



*FloraMa***X**

THE CHEMISTS since 1966



GROWERS GUIDE

FOR COMMERCIAL CROPPING
LED | HID | OUTDOOR

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Analytical Chemists and Horticultural Consultants Since 1966



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Nutrient Management

1. Water quality

Reverse osmosis (RO) or rainwater are ideal because they contain no harmful salts and will not impact pH or EC. Any water stored for more than 2-3 days should be dosed with Pythoff PLUS every 1-2 weeks (0.5ml/L) then stored in the dark for at least 24 hours prior to use.

2. Add nutrient and additives

Follow the FloraMax Dose Chart: This will achieve the recommended EC, and optimum yield and quality. Use the FloraMax 'hard water' chart for hard water (over 0.5mS) or DWC systems.

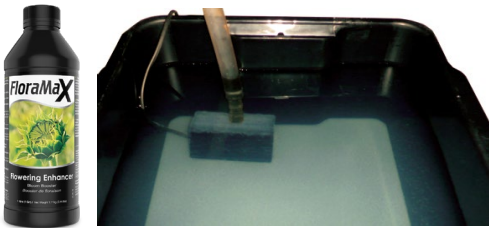


Fig 9.1. Nutrient reservoir with pH above 7: Calcium, sulfate, iron and other trace elements can precipitate in the reservoir and become unavailable for root uptake. **FloraMax Flowering Enhancer** helps "lock" pH below 6.5 and avoids needing a cal-mag.

3. Check pH is 5.0 to 6.3

- **How to measure pH:** Use an electronic meter or liquid test kit. Ensure the nutrient is well stirred before measuring pH.
- **Target pH:** If the pH tends to rise, reduce it to 5.0-5.5. This provides a larger pH safety margin than, for example, 6.0, and minimizes the amount of pH maintenance required.
- **Hard and alkaline waters:** Avoid using recirculating systems. Also, nutrient will be more stable if pH is quickly lowered to 5.0 - 5.5 (Fig 9.1).
- **Adjusting pH:** Add a small amount of pH Down / pH Up. Then stir well and recheck pH. Predilute pH adjusters with water prior to adding. For raising pH, it can be easier and safer to use FloraMax SILICA in 0.1ml/L increments.
- **Recirculating systems:** Check pH daily, or after the addition of top-up water. To help minimize pH fluctuation, supply at least 10 litres of nutrient for each large plant.
- **pH electrodes:** Calibrate regularly using *both* pH Buffer 4.0 and 7.0. Rinse the electrode with distilled water after use. When not being used, soak the electrode's tip in an electrode storage solution - never use pH buffers or distilled water.

4. Nutrient concentration (EC)

This can be checked using an EC (or TDS/µpm) meter. However, NEVER rely on EC unless the meter is regularly calibrated.

- **The recommended EC:** Refer to the FloraMax Dose Chart. Avoid being below this EC level. Although foliage burn may occur if EC is too high, low EC's are typically more costly as they can cause deficiencies and reduced yield!
 - The water's EC must be added to the chart's EC e.g. if the water is 0.7mS, and the chart EC is 1.9mS, then the target EC is 2.6mS (1.9mS + 0.7mS = 2.6mS).
 - For "ppm" meters, EC must be converted to ppm (see Table 10.2). For example, on a Hanna-500ppm meter, 2.1mS is equivalent to 1,050ppm.
- **How to check and adjust EC:** Once the nutrient and additives are added to the reservoir, stir thoroughly then immerse the electrode. Allow the meter to stabilize before recording the reading. If the EC is below target, add extra Veg-1 until the target is reached (Table 10.4). If the EC is too high, add some water then recheck.
- **EC for recirculating systems:** Monitor the water level and EC. Either, top up with water and maintain EC with Veg-1 (Table 10.4). Or, control the water level so the EC remains relatively constant. The nutrient should generally be replaced every 7-14 days. NOTE, hard top-up water will artificially raise the EC and must be replaced more regularly.
- **Over 800ppm CO2 or 1,400 PPFd:** Plants will consume nutrients faster under these conditions. Raise Veg-1 by 0.5mS (2ml/L).
- **Nutrient deficiencies:** To remedy, feed more regularly, or raise EC in 0.3mS increments using 1ml/L Ca-Mg-Fe or Veg-1.
- **Foliage burn:** Salt buildup in the root zone is the

Table 10.4 FloraMax EC Contribution

Each FloraMax product will raise EC by a specific amount. For example, Veg-1 (2-1-4) will raise EC by about 0.5mS when added at 2ml/L or 8ml/Gal.

