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Cover crop management in a Chardonnay/99 Richter vineyard in the coastal region, South Africa. 3. Effect of different cover crops and cover crop management practices on organic matter and macro-nutrient content of a medium-textured soil

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• In the first and second articles of this series, the authors studied the effect of the type of cover crop and the type of cover crop management on *weed control* and *vine performance*, respectively. In the current article – third in the series- the authors study the effect of cover crop and cover crop management on *soil organic matter and micronutrient* buildup. *[For the first and second articles of this series, check* http://wineserver.ucdavis.edu/trellissummary_categories.php*]*

• The nitrogen contribution of cover crops depends on the species of cover crop, the length of the growing season, the climate, and the soil conditions. A previous study showed that more N is mineralized from legume tops than from wheat straw. Another study showed that the amount of N fixed by medics -a legume- is closely associated with the amount of cover-crop dry matter produced. Yet another study showed that the N concentration of a cover crop varies with its stage of growth, and that, at least in legumes, N fixation peaks at bloom or during pod fill. Finally, one study indicated that it may not be necessary to apply N fertilizer to vineyards on soils with at least 6% clay if the organic matter exceeds 1.5%.

• Using a previous experimental set-up, these authors studied the effect of 8 cover crop species, managed in 2 different ways, on the amount of organic matter and macronutrients in a medium-textured soil located in the coastal vinegrowing region of South Africa. Briefly, the cover crop species compared were: rye, 2 types of oats, grazing vetch, faba bean, 2 types of medics, and subterranean clover. The cover crop management practices were: chemical elimination of cover crop before vine budbreak (which we will call BB), or after budbreak (AB), at about pea size, which allows the cover crop to complete its life cycle. There were also 2 controls: no cover crop sowed with weeds controlled mechanically –chemically on the vine row- before budbreak (Control-MECH), and no cover crop sowed with all weeds controlled chemically before budbreak (Control-CHEM).

• Soil samples were obtained from the interrow at 2 depths (0-150 mm and 150-300 mm deep, or 0-6 inches and 6-12 inches) twice in the season (at bloom and after harvest), and they were analyzed for: organic carbon, NH4-N and NO3-N, P and K, exchangeable K, Ca, Mg and Na, and pH.

• **Effect of cover crop on organic matter**. 1) All of the cover crops showed an increase in soil organic matter (OM). The legumes were particularly effective, with increases in OM in excess of 20%. In contrast, the Control-CHEM did not show any change in OM, whereas the Control-MECH showed a decrease of 16% over the 5-year period. 2) The increase in OM was most evident in the 0-150 mm top soil, although some cover crops also increased OM in the 150-300 mm horizon.

• **Effect of cover crop on total nitrogen**. 1) The soil total inorganic nitrogen of most of the medics, the subterranean clover, and the faba bean treatments was significantly higher than the remaining treatments (it is not a coincidence that all of them are N-fixing legumes). 2) These elevated N levels induced luxurious grapevine vegetation over the medium term. 3) As for the two management practices compared, the practice that eliminated the cover crop after budbreak (AB) showed higher nitrogen than the practice in which the cover crop was eliminated before budbreak (BB) for that same species.

• **Effect of cover crop on exchangeable cations.** There was no significant and consistent effect of cover crop on exchangeable K, Ca, Mg, or P.

• The authors were able to draw the following conclusions, applicable to the medium-texture soils of coastal regions:
_ all the cover crops improved the soil organic matter, particularly the legumes, compared to the soils where no cover crops were sown and the weeds were controlled chemically or mechanically;
_ cover crops killed after budbreak (mid-April in the Northern hemisphere) made a significant contribution to the availability of N in the soil after harvest. This N status should ensure sufficient levels in the grape juice to prevent sluggish fermentations;
_ chemical control of the cover crop after budbreak (mid-April) should result in more N being made available to the vines after harvest; whereas chemical control before budbreak (end February) should result in more N being made available during full bloom.

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