Sampling Leaves for Chemical Analyses

The aim of plant analysis (leaves, fruit etc.) is to relate the mineral content of the plant (or part thereof) with its physical appearance, growth rate and yield or quality of the harvested product, and also with the nutrient content of the soil. Precise sampling procedures with respect to the selected plant part and the growth phase (time of sampling) are required. The interpretation of results depends on the assumption that a significant biological relationship exists between the elemental content of the soil, the plant and its growth rate or production.

The purpose of plant analysis therefore is:

- An aid to evaluate the supplying capacity of the soil for nutrients;
- To evaluate the response of the plant to fertiliser applications;
- To evaluate the relationship between the nutritional status of the plant as an aid to estimate fertiliser requirement, e.g. to diagnose for deficiencies of nutritional elements.

Sampling protocol

Plants consist of complex structures of which the elemental composition is not homogenous. It is known that leaves, stems, shoots and fruit, as well as the position of the organ on the plant, differ in elemental composition. Mixing of different organs in a compound sample is therefore not recommended. The choice of the plant part to be sampled needs to be properly selected. **Refer to Table 1 to ensure that the correct plant part and number of leaves are sampled, during the most appropriate time**.

Trees/plants at the edge of the block and at the end of rows should not be sampled - they may be coated with soil/dust particles and/or differ in their nutrient status and irrigation regime from the rest of the block. Do not sample diseased, insect damaged, or dead leaves. Leaves should not be sampled during the hottest part of the day since it can influence leaf composition. **Collect samples in the morning, place the leaves in a clean plastic or paper bag and keep it cool until delivered to the laboratory.** Do not freeze it under any circumstances.

Trees/plants in a problem spot, as well as adjacent healthy ones should be sampled separately. To identify seasonal trends in perennial crops, it is desirable that routine samples are always collected from the same trees - trees should be clearly marked for this purpose.

Table 1. Protocol for leaf sampling as determined by crop type

Crop type	Organ to be sampled	Time of sampling	Sample size & comments
VEGETABLE CROPS, GRAINS & HERBS			
All crops not specified below	Sample the youngest mature leaves.	Sample during the vegetative phase. For fruiting crops, the best time is just before flowering.	Thirty leaves per sample are sufficient. The growth phase of the plant affects leaf composition, it must be indicated.
Asparagus	Spears: Entire above ground part. Ferns: Youngest mature frond.	Plant 10 cm length. Sample during the vegetative phase.	Twenty to 30 plants. Twenty fronds per sample are sufficient.
Canola	Youngest mature leaf	Prior to flowering	Forty leaves.
Ginger	Sample the youngest mature leaves.	105 days after planting, e.g. around mid-December.	Thirty leaves per sample are sufficient.
Onion	Entire above ground portion.	Vegetative stage.	Twenty to 30 plants are sufficient
Peanut	Most recently mature trifoliate leaf	Pre-flowering to early flowering	Forty to 50 leaves.
Potato	Sample the entire 4th leaf including petiole and leaflets, or remove leaflets from the petiole and submit only the petiole of the 4th leaf.	Mid-season.	Thirty tot 40 leaves or petioles are sufficient. Separate the leaves from the petioles immediately – analyse either one.
Soybean	Most recently mature trifoliate leaf	Early flowering to early pod set	Thirty to 40 leaves
Sweet corn & Maize	Sample the youngest mature leaves.	Plant 60cm height or just before flowering/tasseling.	Thirty leaves per sample are sufficient
Sunflower	Sample the third mature leaf from the top.	Sample in the month before bloom.	Twenty to 30 leaves are required.
Wheat, oats, rye, barley	Sample the youngest mature leaves, and flag leaves when they appear.	Five to six leave stage or just before flowering.	Sixty to 80 leaves are required.
FRUIT, OLIVES AND NUTS			
Pome & stone fruit	Leaves at shoulder height at the middle of the current season's growth, on both sides of the tree row.	In the middle of the season, just before onset of fruit ripening (Late Jan to early Feb).	At least 50 leaves are required per sample.
Wine & table grapes	Sample the leaf opposite the bunch, or if removed, the leaf on a bearing shoot between nodes three and five.	At set or veraison. The time of sampling must be indicated.	Thirty tot 40 leaves or petioles are sufficient. Separate the leaves from the petioles immediately – analyse either one.
Citrus	Spring cycle leaves, e.g. sample from four to six month old non-fruiting shoots.	From March to April before autumn fertilization is applied.	Forty to 50 leaves are required per sample.
Avocado	Sample six to eight month old leaves in the middle of the tree.	February to April.	Forty to 50 leaves are required per sample.
Almonds	Leaves at shoulder height at the middle of the current season's growth, on both sides of the tree row.	In the middle of the season, just before onset of fruit ripening.	At least 50 leaves are required per sample.
Bananas	The third youngest leaf from the top.	October to April when 50% of the orchard has flowered.	One leaf of at least 1m long is sufficient.
Blackberry & Raspberry	Mature leaves from middle of non-fruiting canes.	Mid-season, 4-6 weeks after bloom.	Fifty to 60 leaves are required per sample
Blueberry	Mature leaves in middle of non-fruiting branches	Mid-season, 4-6 weeks after bloom or after harvest (end Jan to end Feb).	Fifty to 60 leaves are required per sample
Cherries	Collect fully expanded mature leaves (two to five months old) from non-fruiting spurs.	January to February	Fifty to 60 leaves are required per sample

