

IMPACT: CROP YIELD

Reference 5

Doring, J; Collins, C; Frisch, M; Kauer, R 2019 Organic and Biodynamic Viticulture Affect Biodiversity and Properties of Vine and Wine: A Systematic Quantitative Review AMERICAN JOURNAL OF ENOLOGY AND VITICULTURE 70 3, 221-242 10.5344/ajev.2019.18047

Background and objective

Demand for organically grown crops has increased exponentially in the last few decades. Particularly in the wine sector, organic and biodynamic management systems are gaining more and more importance, with some of the most prestigious wineries converting to organic or biodynamic viticulture. The purpose of the study was to review evidence comparing effects of conventional, organic, and biodynamic viticulture on soil properties, biodiversity, vine growth and yield, disease incidence, grape composition, sensory characteristics, and wine quality. We focus here on organic vs. conventional and on yield.

Search strategy and selection criteria

Literature searches of peer-reviewed published literature were conducted to find studies investigating organic and/or biodynamic viticulture. The following search terms were used in different combinations in the ISI-Web of Science and Pubmed Databases: organic/viticulture, biodynamic/viticulture, biodynamic/agriculture/grapes (last searched on 08/25/17). Only field trials that used replicates of management treatments with representative plots or studies that used a representative number of samples were included in the review in order to avoid bias in individual studies. Data from non-peer-reviewed sources such as conference proceedings, master theses or doctoral dissertations were also included into this study if they met the criteria mentioned above.

Data and analysis

Data were extracted manually from the different studies. If different forms of conventional viticulture were included in the studies, low input conventional plots were chosen for meta-analysis. Linear meta-regression analyses were performed in order to evaluate the quality of the correlations of several parameters (growth, yield and total soluble solids in juice) between conventionally and organically or biodynamically managed vineyards. By meta-regression analyses the following questions were addressed: What is the magnitude of the effect of organic and biodynamic management on vine growth (expressed as pruning weight), vine yields and total soluble solids in juice? To assess if conventional and organic/biodynamic viticulture differ in vine growth, vine yield and total soluble solids in juice and if the observed effects are consistent across all environments ANOVA and Tukey-Test (Post-Hoc-Test) was performed. The factors were treatment (conventional or organic including biodynamic), location of the study (America, Europe or Australia) and interactions between treatment and location were assessed.

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
17	Field studies assessing the performance of organic in comparison to conventional viticulture systems.	Organic systems	Conventional systems	Metric: Vine yield, Pruning material production; Effect size: Not precisely defined.	50

Results

- When pruning weight of organic and conventional management was compared by meta-regression analysis taking into consideration all available datasets of scientific trials, organic and biodynamic treatments showed 21 % less growth as pruning weight compared to conventional treatments. The yield gap under organic compared to conventional viticulture ranges from 44.2% to 119.4% for the data included in the meta-analysis. Looking at the relative organic yield in proportion to the yield level of the conventional or integrated counterpart, no clear relationship between conventional yield level and relative organic yield can be observed.
- Pruning weight of organic and biodynamic treatments differed from conventional/integrated treatments in the respective field trials. The environmental factors had a significant influence on the pruning weight, but no interactions between treatment and environment were observed, meaning that organic and biodynamic treatments always showed lower pruning weights regardless of the location of the trial.
- All the studies included showed an average reduction in pruning weight under organic management.
- NULL
- NULL

Factors influencing effect sizes

- No factors influencing effect sizes to report

Conclusion

A yield decrease of 18 % in organic and biodynamic viticulture compared to conventional viticulture was observed when all available data from scientific field trials were assessed.