Genomics and Applied Biology 2026, Vol.17, No.3, 172-186
http://bioscipublisher.com/index.php/gab

Research Insight Open Access

Effects of Irrigation Frequency on Growth, Fruit Development and Fruit Quality in Melon

Lihua Hu [1,2]

1 Hangzhou Milele Agricultural Technology Co., Ltd, Hangzhou, 311103, Zhejiang, China
2 Zhejiang Agronomist College, Hangzhou, 310021, Zhejiang, China

Corresponding authors: hulihua20080220@163.com

Genomics and Applied Biology, 2026, Vol.17, No.3 doi: 10.5376/gab.2026.17.0014
Received: 25 Apr., 2026
Accepted: 30 May, 2026
Published: 15 Jun., 2026

Preferred citation for this article:
Hu L.H., 2026, Effects of irrigation frequency on growth, fruit development and fruit quality in melon, Genomics and Applied Biology, 17(3): 172-186 (doi: 10.5376/gab.2026.17.0014)

Abstract Melon is a high-value horticultural crop whose market performance depends not only on yield, but also on sweetness, texture, appearance, and storability. Among irrigation variables, frequency is especially important because it controls how often the root zone is rewetted, how strongly soil or substrate moisture fluctuates, and how stable the physiological environment remains during flowering, fruit set, enlargement, and ripening. This review examines how irrigation frequency influences melon growth, fruit development, and fruit quality under open-field, protected, soil-grown, and soilless systems. The literature shows a clear pattern: very infrequent irrigation often restricts leaf expansion, photosynthesis, and fruit growth because melon is sensitive to sudden water deficits, particularly around flowering and early fruit enlargement. By contrast, overly frequent irrigation can sustain vegetative vigor and fruit enlargement but may dilute soluble solids, increase cracking risk in some systems, and reduce water productivity when total water input is excessive. Between these extremes, stage-specific scheduling tends to perform best. Studies from semi-arid and greenhouse systems consistently indicate that adequate or relatively frequent irrigation during flowering and early fruit growth is needed to protect yield, whereas mild deficit or reduced irrigation frequency during late maturation can improve soluble solids, vitamin C, antioxidant activity, firmness, and sometimes reduce cracking without a major yield penalty. Evidence from eastern China, including a two-year greenhouse muskmelon experiment in Haining, Zhejiang, indicates that a moderate irrigation regime can produce a better balance between yield, quality, irrigation water use efficiency, and nitrogen use efficiency than either lower or higher water inputs. In northwestern China and other water-limited regions, pulsed drip irrigation, sensor-guided scheduling, and regulated deficit irrigation have shown strong promise for sustaining fruit quality while reducing water use. Overall, the review argues that irrigation frequency should be treated as a developmental and quality-management tool rather than simply a calendar decision. Future research should separate the effects of frequency from total irrigation amount, compare cultivar-specific responses, and strengthen evidence from humid protected systems such as those common in the Yangtze River Delta.

Keywords Melon; Irrigation frequency; Fruit development; Fruit quality; Deficit irrigation; Drip irrigation; Protected cultivation; Water use efficiency

1 Introduction

Melon is one of the most commercially important fruit vegetables in warm and semi-arid production regions, and it is also widely grown in protected structures where fruit appearance, sweetness, and uniformity determine market value. Recent irrigation research continues to treat melon as a strategic crop because of its high economic return per unit area and its sensitivity to water management. A recent greenhouse-melon study in Taiwan, citing FAOSTAT, described worldwide melon production at roughly 29.48 million tons over more than 1.09 million hectares, while a greenhouse muskmelon study from southeast China emphasized that China remains the dominant producer and that melon occupies a central place in the country's protected horticulture systems. These studies are useful for a review because they connect agronomic management with market quality, not just yield. Melon also has a distinct position in horticultural research because fruit value is shaped by multiple traits at once. Consumers and supply chains judge melons by soluble solids, sugar-acid balance, firmness, flesh color, aroma, netting or skin appearance, and shelf-life behavior. This means irrigation research on melon rarely ends with a simple "more water versus less water" conclusion. Instead, the key question is how to regulate water in a way that preserves enough vegetative strength to fill fruit while also favoring the quality traits that make fruit saleable. Recent studies on fruit development, sugar metabolism, firmness, and ripening biology reinforce this point by