vinetur

Study Finds Electrical Technique Can Track Vineyard Drought Stress

Researchers in France say spectral induced polarization could help growers measure soil moisture changes and vine water stress more precisely.

Wednesday, May 20, 2026



A new study in a vineyard in France’s Médoc region suggests that a geophysical technique more often used in earth science could help growers track water stress in vines and soil moisture changes during drought.

The research, published Wednesday in Geophysical Journal International, tested spectral induced polarization, or SIP, in a commercial vineyard during the summer drought of 2023. The method measures how soil responds to electrical signals across different frequencies. In this case, the scientists combined field measurements with laboratory tests, soil moisture probes and vine sap flow monitoring to see whether SIP could map water dynamics down to 1 meter below the surface.

The team found that the technique could detect drying trends through the growing season and estimate changes in soil water storage. According to the study, soil water storage in the vineyard fell from about 150 mm to 50 mm during the drought. For vines equipped with sap flow sensors, the researchers estimated total transpirable soil water at 98±8 mm.

The work matters because vineyards often face uneven soils, variable salinity and changing moisture conditions that can make irrigation decisions difficult. Standard electrical resistivity methods can be affected by salt levels in the soil water, which can blur readings. The researchers said SIP appeared less sensitive to those salinity changes, especially through its imaginary conductivity signal, making it potentially more reliable for vineyards that receive soil amendments or experience shifts in soil chemistry.

The study also compared several field setups for collecting SIP data, including multiwire cables, fully coaxial cables and hybrid systems. The choice of setup strongly affected data quality, especially when soils were drier. That finding could matter for growers and consultants who want to use the method outside controlled experiments.

The authors said the technique may offer two kinds of information at once: soil moisture dynamics and soil texture patterns. That combination could help identify where vines are under more stress and where irrigation might be needed most. The researchers said their approach was the first attempt to quantify soil water storage in a commercial vineyard using SIP methods.

The study was led by Quentin Chaffaut of Sorbonne Université, Myriam Schmutz of the University of Bordeaux and Lawrence Berkeley National Laboratory, and Jehanne Cavailhes of the University of Bordeaux. It was published as an accepted manuscript and is open access under a Creative Commons license.