Acta Scientific AGRICULTURE (ISSN: 2581-365X)

Volume 5 Issue 2 February 2021

Short Communication

Soil Health: Key to Success

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DOI: 10.31080/ASAG.2020.05.0942

Received: December 22, 2020

Published: January 16, 2021

Success in vegetable crop production has focused on crop plant health for the last fifty years. However, in the last five years soil health has emerged as a critical factor in determining vegetable crop yields and quality. Soil which demonstrates biological health has the continued capacity of soil to function as a living ecosystem that beneficially sustains plants, animals, and humans. Viewing soil as a living ecosystem that has 'health' reflects a fundamental shift in the way we think about soil. Soil isn't an inert growing medium that needs to be filled up with water and nutrients for plants to grow from. Rather, soil must be biologically healthy, teeming with large and small organisms that live together in a dynamic, complex web of relationships. Farm crops and animals were at one time a major part of this unique 'cycle of life', however today that may not be true on major acres farmed.

In their natural environment, plants are part of a rich ecosystem including numerous and diverse microorganisms in the soil. It has long been recognized that some of these microbes, such as mycorrhizal fungi or nitrogen fixing symbiotic bacteria and algae as well as components yet to be understood, play important roles in plant performance by improving mineral nutrition of the plants and soil tilth where roots search for water and nutrients. However, the full range of microbes associated with plants and their potential to enhance synthetic agricultural inputs has only recently started to be uncovered. In the last few years, significant progress has been made in the knowledge on the composition of rhizospheric microbiomes and their dynamics in soil. There currently is clear evidence that plants shape microbiome structures, most probably by root exudates, and also that bacteria have developed various adaptations to thrive in the rhizospheric niche. The mechanisms of these interactions and the processes driving the alterations in microbiomes are, however, largely unknown

While the use of cover crops will help improve soil stability as well as health, cover crops cannot improve soil health by themselves under the current production management of many farms. There is a clear factor to be considered at the time cover crops are planted and after crop harvest on many farms, the soils are cooling. Cooling soils effect the biological clock of microbial activity and their viability.

At the Horticulture Research Farm at Rock Springs, PA, cover crops were planted every fall for more than 10 years with the primary goal being to improve soil health and specifically soil tilth by reducing soil movement into estuaries. The mere planting and growth of cover crops did help in the reducing of soil movement. Unfortunately, soil tilth never improved over time. Soil granulation was less than desirable and over a period of time rare weed species became more prevalent. With annual tillage (moldboard plowing), soils demonstrated platelike structures forming less than desirable hard clumps of soil and lower water holding capacity soil. Over a period of time at the Research Farm, I explored no-till crop production practices. One of the annual factors studied was seed to soil contact in sweet corn and also some field corn production. Differences in seed furrow closure were observed between different replicated field trials that significantly impacted yield and productivity.

In my 40 year career as a horticulturist conducting applied field research, I have had many requests to evaluate organic and biological products that were promoted to improve crop yields and soil health improvement. I found that over the years of conducting

these trials few products demonstrated the ability to validate the statements of the promoters forming my opinion that most were SNAKE OIL and not worth evaluating. In 2016, I initiated a 4 year replicated evaluation trial of a multi faceted microbial material which was applied to the soil. These trials involved multiple crops with multiple application methods including broadcast, at transplanting, through drip irrigation and side-dressing.

From single to multiple applications at different rates over multiple years, this field research demonstrated that soil health parameters were significantly improved - soil tilth, soil organic matter, improved nutrient uptake, improved water efficiency, reduction in soil penetrometer readings and soil water infiltration rates.

Based upon the manufactures label, the material is a diverse mix of microbes known to build soil biology. The formula supplies the soil with a proprietary blend of beneficial microbials to support a balance and healthy soil environment. When used properly in the course of crop production, I would state that the crop and this microbial community worked in unison. Planting cover crops in the replicated plots where the crop trials were planted demonstrated greater value in soil health enhancement. Through my field trials and demonstrations I extended my results through educational programs to growers and companies. My work involves what I can do to help farmers and farm gate profits. After 40 years of conducting applied field research, I am still learning and enjoying this new platform - soil health - to study.