tive, users must establish and maintain conditions supporting the plant-microbe interactions from which they seek to profit. These conditions are largely unknown, thereby: a) helping to explain the erratic and context-specific outcomes from inoculation in field and high tunnel settings reported to date, b) impeding key research, and c) slowing the transmission of related research-based recommendations for product use, all of which raise serious questions about the product category. In response, a program consisting of ongoing sets of integrated and complementary on-station and on-farm experiments (many involving a citizen-science/farmer-led approach) testing hypotheses specific to the effect of product composition, crop, application timing, application rate, and/or experimental setting on crop yield and quality was developed. Since 2015, program experiments have been completed in seven states (Iowa, Illinois, Michigan,Missouri, Ohio, Pennsylvania, and Tennessee), on fifteen farms and two research stations, on seven crops (broccoli, carrot, lettuce, pepper, spinach, squash, and tomato) grown in field or high tunnel settings, and with ten OMRI-listed products (Azos Blue, Biogenesis 1 TM NP, BioYield, EcoFungi, Environoc 401, Hydroguard, MycoApply All Purpose Granular, MycoApply Endomax Concentrated WP, Mycogenesis, NP Bioplin). Individual on-station experiments begin spring, summer, or fall with treatment factorials including multiple levels of product (e.g., four-six) and multiple levels of either rate or timing (e.g., seeding, transplanting, after transplanting), with plots arranged in a randomized complete design and applications made as a root-zone drench. On-farm experiments, however, while also collectively completed over much of each calendar year, involve fewer experimental variables and levels of each. To date, outcomes from standard statistical approaches common in product evaluations, variety trials, and cultural management comparisons show that significant increases in yield or quality have been rare, regardless of inoculation parameters or experimental conditions. When found, yield increases were most common following the application of mixed inocula (single products containing multiple species or strains of bacteria, fungi, or both) and typically below eight percent. Analysis of crop data using approaches (e.g., transformation) common in other areas of study in which skewed data are common (e.g., pathology, entomology, weed science) and economic analyses exploring the return on investment from microbe-containing crop biostimulant use are also underway.

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10:30 AM – 10:45 AM

Soil Balancing Effects on Specialty Crops and Their Soils, Weeds, Farms, and Growers

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Opinions on the "soil balancing" philosophy of soil management among growers and private- and public-sector grower advisors and researchers range wide and, so far, rarely achieve consensus. Proponents, including increasing numbers of specialty crop growers (many sustainable-organic) and some advisors, report that soil chemistry—specifically, percentages and ratios of calcium, magnesium, and potassium – can be altered through applications of lime, gypsum, and other materials to improve soil physics (tilth) and biology and, thereby, crop yield and qualitym and weed control. Investigators and other advisors, however, report that soil balancing claims are unsupported by the data (at minimum) and potentially injurious to farms (at worst). That disconnect is both a problematic trend and important opportunity. As part of a larger effort to understand the use and outcomes of soil balancing as practitioners do while also providing needed data, eight certified-organic main plots (17.1 m × 18.3 m) were established in 2015–18 at the OSU-OARDC in Wooster, OH. Main plots contained two (17.1 m × 9.1 m) subplots based on their having received an annual application of composted dairy manure every year since 2003 or no compost application. Three (5.3 m × 9.1 m) sub-subplots/subplot were created on June 11, 2015 by applying one of three soil amendment treatments: 1) gypsum (1681.5 $kg \cdot ha^{-1}$), 2) potassium sulfate (560.5 $kg \cdot ha^{-1}$), and 3) gypsum + potassium sulfate (same rates). Rock phosphate was also applied at 560.5 $kg \cdot ha^{-1}$ to minus-compost subplots. Treatment applications were repeated at the same locations each mid-May 2016–18. Sub-subplots were direct seeded with four rows of both edamame soybean and dwarf popcorn on 12 June 2015, 25 May 2016, and 23 May 2017, with edamame being reseeded on 21 June 2016 and 14 June 2017. Two rows of butternut squash were also direct-seeded into each sub-subplot on 18 June 2015, 31 May 32016, and 26 May 2017. All crops received multiple applications of fish fertilizer (analysis of 2–4–1) each season either by hand (edamame, popcorn) or via fertigation (squash). Percent stand, above-ground canopy development, mass of mature leaves at the onset of reproductive growth, and crop yield (total, marketable) and quality were recorded each year along with measures of soil macro- and micronutrient levels. Treatments have resulted in few significant differences in either plant growth, or crop yield or quality to date. Weed seedbank analysis and comprehensive assessments of grower attitudes and farm economics are also underway.

Specified Source(s) of Funding: USDA OREI

An asterisk (*) following a name indicates the presenting author.