	EC	/L	/Gal	ID color
Veg-1 (2-1-4)	0.5	2ml	8ml	yellow
Veg-1 (9-6-15)	0.5	0.5g	1.6g	limestone
VegaFlora A	0.5	2ml	8ml	blue
VegaFlora B	0.5	2ml	8ml	red wine
Root-XS	0.1	2ml	8ml	brown
OrganaBud (0-0-2)	0.2	2ml	8ml	brown
Flowering Enhancer	0.4	2ml	8ml	orange
Resin-XS (0-1-4)	0.3	2ml	8ml	pale brown
Growth-XS	0.1	1ml	4ml	brown
Pythoff PLUS	0.03	0.5ml	2ml	colorless
System Maintenance	0.01	1ml	4ml	blue
Silica (0-0-5)	0.05	0.2ml	0.8ml	red
Ca-Mg-Fe	0.5	2ml	8ml	red wine

most common cause. Remedy by flushing more regularly and feed until 10-20% run-off.

5. Feeding

The feeding strategy is critical for achieving optimum root zone nutrient levels. This ultimately depends on plant/pot size, substrate, PPFD and VPD.

Refer to Table 10.3 for 'Feeds per day' and 'Run-off %'. Always feed frequently and ensure the entire root zone is fed and flushed via 10-15% run-off. If top-feeding, assign multiple drippers per plant, and arrange so there are no dry spots.



Fig 11.3 Pythoff PLUS helps prevent root browning, blockages and buildup.

6. Nutrient stability

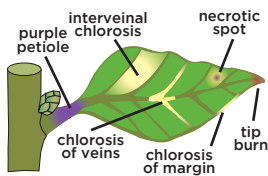
Poor growth is often from failure to condition the nutrient solution. FloraMax Pythoff PLUS and System Maintenance are ideal for this (Fig 11.3) and are fully compatible with FloraMax additives – *NOTE, chlorines and peroxide can destroy organics!* Cover the reservoir to prevent evaporation and light exposure. Light can destroy organic additives and accelerates the growth of slimes and pathogens. Avoid using an aerator in run-to-waste systems.

7. Root zone flush

Flushing removes salt build-up and dirt from the root zone, substrate and feed circuit. Generally flush every 1-2 weeks, or weekly if water quality is poor.

Step 1. Once the nutrient reservoir is empty, remove any obvious build-up then partly refill with water.

Step 2. Add 0.5ml/L Pythoff PLUS and ensure pH 5 - 6. Operate the pump for 15-30 min to flush the root zone, substrate and feed circuit. For coco, soil or Rockwool systems, pump until the



FloraMax Ca-Mg-Fe prevents nutrient deficiency symptoms.

	Feeds*	Run-off**	EC & pH See feed chart	PPFD***	Light per day	VPD** kPa
	per day	%				
	Coco / Soil / Rockwool					
Veg wk 1	2-3	10	If CO2 is over 800ppm, raise VEG-1 by 0.5mS: - 2ml/L (8ml/Gal) - 0.5g/L (1.6g/Gal)	300-450	18hr	0.6-0.8
Veg wk 2+	2-3	10-15		450-600	18hr	0.8-1.0
Bloom wk 1-7	2-3	10-15		600-1,200	12hr	1.0-1.2
Bloom wk 8	2-3	10-15		600-1,000	12hr	1.2-1.5

*Optimum dry-back : First watering at lights-on; Final watering 30-60 min before lights-off.
 **Run-off % : Ensures feed volume is optimum for plant/pot size, substrate, PPFD & VPD.
 ***Measure PPFD and VPD at top of canopy. Light over 1,200 PPFD generally requires 1:1 ratio of CO2 e.g. 1,400 PPFD needs 1,400ppm CO2.
 Ref. FloraMax & The Hydro Institution (AUST.)

run-off is within 0.5mS of the input water.

