Silicon
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ORIGINAL PAPER

Effects of Silicon on Growth, Yield and Fruit Quality of Cantaloupe under Drought Stress

Ashraful Alam[1] · Bambang Hariyanto[1] · Hayat Ullah[1] · Krishna R. Salin[2] · Avishek Datta[1]

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Abstract
Silicon (Si) plays an important role in mitigating adverse effects of various biotic and abiotic stresses including drought. Polyhouse experiment was conducted to evaluate the effects of Si on growth, yield and fruit quality of cantaloupe under drought stress. The treatments consisted of four Si fertilizer doses (0, 100, 200 and 400 kg ha^{-1}) applied in the form of silicic acid [H_4SiO_4, 20% Si content] and three soil moisture regimes (100%, 75% and 50% field capacity [FC]). Growth, yield and fruit quality were significantly ($p < 0.01$) affected by decreasing soil moisture level. Yield and water productivity were reduced by 63–69% and 19–34%, respectively, at different Si fertilizer doses when soil moisture was reduced from 100% to 50% FC. Overall, application of Si fertilizer was beneficial at all soil moisture regimes. There was no significant difference in yield and water productivity among four Si fertilizer doses at 50% FC, while these parameters were increased by 18–27% and 16–22%, respectively, at 75% FC and by 10–19% and 2–12%, respectively, at 100% FC with increasing Si fertilizer dose. Flesh thickness and total soluble solids content were also higher in Si-fed plants than the control. Application of silicic acid at 200 and 400 kg ha^{-1} maximized yield at 75% and 100% FC, respectively, and hence could be recommended as optimum doses. Selection of proper Si dose in synchronization with soil moisture level could be critical in cantaloupe production when soil moisture is a limiting factor.

Keywords Abiotic stress · Muskmelon · Quality · Silicon · Water-deficit stress · Water productivity · Yield

1 Introduction

Cantaloupe (*Cucumis melo* L.), commonly known as muskmelon, is a popular fruit in many countries of the world including Bangladesh. It belongs to the Cucurbitaceae family and prefers warm to hot climate. Asia has the highest cultivated area under cantaloupe production [1]. In 2018, China was the largest producer of cantaloupe on a global scale with nearly half of the global production followed by Turkey, Iran, Egypt and India [1]. Like other horticultural crops, cantaloupe also requires proper management practice for producing satisfactory yield with high-quality fruit. The optimum temperature range for cantaloupe cultivation is 22–33 °C and it thrives well in a place receiving sufficient sunlight [2]. Cantaloupe fruit is round to oval in shape and ranges in weight from 0.5 to 5 kg. It is a short-duration crop (less than 3 mo), and growers often face problems related to the quality of fruit setting, size and taste. Poor fruit quality remains a major concern in cantaloupe production, which includes small fruit size, fruit cracking, soft texture and tastelessness of flesh. Maestro and Alvarez [3] reported low quality of fruit setting due to improper and incomplete pollination, very hot weather or water-deficit stress. Various agronomic factors, such as water shortage, injudicious nutrient management, improper farming practices, inferior quality seeds and insufficient and/or improper pest management practices, are largely responsible for the production of low-quality fruit [4–6]. Cantaloupe is susceptible to a range of biotic and abiotic stresses, but very limited published literature is available about its susceptibility and coping mechanism.

✉ Avishek Datta
datta@ait.ac.th; avishek.ait@gmail.com

[1] Agricultural Systems and Engineering, Department of Food, Agriculture and Bioresources, School of Environment, Resources and Development, Asian Institute of Technology, Klong Luang, Pathum Thani 12120, Thailand

[2] Aquaculture and Aquatic Resources Management, Department of Food, Agriculture and Bioresources, School of Environment, Resources and Development, Asian Institute of Technology, Klong Luang, Pathum Thani 12120, Thailand

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