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Nova Scotia Vineyard Soils Show Uneven Nitrogen Storage

Study finds clay and silt hold more of the nutrient, pointing growers toward more precise fertilizer use

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A new study of vineyard soils in Nova Scotia suggests that the way nitrogen is stored and released in grape-growing land depends strongly on soil texture and on where samples are taken within a vineyard, findings that could help growers fine-tune fertilizer use and reduce waste.

The research, published in Agriculture, Ecosystems & Environment, examined 11 vineyards and looked at how different soil particle size fractions — sand, silt and clay — affect the biological availability of nitrogen. The work focused on nitrogen because it is one of the main nutrients shaping vine growth, fruit development and grape quality, but too much of it can also increase costs and environmental pressure.

Researchers collected soil samples from multiple locations across each vineyard to capture spatial differences in the ground. They then separated the samples into particle fractions and measured how much nitrogen each fraction could retain and supply in forms that vines can use. The study found that finer particles, especially clay and silt, tended to hold more organic nitrogen compounds. Those compounds are released more slowly as they break down, which can provide a steadier source of nutrition for vines over time.

Sandy soils behaved differently. They held less nitrogen overall, but they allowed faster turnover of the nutrient. That means nitrogen in sandier areas may become available more quickly, but it may also be lost more easily through leaching or other pathways if it is not managed carefully.

The study also found that nitrogen availability was not uniform across vineyard blocks. Instead, it varied significantly from place to place, shaped by topography, root distribution and management practices. That unevenness matters because a single fertilizer plan for an entire vineyard may not match what vines actually need in different zones.

For growers, the findings point toward more precise nitrogen management based on soil maps and texture data rather than broad application rates. In practice, that could mean applying less fertilizer where soils already store enough nitrogen and targeting more carefully where soils are poorer at holding it. The approach could improve nutrient efficiency, limit runoff and other environmental impacts, and help stabilize vine health and yields.

The study adds to a growing body of work showing that vineyard management is increasingly moving toward site-specific decisions. In regions where growers are trying to balance productivity with sustainability, understanding how soil particle size affects

nitrogen availability may become a useful tool for deciding when, where and how much fertilizer to apply.