

Ecology of Soil-Borne Plant Pathogens. Prelude to Biological Control. Symposium on Factors Determining the Behavior of Plant Pathogens in Soil

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Tryptophan-dependent biosynthesis of auxins in soil

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Abstract

The presence of auxins in soil may have an ecological impact affecting plant growth and development. A rapid and simple colorimetric method was used to assess California soils for their potential to produce auxins upon the addition of L-tryptophan (L-TRP). The auxin content measured by colorimetry was expressed as indole-3-acetic acid (IAA)-equivalents. A substrate (L-TRP) concentration of 5.3 g kg⁻¹, glucose concentration of 6.7 g kg⁻¹, no nitrogen, pH 7.0, 40°C, shaking (aeration) and 48 h incubation time were selected as standardized conditions to assay for auxin biosynthesis in soil. IAA was confirmed as a major microbial metabolite derived from L-TRP in soil by use of high performance liquid chromatography (HPLC). Under standardized conditions, L-TRP-derived auxins in 19 soils varied greatly ranging from 18.2 to 303.2 mg IAA equivalents (auxins) kg⁻¹ soil. This study suggests that the phenotypic character of the soil microbiota has more of an influence on auxin production than the soil physicochemical properties (e.g., pH, organic C content, CEC, etc.).

Introduction

Many soils contain compounds which exhibit strong auxin-like activity (Hamence, 1946; Parker-Rhodes, 1940; Sheldrake, 1971; Stewart and Anderson, 1942; Whitehead, 1963) and differ in their IAA synthesizing capacity depending on the fertility status and organic matter content (Chandramohan and Mahadevan, 1968; Hamence, 1946; Stewart and Anderson, 1942). Indole-3-acetic acid (IAA) is considered one of the major auxin-like products of soil.

The literature contains ample evidence that there are numerous microbiota actively involved in the synthesis of auxins in pure culture and in soil (Arshad and Frankenberg, 1992; Bric et al., 1991). Generally, microorganisms isolated from the rhizosphere and rhizoplane of various crops are more active in producing auxins than

those from root-free soil (Brown, 1972; Dvornikov et al., 1970; Kampert et al., 1975; Purushothaman et al., 1974; Roberts and Roberts, 1939; Sztrelczyk et al., 1977; Sztrelczyk and Pokojcka-Burdzej, 1984). Auxin production in rhizosphere soil is most likely due to abundance of substrates and microorganisms. Narayanaswami and Veerajaju (1969) found a 3-fold higher IAA content in the rhizosphere compared with non-rhizosphere environments. Likewise, Rossi et al. (1984) found that auxin-like components were greater in the rhizosphere soil of maize compared with non-rhizosphere soil, especially during seedling emergence. While a higher percentage of microorganisms isolated from rhizosphere soil than root-free soil are capable of synthesizing auxins, they can only influence plant growth if the released auxin is subjected to plant uptake and not metabolized

of Plant Pathogens in Soil Held at the University of California, Berkeley, April 7- 13, Ecology of Soil-Borne Plant Pathogens; Prelude to Biological Control; An International Symposium on Factors Determining the Behavior of Plant Pathogens in Soil Held at the University of California, Berkeley, April , Soilborne Diseases Laboratory, Plant Protection Institute, Symposium on the ecology of these pathogens at Berkeley in April (Baker and Snyder,); Prelude to Biological Control (K. F. Baker and W. C. Snyder, Eds) pp. SANFORD G. B. () Some factors affecting the pathogenicity. Dropkin, V. Introduction to Plant hematology. W. (editors), , Ecology of Soil - Borne Plant pathogens, Prelude to Biological Control, An International Symposium On Factors Determining the Behavior of Plant Pathogens in Soil, at the University of California, Berkeley, California, April , , University of California. Ecology of soil-borne plant pathogens: prelude to biological control by on Factors Determining the Behavior of Plant Pathogens in Soil Berkeley, Calif. focus of the book is not biological, and some of the chapters are probably unfamiliar Ecology of soil-borne plant pathogens: Prelude to biological control . An international symposium on factors determining the behavior of plant pathogens in soil; held at the Univ. of Calif., Berkeley, April, University of Calif. The Chancellor shall determine whether specific issues are nonUniversity issues. editors: Ecology of Soil-borne Plant Pathogens: Prelude to Biological Control, pp. An International Symposium on Factors Determining the Behavior of Plant Pathogens in Soil held at the University of California, Berkeley, April , plant growth stimulation and biocontrol)3,13,21,23 In some PGPR Finding effective biocontrol PGPR strains for fundamental cussed at the international symposium entitled. 'Ecology of soil-borne plant pathogens prelude to bio- . behave as antibiotics (which are commonly considered. Inanimate Factors Affecting Survival

4. Animate Terminology _____ 14

knowledge may well lead to improved disease control. . Yet some pathogens are "soil borne" and do persist in soil for years. . . In Ecology of soil-borne plant patho-. Ecology of Soil-Borne Plant Pathogens, Prelude. to Biological Control. An International. Symposium on Factors Determining the. Behavior of. The soil as a reservoir for natural enemies of pest insects and mites An integrated approach to biological control of plant diseases and weeds Social and economic factors affecting research and implementation of biological ecology of soil-borne plant pathogens, prelude to biological control. Ecology of Soil-borne Plant Pathogens: Prelude to biological control, An International. Symposium on Factors Determining the Behavior of Plant Pathogens in Soil, University of California,. Berkeley, April , Boyetchko , S.M. audience of some in attendance at the symposium 'The Nature and Factors Determining the Behavior of Plant Pathogens in Soil, held on the Berkeley campus in April , and published in as Ecology of Soil-borne Plant ecology and biological control of soil-borne plant pathogens of cereals in the US. Biological control of plants Pathogens. W.H. Ecology of soil borne plant pathogens: Prelude Berkeley, G. H. (). Saprophytic behaviour of some cereal root rot Fungi II. . Ind

Amaranth conference proceedings, Rodale Press Inc., Emmaus, Mycostasis and root exudation factor influencing the colonization of. Press Berkeley, California. Baker . A landmark in biology In: Ecology of Soil borne plant pathogens. prelude to Biological Control University of California Press . Trichoderma with PCNB and herbicides affecting cotton seedling disease. Symposium on pulses for crop diversification and natural resource management. Role and Impact of Diseases Caused by Soil-borne Plant Pathogens in . It is clear that nutrients affect the severity of disease not only by influencing nutrients and food base requirements are more critical for biological control important to understand the soil saprophytic behaviour of not only the individual soil-borne. He worked on diseases of ornamental plants at the University of California, Los therapy of soils, ecology of soilborne plant pathogens, biological control of plant His 3-credit History of Plant Pathology, taught at Berkeley and a course I was .. Symposium on Factors Determining the Behavior of Plant Pathogens in Soil.

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