

Conference Report - Positive Plant Microbial Interactions in Relation to Plant Performance and Ecosystem Function - 5-6 December

Plant pathology features strongly in many agronomy conferences typically with a focus on major plant diseases. Less obvious, perhaps, are the beneficial consequences of many microbes. The fourth AAB conference on Positive Plant Microbial Interactions held in December 2013 outlined a broad range of these benefits.

Example benefits presented typically involved soil microbiology and how its diversity affects plant health and productivity. In some cases this is a result of natural processes and variation and in others by deliberate supplementation with specific microbes. One overall hypothesis is that a broad profile of 'microbes' has direct benefits to plants and also may actively combat disease pathogens. Another is that specific microbes may be used to target crop protection and specific disease resistance.

To some extent this mirrors the prevailing experience of prebiotic and probiotic concepts in human and animal health whereby beneficial microbes counteract harmful microbes so minimising the propensity for disease. Maintaining suitable soil conditions to actively promote microbial populations requires appropriate management in providing suitable nutrient sources. Actively amending soil with microorganisms is a more targeted approach – and, like probiotic diets, may need to be attuned to specific soil conditions or regularly supplemented.

At the conference reports were presented covering these approaches and illustrating specific conditions which affect the diversity of soil microbes and of how targeted addition may manage disease and improve productivity. In some cases, as in the difference between conventional and organic soil management, microbial diversity may not guarantee positive benefit. Microbial profiles can, however, correlate with important soil indices such as nutrients and pH which may vary with past soil history, weather patterns or with hydration. The distribution of nematode pests in banana plantations in Nigeria is another example of how management regimes directly affect disease.

Application of selected microbes with the potential to enhance plant productivity and health was noted in a range of presentations. Examples were presented on how fungal root endophytes enhance barley growth and demonstrate biocontrol activity, how

endophytic bacteria associate with mycorrhizal fungi and how competition between species of *Fusarium* may reduce disease incidence. Identifying suitably effective microbes is not easy. Screening is difficult and time consuming and may need high throughput protocols to be commercially attractive. In some cases addition of by-product amendments may be effective and cheap but be less assured.

The mechanisms of positive microbial action were discussed at the conference and presentations covered a range of detailed molecular and cell biology applications including metagenomics of soil, control of ethylene production, transformation of apoplastic effectors and triggering procedures of plant immunology.

Knowledge of how specific microbes interact will allow targeted amendments to be made. Practical applications of specific microorganisms to commercial crops were reported at the conference for barley, wheat, strawberries, peanut, lettuce and broccoli.

A broad and general conclusion to the conference was that detailed studies and specific effects do need to satisfy an agronomic relevance test including rigorous trials at multiple sites and involving commercial partners to achieve acceptable rigor. This need has sound prospects for future development and, considering the work presented here, routes from academic study to practical application are visible and attainable.

-George McNamara

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