

Effect of Aluminum on Root Growth and Nutrient uptake of Pineapple

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Abstract

Aluminum usually has phytotoxicity and inhibits the root growth in the strongly acidic soils. The purposes of this study were to simulate the influence of aluminum content in hydroponic culture on root growth and nutrient uptake of four cultivars of pineapple (Cayenne, Tainung No.6, Tainung No.13 and Tainung No.17). The pineapples had been planted in the pH 4.5 hydroponic solution containing 0, 100, 200 and 300 μM AlCl_3 , respectively, for four weeks. The root elongation, the content of aluminum accumulation on the root tip, nutrient uptake and the kinds and amount of organic acids in root secretion were determined. The results showed that the root elongation of the four cultivars was improved when they were grown in the solution of 100 μM AlCl_3 , however, the inhibition of root elongation was found for Tainung No.6 and Tainung No.13 as they were planted in the solution containing 200 and 300 μM AlCl_3 , especially for Tainung No.13 cultivar. The nutrition uptake was less inhibited when they were planted in the Al free solution, and uptake increased with the increase of Al concentration for Cayenne cultivar, but inhibited when the Al concentration was 200 μM for other three cultivars, especially for Tainung No. 13. In addition, the nutrient uptake of Tainung No.6 and Tainung No.13 cultivars were significantly inhibited when they grew in the solution containing 300 μM AlCl_3 , and more seriously inhibited was found for Tainung No. 13 cultivar. Results also showed that the contents of tartaric and malic acid in the root secretion increased with increasing Al concentration, however, the content of malic acid was decreased in the root secretion as Al addition increased, therefore, it need to be investigated if the reduction of Al toxicity is related to the chelation of Al with these two organic acids secreted from pipeapple root.

key words: Acid soils, Al toxicity, root elongation, root exudates.

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