

A COMPARATIVE STUDY OF THE CHARACTERS OF *STREPTOMYCES ACIDOPHILUS* (JENSEN, 1928) AND THE NEWLY ISOLATED ACIDOPHILIC STREPTOMYCETES*

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Introduction

With the establishment of a group of acidophilic streptomycetes existing in habitats, it became necessary to assess their actual taxonomic position, morphological, cultural and physiological characters and all their relationship with the only other recorded example of acidophilic streptomycetes, *Streptomyces acidophilus* (Jensen 1928).

During the course of critical studies, acidophilic streptomycetes were found to differ with the neutrophiles not only in their pH requirements, but also in other interesting points (Willimas & Khan, 1974). It was decided to compare the results obtained with the newly isolated acidophilic streptomycetes with those of *Streptomyces acidophilus* (Jensen, 1928) and ascertain similarities and differences between these two groups. The low pH requirement of some of these newly isolated strains was reported elsewhere (Williams et al, 1971).

Materials and Methods

Nine of the newly isolated acidophilic streptomycetes were used in the investigation. The characters of *Streptomyces acidophilus* (Jensen, 1928) were collected from the available literature and the characters of the newly isolated acidophilic streptomycetes were taken from the test results as obtained by the authors. Though a vast number of characters of the newly isolated strains were studied only the comparable ones were selected for this report.

The acidophilic strains used in the present investigation were isolated from soils of Storeton, Cheshire, England and Wisconsin, U.S.A. Storeton soil was a podzol having a mixed cover of *Pinus sylvestris* and *Quercus petraea*. The pH of the soil varied from 3.7 in the A₂ horizon to 4.6 in the A₀ horizon.

The percentage moisture content was maximum in the H horizon with 64.9% and a minimum of 18.7% in A₂ horizon.

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Wisconsin soil was a surface soil under *Robinia pseudoacacea* (Black locust trees) on open cast spoil bank (samples received by courtesy of Professor T.D. Brock). The soil pH (0—5 cm depth) was 4.3 and percentage moisture content was 11.0%.

For utilization of carbon sources the test was carried out using basal mineral salt agar (ISP—9) supplemented with Pridham & Gottlieb's trace salt solution as prescribed by Shirling & Gottlieb (1966). More stable carbon sources were added to the medium before sterilization while the others were sterilized with ether as suggested by Shirling & Gottlieb (1966). For culturing the acidophiles, di potassium monohydrogen phosphate was omitted from the medium giving a final pH of approximately 4.5.

Results and Discussion

Microorganisms capable of living under extreme environmental conditions have been reported from time to time and particularly the acidophilic microorganisms including fungi & bacteria (Starkey & Waksman, 1943; Fott & McCarthy, 1964; Klein & Cronquist, 1967; Tuttle et al, 1968; Uchino & Doi, 1967; Lynn & Brock, 1969; Brock & Brock, 1970; Darland & Brock, 1971; Brock et al,

TABLE 1. Comparison of selected Acidophiles with the four strains of Jensen (1928).

Strains	pH range	NO ₃ reduction	soluble pigment	Carbon Source			
				Mannan	Dextran	Sucrose	Inulin
I*	2.57-5.88	Faint	Light yellowish	—	+	+	—
II	2.76-5.84	Faint	„ „	—	+	+	—
III	2.57-6.50	—	„ „	+	+	+	—
IV	2.76-6.50	—	Pronounced	+	+	+	—
A1/37	3.5-5.5	—	—	—	—	—	—
A ₁ /38	3.5-5.5	—	—	—	—	+	—
A1/43	3.5-5.5	—	—	—	—	+	—
A1/48	3.5-5.5	—	—	—	—	+	—
A1/49	3.5-5.5	—	—	—	—	+	—
A2/27	3.5-5.5	—	—	—	—	+	—
A ₂ /28	3.5-6.5	—	—	—	—	—	—
A2/31	3.5-5.5	—	—	—	—	—	—
B ₁ /6	3.5-6.5	—	—	—	—	—	+

aStrains I, II, III and IV as reported by Jensen (1928).

1972). The only other example of acidophilic streptomycetes in literature are the four strains of *Streptomyces acidophilus* reported by Jensen in 1928.

In the present group of acidophilic streptomycetes there was no production of soluble pigment in the media tested. Soluble pigment was pronounced in one of Jensen's strains and in others the pigment was light yellowish and variable. Dextran and sucrose were the best sources of carbon for all the four strains of Jensen (1928) but none of the selected nine strains utilized dextran while five out of nine could utilize sucrose. Jensen considered glycerin, inulin and cellulose of no value for his four strains. This was in agreement with the present findings but it was striking to observe that strain B1/6 did utilize inulin. Jensen stated that his four strains fell into two apparently well defined sub-groups distinguished by the sparse or abundant spiral spore chain formation and the positive and negative utilization of nitrate and mannan. In the present study only one strain (A2/28) was found to produce predominantly spiral spore chains. Some of the present isolates could therefore be referred to *S. acidophilus*, others were clearly different.

Like other physiologically and ecologically specialized groups, acidophilic microorganisms particularly acidophilic streptomycetes need careful attention not only to know how they withstand such extreme environmental conditions (high hydrogen ion and metal concentrations), but also for the possible extraction of acid stable antibiotics (Williams & Khan, 1974), which might be used against acidophilic pathogens.

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