

The Science Behind Biodynamic Preparations: A Literature Review

By Linda Chalker-Scott

Major news outlets have featured biodynamic agriculture (biodynamics) as the newest version of organic agriculture. With the high visibility and promotion of biodynamic products such as wines, farmers and gardeners alike are increasingly interested in biodynamics as an alternative agricultural practice. Dr. Chalker-Scott recently published an extensive, peer-reviewed summary of biodynamics, a condensed version is published here.

The Origins of Biodynamic Agriculture

Biodynamics is system of agricultural management based on a series of lectures given by Rudolf Steiner in 1924. A philosopher by training, Steiner sought to influence organic life on earth through cosmic and terrestrial forces via nine preparations (see list on next page) that would stimulate vitalizing and harmonizing processes in the soil. Unfortunately, he gave no rationale for most of these processes.

In the past decades, biodynamic agriculture has evolved to include many current farming practices (such as crop rotation and cover cropping), which have benefits on soil and crop production. Steiner's original teachings did not include these methodologies.

Previous Reviews

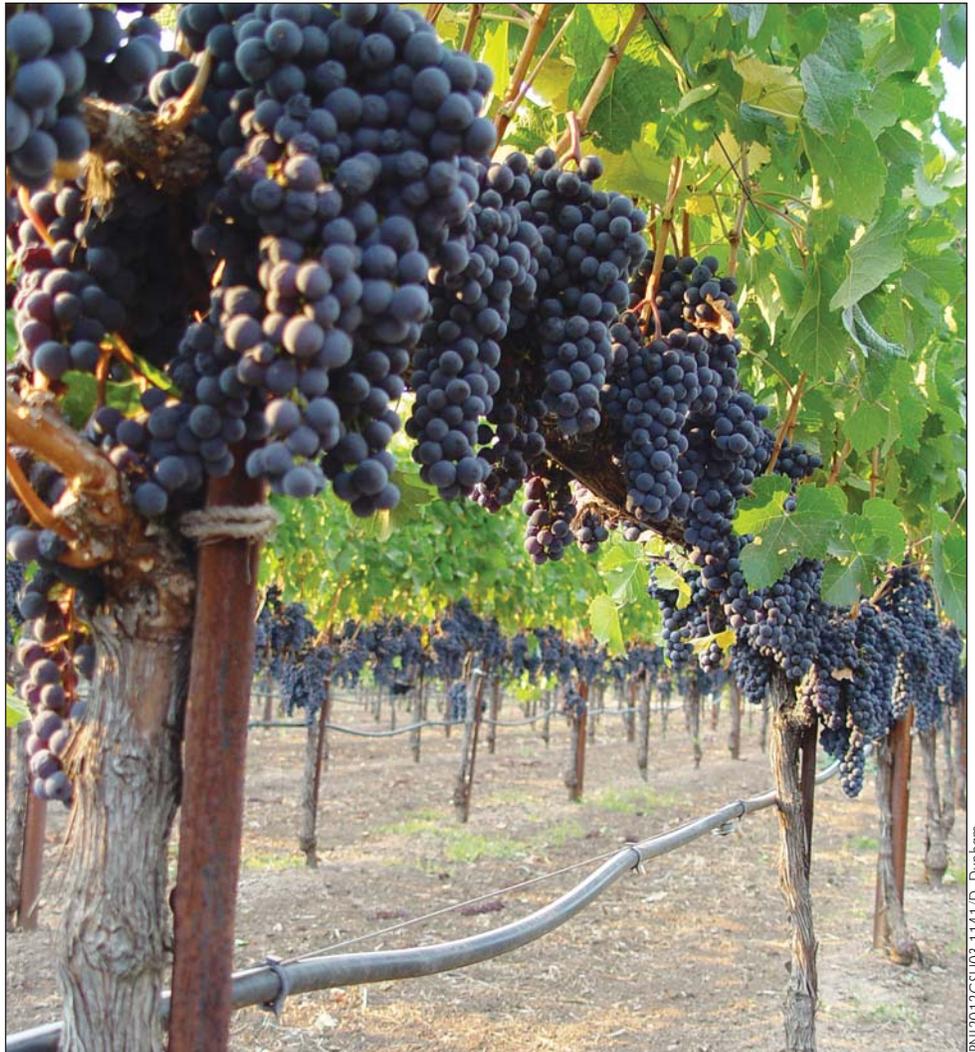
There are relatively few refereed articles on biodynamics. The earliest studies had limited international distribution and many were found to be of questionable scientific quality. A detailed scientific bibliography is included in the original article.

