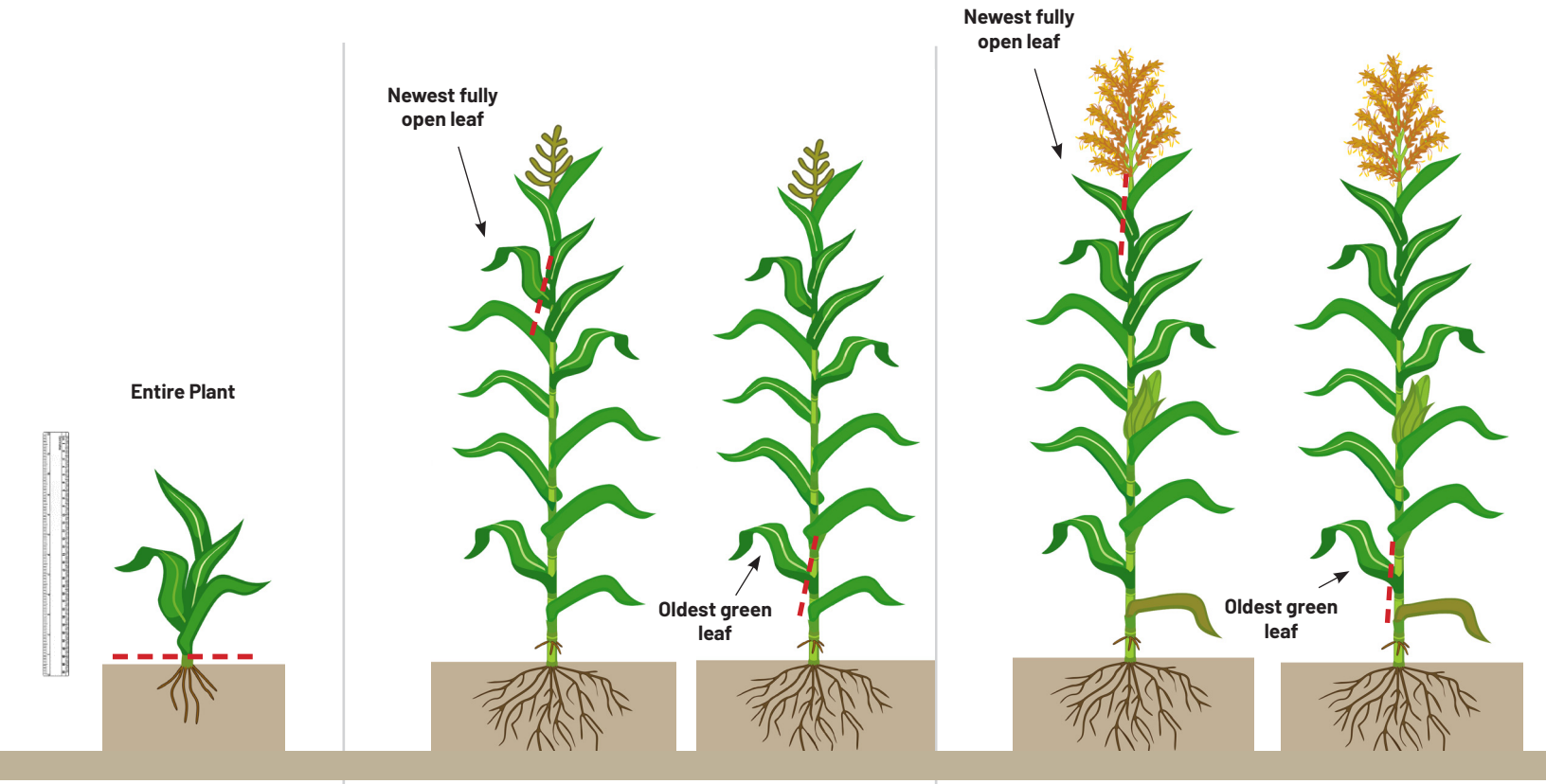
Flowering
R1-R2

Collect the **first fully developed trifoliate leaf from the top** and the **oldest green leaf at the bottom**. Cut this leaf at the base where it joins the stem.

