



## «Terroir» effect, as a result of environmental stress, depends more on soil depth than on soil type (*Vitis vinifera* L. cv. Grenache noir, Côtes du Rhône, France, 2000)

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Even though the authors reveal quite a bit in their title, this research project started with their desire to find out whether soil type could be a reliable indicator of potential grape quality.

- Soil acts on grape quality through its effect on 1) vine water supply, 2) vine nutrient supply, and 3) the depth and temperature of the roots. Vine water supply is determined by soil *water holding capacity*, which in turn, depends on soil texture and soil depth. Nutrient supply, on the other hand, is determined by soil *mineral composition*, *pH*, and *cation exchange capacity*. Nitrogen supply is particularly important, and it is influenced by the level of soil organic matter and the mineralization speed for the area. With all of this going on, you would expect soil type to affect grape quality! And that's what the authors want to take a serious look at.
- They studied 5 soil types that supported vineyards, which they were lucky to find clustered together in the southern west bank of the Rhône river (France): 1) marl soil, 2) deep, colluvial soil, 3) sandy soil, 4) stony terraces, and 5) reworked sandy marl soil. All the soils were calcareous, except for the decarbonated stony terraces. The soils included a range of soil depths: colluvial soils and stony terraces were consistently deep; sandy soils were consistently shallow, the marly plots varied widely in depth. (See *Table 1* of original text for details). All the soils were replicated, except for one, for a total of 15 vineyard plots compared.
- What the authors do next is basically measure *vine nitrogen* and *vine water* (pre-dawn leaf water potential) for the vines growing in each of the soils, and compare them to *vine growth parameters* and *fruit composition*. It is probably worth mentioning that they measure nitrogen with a "N-tester", which measures the intensity of green coloration of the leaves: "deep green = high nitrogen".
- **Effect of soil on water uptake.** The deep colluvial soils and the stony terraces had high pre-dawn leaf water potentials (average -0.35 MPa), meaning lower water stress. In contrast, the sandy soils and the reworked sandy marls had significantly lower water potentials (average -0.5 MPa), meaning higher water stress.
- **Effect of soil on nitrogen supply.** No significant relationship could be established between soil and nitrogen supply, with the exception of the deep colluvial soils, which were a source of high nitrogen supply. In general, deeper soils tended to have higher nitrogen readings (N-tester) than shallower ones. (The authors note that they did not track nitrogen fertilization of the plots, which tends to be light in French vineyards, but had it happened, it would have affected the results).

• **Effect of soil on vine growth and fruit composition.** To determine these relationships, the authors ran a Principal Component Analysis on 14 variables measured across the 15 plots. Their results were presented in 2 maps. The first map showed that the parameters **“high berry sugar” and “high anthocyanin content”** were correlated with **“low water” and “low nitrogen supply”**. In the second map, “exposed leaf area” explained additional variability, but it was harder to establish its relationship with the rest of the parameters.

• Based on the above analysis, the 15 plots clustered themselves in 4 groups. Unfortunately, the 5 types of soils analyzed were all over the place, scattered among all 4 groups. However, **soils in groups 1 and 2, characterized by high berry sugar and high anthocyanin content, were mostly shallow soils; whereas soils in groups 3 and 4, characterized by low sugar and low anthocyanin, were mostly deep soils.**

The authors conclude that no relationship could be clearly established between grape quality potential and a particular type of soil, but a clear relationship existed between grape quality potential and soil depth. The authors also found high sugar and high anthocyanin content in the berries to be related to low vine water and low nitrogen status. This study sheds some more light on the controversial point of whether vines need to be stressed to produce high quality grapes. In the authors’ opinion, quality red grape growing *is* related to the existence of some environmental stress, be it *limited water supply* or *moderate nitrogen deficiency*.

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