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Effect of the ethylene precursor, 1-aminocyclopropane-1-carboxylic acid on different growth stages of *Haematococcus pluvialis*

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Abstract

In this study, we explored the effects of ACC on other stages of *H. pluvialis*. Interestingly, even though ACC displayed a dose-dependent effect on astaxanthin production, it is evident that astaxanthin production could be facilitated whenever the cells were treated at the early red stage. The transcriptional levels of *BKT*, *CHY*, *SOD*, and *CAT* genes supported enhanced astaxanthin biosynthesis upon ACC treatment at the early red stage. The combinatorial synergistic effect of ACC and light intensity was also confirmed. Finally, two-step application of ACC at the vegetative phase to increase biomass production and at the early-red stage to promote astaxanthin biosynthesis was proposed to maximize the efficiency of ACC treatment.

Keywords: *Haematococcus pluvialis*, astaxanthin, 1-aminocyclopropane-1-carboxylic acid, two-step applications

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