# Monitoring early rooting behavior of grapevine rootstocks: a 2D-imaging approach

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## Abstract

The plasticity of grapevines in response to diverse growing conditions is influenced, among other factors, by the extent to which the roots explore the soil and the ability to accumulate and retrieve water and nutrients.

Newly planted grapevines, in particular, face challenges due to limited resources. The young plant's ability for a fast and intensive penetration of the soil is vital in periods of water scarcity. The selection of an appropriate, site-specific rootstock significantly impacts both, the quality of the fruit produced and the economic success of the wine estate. This underscores the importance of providing guidance and recommendations to winegrowers, enabling them to make informed decisions about the selection of suitable planting materials. Despite its critical significance, there is very limited information available on the early rooting behavior of commercial rootstocks. Observing below-ground growth poses challenges, but the use of rhizoboxes has proven effective in investigating root-related issues across different species.

Therefore, we established a semi-automated platform using RGB imaging to monitor the root development of three commercial grapevine rootstocks and characterize root architecture parameters including maximal rooting depth and the area colonized by roots. The image processing method enables a rapid batch analysis, yielding reliable data that is highly comparable to the manually assessed reference dataset. This approach serves as a valuable framework for future evaluation of the assertiveness of commercial grapevine rootstocks under challenging planting conditions.

**Keywords:** rhizoboxes, root phenotyping, root system architecture, climate change, drought stress.