

Title The development of the modern strawberry *Fragaria x ananassa*: Physiology, biochemistry and morphology of progenitor species *Fragaria virginiana* and *Fragaria chiloensis* and resulting cultivars

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Abstract

The cultivated strawberry (*Fragaria x ananassa*) in the northeastern United States has seen limited improvement in yield over the past century. Narrow germplasm diversity has been suggested to be a possible limitation and has resulted in evaluation of the progenitor species: *F. chiloensis* and *F. virginiana* for desirable characteristics. One of the possible avenues explored to improve the productivity of the cultivated strawberry is to increase the photosynthetic capacity through the use of *F. chiloensis* which has a high photosynthetic capacity. Previous research has relied exclusively on gas exchange data to quantify photosynthetic capacity; however, due to the complexity of regulatory processes that influence gas exchange it is difficult to identify the basis of the different gas exchange rates observed. Evaluation of the strawberry cultivar 'Jewel' and the two progenitor species was conducted to determine the basis of the observed differences in photosynthetic capacity. Results of this research suggest that the high photosynthetic capacity of *F. chiloensis* may be based on higher light use efficiency, determined by chlorophyll fluorescence, and increased activity of key enzymes of the Calvin Cycle. As these photosynthetic parameters are based on gene expression, these higher rates may be genetically heritable.

In order to determine the most effective use of the wild species to improve the cultivated strawberry, a field study of cultivars released during the last century was established to evaluate changes in horticultural and physiological characteristics that have occurred and to identify possible limitations to productivity. Results indicated that limited changes have occurred in carbon allocation patterns and photosynthetic characteristics and suggest that there may be opportunity to increase the productivity through altering carbon allocation patterns and increasing fruit number. The lack of change in photosynthesis suggests that improving photosynthetic capacity of the cultivated strawberry may lead to increased productivity. Further research evaluating hybrids of *F. chiloensis* and the cultivated strawberry may allow us to better exploit this characteristic.