

The utilization of vermicomposts in horticulture and agriculture
Norman Q. Arancon and Clive A. Edwards
Soil Ecology Laboratory
The Ohio State University
Columbus, OH, U.S.A.

Vermicomposts are organic materials, broken down by interactions between earthworms and microorganisms, in a mesophilic process (up to 25 C), to produce fully-stabilized organic soil amendments with low C:N ratios. They have a high and diverse microbial and enzymatic activity, fine particulate structure, good moisture-holding capacity, and contain nutrients such as N, K, P, Ca and Mg in forms readily taken up by plants.

Vermicomposts can have dramatic effects on the germination, growth, flowering, fruiting, and yields of crops independent of the availability of nutrients. We have demonstrated dramatic effects of vermicomposts produced from pig and cattle manures and food and paper wastes on a range of ornamentals and vegetables in the greenhouse. The crops tested include petunias, marigolds, asters, and chrysanthemums but there is little doubt that they will also increase growth of other greenhouse crops. In most of our greenhouse experiments we have substituted vermicomposts into soil-less growth media and vegetable crops tested in the greenhouse and field include: tomatoes, cucumbers and peppers. Fruit crops tested in the field include strawberries, raspberries, and grapes; all with very significant effects on yields independent of nutrient availability.

There is a consistent pattern of plant responses to vermicomposts. Usually growth and yields are improved more by low substitution or application rates than by large rates. Growth in 100% vermicompost is usually less than in substitution rates of 20%-40%. This can be partially explained by possibilities for large amounts of inorganic salts in 100% vermicomposts.

However, we have demonstrated conclusively that there are large amounts of plant growth hormones such as indole acetic acid (IAA), kinetin or gibberellins, and plant growth regulators such as humates and fulvates in vermicomposts. These are produced by the greatly increased microbial activity in vermicomposts compared with that in the parent organic wastes because it is well-established that microorganisms can produce plant growth regulators. Our proven hypothesis is that plant growth hormones such as IAA which are very soluble and breakdown in UV light, become absorbed on to the humates and released slowly to promote growth.

We have also demonstrated that liquid extracts from vermicomposts which are termed vermicompost 'teas' can also promote plant growth when they watered around plants. Finally, we have demonstrated suppression of a wide range of plant pests by vermicomposts and used 'teas'. These include biting caterpillars, beetles such as cucumber beetles, and sucking arthropods such as scale insects, mealy bugs, aphids, and spider mites. The vermicomposts not only make the plants less attractive to pests but also decrease their reproductive rates. Vermicomposts also suppress plant pathogens such as *Pythium*, *Rhizoctonia*, *Plectosporium*, *Verticillium*. We have also recorded very significant suppression of plant parasitic nematode populations and nematode crop damage by vermicomposts. The nematodes we studied most intensively were *Heterodera* (stem nematode) and *Meloidogyne* (root kind of nematode).

Clearly, vermicomposts are very valuable tools in crop production and pest and disease management.

