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University of Talca Researchers Develop Grape Sensor That Reads Maturity in Less Than Five Seconds

The non-destructive device could give vineyards instant field data on fruit quality before deciding when to harvest.

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Researchers at the University of Talca in Chile are developing a portable optical sensor designed to measure grape maturity and quality in seconds without damaging the fruit, a project that could change how vineyards decide when to harvest.

The technology, called GrapeScan, is being developed at the university's Center for Research and Transfer in Irrigation and Agroclimatology, known as CITRA. According to information released by Portal Agro Chile, the work is supported by a VIU research commercialization grant and is now moving from years of academic research toward the creation of a functional prototype.

The project is led by María Ignacia González Pavez, an agricultural engineer, master's graduate in fruit growing from the University of Talca, and CITRA researcher. She said the goal is to give growers a way to assess grape maturity directly in the vineyard, on the berry itself, without relying only on destructive sampling or waiting for standard laboratory results.

GrapeScan is based on optical sensing at specific wavelengths. The planned device would be small and portable, roughly comparable in size to a refractometer, and would work by making contact with the grape berry. With a single measurement, the team aims for the sensor to provide a multi-variable reading of each cluster, delivering six response variables tied to maturity and quality.

The researchers expect each reading to take less than five seconds. That speed is central to the project's value, since current vineyard sampling often depends on collecting fruit, sending it for analysis, and then waiting for results before making harvest decisions. A faster method could allow more frequent checks across a larger area of the vineyard.

The team also plans to add georeferencing and a digital platform to store field measurements. If that part of the system is completed as planned, each reading could be linked to a GPS point, allowing growers to build maps that show how fruit condition changes from one part of a vineyard to another. That could help identify uneven ripening patterns and improve decisions about monitoring and harvest scheduling.

For the wine industry, that potential matters beyond research. If field validation is successful, a non-destructive tool that produces rapid, georeferenced data could make grape sampling more efficient and give wineries more precise information for planning harvest timing and winery intake. That could be especially useful in vineyards where fruit maturity varies sharply by block, slope, soil condition, or irrigation pattern. The commercial value of the system, however, will depend on how well the prototype performs under real vineyard conditions.

Samuel Ortega Farías, director of CITRA, said the project grows out of a scientific line that has been developed at the center over several years. He said the work combines spectrometry, data processing, and mathematical modeling to address what he described as a current need in viticulture: a simple, dynamic, and non-destructive way to sample fruit quality.

The research also includes collaboration with Carlos Poblete Echeverría of Stellenbosch University in South Africa, a former student of the University of Talca who has worked in the same research area. That connection suggests the project is drawing on expertise from outside Chile as it moves toward a usable product.

At this stage, GrapeScan is not yet a market-ready device. The next phase will focus on engineering work to build the hardware and software, followed by field trials during the agricultural season. Those tests are expected to show whether the sensor can deliver reliable readings under normal vineyard conditions, where factors such as berry variability, weather, and handling can affect performance.

The team’s early business plan envisions a phased rollout. González Pavez said the first step would likely be to offer advisory services using the sensor rather than selling the device immediately. A broader commercial launch, including direct sales in Chile and abroad, would come later if the technology reaches commercial scale.

That path is common for university research projects that need to prove technical performance before manufacturing and distribution become realistic. In this case, the underlying research has already been built through graduate work and further specialization in spectrometry, but the project still must pass the harder test of turning laboratory and academic findings into a dependable field instrument that growers can

use during the narrow and high-stakes harvest window.