



THINNER TOPSOIL IMPROVES FRUIT COMPOSITION IN MID-ATLANTIC UNITED STATES VINEYARDS: PRELIMINARY RESULTS

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Abstract

Aim: The aim of this study was to investigate the impact of topsoil thickness on dormant pruning weights, cluster compactness, and fruit composition (°Brix, titratable acidity, pH) in the Mid-Atlantic of the United States.

Methods and Results: An Albariño vineyard in Frederick County, Maryland was previously terraced, resulting in topsoil (A-horizon) thickness differences while other factors are constant (weather, vine spacing, training, cultivar/clone/rootstock). We surveyed topsoil thickness along two transects using a combination of hand dug pits and soil probes, determining “topsoil” based on soil color and structure. The topsoil thickness we surveyed ranged from 0 to 30 cm. For reference, the vineyard’s mapped soil series, Mt. Zion, has 13 to 15 cm of topsoil. Each panel of six vines served as an experimental unit, and we sampled 29 panels total corresponding to the topsoil measurement locations in 2019. We collected dormant pruning weights as well as cluster compactness (berries per cm rachis) and fruit chemistry (pH, titratable acidity, and °Brix). Fruit from vines growing in thinner topsoil had significantly lower titratable acidity and higher °Brix ($R^2 = 0.24$). The correlation between topsoil and fruit titratable acidity was particularly strong, with topsoil thickness explaining 66.1% of variation in titratable acidity. There was not a significant relationship between topsoil thickness and fruit pH, but vines in thinner topsoil exhibited looser clusters ($R^2 = 0.27$) and lower pruning weights ($R^2 = 0.58$).

Conclusions: Preliminary results suggest that fruit from vines growing in thinner topsoil ripen earlier. Compared to vines growing in thicker topsoil, they had lower titratable acidity and higher °Brix. Thinner topsoil also resulted in lower dormant pruning weights which indicates smaller vines, and looser clusters which may help with disease pressure. Understanding topsoil's contribution to vine growth and fruit composition will help inform decisions about vineyard site selection, soil management, harvest time, and the overall terroir of a site.

Significance and Impact of the Study: The viticulture industry in the Mid-Atlantic United States is growing, but their ability to support high-quality wine grape production may be hindered by certain soil properties. Many Mid-Atlantic soils are highly fertile and have relatively high available water holding capacity. In combination with the Mid-Atlantic’s humid continental climate, these soil properties can provide excessive plant-available water and nutrients to grapevines. Such excesses often produce vigorous vegetative growth (i.e., vigor) and detrimentally impact fruit composition and potential wine quality. Topsoil management could be an approach for growers to influence hydrology and fertility of vineyard soil. Choosing sites with less topsoil and/or managing topsoil thickness may help growers optimize their fruit chemistry and potentially predict and/or influence fruit ripening.

Keywords: Soil fertility, soil hydrology, soil management, Mid-Atlantic



Thinner Topsoil Improves Fruit Composition in Mid-Atlantic United States Vineyards

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Question: Is there a relationship between A-horizon depth and:

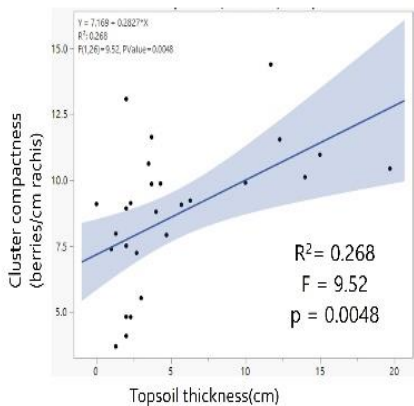


CLUSTER COMPACTNESS (berries per cm rachis)



Deep topsoil

Shallow topsoil



Topsoil thickness explains 27% of differences in **cluster compactness**.

Background:

- Mid-Atlantic has a humid continental climate
- Mid-Atlantic soils are highly fertile and have relatively high available water holding capacity
- excessive plant-available water and nutrients to grapevines. Such excesses often produce vigorous vegetative growth (i.e., vigor) and detrimentally impact fruit composition and potential wine quality

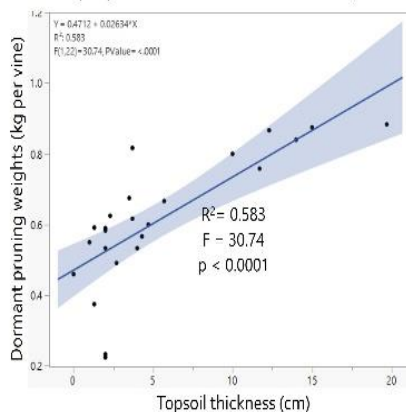


VINE GROWTH (Dormant pruning weights)



Deep topsoil

Shallow topsoil

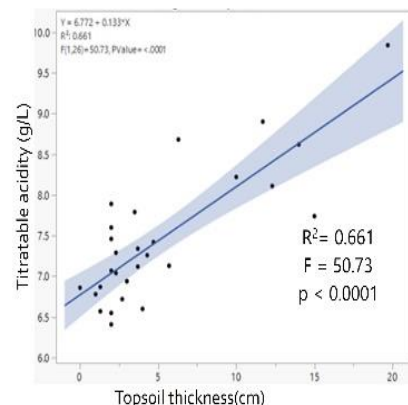
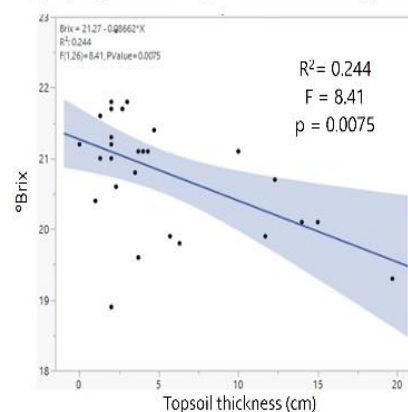


Topsoil thickness explains 58% of differences in **dormant pruning weights**.

Conclusions: Preliminary results suggest that fruit from vines growing in thinner topsoil ripen earlier. This will help inform decisions about vineyard site selection, soil management, harvest time, & the overall terroir of a site.



FRUIT COMPOSITION (pH, sugar content, titratable acidity)



Topsoil thickness does **not** have a significant impact on fruit pH.

Topsoil thickness explains 24% of differences in **fruit sugar content** & 66% of differences in **fruit titratable acidity**.

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