Soils: In the words of one research team “no significant differences were found between soils fertilized with biodynamic vs. nonbiodynamic compost.” Other studies confirm a lack of efficacy on soil fertility and quality, though the combined application of Preparations 500 to 507 and biodynamic field sprays were found to be “moderately effective” in increasing soil pH. Not surprisingly, organic matter in organically treated soils (with manure added as a fertilizer) was higher than in unmanured soils treated with biodynamic Preparations 500 to 504.

Microbes: Researchers have consistently found no differences in microbial activity, biomass, or fungal colonization in biodynamically treated soils compared with organically managed soils.

Crops: When added to organically grown crops, biodynamic preparations have been uniformly ineffective. Compared

Abbreviations and Notes: N = nitrogen; P = phosphorus; K = potassium; Ca = calcium; Fe = iron; Si = silicon.



Wine grape producers and other high value crop sectors have tried Biodynamic methods as a strategy to distinguish themselves within organic markets, but have received little measurable benefit.

with organically managed systems, additions of biodynamic preparations did not affect yields of cover crops, forage grasses, lentil, rice, spelt, sunflower, or wheat.

Wine-makers are particularly interested in biodynamic grapes, but researchers have found no difference in leaf nutrients or cluster numbers, weights, or yield of California-grown merlot. Though some small differences were found in grape chemistry, they were of “doubtful practical significance” according to the authors, leading them to conclude, “there is little evidence the biodynamic preparations contribute to grape quality.” In fact, the finished product may be negatively affected; in one trial organically grown California merlot was notably more preferred by tasters than the biodynamically grown product.

Pests and Pathogens: No differences were found in weed control using biodynamic preparations, in soil cover, species richness, diversity, and evenness of weed species. In one long-term study, biodynamic Preparations 501 and 502 increased disease intensity in organically grown wheat.

Evaluating the Literature Critically

In considering the current body of literature on biodynamics, there are some points to keep in mind.

Statistics: When the number of comparisons made among treatments increases, the likelihood of finding a significant difference also increases, if only by chance. The way to reduce this systematic error is to use a statistical correction factor, which sets a higher bar for what is considered “significant.” This correction is often overlooked and it points out a possible source of statistical error.

Look for the Positive: It is tempting to focus on isolated positive results, highlight the significant results, and say little about the rest, especially in the article’s abstract or conclusion. Reading the entire article, not just a summary, provides a more complete picture.

Science-based Agriculture

We live in a culture that increasingly holds scientific evidence as just another belief. This is partly due to a failure of agricultural researchers and educators to draw clear lines between methods that have been rigorously tested and those that have not.

There are currently no clear and consistent effects of biodynamic preparations on organically managed systems. Other alternative techniques, including use of cosmic rhythms to schedule various farm activities and image formation to

Components of biodynamic preparations

- #500 – Cow manure packed into a cow’s horn
- #501 – Silica from finely ground quartz, mixed with rain water, packed into a cow’s horn
- #502 – Yarrow (*Achillea millefolium*) flower heads fermented in soil
- #503 – Chamomile (*Matricaria* sp.) flower heads fermented in soil
- #504 – Stinging nettle (*Urtica* sp.) tea
- #505 – Oak (*Quercus* sp.) bark packed into the skull of a domestic animal
- #506 – Dandelion (*Taraxacum officinale*) flower heads packed into cow mesentery
- #507 – Extract from valerian (*Valeriana officinalis*) flowers
- #508 – Horsetail (*Equisetum arvense*) tea

Note: Species of plants used differ with global geography.

visualize nutritional quality of plants do not lend themselves to rigorous experimental testing. Given the thinness of the scientific literature and the lack of data supporting the efficacy of biodynamic preparations, biodynamic agriculture is not to be recommended as a science-based practice at this time. 

Extracted from Chalker-Scott’s review article in HortTechnology, 2013 26:814-819.

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New Nutri-Facts Series Available

The International Plant Nutrition Institute (IPNI) has recently released a new publication series titled *Nutri-Facts: Agronomic Fact Sheets on Crop Nutrients*.

The set of *Nutri-Facts* is focused on providing a condensed set of information for all essential plant nutrients, and key aspects related to their appropriate use. Currently, *Nutri-Facts* are available for nitrogen (N), phosphorus (P), potassium (K), sulfur (S), boron (B), manganese (Mn), and zinc (Zn). New additions are expected to complete the series later this year.

To obtain pdf copies of *Nutri-Facts* see <http://www.ipni.net/nutrifacts> 

