Cellulolytic enzyme activity in *Galdieria. sulphuraria* cultures

Ujala Sehar, Khadija Mozaffari, Barry Dungan, Omar F. Holguin

Plant and Environmental Sciences, New Mexico State University, Las Cruces, 88003, USA

Contact: sujala@nmsu.edu

Plants convert sunlight to biomass, this biomass is primarily composed of lignocellulose which is the most abundant natural biopolymer and a potential feedstock for fuel and chemical production. The stringency and complexity of the cellulosic structures have resulted in the evolution of a wide array of cellulose degrading enzymes. Microorganisms with the potential of degrading cellulose produce enzymes with cellulolytic and non-cellulolytic domains that work harmoniously on the substrate to break it down and thus known as cellulases. The Cyanidiophyceae class members are known to be extremophiles in nature and are believed to be the most acidophilic photosynthetic organisms known so far. *Galdieria sulphuraria* is a unicellular, red alga that belongs to this class Cyanidiophyceae.

G. sulphuraria is an extremophile with the capacity of growing both photosynthetically and heterotrophically over fifty different carbon sources due to its diverse metabolic potential. In the current study, an important paradigm of adaptation is being presented, highlighting its ability to produce cellulolytic enzymes in the presence of different carbon sources at extreme conditions. When grown under mixotrophic conditions, secretion of beta galactosidases by the cells cause digestion of carbohydrate polymers. Moreover, the activity has been observed by disintegrated cells when treated with model substrates, which leads us to believe that cellulolytic enzymes might be present on cell wall and membranes. Thus *G. sulphuraria* may serve as a biocatalyst for cellulosic sugar production.

Key Words: cellulolytic enzymes, mixotrophic, cellulose, extremophiles