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Spanish vineyard trial finds five years can rank commercial rootstocks reliably

A 10-year Tempranillo study found newer pre-commercial rootstocks need longer testing before performance rankings become stable

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A 10-year vineyard trial in northern Spain has offered a clearer answer to a costly question for grape growers and nurseries: how many harvests are needed before rootstock rankings can be trusted.

The study, published July 1 in OENO One, analyzed Tempranillo vines grafted onto both established commercial rootstocks and newer pre-commercial selections. The researchers found that rankings for commercial rootstocks became relatively stable after a few years, while newer selections took longer to show consistent results. The finding matters for the wine sector because rootstock trials require years of land, labor and monitoring, and a better estimate of the minimum testing period could reduce risk for nurseries, breeders and wineries deciding where to invest.

The work was led by Luis Gonzaga Santesteban and colleagues and drew on data collected from 2014 through 2023 at the Vitis Navarra nursery in Miranda de Arga, in Navarre, within Spain's Ebro Valley wine region. The vineyard was planted in 2011 with bench-grafted Tempranillo vines on 12 commercial rootstocks and 9 newly developed rootstocks from the RG series. The site was managed under consistent conditions over the life of the trial, with three replicates of 10 vines per rootstock.

Rootstocks are the underground part of the vine onto which a fruiting variety is grafted. They can influence yield, vigor and tolerance to drought, pests and other stresses. Because those effects may change as vines age, long-term field trials are standard in viticulture. But they are expensive and slow, and researchers say there has been little evidence on how long such trials must run before conclusions become robust.

To test that question, the team examined four measures: cluster number, yield, pruning weight and Ravaz index, a ratio commonly used to assess crop load by comparing yield with pruning weight. For each possible trial length from two to 10 years, they compared rankings based on partial year combinations with rankings from the full 10-year dataset.

They used two rank-based measures of stability. One was Kendall's tau, which shows how closely two rankings match. The other was pairwise inversion rate, which estimates how often the relative order of two rootstocks would be reversed when fewer seasons are used. In practical terms, a lower inversion rate means less risk of misclassifying which rootstock performs better.

The results showed that stability improved as more years were added, but not at the same pace for every trait. Using a Kendall’s tau value near 0.85 as an indicator of high stability, cluster number and pruning weight reached that level after about four years. Yield needed about five years. Ravaz index was slower and did not reach similar stability until about seven years.

When the researchers separated commercial rootstocks from the RG selections, the gap became clearer. For nearly all variables except Ravaz index, commercial rootstocks showed higher stability sooner. The newer RG materials converged more slowly and remained more dispersed when only short or medium-length time series were used. According to the paper, Kendall’s tau values for the RG group did not reach a clear plateau even after 10 years.

The inversion-rate analysis pointed in the same direction. Misclassification risk fell as more seasons were included. Cluster number and pruning weight improved fastest, yield showed an intermediate pattern, and Ravaz index remained the least stable measure. Commercial rootstocks generally had lower inversion rates than the RG series.

The authors say several factors may explain why newer materials need longer evaluation. Some of the RG rootstocks in this trial appeared to lose productivity gradually as vines aged, which would delay stabilization of their rankings. They also suggest that commercial rootstocks may already reflect a long filtering process: materials that perform poorly over time are less likely to remain widely planted and sold. Newer selections have not yet gone through that same long market test across many sites and years.

The study also points to differences among traits themselves. In Mediterranean conditions, yield tends to respond more strongly than cluster number or pruning weight to year-to-year changes in water status and weather. That sensitivity may help explain why yield rankings took longer to settle. Ravaz index was even slower, likely because it combines two variables and can amplify short-term variation.

The trial took place in a continental-Mediterranean climate with annual rainfall around 350 mm to 400 mm. The soil was described as sandy loam alluvium with moderate active lime at 7.5% to 8.0%, pH near 8.6 and organic matter around 2.0%. Summer drip irrigation of about 30 mm to 70 mm per season was applied equally across all rootstocks to avoid severe water stress.

The authors caution that their conclusions come from one long-term dataset under one set of environmental and management conditions. They say broader confirmation will require similar analyses across more vineyards, climates and genetic backgrounds. Even so, they argue that the case study offers a practical benchmark for trial design.

For commercial rootstocks, the paper suggests that around five years of evaluation may be enough to produce useful rankings for vineyards of similar age, even if that window may miss declines that appear later in a vine’s life. For lesser-known or pre-commercial materials, longer testing appears necessary before researchers or growers can draw conclusions with comparable confidence.

That distinction could have direct consequences beyond academic research. Rootstock development is tied to efforts to improve tolerance to drought and other biotic and abiotic stresses at a time when wine regions are under pressure from climate variability and rising production costs. If breeders can better judge when evidence is strong enough for established materials, while recognizing that new selections need more patience, companies may be able to allocate trial budgets more efficiently without moving too quickly on plant material that has not yet proved stable over time.

The paper was published as a short communication in cooperation with the 16th International Terroir Congress and the 3rd ClimWine Symposium held in Angers, France. It was received on Jan. 29, accepted on April 8 and published on July 1.