Step 3. Repeat the process if the waste is very dirty.

Step 4. Inspect filters and drippers prior to making fresh nutrient as these can become blocked during flushing.

8. Post harvest clean-up

This helps prevent diseases in the next crop:

Step 1. Remove plants and non-recyclable substrate then do as much manual cleaning as possible.

Step 2. Partly fill the reservoir with water. Ensure pH 5 - 6. Add Pythoff PLUS at 2-4ml/L and mix well. Ensure good ventilation and low light.

Step 3. Run the pump at least once every hour over a 24-hour period. 'Flooding' may be necessary to contact hidden surfaces.

Step 4. Discard this solution then flush several times with fresh water to remove excess Pythoff PLUS. Drippers may need to be dismantled and cleaned.

mS (mS/cm)	cF	Hanna 500ppm	Eutech 640ppm	Truncheon 700ppm
0.7	7	350	448	490
0.8	8	400	512	560
0.9	9	450	576	630
1.0	10	500	640	700
1.1	11	550	704	770
1.2	12	600	768	840
1.3	13	650	832	910
1.4	14	700	896	980
1.5	15	750	960	1050
1.6	16	800	1024	1120
1.7	17	850	1088	1190
1.8	18	900	1152	1260
1.9	19	950	1216	1330
2.0	20	1000	1280	1400
2.1	21	1050	1344	1470
2.2	22	1100	1408	1540
2.3	23	1150	1472	1610
2.4	24	1200	1536	1680
2.5	25	1250	1600	1750
2.6	26	1300	1664	1820
2.7	27	1350	1728	1890
2.8	28	1400	1792	1960

How to Make Cuttings

1. Make nutrient solution: Refer to 'Cuttings' phase on the FloraMax Dose Chart.

2. Add substrate to pots then water thoroughly with the nutrient solution. Allow to drain well.

3. Take cuttings from a healthy mother plant.

TIP: FloraMax veg-wk-2 schedule is ideal for mums. Growth-XS will radically improve the amount of cutting material.

• **Step i. Take cuttings from "semi-hard" material.** Ideal length is 3 – 5 inches with two spare leaves at the base for removal during Step ii (Fig 5.1).

• **Step ii. Remove lower set of leaves** flush with stem (Fig 5.2). Then about 1/4 inch below this, cut through the stem at a 45-degree angle. Use a sharp and sterile blade and do not tear or crush the stem.

• **Step iii. Dip 1-inch of base of cutting** into FloraMax Cloner (Fig 5.3). Then gently insert stem about 1-inch deep into a slightly undersized hole in the centre of the pot (Fig 5.4). *Do these steps quickly to minimize stresses on the cutting.*

4. Place a clear propagator lid over the cuttings and close vents (Fig 5.5). Relative humidity should be maintained about 90% (open vents slightly if required). To promote root growth and combat wilting, spray 1-3 times per day with a solution of FloraMax Clone Spray.

5. Place under low intensity fluoro or LED light. Leave on for 24 hours a day. Monitor temperature inside the propagator. Aim for 75-80 deg F (24-27 deg C). Use a 'heat mat' if temperatures are too cold.

6. Check cuttings regularly. Once roots form (typically 5 – 10 days) the substrate needs to be fed more regularly with nutrient solution. Note how heavy plants feel once fed and do not refeed if they still feel heavy.

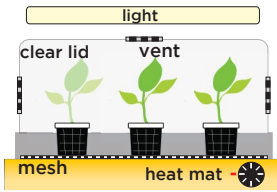


Fig 5.5 Propagation units help improve the speed of cuttings.

