

The Backyard Agronomist



Soil chemical analysis

Client: James Hutchinson

Sample taken: 22 Jan 2018

Laboratory: Spectrum Analytic, Ohio USA

Location: 'Camp Hill' Huon Rd

Soil analysed: 5 Feb 2018

Test method: Mehlich 3 extraction¹

Results

	Camp Hill	Targets
Total Cation Exchange Capacity (TCEC)	9.3	
pH	5.6	6.5
Electrical Conductivity (EC)	0.08 dS/m	<0.15 dS/m
Organic matter (OM)	3.3%	>5%
Phosphorus (P)	19 ppm	40-70 ppm
Potassium (K)	125 ppm 3.4%	4.1%
Magnesium (Mg)	184 ppm 16.5%	12-20%
Calcium (Ca)	790 ppm 42.4%	68%
Sodium (Na)	52 ppm 2.4%	<50 ppm <1.5%
Sulphur (S)	10 ppm	23 ppm
Boron (B)	0.6 ppm	1.0 ppm
Zinc (Zn)	4.8 ppm	5.0 ppm
Iron (Fe)	263 ppm	50 ppm
Copper (Cu)	2.5 ppm	3.0 ppm
Manganese (Mn)	23 ppm	>20 ppm

The above table shows results for the soil sampled by James from the Camp Hill site. The targets are based on a mix of the Base-Cation Saturation Ratio (BCSR) approach and the more mainstream approach of nutrient sufficiency. Values that are problematically low are orange, excessive are blue.

¹ The lab method used is important, as you cannot directly compare results from one method with another.

Recommendations

This soil is moderately acidic and is lacking in many nutrients.

- **Organic matter** is low.
 - Apply at least 20L/m² of compost before each planting.
 - Ramial wood chip² produces long-lived organic matter and is excellent food for fungi. It can help to open up soils with tight clay structures. Apply 20L/m² and incorporate into the top 5cm. Alternatively, let the chip age in paths for a year or two then turn onto the beds. Plant low demand crops in the first year after applying fresh wood chip.
 - Biochar may increase the soil's CEC and water-holding capacity.
 - Maintain actively growing plant cover at all times. Plants exude sugars through their roots which feed the soil microbes that produce soil carbon.
- **Phosphorus** is low.
 - Apply phosphorus at a rate of 18 g/m².
- **Potassium** is low.
 - Apply potassium at a rate of 11 g/m². Potassium sulphate is 42% potassium, so apply 25 g/m².
- **Magnesium** is optimal. Do not apply dolomite.
- **Calcium** is low.
 - Apply lime at 290 g/m².
- **Sodium** is acceptable, **electrical conductivity** is optimal. Monitor sodium and EC in the future.
- **Sulphur** is low.
 - Apply gypsum at 20 g/m².
- **Boron** is low.
 - Broadcast fertilise with boron at a rate of 0.09 g/m². Borax is 10% boron, so you would need 0.9 g/m². Boron leaches easily, so reapply this amount annually in spring.
- **Zinc** is borderline low. Extra zinc may be needed in the future as phosphorus increases.
- **Iron** is high. No action needs to be taken.
- **Copper** is low.
 - Broadcast fertilise with copper at a rate of 0.11 g/m². Copper sulphate is 25% copper, so you would need 0.4 g/m².
- **Manganese** is sufficient.
- **Trace minerals** have not been measured by this soil test. To ensure you have enough, apply kelp meal and/or rock dust, for a total rate of 20 g/m².

² Ramial wood chip is sourced from deciduous branches with a diameter less than 7cm. Conifer and eucalypt should be kept to less than 20%. Unscreened chip from local waste depots has been found to be effective, especially if allowed to age first.

Apply amendments before planting as follows:

- **Lime and phosphorus:** incorporate thoroughly into top 15cm during bed renovation. If this is not possible (due to established plants or use of no-till methods) then fork in during bed preparation. Failing that, apply half the amount as a top-dressing – you may need to apply the rest in a year or two.
- **Micronutrients** (except manganese): a more even distribution can be achieved by applying with a soil drench. Dissolve required amount in a watering can and apply evenly. A 9L can do up to 10m².
- For the rest, incorporate as thoroughly as possible, preferably by forking in with compost.

Additional maintenance applications of the major nutrients, particularly of nitrogen, sulphur and boron, will be required in the future. I recommend re-testing in two to three years time (at a similar time of year) to determine if any fine-tuning is required.

Nitrogen

Nitrogen is one of the most important nutrients. However, lab tests are not able to measure the amount of nitrogen available over the course of a growing season. Tree crops require 5 g/m² of nitrogen. Vegetable crops require 10-20 g/m² of nitrogen, depending on if they are low or high demand. Sources of nitrogen are:

- Blood & bone is 5-8% quick-release nitrogen. This is ideal for early spring and leafy greens. It also has a useful level of phosphorus (3%). It is best not to apply more than 5 g/m² of N via blood & bone, as this can lead to excessive growth and susceptibility to pests (e.g. aphids). Avoid blood and bone which has had extra potassium and other minerals added as this will put your soil out of balance.
- Seed meal is 6% slower-release nitrogen. This is ideal for providing a consistent source of nitrogen year-round. To provide 10 g/m² of N, apply 170 g/m² of seed meal.
- In spring, a good combination is ¼ blood and bone, and ¾ seed meal. This works out to 30 g/m² blood and bone and 125 g/m² seed meal.
- Composted or pelleted chicken manure with >3% N. Fresh chicken manure is too strong, and aged chicken manure has lost much of its nitrogen to the atmosphere. To provide 10 g/m² of N, apply ~300 g/m² of composted chicken manure.
- Organic pelleted fertilisers such as Neutrog Rapid Raiser or Terra Firma Organic Life are based on chicken manure but with additional amendments to make for well-balanced nutrient sources. Rapid Raiser is a good choice if your soil has ample phosphorus and potassium, whereas Terra Firma is a good choice if you need to maintain levels of P & K.
- Compost must be of very high quality to be useful as a nitrogen source, with >3% N and a carbon-to-nitrogen ratio <12:1. This is difficult to achieve with home-made compost. It is best to treat compost (and also sheep and cow manure) more as soil conditioners and sources of organic matter, rather than as sources of available nitrogen. An annual application 5mm (5L/m²) thick is sufficient to maintain organic matter levels.

As a guide for vegetables, apply 10 g/m² of N at planting. If it is a high-demand crop, side-dress with a further 5-10 g/m² of N mid-season.

Tailored fertiliser

The recipe below is to be used once only for correcting pH and mineral levels. Spread over 10m² of garden beds and incorporate thoroughly to 15cm.

Fertiliser	Weight (g)	Volume (mL)
Canola meal	1350	2100
Blood & bone	250	200
Guano	350	250
Potassium sulphate	200	150
Lime	2850	2350
Soft rock phosphate	1400	1150
Gypsum	200	150
Kelp meal	100	120
Eco-Min rock dust	100	~80 ³
NTS Powdered Humic Acid	70g	~70mL ³
NTS Boron Granules	25g	25mL
Copper sulphate	5g	5mL
NTS Soluble Humate Granules	5g	~5mL ³
<i>TOTAL</i>	<i>6,905</i>	<i>6,645</i>

The micro-nutrients can be hard to apply in powder form. A more even distribution can be achieved by dissolving the sulphates and soluble humates in a 9L water can and applying across 10m².

3 I don't know the bulk density of these amendments, so am not sure what the equivalent volume would be.