Bloom to Full Seed
R3-R5

Collect the **first fully developed trifoliate leaf from the top** and the **oldest green leaf at the bottom**. Cut this leaf at the base where it joins the stem.

Leaf Tissue Collection for **Corn**



Seedling (V1-V5) <12 inches tall

Collect **all of the above ground portion** about 1/2 inch above ground level.

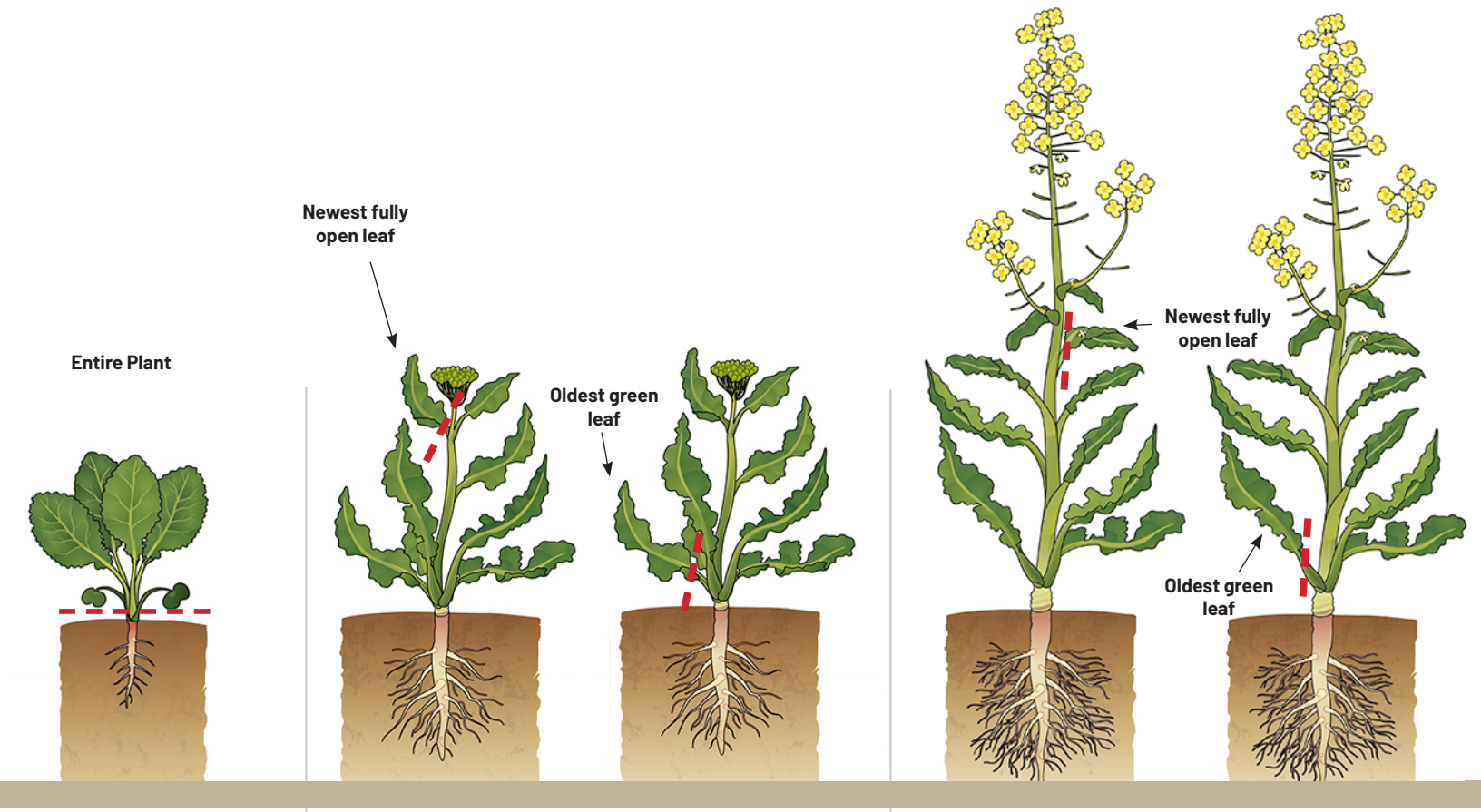
Tasseling (V6-VT) > 12 inches tall

Collect the **first fully developed leaf from the top** and the **oldest green leaf at the bottom**. Cut this leaf at the base where it joins the stem.

