



“Soil and winegrape quality in biodynamically and organically managed vineyards”

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Does biodynamic farming make a difference? In this paper the authors try to answer that question.

- Biodynamic farming shares with organic farming the elimination of synthetic fertilizers and pesticides. But unlike organic farming, biodynamic farming uses, in addition, a series of fermented manure, plant, and mineral-based preparations which are added to the soil, crops, and compost. These substances are said to stimulate soil nutrient cycling, compost development, and photosynthesis. Approximately 500 ha of winegrapes are certified biodynamic in the United States. France is the country with the most rapid biodynamic development (15,000 ha in 1993). But whether the unique biodynamic preparations are beneficial in themselves remains a controversial subject.
- From 1996 to 2003, the authors compared two vineyards: one certified organic and one which had transitioned into biodynamics in 1996 (and was fully certified in 1997). The experimental site was in Ukiah, California, and the design was a randomized complete block design, with 4 replicate plots for each of the two soil-management treatments, with 50 rows of 27 vines/row per treatment. Even though during the initial years yields averaged 15 tons/ha (6.1 tons/acre), they were thinned to a projected 10 tons/ha (4.1 tons/acre) for both treatments in later years. Every year there was a cover crop –whose nature fluctuated depending on the year- which had the goal of both attracting insects and fertilizing the soil when turned under. In 1997 both treatments also received a pomace/manure compost (which in the case of the biodynamic plots had preparations added to it). Conventional farming plots for comparison were not available at the ranch.
- The only differences between the management of the two treatments consisted of the biodynamic treatment receiving the annual application of the following “preparations”:
 - a *cow manure* (“preparation 500”) spray 2 weeks after budbreak, and again 2-4 weeks after harvest;
 - a *finely-ground quartz silica* (“preparation 501”) sprayed 10-15 days pre-bloom;
 - a *barrel compost* spray (see table at the end of this summary), along with preparation 500 above, applied in the fall,
 - as mentioned before, the compost applied to both treatments in 1997 was identical except for the addition of preparations 502 – 507 to the compost used in the biodynamic treatments.
- The authors conducted a very extensive and rigorous soil analysis at the beginning and at the end of the experiment, both to assess the presence of any differences before the onset of the trial -which they emphasize as crucial-, as well as to learn about any differences that the treatments might have created. These soil measurements included: organic matter, CO₂ output, aggregates, conductivity, nitrate, available P, exchangeable K, Na, Ca, Mg, micronutrients, cation exchange capacity (CEC), and earthworms. (You are referred to the Materials and Methods of the original paper if you are interested in the respective techniques, which the authors explain in great detail).

- As for vine analyses, they measured leaf tissue micronutrients, vine yields, cluster numbers, cluster weights, berry weights and pruning weights for each of the two farming regimes. Finally, they tested grape Brix, total phenols, and free and total anthocyanins.

- **Effects on soil.** There were no differences between biodynamically treated and untreated plots. Also, no effects were found on microbial efficiency.

- **Effects on vine nutrition.** Leaf tissue analysis showed no differences among treatments. Most plant nutrients were present in adequate amounts in both treatments.

- **Effects on viticulture parameters.** Yield, clusters counts and weights, and berry weights showed no difference between treatments. Disease pressure was also minor in both blocks. In contrast, yield to pruning weight ratios did show a significant difference. The respective fruit to pruning weight ratios point out that **the biodynamic vines** (ratios between 4.5 and 5.3) **were better balanced than the organic vines, which were slightly overcropped** (ratios between 6.3 and 6.5). As a reference, the authors note that ratios between 5 and 6 are appropriate for most varieties (lower ratios seem appropriate for Pinot noir and Merlot). The authors don't mention the mechanism they believe is responsible for this difference.

- **Effects on must composition.** The differences observed were too small to be of any significance and the authors believe it is unlikely that biodynamic preparations contribute to grape quality.

In conclusion, the only difference the authors were able to detect in this rigorous 8 year study that compares two types of farming is a shift of the yield to pruning weight ratio in the biodynamic farming towards a better vine balance. Even though the authors applied compost only once to avoid instigating overly vigorous growth, they do point out that biodynamic practices tend to involve repeated compost applications that may be more likely to develop treatment differences. Because differences may also develop in future years, the authors are considering continuing monitoring the vines.

Preparation name	Main ingredient	Use
500	Cow (<i>Bos Taurus</i>) manure	Field spray
501	Finely -ground quartz silica	Field spray
502	Yarrow blossoms (<i>Achillea millefolium</i> L.)	Compost
503	Chamomile blossoms (<i>Matricaria reclusita</i> L.)	Compost
504	Stinging nettle shoots (<i>Urtica dioica</i> L.)	Compost
505	Oak bark (<i>Quercus robur</i> L.)	Compost
506	Dandelion flowers (<i>Taraxacum officinale</i> L.)	Compost
507	Valerian flower extract (<i>Valeriana oficinalis</i> L.)	Compost
Barrel compost	Cow manure fermented with 502-507	Field spray

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