Collaborative research on the development and potential commercialization of key technologies for agricultural soil remediation and improvement

The main goal of this project was to investigate the use of two management techniques, cover crops and agrominerals, in vineyards.

In the greenhouse, four cover crops, common chicory, oilseed radish, alfalfa, and red clover, were grown in monocultures or in mixtures to compare their performances when grown in soil amended with SRC or synthetic fertilizer.

The mixture of the four cover crops and a monoculture of ryegrass, amended with SRC or synthetic fertilizer were grown in a vineyard to test their influence on soil nutrients and pH, soil insect and vegetation diversity, and grape and leaf composition.

Agroecosystems

Agricultural land functions as a managed ecosystem, with the major purpose being food production. Agroecosystems can have a major impact on soil health and biodiversity, so maintaining ecological integrity in these systems is critical for sustainability.

Spanish River Carbonatite (SRC)

SRC is an inorganic agromineral soil amendment, that originates from a rock deposit near Sudbury, Ontario. Agrominerals are used as fertilizer supplements, as they provide plants with many of the nutrients needed for growth, or as a liming agent. They release nutrients into the soil slowly. They can be a long-term strategy to decrease reliance on synthetic fertilizers.

Cover Crops

Cover crops are planted among, or in rotation with cash crops. These plants can provide many benefits above and below ground, such as weed suppression, soil conditioning, water retention, and improving the soil's nutrient profile. Different species of cover crop provide different services, and overall improve the system biodiversity.

Lessons Learned

In the greenhouse, plant growth response was species dependent and changed over time. The plants, especially legumes, grown in soil amended with SRC often had a greater or equal biomass compared to those grown in soil amended with synthetic (20-20-20) fertilizer.

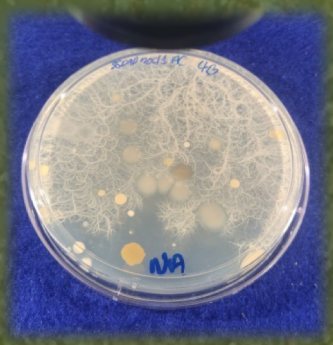
In the vineyard, SRC and synthetic fertilizer showed similar results. More time may be needed before effects can be seen in an outdoor setting. Ryegrass planted in monoculture resulted in increased plant diversity.

It is important to understand previous and current grower's management as this may also affect the results.

Microbial Life

It is interesting to note that the soil containing SRC also showed a higher abundance of certain microbes, including those that fix nitrogen in a symbiotic relationship with legumes.

Plant combinations also had an impact on the microbial environment, showing the complexity of the relationships between plants and their amendment.



Moving Forward

The vineyard that was studied in this experiment had alkaline soil (high pH), which could slow the breakdown of the SRC. Slower breakdown would mean lower rates of nutrient release.

The reporting period covered here was two growing seasons, which limits results. Looking at the potential changes over a longer period of time may enhance our understanding of how these ecologically focused management practices can improve a vineyard agroecosystem from soil to crop.

In the right circumstance, SRC may provide many benefits to crops, all while decreasing our ecological footprint.

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