Silking (R1-R3) >12 inches tall

Collect the **leaf immediately below the apposite the ear** and the **oldest green leaf** at the bottom. Cut this leaf at its base where it joins the stem.

Leaf Tissue Collection for **Canola**



2-6 leaf
BBCH 12-16

Collect **all of the above ground** portion

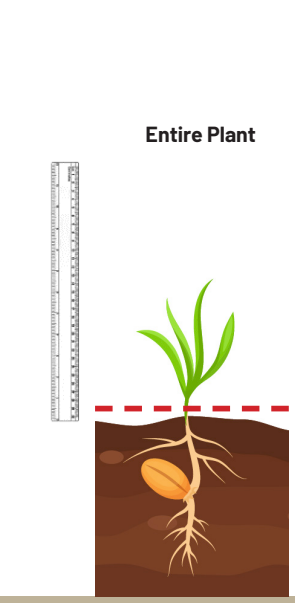
Budding to Bolting
BBCH 30-50

Collect the **uppermost fully developed leaves** and the **oldest green leaf** at the bottom. Cut this leaf at its base where it joins the stem.

Flowering
BBCH 61-65

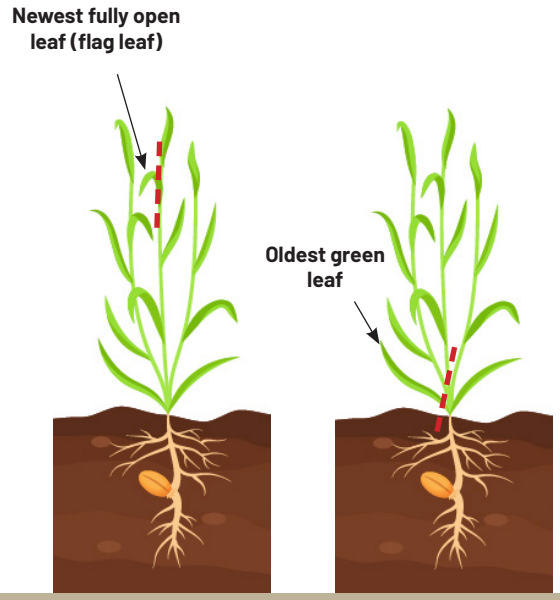
Collect the **uppermost fully developed leaves** and the **oldest green leaf** at the bottom. Cut this leaf at its base where it joins the stem.

Leaf Tissue Collection for **Cereals**



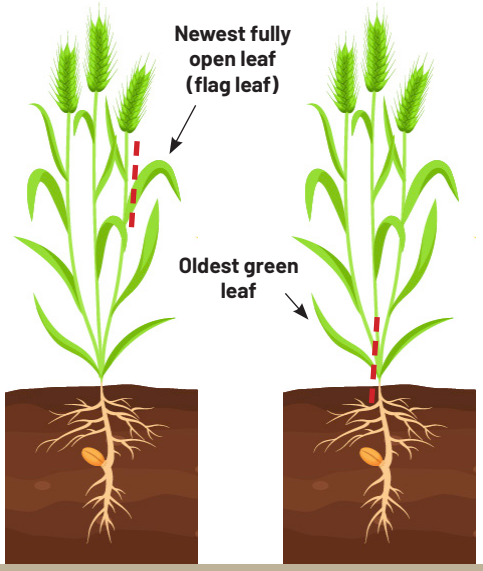
3 leaf to Stem Elongation BBCH 13 to 31

Collect **all of the above ground** portion about1/2 inch above ground level.



