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GROWTH PATTERNS IN *BACILLUS* *STEAROTHERMOPHILUS*

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INTRODUCTION

Bacillus stearothermophilus was isolated from spoiled canned corn and string beans in 1920 by Donk. He found the organism to be a heatloving or thermophilic organism—hence, its name *thermophilus*. Recently, this organism has been isolated from tomato plants (*Lycopersicon esculentum* var. *Bradley*) thought to be suffering from fusarium wilt, a fungal disease of tomato.

Before pathological work was initiated, the bacterium was identified.

This paper involves a detail growth study of this bacterium under a wide range of conditions.

MATERIALS AND METHODS

Experiments were done at constant temperature (without shaking) and at room temperature with Burrill wrist-action shakers. The assay systems for the determination of the cell population were turbidimetric and cell counts. The Bacteria were grown in either Nutrient agar and/or nutrient broth and potato dextrose agar (PDA).

RESULTS

The first experiment was designed to determine the upper and lower temperature limits for the growth of *Bacillus stearothermophilus*.

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Growth Patterns in Bacillus stearothermophilus

TABLE I

Growth of *B. stearothermophilus* on PDA

I. (Growth after 46 hours-lower limit)

Temperature°C *Growth(+, +, +, + + ..) After 24 hrs at 27°C

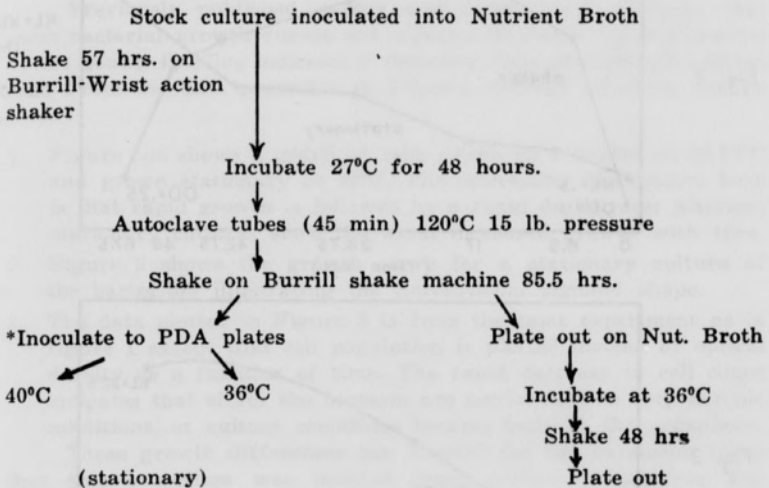
Frozen (less than -10°)	—	+++
2	+	+++
4	+	+++
9	+	+++
16	++	+++
20	++	+++
	(upper limit — growth after (24 hrs.)	
28	+	
32	+	
36	++	
40	+++	
45	+++	
54	++	
68	—	++
70	—	+++

*Growth comparison +, vs. +++ etc.
higher + means more growth

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The data (table I) indicates that the ability of a previously frozen bacterial culture as well as one grown at 70°C to resume growth when placed at 27°C for 24 hours. Autoclaving kills the cells and their spores. The procedure for determining the effect of autoclaving is outlined in figure 1.

(FIGURE 1)



*Growth occurs better on PDA
than nutrient agar

Growth Patterns - *Bacillus Stearotherophilus*

Fig. 2

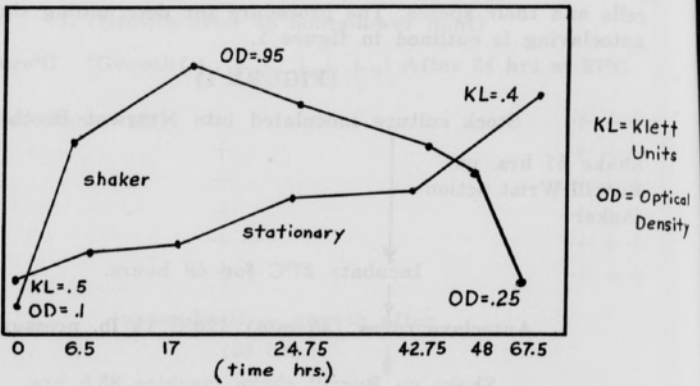


Fig. 3

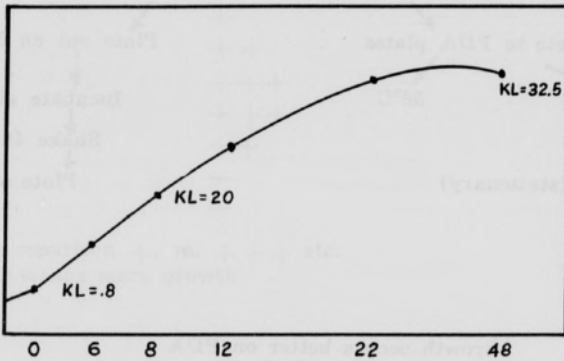
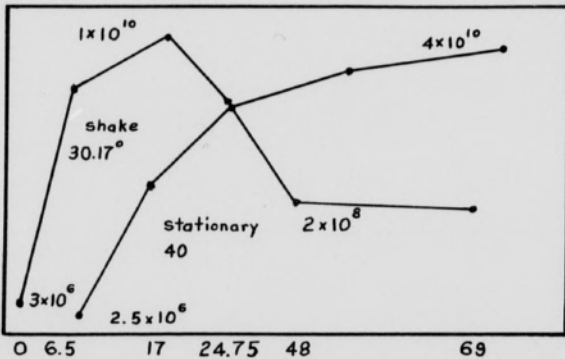


Fig. 4



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Growth was measured at different temperatures utilizing stationary and shake nutrient broth cultures. The results of these experiments are shown in Figures 2-4.

DISCUSSION

Previously published papers and texts (1,2,3) indicate that most bacterial growth curves are sigmoid in shape. Growth studies of the genus, *Bacillus* indicates a deviation from the sigmoid pattern (4). From the data presented in Figures, 2-4 the following can be said:

1. Figure one shows a graph of cells grown on a shaker at 30.17°C and grown stationary at 40°C. The interesting observation here is that rapid growth is followed by a rapid death rate; whereas, stationary cultures show the usual increased growth with time.
2. Figure 2 shows the growth curve for a stationary culture of the bacterium illustrating the conventional sigmoid shape.
3. The data plotted in Figure 3 is from the same experiment as in figure 1 except that cell population is plotted instead of optical density as a function of time. The rapid decrease in cell count indicates that either the bacteria are nontolerant to very aerobic conditions, or culture conditions became toxic to the organisms.

These growth differences can account for the numerous times that this bacterium was isolated from various solanaceous and curcubitaceae crops (5) in that the bacterium can survive many physical environments.

This study enables the feasibility of planning future experiments to determine the optimum growth for this bacterium when introduced in certain plant hosts because the relationship of the growth is worked out in fair detail.

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