The Efficiency and Characterization of CO_2 Reduction by Artificial Photosynthetic *Escherichia coli* Having Calvin-Benson-Bassham Cycle Isolated from *Rhodobacter sphaeroides*

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In recent years, the CO_2 concentration was continually increase. *Rhodobacter sphaeroides*, one of non-sulfur purple photosynthetic bacteria, have an ability to CO_2 fixation. The recombinant *Escherichia coli* harboring 11 genes of Calvin cycle using a dual plasmid system; having 5 genes in Form I operon and having 6 genes in Form II operon. The Calvin cycle proteins were successfully expression in *E. coli* and the CO_2 reduction of recombinant *E. coli* transformed whole Calvin cycle was the highest. In addition, the increase of CO_2 reduction efficiency by treating FBP, RuBP, and Mg^{2+}. TEM image and intracellular ATP and NAD^+/NADH ratio results indicated the increase of activity. The protein expressions existed Mg^{2+} was strongly expression than treated IPTG. The amount of residual CO_2 in recombinant *E. coli* was lower than *R. sphaeroides*, however, per-cell base measurement was higher than *R. sphaeroides* using co-culture with *S. cerevisiae*.
This work was carried out with the support of "Cooperative Research Program for Agriculture Science & Technology Development (Project No: PJ01051502)" Rural Development Administration, Republic of Korea.