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Development of nutrient formulations for different crop growth stages in simplified hydroponics

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Increase in quality and yield and reduction of the cost for fertilizers can often be obtained with nutrient formulations developed, based on the crop, growth stage of the plant and climatic conditions. Simplified hydroponics is a potential growing system applicable to any part of Sri Lanka. A low cost nutrient pack, preferably optimized according to the growth stage is much needed in order to popularize it. Therefore, in this study, a new nutrient formulation (NF) which was proved to be more productive and of low cost (compared to Albert's Solution) when applied to simplified hydroponics system was optimized according to the growth stages and named after three main growth stages, "Grow", "Bloom" and "Fruiting". For the optimization of NF, the important factors considered were, the change in the nutrient levels after application in the field trial with NF, optimized formulations used in countries having similar climatic conditions and K : N ratios accepted as required according to the growth stages. The composition of macro elements in the new formulations were (in ppm): Grow - N = 356, P = 80, K = 392, Ca = 301, Mg = 78; Bloom - N = 270, P = 90, K = 569, Ca = 270, Mg = 78; Fruiting - N = 169, P = 95, K = 650, Ca = 169, Mg = 95. The composition of micro elements in all three formulations were (in ppm), Cu = 0.29, Fe = 1.2, Zn = 0.26, Mn = 1.8, Mo = 0.05 and B = 0.4. The Optimized formulations were prepared using commercial grade chemicals. The cost of the chemicals for the optimized formulation was about 38% less than that of Albert's Solution. A field trial (May – Oct.,2007) was carried out in the wet zone for bean and tomato plants with the optimized formulations (O – for all the optimized formulations) and Albert's Solution (Al) (control). Foliar analysis showed that the levels of the essential elements of bean plants, of the treatment O, of both "Grow" and "Bloom" stages were in the sufficient range for beans. The nitrogen level of bean plants of both "Bloom" and "Grow" stages and the levels of P and Cu in the "Bloom" stage of treatment Al were lower than that of the sufficient range. Levels of Ca and Fe in both "grow" and "bloom" stages of both the treatments, the level of Mn in the "Grow" stage of both treatments and the level of N in the "Grow" stage of treatment Al were lower than the sufficient levels of these elements in tomato leaves. Since plant growth could not be continued to the "fruiting" stage, further field evaluations should be carried out with the new optimized formulations (O) involving fruit and foliage analysis, crop growth and yield performances.

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