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Center for Smart Agriculture

Hydroponics technology



Module 3 : Crop management and harvesting in hydroponics system

Session 13 : Nutrient Management

Preparation of nutrient solution and its application





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Nutrient	Hoagland & Arnon (1938)	Hewitt (1966)	Cooper (1979)	Steiner (1984)
	mg L⁻¹			
N	210	168	200-236	168
P	31	41	60	31
K	234	156	300	273
Ca	160	160	170-185	180
Mg	34	36	50	48
S	64	48	68	336
Fe	2.5	2.8	12	2-4
Cu	0.02	0.064	0.1	0.02
Zn	0.05	0.065	0.1	0.11
Mn	0.5	0.54	2.0	0.62
B	0.5	0.54	0.3	0.44
Mo	0.01	0.04	0.2	Not considered



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Hydroponic nutrients are at the core of good management. Hydroponic systems can conserve more water and represent huge efficiencies because they are water-based; that is, they use water as the main delivery method of plant nutrients. Because nutrients are more directly available to plants, hydroponic systems can eliminate bottlenecks to production that are involved in nutrients. This increases the growing capacities of these types of systems. It also makes nutrient management the crux of a well-run hydroponic system.



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CALCULATIONS OF NUTRIENT FORMULATIONS

If a nutrient formulation calls for 200 ppm of calcium (200 mg/L), we need 200 mg of calcium in every liter of water. In 164 mg of $\text{Ca}(\text{NO}_3)_2$ we have 40 mg of Ca [using the atomic and molecular weights to determine the fraction of calcium in calcium nitrate—assuming 100% purity of $\text{Ca}(\text{NO}_3)_2$].



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The first step is to calculate how much $\text{Ca}(\text{NO}_3)_2$ is required to obtain 200 mg of Ca. This is done by setting up a ratio as follows:

164 mg $\text{Ca}(\text{NO}_3)_2$ yields 40 mg Ca

x mg $\text{Ca}(\text{NO}_3)_2$ yields 200 mg Ca

Ratio of Ca $\text{Ca}(\text{NO}_3)_2$ is given by $40/164 = 200/X$

Solving for X :

$$40X = 200 \times 164$$

$$X = 200 \times 164 / 40 = 820$$



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Therefore, 820 mg of $\text{Ca}(\text{NO}_3)_2$ will yield 200 mg of Ca. If the 820 mg of $\text{Ca}(\text{NO}_3)_2$ is dissolved in 1 L of water, the resultant solution will have a concentration of 200 ppm (200 mg/L)

of Ca. This assumes, however, that the $\text{Ca}(\text{NO}_3)_2$ is 100% pure. If it is not—which is usually the case—it will be necessary to add more to compensate for the impurity. For example, if the $\text{Ca}(\text{NO}_3)_2$ is 90% pure, it will be necessary to add.

$$100/90 \times 820 = 911 \text{ mg Ca } (\text{NO}_3)_2$$

Hence, 911 mg $\text{Ca}(\text{NO}_3)_2$ in 1 L of water will give 200 ppm of Ca.



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Thank you....