Coffee	Collect the fourth pair of leaves, counting from the first fully-opened leaf at the tip of a primary branch from the mid-canopy of the cropping region of the tree. Do not count the first pair if they are less than 20 mm long.	Full bloom, e.g. October to November.	Take four pairs of leaves from each tree and sample at least 10 trees, i.e. 80 leaves.
Figs	Sample the youngest fully expanded, exposed leaves on non-fruiting branches from the perimeter of the tree at a 1.5- 1.8 m height.	Mid to late summer, e.g. January to February.	Thirty to forty leaves are required.
Granadilla	Mature leaves from non-bearing shoots.	September to December.	Forty to 50 leaves are required per sample.
Guava	Young, fully developed leaves directly behind the largest fruit.	Five months after pruning, e.g. January to March.	Forty to 50 leaves are required per sample.
Kiwi's	Sample the youngest mature leaf for early sampling and for mid-summer sampling, sample the second leaf past the final fruit cluster from non-terminated female vines.	Before fruit-set (Oct to Nov) or late summer (Dec to Feb)	Forty to 50 leaves are required per sample.
Litchi	Sample the second last leaflet pairs on terminal shoots.	September to November.	Forty to 50 leaves are required per sample.
Macadamia	Sample mature, three month old leaves, e.g. third & fourth from the terminal end of the new shoot.	Three month old leaves – October to November.	Forty to 50 leaves are required per sample.
Mangoes	Sample 7-months-old fully developed hardened-off leaves from fruit-bearing twigs.	Mid-summer to onset of ripening.	Thirty to 40 leaves are required.
Olives	Mature leaves from the middle of non-bearing, current season shoots.	Sample during the mid-summer period, e.g. late December to end-January.	Eighty to 100 mature leaves are required.
Papaya	Sample mature leaves of which the petiole is removed - analyse the petiole.	Two weeks before harvest.	Twenty petioles are required.
Pecan nuts	Middle leaflet pairs from mature leaves on terminal shoots.	Mid-season, six to eight weeks after bloom.	Forty to 60 leaves are required.
Pineapple	D-leaves: a whorl of three leaves, including the tallest on the plant.		Ten to 15 leaves are sufficient per sample.
Pomegranate	Mature spring cycle leaves from non-fruiting shoots at the middle third of the branch.	Mid-summer, e.g. December to January.	Ninety to 100 mature leaves are required.
Strawberries	Youngest fully mature tri-foliate leaf.	Vegetative to fruiting stages.	Fifty to 60 leaves are required. Separate the leaves from the petioles immediately – analyse either one.
Sweet melon & water melon	Collect the 9th petiole and leaf blade from the growing tip.	Collect leaf blade and petiole samples at early bloom.	Thirty tot 40 leaves or petioles are sufficient. Separate the leaves from the petioles immediately – analyse both.
PASTURES, SUGAR CANE & TURF			
Lucerne/Alfalfa	Sample the top 20 cm of the plant.	Shortly before bloom.	Approximately 300 grams of leaves is required.
Sugar cane	Sample second fully mature leaf.	Mid-season.	Twenty to 30 leaves are required.
Turf	Leaves, clipped by hand.	Early to mid-Summer	Approximately 200 grams of leaves is required.