Flag Leaf to Awns Visible BBCH 39 to 49

Collect the **uppermost fully developed leaves (flag leaf)** and the **oldest green leaf** at the bottom. Cut this leaf at its base where it joins the stem.

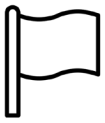


Heading to Late Milk BBCH 50 to 79

Collect the **uppermost fully developed leaves (flag leaf)** and the **oldest green leaf** at the bottom. Cut this leaf at its base where it joins the stem.

Sample Collection for **Leaf Tissue Analysis**

1. For each of the sampling techniques be sure to collect leaf tissue samples from a minimum of 10 plants in an area.



2.
- Have GPS coordinates for each sample area. It can be beneficial to place a flag in the field from where the sample was taken to help with repeat sampling.
- Sample from the same area of the field each time.
- Sample in the morning after the dew is off the leaves, but before the heat of the day.
- Sample at the same time of day every time you are sampling the field.

3. Put on clean gloves prior to sampling.

4. Use clean shears to collect the plant parts.

5. Properly label the leaf tissue sample bag with the appropriate field location, crop type, plant part and date.

6. Ensure that the scanning surface is completely covered with leaves.

With the NutriScan tool:
- Scan the leaf tissue samples for nutrient status back at the vehicle; or,
- Store the collected leaves in sample bags and place in a cooler filled with ice packs to keep them cool until scanning can be conducted.
- Scan the samples within 4 hours of sampling.

Materials Check List

- ✓ NutriScan
- ✓ Field Flags
- ✓ Clean gloves
- ✓ Sharp scissors or pruning shears
- ✓ Leaf sample bag
- ✓ Ice packs and coolers if scanning is not be conducted immediately

Watch Outs
Leaf Tissue Sampling

Watch outs	Rationale
Do not sample in the heat of the day when the plant will shut down and can cause the leaf nutrient status to be affected.	The best time to sample is in the morning after the dew is off the field, and before high heat in the afternoon. Stomatal closure is apparent during high heat periods.
Be sure to wipe off any soil, dust, fertilizer, or chemical residue from the leaf before scanning.	Dusty samples will yield a false nutrient analysis. Do not wash with water unless there are fertilizer or spray residues present, as this could reduce levels of other key nutrients.
If necessary, wipe the leaves with a damp cloth to remove the hard to remove debris.	Wipe the samples using a damp cloth with cold distilled water for no longer than 10 seconds. Air dry. Extended washing may damage the plant tissue and remove some of the soluble elements.
Be sure to sample after the dew is off the plants. Be sure to wipe the leaves dry of any moisture prior to scanning.	Moist samples can deteriorate the leaves and can impact nutrient readings with the scanner.
Do not freeze the samples.	Freezing will damage the integrity of the leaf sample and the scan will not be accurate.
Do not place the leaf tissue samples in a plastic bag.	These practices encourage moisture accumulation, and do not provide sufficient ventilation for the samples to dry.
Do not leave leaf tissue samples on the dashboard of the vehicle as the plant tissue will be compromised.	If tissue is not immediately tested, keep the sample dry and cold. Place leaf tissue in a clean well ventilated paper bag or store in a cooler with an ice pack.
Do not store samples in a metal container.	Metal containers can introduce metal ions, contaminating and impacting the results.
Do not sample parts of the field that are under a high level of environmental or man made stress.	Inaccurate nutrient results can occur from abiotic stress such as excessively wet soil conditions, herbicide drift, cultivator damage, drought, salinity, etc.
Avoid samples that show visible and extreme nutrient deficiencies.	Inaccuracies can result from analyzing plants that have experienced prolonged nutrient stress. For instance, deficiencies detected in certain nutrients might be attributed to the effects of another nutrient's shortage on the plant's metabolism, rather than an actual deficit of the detected nutrient. A soil sample is a better tool to use in this situation and can complement a tissue test.
Do not sample areas of the field that have been affected by disease and/or insect pressure.	Disease and insects can disrupt the uptake and translocation of water and nutrients throughout the plant, inaccurately representing the crop's nutrient status.

Learn more at **atpag.com** or **1.877.538.5511**