NOTE ON THE TAXONOMY AND ECOLOGY OF
STREPTOMYCES MALACHITICUS AND RELATED SPECIES

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ABSTRACT. Seven species of Streptomyces closely related to Streptomyces malachiticus (Gause et al.) Pridham, Hesseltine and Benedict, all having within the vegetative mycelium a nondiffusible green pigment, are compared and described. A key to the identification of the species proposed is included. S. malachiticus seems to be unique in its temperature requirements in its natural habitat, since all the strains known and available were isolated from soils of a warm climate.

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Streptomyces malachiticus (Gause et al. 1957) Pridham, Hesseltine and Benedict 1958 is distinguished by its green vegetative mycelium. The colouration is due to a green endopigment which does not diffuse into the medium. In detailed studies Preobrashenskaja et al. (1964) found this pigment closely related to ferroverdin, a green iron-containing metabolite (Chain et al. 1955, Ballio et al. 1963). Szabo et al. (1963), Preobrashenskaja et al. (1964) and Krasil'nikov and Egorova (1965) examined a number of Streptomycetes with a green vegetative mycelium, divided them on the basis of spore morphology and carbohydrate utilization, and proposed several new species. Surveying the relevant literature as far as available, I found seven species with a green vegetative mycelium, the pigment of which was nondiffusible into the medium (Table 1). They differ by one or another morphological or physiological character.

Depending on the individual concept of a species—the worker being a "lumper" or a "splitter"—all the species may be collected in a "malachiticus" group or be considered as separate species which are very closely related. Following the working scheme previously suggested (Küster 1967)

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the species can be classified in the following key (Table 2). Szabo et al. (1967) designated Actinomyces herbiferis Krasil'nikov and Egorova 1965 synonymous with S. finlayi. Depending on the weight given to the differentiating characters, this may be true.

When comparing the references given to the sources from which the strains in question were originally isolated (Table 1), it is conspicuous that nearly all the strains of S. malachiticus derive from soils of the tropical or subtropical climatic zones. This ecological relationship is less obvious with cultures of the other species related to S. malachiticus.

S. finlayi was first isolated from a soil sample from Western Hungary (Szabo et al. 1963). This species was also found to be predominant among the streptomycetes isolated from the intestinal tract of larvae of Bibio marci (Szabo et al. 1967).

A. herbeus and A. herbescens were isolated from soils from Egypt and from the Pamir Mountains respectively (Krasil'nikov and Egorova 1965).

There is unfortunately no information available on the sources of A. malachitorectus, A. malachitofuscus, and A. herbiferis.

If I confine my consideration to S. malachiticus, this species seems to be one of the very few or even the only one, the strains of which have been isolated from soils of a well-defined climatic zone. Numerous microorganisms are known to prefer a particular temperature in their natural habitat, but no particular Streptomyces species is—to my knowledge—described which is found only in a warm or even tropical area. The importance of special nutritional requirements or that of accompanying organisms for the occurrence of a species is in many cases well studied. With this brief note I wish to draw attention to the climate as another ecological factor, which may favour or even allow the presence of a particular species. I would like to ask the readers for comments from their experience which confirm or reject my hypothesis.

Table 1. List of strains of Streptomyces species with a green endopigment.

Species	Strain	Obtained from ¹	Isolated from soils of:	Reference
<u>S. malachiticus</u>	7035	Prof. Gause (Moscow)	Various areas ²	Gause et al. 1957
"	K 50	Own isolate	Eastern Africa (Tanganjika)	Kutzner 1956
"	A 305	Dr. Tonolo (Rome)	Belgian Congo ³	Ballio et al. 1963
"	K 6	Prof. Welsch (Liège)	Belgian Congo ⁴	Welsch et al. 1963
<u>S. finlayi</u>	A 111	Dr. Williams (Liverpool)	Western Hungary	Szabo et al. 1963
<u>A. malachitorectus</u>	8954	Prof. Gause		Preobrashenskaja et al. 1964
<u>A. malachitofuscus</u>	7171	" "		"
<u>A. herbiferis</u>				Krasil'nikov and Egorova 1965
<u>A. herbeus</u>			Egypt	" "
<u>A. herbescens</u>			Pamir	" "

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² Most of the 20 strains of the Gause collection were isolated from soils in Armenia, Krasnodarsk, others from Abyssinia, Italy, Mexico, China (personal communication from Dr. Preobrashenskaja 1966).

³ Produces ferroverdin.

⁴ 50% of the Streptomyces flora of the particular soil sample K VI consisted of this green species.

Table 2. Key of the Streptomyces species with a green endopigment.CharacterColour of
Aerial Mycelium

Melanin

Sporophores

Spore Surface

Carbon Utilization

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