Soilless Nutrigation™ with Poly-Feed GG

Complete balanced plant nutrition solutions

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Nutrigation™ = application of pure **plant nutrients** through the irrigation system featuring:

- "Teaspoon Feeding", dynamic attention to plant requirements
- Full control over plant nutrition
- No residues left in the growing medium

Poly-Feed GG: Greenhouse-Grade Nutrigation™ formulae

- Carefully-balanced NPK formulae, enriched with secondary- and micro-nutrients
  - Consist of 100% plant nutrients
  - Virtually free of chloride, sodium and other detrimental elements for plants
  - Made of high quality ingredients
- Fully soluble in water, safe for use with the finest water passages in micro-irrigation systems
- Wide range of formulae, addressing the requirements of numerous crops at different growth stages
- Labor saving with ready-made formulae
- Right balance between NO_3^- and NH_4^+
- Potassium source is potassium nitrate

Nutritional Requirements of Soilless-Grown Crops

Soilless-grown crops require special control over their nutrition:

- The medium has no capacity to store plant nutrients
- Nutrition rate and composition should fully address plant requirements
- Growth conditions allow minimum tolerance to nutrient deficiencies or excesses
- Composition of the nutrient solution must be monitored continuously

The chemical & physical nature of the system imposes additional requirements:

- Fertilizer materials must be fully water-soluble
- Chloride, sodium and detrimental elements should be avoided
- Urea cannot be used for nitrogen
- Micro-nutrients are consumed efficiently only in chelated form
- Nitrate / ammonium ratio should be optimized

Poly-Feed GG provides complete nutritional program throughout the growth cycle

Common Formulae

Stage	Formula	$N\text{-}NO_3$ (%)	$N\text{-}NH_4$ (%)	SO_3 (%)	E.C (mmho/cm) 0.5 g/l	1 g/l	1.5 g/l	2 g/l	3 g/l	pH
Establishment	18-18-18+ME	10	8	-	0.78	1.16	1.72	2.26	3.3	5.9
vegetative	20-9-20+ME	12	8	-	0.72	1.16	1.69	2.16	3.12	5.3
Reproductive	9-12-36+ME +3MgO	8.3	0.7	-	0.60	1.10	1.60	2.10	3.05	5.3
	11-8-34+ME +2MgO	10	1	3.9	0.66	1.10	1.60	2.10	3.10	5.7
	14-10-34+ME	11	3	-	0.58	1.07	1.61	2.14	3.12	5.8
	17-10-27+ME	11.5	5.5	-	0.72	1.16	1.70	2.25	3.29	5.6

Chemical Compatibility: the Three-Tank System

The challenge:

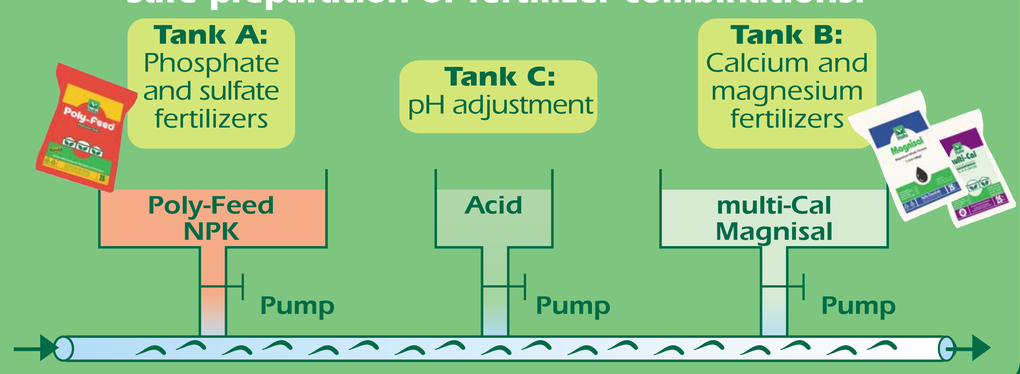
- All nutritional elements must be present in the feeding solution at every moment
- In a concentrated stock solution some components might react with others to form insoluble precipitates which might clog water pipes and drippers

The solution: Three-Tank System

- Incompatible fertilizer materials are dissolved in separate tanks. Their solutions are injected to the irrigation water
- Addition of acids enables control over pH

The product should form clear solution, free of precipitate, with precise composition and balanced pH

Safe preparation of fertilizer combinations:



Example: Poly-Feed Nutrigation™ program for Soilless-Grown tomatoes

1.Necessary considerations

- Nutrient requirements of the crop throughout the growth cycle
- Expected yield
- Water analysis: pH, E.C, hardness and nutrient content
- Characteristics of the growing medium
- Light intensity

Nutrient requirements:

Growth phase	N	P_2O_5	K_2O	Ca	Mg	Fe
Establishment	100-150	80-115	150-220	20-40	20-40	0.3
Flowerring and fruit formation	150-180	115-135	220-260	60-80	20-40	0.6
Early maturation 1st-3rd floor	180-250	135-195	260-370	60-100	40-60	1.0
Late harvest 4th-6th floor	250-150	195-115	370-220	60-80	20-40	0.6

The actual concentration should be determined according to plant biomass, fruit development and yield potential.

2.Preparation of stock solutions

- Prepare a stock NPK solution in tank A
- Prepare a stock solution of calcium and magnesium in tank B
- Fill acid in tank C

Nutrigation program:

Growth phase	Tank A Poly-Feed GG(1)	Tank B Multi Cal+Magnisal(2)	Tank C Sulfuric acid 40%(3)
Establishment	1.5-3.0 l/m³ 11-11-30+ME	1 l/m³	3.0-3.4 l/m³
Flowerring and fruit formation	3.0-4.0 l/m³ 11-11-30+ME	1-2 l/m³	3.0-3.2 l/m³
Beginning of ripening and harvest 1-3 floor	2.8-4.0 l/m³ 12-8-40+ME	2-2.5 l/m³	3.0-3.2 l/m³
Late harvest 4-6 floor	2.8-1.5 l/m³ 12-8-40+ME	1-2 l/m³	3.0-3.4 l/m³

Multi Cal- Haifa's Calcium nitrate 15.5-0-0+26.5 CaO (19.0Ca)
Magnisal- Haifa's Magnesium nitrate 11-0-0+16 MgO (9.6Mg)

(1) Concentration of the Poly-Feed in tank A is 30% w/v
(2) Concentration of Magnisal and Multi Cal in tank B is 20% w/v
(3) 10% solution of sulfuric acid 40% assuming that water contains 5.5 meq/l bicarbonates

The pH should be adjusted to be 5.5 to 6.5

Haifa

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