Regulation of Soybean Net Photosynthetic CO_2 Fixation by Interaction of CO_2, O_2, and Ribulose 1,5-Diphosphate Carboxylase—Commentary

Laing WA, Ogren WL, Hageman RH (1974) Regulation of soybean net photosynthetic CO_2 fixation by the interaction of CO_2, O_2, and ribulose 1,5-diphosphate carboxylase. Plant Physiol **54:** 678–685

In 1971, through a perceptive comparison of photosynthesis and photorespiration in leaves with the oxygen inhibition of carboxylation by the isolated enzyme, Ogren and Bowes (1971) reasoned that photorespiration and photosynthesis were initiated by the same enzyme, ribulose 1,5-diphosphate carboxylase. Bowes et al. (1971) then proceeded to demonstrate that this enzyme catalyzed the production of phosphoglycolate via an alternative substrate, oxygen, and the enzyme subsequently was renamed ribulose 1,5-bisphosphate carboxylase/oxygenase (usually shortened to Rubisco). Because glycolate had been shown to be the precursor to photorespiratory CO_2 release, this discovery provided the missing link for understanding the interrelation between photosynthesis and photorespiration. These reports instigated a very controversial period in photorespiration and Rubisco research (Ogren, 2003).

In 1972, William Laing came to Ogren's lab from New Zealand to obtain a doctoral degree. As reported in this classic *Plant Physiology* article, they derived enzyme kinetic equations for a dual substrate enzyme and meticulously showed that the kinetic properties of the isolated Rubisco enzyme could explain the effects of both oxygen and temperature on photosynthesis and photorespiration. By the early part of 1983, the article had already been cited 165 times and thus was selected as a Citation Classic by Current Contents (Laing, 1983). As Laing noted in his commentary, its significance is in part "because it showed the physiological relevance of biochemical studies into RuBP carboxylase" and thus, by inference, many other enzymes. The enzyme kinetic equations developed in this article later formed the basis for a complete biochemical model of leaf photosynthesis that was developed by Farquhar et al. (1980), a classic article in its own right.

A recent search of the ISI Web of Knowledge database reveals that this article is the second-most cited photosynthesis research article in *Plant Physiology* and one of the most highly cited Rubisco articles in the literature (with more than 400 citations to date).

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