Trends in
Technical & Scientific Research

Juniper Publishers
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Mini-Review
Volume 2 Issue 1 - June 2018

A Short Review on "Water Management in Onion"

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Submission: May 15, 2018; **Published:** June 06, 2018

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Abstract

Being a shallow-rooted crop, onion extracts most of the water from the top 30cm of soil and is more sensitive to water stress during bulb formation and enlargement than during the vegetative stage. Lack of irrigation results in a shorter duration of bulb growth, a lower percentage radiation interception and a lower efficiency of conversion of radiation to dry matter and all these contribute to lowered bulb yield.

Keywords: Onion; Water management; Water stress; Bulb growth

Introduction

The cultivated onion (*Allium cepa L.*) is an important crop with world production of about 84.76million metric tonnes for the year 2013-2014 [1]. Water is the main limiting factor for low bulb yield in onion. The crop requires 350-500mm of water over the growing season [2]; hence, adequate moisture through irrigation is important in the production of onions. Being a shallow-rooted crop, onion is more sensitive to water stress and therefore the production of bulbs and dry mat¬ter are highly dependent on the availability of soil water [3-11]. Frequent irrigation is required to maintain high soil moisture to produce high yields of onion [12-14]. Moreover, since onion shows the reduction of both evapotranspiration rate and yield under water deficit, irrigation is necessary to obtain the optimum size and weight of bulbs, especially during the stage of bulb development [14,15].

Notably, the highest yield of onion bulbs occurs when the soil is constantly kept moist but the irrigation is performed until two weeks before harvest, which also prevents rot and sprouting during storage [16-18]. However, excessive irrigation during the vegetative period may lead to a delayed and attenu¬ated development of bulbs [19]. As for bulb quality, total soluble solids significantly increase with the increase of soil moisture, may be due to both the fulfillment of crop water demand and the use of nutrients under optimum availability of soil moisture [16,20]; protein content shows the opposite trend [20].

Water stress during the critical growth period causes reduction in size and weight of onion bulbs [14,15,21,22]. Onions under water deficiency decrease evapotranspiration and consequently yield [23]. Drought stress during the last 3 weeks of the season reduces onion yields [24]. Soil-water stress caused by withholding irrigation at both the 3 and 7-leaf stages reduced bulb yield by 26% compared with the control [25]. When water stress was imposed 30 days after transplanting for a period of 15 days, leaf area and bulb growth was considerably decreased with a reduction of 17-26% in onion yield [26]. When water stress imposed for a period of 3 weeks, caused a greater reduction in photosynthetic rate, total plant dry matter accumulation, bulb dry matter and bulb size [27]. Appropriate water supply during the development and ripening stages increased bulb yield [21,28-30]. Higher water supply increased double and bolter while decreased exportable bulbs [31]. Water deficit during crop cycle leads to a significant reduction of bulb size, which suggests the need to finely adjust water management in this crop [22].

Conclusion

Irrigation has a significant effect on the growth and quality of onion, which is significantly affected by the volume of water supplied. Water stress results in reduced yield of marketable bulbs due to earlier ripening of bulbs. Appropriate water supply during the development and ripening stages increases bulb yield Monitoring soil moisture is therefore important to determine when irrigation may be needed.

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