Development and characterization of hydroponics solution for Lettuce

D R Ratnaweera[1], J A Liyanage[1*] and K D N Weerasinghe[2]

[1] *Department of Chemistry, University of Kelaniya, Kelaniya*

[2] *Department of Agriculture Engineering, Faculty of Agriculture, University of Ruhuna, Mapalana, Kamburupitiya*

Hydroponics is the growing of higher plants with their roots in a dilute nutrient solution instead of in soil. The major advantage of hydroponics is it permits control supply of all mineral elements. The basic principle behind the process is that of growing plants with their roots in contact with a solution containing all the essential plant nutrients in amount needed for optimum plant growth.

The main problem of the commercially available hydroponics formulations is that they are not specific. For lettuce, the total yield of the plant is harvested within a very short period. So the total consumption of nutrients by lettuce is less than the other plants. Hence use of the existing formulations, which are common for all plants for lettuce is wastage of nutrients and uneconomical.

When growing plants in nutrient solutions, the pH of the solution changes while plants are in it. Nutrients, especially metals, can be precipitated during the plant growth, when pH of the medium increases and this is one of the major problems in existing hydroponics mixtures.

Hence, a low cost hydroponics mixture, which satisfies the nutrient requirement of lettuce was developed using available chemicals and characterized using computer aided chemical speciation programs.

According to the results of the modelling work high percentage of iron complexes with Ethelenediaminetetraacetic acid (EDTA) and remains in the solution. Hence, EDTA was added to prevent the precipitation and to keep the nutrients in a soluble form. Within the pH between 5-6, the optimum pH required for lettuce and also during the plant growth all the nutrients are present in a soluble form with out forming any precipitation and hence they are readily available for the plant.

The results obtained from the performance assessment carried out in the field using this nutrient mixture in comparison to the commercially available hydroponics mixture for growth & yield show that there is a significant improved performance in the crop on number of leaves and the length and width of the seventh leaf at the harvesting stage, shoot length, fresh weight and leaf weight after harvesting and further an even growth pattern from top to bottom of the crop was obtained when this formulation is used. The cost per unit weight of the product is about five times less than the existing one. Hence, this newly formulated nutrient mixture can be used as a low cost hydroponics medium for Lettuce.

* janitha@kln.ac.lk Tel: 011 2914486