



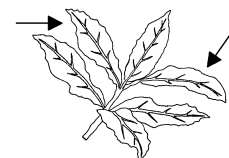
Sampling Notes

Sampling and interpretive information for macadamia trees was originally sourced from Queensland, but has recently been modified by local research and experience.

Yields of macadamia from New Zealand orchards are generally low compared to overseas crops, but there are some trees that yield as well as those overseas. This suggests the potential for macadamia production is far from being fully realised. While mineral nutrition may contribute to this, other factors considered to be important include cultivars, climate, carbohydrate supply and pollination.

Leaf

Sampling Time:	April and May.
Plant Part	Leaf, with petiole.
Collect From:	First leaf below the non-fruiting, non-flushing growth terminals.
Quantity per Sample:	2-3 representative leaves from each of 30 trees.
Recommended Tests:	Basic Plant (BP).



Comments: Australian recommendations are to sample in the spring. The leaf nutrient levels are relatively stable then, as the main growth flush in Australia occurs in the summer period. In New Zealand, these levels are not stable then, due to active vegetative growth at this time. Leaf nutrient levels have been found to be more stable in the autumn period.

Note that the Australian sampling guidelines recommend collecting leaves from the second whorl. The New Zealand recommendation is now to sample at a non-flushing time, and taking the leaves from the first whorl back from the terminal tip.

Leaves should be selected from trees of the same age, cultivar, management regime, and grown in the same soil type. Considerable differences have been found between apparently similar trees growing in close proximity.

Soil

Sampling Time:	Prior to crop establishment and annually at any time of the year, although autumn to early winter is recommended.
Core Depth	15cm.
Collect From:	From the drip zone of the trees.
Quantity per Sample:	12 - 20 cores.
Recommended Tests:	Basic Soil (BS).
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.

If the orchard has herbicide treated strips, then it is best if these are sampled separately from the grassed areas between rows. Quite different nutrient levels may exist between these two areas.

When sampling prior to orchard establishment, a 15 - 40 cm depth sample should also be taken, primarily to check the sub-soil pH.

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	%	1.3 - 1.4	pH	pH	5.5 - 6.5
Phosphorus	%	0.10 - 0.12	Olsen Phosphorus	mg/L	10 - 25
Potassium	%	0.60 - 0.70	Potassium	me/100	0.50 - 0.80
Sulphur	%	0.20 - 0.26	Calcium	me/100	5.0 - 10
Calcium	%	0.80 - 0.90	Magnesium	me/100	0.80 - 3.0
Magnesium	%	0.090 - 0.15	Sodium	me/100	0.0 - 0.50
Sodium	%	0.0 - 0.040	CEC	me/100	12 - 25
Iron	mg/kg	70 - 80	Volume Weight	g/mL	0.60 - 1.0
Manganese	mg/kg	100 - 500			
Zinc	mg/kg	10 - 15			
Copper	mg/kg	5.0 - 15			
Boron	mg/kg	30 - 50			

Comments

In New Zealand, macadamia are generally produced on the more cool tolerant 'Macadamia tetraphylla' or hybrid cultivars, rather than the 'M. integrifolia' cultivars grown in Hawaii.

Comparing local data with Australian guidelines has resulted in some modifications to the interpretation data. Except for calcium and sulphur, all the major nutrient levels are lower than those found in Australia. This may be due at least in part to the different patterns of growth flushes between the two countries. The decision to standardise in New Zealand on autumn sampling was to ensure stable leaf levels have been obtained.

Extremely high manganese levels have been observed in New Zealand crops. This may be due to acidic and poorly aerated sub-soils where these trees are grown in Northland. It is uncertain at this time whether these high levels are having any adverse effects.

Very low zinc and boron levels have also been observed. Both of these nutrients have been known to restrict yields in Australia.

Iron deficiencies have been observed during cool spring conditions. Iron deficiency can also be induced by high levels of phosphorus.

Because of the variability that can occur between trees, it is recommended that growers keep records of individual tree performance. Soil type, fertiliser history and other management practices, as well as variations between cultivars, can significantly influence leaf nutrient levels.

References

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 Richardson, A.C. and Dawson, T.E. 1993. The nutrition of macadamia trees in New Zealand. The Orchardist of New Zealand 66(9): 37-40.
 Richardson, A.C. and Dawson, T.E. 1991. New Zealand macadamias: The industry and its research needs. The Orchardist of New Zealand, 64(6): 30-33.

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.