Soil Management

Dormancy period the key to improving soil health

The dormancy period is a great opportunity to improve your vineyard's soil health and achieve chemical and structural balance in the most integral part of your farming system, as viticulturist Sam Bowman writes.

Across Australia, there are many diverse soil types in grapegrowing regions, all adding their own unique characteristics to the flavour profiles of the wines they produce. One thing they all have in common is their ability to retain moisture, transfer nutrients and even break down synthetic chemicals relies on their chemical and microbial composition.

I typically complete nutritional total soil tests every two years, which allows enough time to assess inputs from programs and ensure there are no major issues with elements like phosphorus that are prone to binding with other cations such as iron and calcium. A soil test is a great way to assess pH, salinity, elemental balance, organic carbon levels and, importantly for soil nutrient mobility, the calcium to magnesium ratio.

Many soils in the country have layers of marine limestone and carbonate rubble (Langhorne Creek, the Murray Darling, and McLaren vale for example) which severely effects the balance of calcium to magnesium. If you've ever seen vines turn yellow in the early spring in these regions, it's most likely lime-induced chlorosis. This yellowing occurs in calcareous soils at this time due to the solubilisation of calcium in the soil solution, which creates an antagonistic response to the iron that's required for chlorophyll development.

Mitigating these issues by balancing calcium and magnesium at a ratio of 6:1 will aid in improved soil chemical structure and nutrient mobility during the season. The other vital piece of information on your total soil test is the soil organic carbon.

Soil carbon resides mostly in the top 30cm of the soil profile and, whilst it only equates to between two to 10 percent of the total soil mass, it plays a vital function in the biological, chemical and physical structure of your vineyards' soil. This layer of soil is capable of sequestering atmospheric CO_2 and an increase in soil carbon from 1% to 1.5% can sequester 22.02 tonnes of atmospheric CO_2 per hectare.

Boosting biological and fungal populations

Increasing the soil carbon boosts the important biological and fungal populations that have many functions on improved plant growth and health. As microbes decompose soil organic carbon matter, their secretion of acids in the rhizosphere cleave and convert vital elements such as nitrogen and phosphorus making them plant available, this decomposition process also produces thick resin like exudates which bind soil particles adding to the physical composition of the soil.

The improved soil aggregates allow water and gas exchange to occur unimpeded and also provides a healthy environment for root development and exploration. As the soil organic carbon increases, so too does the biological and fungal diversity in the rhizosphere, these microorganisms play vital functions in nutrient mobility, moisture retention (from the resin like exudates) and lastly with soil detoxification.

The addition of synthetic chemicals (such as glyphosate) into the farming system has increased the need for microbial degradation in the soil to cleave bound elements and avoid contamination of lower soil layers, water tables or future crops. Increasing the soil organic carbon levels will also aid in reducing residues of toxic chemical additions by improving the abundance of microorganisms capable of digesting the chemical components and cleaving them into their organic forms.

In the instance of glyphosate, microorganisms will cleave the carbon-phosphate bond of the chemical as a form of soluble phosphorus or carbon, some utilise it as a source of nitrogen in a different pathway. There are by-products of this microbial decomposition. One of which is aminomethylphosphonic acid, which can inhibit DNA and mRNA synthesis in animals and plants, which is why there is importance in increasing microbial diversity to allow varied pathways of decomposition and multiple avenues of soil detoxification.

Increasing soil organic carbon and general soil health can be achieved by the application of manures or composts, the fertigation of microbial inoculants, carbon source additions such as kelp and fish emulsions and multi-specie cover crops in the mid-row area. The winter months are the optimum time to apply organic matter additions and to sow cover crops to establish mid-spring. Now is the time to test your soil and plan out the year ahead. GW