PHOTOSYNTHESIS WHEN CULTURES ENTER THE LIGHT PHASE COULD THEREFORE BE DUE TO AN INCREASED AVAILABILITY OF INTRACELLULAR MgATP, OF THE Fe-PROTEIN OF NITROGENASE (FIG Ic) ADDITION OF REDUCTANT, POSSIBLY ACTING THROUGH A THIOREDOKX-REACTED SysteM, THAT THE PROTEOLYTIC SYSTEM MIGHT BE LIGHT-SIMULATED CONSISTENT WITH THIS, EXTRACTS OF GLOEOTHECE PREPARED FROM CELLS SAMPLED 1 h INTO THE DARK PHASE (LI) SHOWED VERY HIGH RATES OF DEGRADATION OF THE Fe-PROTEIN, WITH COMPLETE DEGRADATION OCCURRING BETWEEN 24 h AND 72 h AFTER PREPARATION (FIG 1b).

ADDITION OF 0.1 mg/ml OF CHLORAMPHENICOL TO CULTURES OF GLOEOTHECE, 6-8 h INTO THE DARK PHASE (TOO LATE TO INHIBIT SYNTHESIS OF NITROGENASE, WHICH HAD ALREADY STOPPED), MARKEDLY DELAYED DEGRADATION OF THE Fe-PROTEIN OF NITROGENASE. THIS IMPLIES THAT SOME PROTEIN FACTOR ASSOCIATED WITH DEGRADATION OF NITROGENASE IS ITSELF SYNTHESISED DURING THE LATER STAGES OF THE DARK PERIOD. ADDITION OF PROTEASE INHIBITORS 6 h INTO THE DARK PHASE ALSO INHIBITED DEGRADATION OF THE Fe-PROTEIN IN THESE CULTURES [5].

IN CULTURES OF GLOEOTHECE, NITROGENASE PROTEINS RAPIDLY DISAPPEAR FROM CELLS AS SOON AS THEY ENTER THE LIGHT PHASE [3]. THIS SUGGESTS THAT THE PROTEOLYTIC SYSTEM MIGHT BE LIGHT-STIMULATED. CONSISTENT WITH THIS, EXTRACTS OF GLOEOTHECE PREPARED FROM CELLS SAMPLED 1 h INTO THE LIGHT PHASE (L1) SHOWED VERY HIGH RATES OF DEGRADATION OF Fe-PROTEIN, WITH COMPLETE DEGRADATION OCCURRING BETWEEN 24 h AND 72 h AFTER PREPARATION (FIG 1b).

ADDITION OF 10 mM DITHIOURETHReTo AN EXTRACT OF GLOEOTHECE, PREPARED FROM CELLS COLLECTED AT D10, GREATLY STIMULATED DEGRADATION OF THE Fe-PROTEIN OF NITROGENASE (FIG 1c). ADDITION OF 1 mM ATP + 10 mM MgCl2 HAD A VERY SIMILAR EFFECT. THE STIMULATED RATE OF DEGRADATION OF NITROGENASE SEEN WHEN CELLS ENTER THE LIGHT PHASE COULD THEREFORE BE DUE TO AN INCREASED AVAILABILITY OF INTRACELLULAR REDUCTANT, POSSIBLY ACTING THROUGH A THIOREDOKX-REACTED SYSTEM [6], INCREASED AVAILABILITY OF MgATP-, OR INCREASED INTRACELLULAR O2, ALL OF WHICH WOULD BE CONSEQUENT UPON THE RESUMPTION OF PHOTOSYNTHESIS WHEN CELLS ENTER THE LIGHT PHASE.

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