

Environmental control for efficient production of functional proteins by using transgenic everbearing strawberry in a closed plant production system

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Abstract

To achieve efficient production, environmental conditions should be optimized for maximizing the yield of target organs (leaf, fruit, and/or root) and accumulation of the target functional protein, while minimizing the cultivation period and energy consumption, thereby reducing the total cost. A closed plant production system with artificial light is considered as an advanced facility for the efficient and stable commercial production of functional protein using transgenic plants. In this presentation, we will introduce our strategy to determine the optimal light and air temperature conditions required for promoting growth, flowering, and accumulation of the target protein of transgenic everbearing strawberry plants. In our results, light quality and photoperiod are important determinants of flower induction in strawberry plants. Similarly, air temperature affects the photosynthetic rate, and fruit maturity and color, which eventually modulates the cultivation period and protein yield. In other experiments, we found that low air temperature increased the total soluble protein content in the strawberry plant, however, there was no increase in the target protein content. Our results suggested that the accumulation of target protein was independent of the accumulation of other proteins, and the optimal environmental conditions for the functional protein production were different depending on each transgenic plant.

Keyword *artificial light, energy consumption, Fragaria × ananassa Duch., pharmaceutical and functional protein*

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