



## Sampling Notes

The nutritional status of avocado crops is monitored using soil tests and plant analysis. Annual monitoring is important to help sustain optimum levels and avoid nutritional disorders. If disorders do occur, leaf analysis is a valuable tool to assist with the diagnosis of the problem.

Sampling for nutrient monitoring should be done in April - May to coincide with cessation of the season's growth.

### Leaf

<b>Sampling Time:</b>	April to May, when the summer flush has ceased.
<b>Plant Part</b>	2-4th leaf from the terminal bud (blade plus petiole).
<b>Collect From:</b>	Shoots that are not flushing nor fruiting. Select from the canopy of the trees at shoulder height, and exclude boundary trees.
<b>Quantity per Sample:</b>	4-8 leaves from each of 20 trees selected at random from throughout the sampling area.
<b>Recommended Tests:</b>	Basic Plant (BP), Chloride (Cl).



**Comments:** Select trees that are sampled and identify them so that they can be sampled again the following year.

Ensure leaves from each tree are taken evenly from the sunny and shaded sides.

Do not mix cultivars or trees of different ages in the samples.

To help diagnose an obvious problem, leaves showing the first signs of the distinctive symptoms should be collected as soon as abnormalities appear. If sampling outside the normal sampling time it is useful to take a second sample of similar, healthy leaves from nearby unaffected trees for analysis as a comparative standard.

### Soil

<b>Sampling Time:</b>	Prior to crop establishment and annually at any time of the year, although autumn to early winter is recommended.
<b>Core Depth</b>	15cm.
<b>Collect From:</b>	The drip zone of the trees.
<b>Quantity per Sample:</b>	One core from each of 15 - 20 trees.
<b>Recommended Tests:</b>	Basic Soil (BS), Mehlich 3 (M3).



**Comments:** Separate samples should be taken from blocks that differ in age, cultivar types, tree performance, soil types, topography and fertiliser history.

Where fertiliser has been broadcast, sample from the drip zone of the trees. Where fertiliser has been banded, samples should only be taken from areas under the drip zone which have previously received fertiliser.

When sampling prior to orchard establishment, a 15 - 30 cm depth sample should also be taken, primarily to check the sub-soil pH.

If trying to diagnose a problem with crop growth and yield, samples should be collected from the rooting zones of the worst affected plants. In these circumstances, a second sample taken for comparative purposes from the rooting zones of normal plants may be useful.

## Interpretation

Interpretation of the laboratory's results is possible by comparison with normal levels expected for the crop in question. The interpretation given is based on the best information available and relate specifically to the sampling instructions given.

Leaf			Soil		
Analyte	Unit	Range	Analyte	Unit	Range
Nitrogen	%	2.4 - 2.9	pH	pH	6.0 - 6.5
Phosphorus	%	0.12 - 0.18	Olsen Phosphorus	mg/L	25 - 50
Potassium	%	0.90 - 1.2	Boron	mg/kg	4.0 - 6.0
Sulphur	%	0.20 - 0.30	Potassium	me/100	0.50 - 0.80
Calcium	%	1.2 - 2.0	Calcium	me/100	7.0 - 18
Magnesium	%	0.30 - 0.55	Magnesium	me/100	1.0 - 3.0
Sodium	%	0.0 - 0.25	Sodium	me/100	0.0 - 0.50
Iron	mg/kg	40 - 100	CEC	me/100	12 - 25
Manganese	mg/kg	80 - 300	Volume Weight	g/mL	0.60 - 1.0
Zinc	mg/kg	25 - 50	Aluminium (Mehlich 3)	mg/L	900 - 1,300
Copper	mg/kg	5.0 - 15	Boron (Mehlich 3)	mg/L	2.5 - 4.5
Boron	mg/kg	30 - 50	Calcium (Mehlich 3)	mg/L	1,100 - 2,200
Chloride	%	0.0 - 0.25	Copper (Mehlich 3)	mg/L	2.0 - 5.0
			Magnesium (Mehlich 3)	mg/L	100 - 300
			Manganese (Mehlich 3)	mg/L	8.0 - 35
			Phosphorus (Mehlich 3)	mg/L	55 - 110
			Potassium (Mehlich 3)	mg/L	150 - 250
			Sodium (Mehlich 3)	mg/L	0.0 - 90
			Zinc (Mehlich 3)	mg/L	5.0 - 15

## Comments

Avocado trees have a moderate nutrient demand and will tolerate a wide range of nutrients in the soil, provided there is good drainage. Avocado roots are extremely sensitive to low oxygen concentrations in the root zone.

The nutrients identified as being of concern in New Zealand are nitrogen, zinc and boron. Normal Range nutrient levels for nitrogen apply to the Hass variety. Other varieties such as Fuerte have a lower leaf nitrogen levels of 1.6-2.0 %.

Avocado require high levels of nitrogen for adequate flowering and fruit set. However, excess nitrogen, which is not common in New Zealand, contributes to excessive vegetative growth at the expense of flowering, fruit set and fruit quality.

Zinc deficiencies affect young leaves. They tend to be small, narrow, chlorotic and often rosetted.

Boron deficiencies may inhibit the elongation of growing shoots, giving rise to short internodes. Pollination and fruit set can be poor, and developing fruit shape may become distorted. Leaves become thick and corky with necrotic patches, and the lower surface veins may split. Overcoming boron deficiencies has proven difficult in New Zealand, where standard application rates of boron appear insufficient. Soil levels can be medium to high, but leaf analysis still show a very low boron status.

Calcium in the soil is also important, not so much as a nutrient, but as a means to manage the root fungus Phytophthora. For this, a pH over 6.2 is preferable.

Soil pH greater than 7 may induce iron deficiencies due to the immobilisation of iron. Symptoms are interveinal chlorosis of young leaves, with veins and older leaves remaining darker. Soil testing for iron is unreliable and not recommended by this laboratory.

## References

- Fertiliser recommendation for horticultural crops. HortResearch HortNET, 1997.  
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 Banks, Alex 1992. Growing Avocados in Queensland.  
 New Zealand Avocado Growers Association Manual.  
 Cutting, J. 1997. Guidelines for drawing leaf analysis samples. Pers. Comm.

## Disclaimer

Normal Range levels quoted relate specifically to the sampling procedure given. The Normal Range levels and Comments provided are the most up to date levels available, but may be altered without notification. Such alterations are implemented immediately in the laboratory histogram reports. It is recommended that a consultant or crop specialist be involved with interpretations and recommendations.