PETIOLE TESTING FOR NUTRIENT ANALYSIS

Petiole sampling and analysis is an effective and simple way to determine the nutrient status of a crop, including diagnosing any deficiencies or toxicities in potato plants. Like any analyses, getting the sampling right is the first step, writes Paulette Baumgartl.

Petioles are the tiny stems that connect potato plant leaflets. They not only provide support, but function like straws, drawing nutrients up from the soil and distributing them to the growing leaves.

Data from petiole analysis offers a window into the nutrient status of a crop. This may be quite different to the nutrient profile revealed through soil testing. Petiole analysis does not replace, but rather complements, soil testing, as together they indicate how available soil nutrients are to the developing plants.

While soil testing provides a good indicator of fertiliser needs before the crop is planted, testing the plant tissue acts as a 'barometer', indicating the success or otherwise of a fertiliser regime. As it measures accumulated nutrients in the plant tissues, it can also indicate where there are nutritional disorders. Nutrition can then be adjusted during the growing season. For example, petiole testing could reveal a need for additional K during tuber bulking. However, most often it provides a guideline for future crops.

Rob Cirocco from Phosyn Analytical agrees that petiole testing is worthwhile for many nutrients, including N, S, P, K, Ca, Mg, Cu, Zn, Mn, Fe, B, Na, Cl, NO_3-N (nitrate nitrogen).

"A regular petiole testing regimen can assess the adequacy of fertiliser programs, diagnose deficiency or toxicity symptoms, and reduce the potential for environmental pollution through excess inputs," Rob said.

As with all testing, the value of the information gained from petiole analysis will be directly related to the effort and attention put into the sampling. It is also important to note that a single test will not provide all answers, with three of four rounds of sampling, a few weeks apart, recommended.

Fortunately, with a few simple steps, it is easy to collect and handle tissue samples ready for analysis in a laboratory.

Analytical laboratories can provide specific instructions on how to sample, handle, store, label, and send the samples.

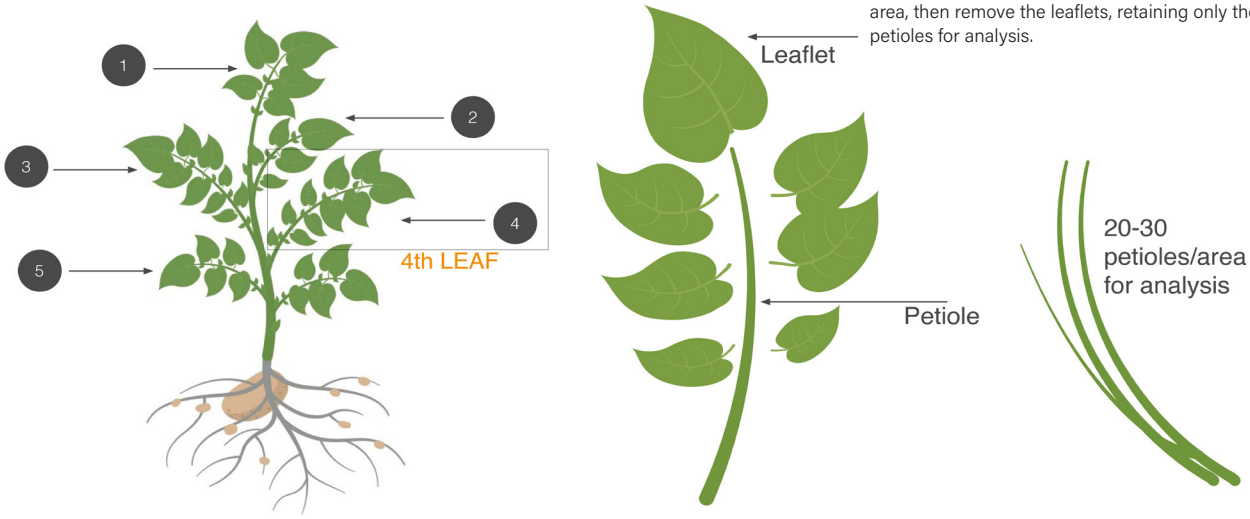

Figure 1. The usual procedure is to collect the youngest mature potato leaf from each of 20 to 30 plants, using an ordered pattern across the crop area, then remove the leaflets, retaining only the petioles for analysis.

WHEN TO SAMPLE

Petiole sampling is best commenced at the S2 growth stage, usually defined as the point where the length of the longest tuber is 10mm. Collect the first petiole sample at the S2 stage and repeat the sampling every two to three weeks as necessary for up to four samples. Take note of the crop stage at sampling.

HOW TO SAMPLE

Commercial plant test kits are available. They include clear instructions on how to collect and manage samples to ensure reliable results from the analysis.

In general, collect the youngest mature potato leaf from each of 20 to 30 plants in an ordered pattern across the crop area to be tested.

Leaf samples may be taken in a zig-zag or a grid pattern; it is important that the whole crop area is sampled comprehensively. As a rule of thumb, collect one sample every 200 square metres, yielding 20 collected samples for every 0.4 hectares.

The youngest mature leaf is the fourth or fifth from the top of the plant. The leaves should be detached from the main stem of the potato plant, with the petioles intact (Figure 1).

Immediately after collection, detach each leaflet where it joins the main stem of the potato plant. Place the 20 to 30 petioles in a labelled sample bag. Note that this is usually paper, not plastic, to avoid increased moisture – again, analytical labs will provide instructions, including whether it is necessary to dry samples before posting.

While analytical laboratories recommend collecting samples from the entire crop, patch sampling can also be carried out to diagnose a potential nutrient disorder in one part of the crop. In this case it is important to take samples of both healthy and unhealthy plants for comparison.

Some laboratories will also request that sample notes include the length of the largest tuber.

HANDLING SAMPLES

Petiole samples should be kept cool and sent to your chosen laboratory service for analysis as soon as possible after collection. They should not be left in the sun or in a hot car.

If there is a delay between time of collecting and submitting samples, keep them in a fridge at 4ºC in the meantime.

Rob emphasises the importance of sending those samples quickly.

"To maximise the integrity of a sample requiring analysis, always send it to the lab using the fastest possible service. In many instances, Australia Post's Express Post service is suitable."

IMPORTANT DOS AND DON'TS OF PETIOLE SAMPLING

Dos

- ✓ Collect tissue samples before 10am.
- ✓ Use clean plastic disposable gloves to sample as sweaty or dirty hands can contaminate the sample.
- ✓ Pull the whole leaf from the plant, then strip the leaflets from the petiole stem.
- ✓ Make a note of growth stage of the plant, including tuber size and if possible, weeks from emergence – specific details should be supplied with a sample.
- ✓ Collect samples in a paper bag, as opposed to a plastic bag, to avoid the sample sweating.
- ✓ Send to the lab as quickly as possible.

Don'ts

- x Avoid sampling 3-5 days after crop has been sprayed with pesticides or foliar nutrients.
- x Avoid soiled, damaged, dead, or dying plant tissue.
- x Do not sample plants stressed by environmental conditions, for example, drought, flood, extreme cold or heat wave conditions.
- x Do not sample plants affected by disease, insects, or other organisms.
- x Avoid atypical areas of the paddock, such as poorly drained areas.