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Can negligible levels of Rubisco activase, be the reason for decreased rubisco activity levels in guard cells?

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Rubisco in guard cell chloroplasts has been a subject of controversy for decades. Several studies have unequivocally confirmed not only the presence of Rubisco in guard cells but also found it to be catalytically active. Based on a cell basis, the amount of Rubisco in guard cells is suggested to be in the range of 0.6 to 1.4 % whereas its activity is reported to be in the range of 0.35 to 0.5%, of a mesophyll cell. This low activity may be due a) to a low Rubisco content, and/or, b) to either the absence or an inactive functional activation mechanism in guard cells. Rubisco activase, enables rubisco to function under physiological conditions. Rubisco activase has been detected immunologically in cyanobacteria, unicellular green algal species and higher plant species. In this study, evidence have been provided for the presence and/or absence of both rubisco and rubisco activase, in guard cells and mesophyll cells of C₃ and C₄ plants, using immunoblot and immunogold electron microscopy techniques. Results suggest that: 1.) Mesophyll cell chloroplasts in C₃ plants and bundle sheath cell chloroplasts of a C₄ plant have both rubisco and rubisco activase; 2.) In bundle sheath cells, rubisco activase appears to be a low abundant protein when compared to C₃ mesophyll cell chloroplasts; 3.) Guard cells of both C₃ and C₄ plants have rubisco; and, 4.) rubisco activase, if present, is present in negligible amounts in both C₃ and C₄ guard cells. Reported inadequate levels of rubisco activity in guard cells are consistent with inadequate level of rubisco activity in *Arabidopsis* mutants lacking rubisco activase.