

AGRICULTURAL MANAGEMENT

Solarizing networks

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Credit: Silvia Casali / Moment Open / Getty

Soil solarization is one of the most effective and environmental friendly methods for agricultural management. The method involves utilization of a transparent plastic cover to trap the sun's radiant energy that heats the soil for agricultural benefits. In general agricultural practices, solarization for four to six weeks during the hot season can kill weeds and soil plant pathogens, increase the levels of soil nutrients, promote beneficial microorganisms and cause some other effects in various agroecosystems. Recently, Yasunori Ichihashi from the RIKEN BioResource Research Centre, Japan, and his collaborators applied a multi-omics approach to analyse the effects of soil solarization in combination with different types of nitrogen fertilizers.

Ichihashi et al. designed four groups of soil treatments, including chemical nitrogen fertilizer with or without soil solarization (CheSS and CheNS, respectively), and organic compost with or without soil solarization (OrgSS and CheNS, respectively). They conducted the soil treatments before seeding Japanese mustard spinach (*Brassica rapa* var. *perviridis*) in a split-plot designed agricultural field. The soils at the seeding and harvest stage

were collected for soil metabolome and ionome analyses. Eight-week-old plants after harvest were characterized for detailed phenotypes and metabolome. Additionally, Ichihashi et al. analysed the soil microbiome and rhizosphere microbiome to survey the effects of different soil treatments on the composition of microorganisms. All the datasets were integrated together for principal component analyses and the construction of an unsigned correlation network. Consistent with the known benefits of solarization, the CheSS- and OrgSS-treated plants showed better growth performance than the CheNS and OrgNS groups. But unexpectedly, they found that soil organic nitrogen is likely a key factor that enhances crop production under solarization.

Network analysis never ends up with thin conclusions. This study, for example, leads us to rethink the optimal planting conditions and the future improvement of agricultural management for sustainable development.

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