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D.G. Zvyagintsev and G.M. Zenova, *The Ecology of Actinomycetes*, Moscow: GEOS, 2001

The recently published monograph of D.G. Zvyagintsev and G.M. Zenova, *The Ecology of Actinomycetes*, is a new stage in developing the ecology of microorganisms in general and actinomycetes in particular. Books like this always find a ready welcome in scientific circles. The degree to which this problem has presently been treated does not correspond to the role played by actinomycetes in nature, where they are involved in the degradation of complex and recalcitrant organic compounds, in the formation of soils and soil fertility, and in the bioremediation of the environment.

The monograph describes natural biogeocenoses, the biodiversity of soil actinomycetes, the ecological characteristics of mycelial prokaryotes, and their role in soil formation. The structure of actinomycete complexes in the major types of soil is described using various qualitative and quantitative criteria, such as the generic and species composition of actinomycetes, their range, and the number of dominant species. The structural organization of actinomycete complexes in biogeocenoses is considered to be subject to a vertical stratification, which is either continuous (in the case of streptomycetes) or discrete (in the case of other actinomycete genera). Algobacterial cenoses at the sites of primary soil formation and in the gastrointestinal tract of soil invertebrates are characterized by a high activity of mycelial prokaryotes.

The systemic analysis of the role of actinomycetes in the degradation of organic matter in soil allowed the authors to show that particular stages of this process are implemented by particular mycelial prokaryotes, which occupy certain spatial and temporal positions in ecosystems in accordance with their adaptation to the terrestrial environment, the properties of their mycelium and spores, their ecological strategy, and their relation to other actinomycete genera. Under certain conditions dependent on the type of soil and the succession stage, the fraction of the so-called rare genera of actinomycetes in soil may reach that of streptomycetes and even exceed it.

The succession analysis of soil actinomycete complexes led the authors to a conclusion that the population density of different actinomycete genera is maximal in different stages of succession initiated by soil wetting. For instance, the population density of micromonosporas was found to be maximal in the intermediate stages of succession, whereas that of streptomycetes is maximal in the early and late stages. The succession analysis also allowed the dynamics of the taxonomic composition of soil actinomycete complexes to be directly observed in their natural habitats. The econiches of different actinomycete taxa (genera and species) in soil partly overlap, suggesting competitive relations between them. As a result, taxonomically distant actinomycetes may occupy close econiches and vice versa. The authors characterized the population dynamics of streptomycetes and micromonosporas in soil with respect to the number of their spores and the amount of their mycelia, determined the ecological strategy of rare actinomycete genera (*Micromonospora* and *Streptosporangium*), and described the role of these genera in the degradation of recalcitrant organic compounds in soil.

Of particular interest are findings in the ecology of actinomycetes, a new line of research initiated by the authors. The study of the interaction of actinomycetes with other soil organisms, such as algae, heterotrophic microorganisms, and invertebrates, allowed the authors to establish the existence of a lichenlike association of actinomycetes and algae (so-called actinolichen) and describe its properties and ecological importance. In actinolichens, actinomycetes play the role of a cenosis-forming and stabilizing component, which controls the amount of the algal component and stimulates the formation of chlorophyll.

The soil invertebrate intestines represent a specific niche for actinomycetes, where they reproduce in such a way that the rare genera of mycelial prokaryotes begin to dominate. Soil invertebrates have been found to consume the mycelium and spores of actinomycetes from natural substrates. In earthworm intestines, a portion of the consumed mycelium and spores is digested, whereas the remaining mycelium and spores develop and then accumulate in faeces. In the litter millipedes, the actinomycete mycelium and spores accumulate in the posterior section of the intestines, where actinomycete cells utilize chitin liberated from the degraded peritrophic membrane. The actinomycetes present in the invertebrate intestines may produce antibiotics.

Of great theoretical and practical interest are integral quantitative criteria that were developed by the authors to characterize soil actinomycete complexes. These criteria make it possible to establish the regularities of distribution of actinomycetes in native biogeocenoses and to evaluate anthropogenic impact on soils and biogeocenoses. The structure of actinomycete complexes may be used for the microbiological monitoring of soils.

The book is provided with a methodological supplement for the study of soil actinomycetes. The use of nonstandard methods for the isolation of actinomycetes from natural sources may promote the obtaining of new actinomycete species and reveal the habitats of species capable of producing antibiotics and other biologically active compounds. The authors give relevant diagnostic keys for the identification of actinomycete genera that are most frequently isolated from soil.

The investigation of the associations of actinomycetes with soil algae and invertebrates has shown their considerable promise in a search for new pharmacologically active substances and their natural producers.

The book is intended for qualified microbiologists, soil scientists, and agrochemists. It may also be used as a treatise by students studying soil science, ecology, microbiology, and agrochemistry.

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