Bul. Agron. (35) (2) 118 – 126 (2007)

Application of Deep Sea Water (DSW) for Nutrient Supplement in Hydroponics Cultivation of Tomato : Effect of supplemented DSW at Different EC Levels on Fruit Properties

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Diterima 1 Mei 2007/Disetujui 26 Juli 2007

ABSTRACT

Deep sea water (DSW) has the potential characteristics for nutrient supplement in hydroponics cultivation. This experiment was carried out to evaluate the application of DSW as a nutrient supplement for tomato cultivation in hydroponics system. Tomatoes were grown on 4 beds in nutrient film technique (NFT) system circulated with 1.5 dS m^{-1}(control), 10 dS m^{-1} 15 dS m^{-1} and 20 dS m^{-1} of nutrient solution, respectively. DSW was supplemented into nutrient solution of control to obtain high EC level. Fresh weight of fruits decreased varied from 10-20% by increasing DSW concentration in nutrient solution, but the effect of the treatment was not found on size of 3rd truss fruits. The density of fruits increased as the DSW concentration increased in nutrient solution. Tomato stiffness of treated plants had almost the same value among EC levels although different among 3 trusses. Fruit quality parameters increased by increasing the DSW concentration in nutrient solution. Treated plants circulated with EC 20 dS m^{-1} supplemented nutrient solution for 2 weeks produced tomatoes with highest soluble solids, 8.0% Brix or increased 30% of control (1st truss). However there were no significant effect on fruits of 2nd and 3rd trusses. DSW could be used as nutrient supplement for hydroponics cultivation of tomato.

Key words : Deep sea water, fruit quality, electrical conductivity, tomato

INTRODUCTION

Deep sea water (DSW), accounting for 95% of all the sea water, generally refers to sea water from a depth of more than 200 m. DSW has cold temperature, abundant nutrients, and good water quality that is pathogen-free and stable. DSW contains a lot of minerals such as Na^+, Mg^{2+}, K^+, and Ca^{2+}. When DSW is supplemented into nutrient solution for hydroponics it increases electrical conductivity (EC) of the nutrient solution (Fallah, 2005).

Previous studies have shown that parameters of fruit quality such as soluble solids content, titratable acidity and dry matter increased by increasing EC level of nutrient solution from 2 to 10 dS m^{-1} (Soria and Cuartero, 1998; Eltez et al., 2002; Ling Li et al., 2001; Okano et al., 2002). However, the higher quality of tomato fruits that was obtained in high EC level of nutrient solution is often adversely affected by the appearance of blossom end rot (BER) and the yield is decreased by 5.1 % per dS m^{-1} above 2 dS m^{-1} (Ling Li et al., 2001). In previous study, salinity was obtained by adding sodium chloride (NaCl), or concentrated nutrition to obtain varied EC level of 2 – 9.5 mS m^{-1}(Schwarz and Kuchenbuch, 1998; Ling Li et al., 2001; Eltez et al., 2002; Okano et al., 2002; Katerji et al, 2003). It was reported that under higher EC level of nutrient solution, treated plants produced fruits in smaller size (Eltez et al., 2002; Okano et al., 2002). It was reported that in single-truss tomato cultivation, there was a high rate of occurrence of blossom-end rot when salinity was applied 3 days after pollination (Okano et al., 2002). Therefore, EC of the nutrient solution should be maintained at the right level not only for high quality of tomato fruit but also for preventing BER.

In this experiment, DSW that pumped from DSW station located at Muroto, Kochi prefecture, was added at different levels into nutrient solution in hydroponics cultivation of tomato plants to increase EC level of nutrient solution. This experiment was carried out to study the effect of different concentration of DSW in nutrient solution on fruit properties.

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