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Effect of Glucose and Potassium Ion on Growth and ATPase Activity in *Thermus scotoductus* K1

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ABSTRACT

Thermus scotoductus K1 is a metabolically versatile thermophile capable of adapting to nutrient limitations. This study investigates how carbon source (glucose) influences growth rate, ATPase activity (F-Type reported for thermophiles), and potassium distribution in the strain. It is well known that potassium ions (K^+) are essential for microbial bioenergetics, enzymatic regulation, growth, etc. To assess these effects, the strain was cultivated aerobically in Thermus media without and with 2 g/L glucose in 65°C at pH 8.5. The specific growth rate was 0.24 h^{-1}, increasing to 0.33 h^{-1} with 2 g/L glucose. Meanwhile, viability shown to have slight effect in contrast with carbon-free grown media: CFU/ml rising from 1.91×10^7 to 2.07×10^7 in presence of glucose. Thus, the results obtained from assays, provided by cell pellets with similar viability. Total ATPase activity was measured in membrane vesicles under the same growth parameters. 164 nM Pi/min/mg protein total ATPase activity was calculated in membrane vesicles obtained from cells grown in carbon-free media, whereas the activity was increased slightly with K^+ (0.1M) addition. Grown in presence of glucose, K^+ addition slightly reduced enzyme activity from 183.95 nM to 162.85 nM. This assumed altered ion sensitivity for the strain in bioenergy conservation processes. This hypothesis was supported by measuring total extra- and intracellular K^+ concentration after 20-22 h of growth, where the ratio was 16.8:1 in carbon free media, and 19.3:1 grown in glucose. Thus K^+, essential for vital cellular processes, are replaced by other ions in living organisms under extreme conditions. These findings replenish carbon source-dependent modulation of energy conservation in *T. scotoductus* K1. Such mechanisms in thermophiles are fundamental to discover and understand energy adaptation systems in bacteria at high temperatures.

Keywords: *T. scotoductus* K1, glucose, ATPase activity, potassium ions (K^+), metabolic regulation

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