TIP: Top-feeding can fail to feed the entire root zone. Full immersion of the pots can be more effective.

7. Humidity and disease: Vents can be gradually opened over a few days once roots have formed. This will help prevent diseases and prepare the freshly rooted cuttings for lower humidity. Also, keep hard surfaces clean and dry, remove any dead plant matter and always use Pythoff PLUS.

8. Air-pruning: Placing the pots on "mesh" to raise them slightly off the bottom of the tray, kills any roots that try to grow outside of the pot. This promotes a better root structure within the actual substrate (Fig 6.1).



FloraMax Clone Spray produces explosive root growth. P.B., Detroit MI



Fig 6.3 Never transplant until roots have colonized the substrate

Transition to Veg Phase

Avoid stressing plants with sudden changes in humidity, temperature, light and EC.

Are plants ready for transplanting?

1. Ensure there are plenty of air pruned roots on the outside of the pot and check that roots have colonized the substrate (Fig 6.3).

2. Test the cuttings capacity to withstand the humidity and temperature used in the vegetative phase. Test for an hour or two to begin with.

Keys for transplanting

1. Choose the right pot size. Transplanting to an over-sized pot will discourage roots from searching for water. Use an intermediate sized pot and give the roots time to fully colonize the substrate BEFORE replanting into a larger pot (Fig 6.2).

2. Ensure that the new substrate is flushed and watered with fresh nutrient solution. Refer to Veg week-1 on the FloraMax Dose Chart.

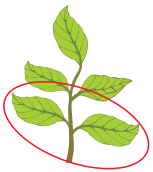


Fig 5.1 Cuttings need "spare" leaves at the base

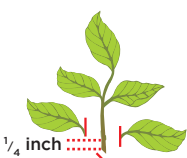


Fig 5.2 Where to cut



Fig 5.3 Dip cutting in FloraMax Cloner



Fig 5.4 Insert base of cutting into substrate



FloraMax Root-XS: Root growth over 8-days. @h2ohydroponics, USA



Growth-XS: Ideal for 'mums' and early veg. Suncoast Hydro, Australia

Veg Phase (Veg)

Creating the right environment is essential for promoting a short, stocky plant. This is the ideal shape for indoor growing:

- 1. Be careful changing straight to powerful LED or HID lights** as plants may become stressed. Optimum PPFD and day length of 18 hours will help avoid "stretch". See Table 10.3.
- 2. Root-XS, OrganaBud and Growth-XS** will ensure optimum root and structural growth. For coco, soil or Rockwool, ensure feeds are frequent and with enough run-off - see Table 10.3.
- 3. Topping and Low Stress Training (LST)** should be done during veg to maximize the number of bud sites and ensure all foliage receives enough light.
- 4. Humidity and temperature:** See Table 10.3 for optimum VPD. Generally maintain 50-70% RH and "lights-on" temperatures of 68-82 deg F (20-27 deg C). At "night" do NOT allow the temperature to drop by more than 9 deg F (5 deg C).



Fig 6.1 Use mesh to ventilate and 'air prune' cuttings.

- 5. Pest management:** Insects can be prevented from entering the system by filtering incoming air. Use a magnifying glass to

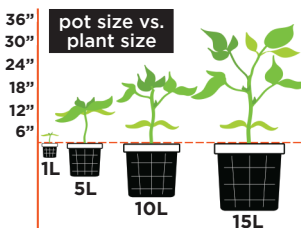


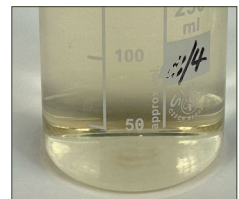
Fig 6.2 Pot size is key for enabling roots to fully colonize the medium.



Veg-1: Rapid veg growth without a cal-mag or any nitrogen supplements. @hydropacific, USA



Thick stems. No cal-mag. @55hydro, USA



FloraMax feed AFTER 8-months. pH 6.3, EC 2.6. @floramaxlab

Veg to Bloom

Plants begin budding when switched to at least 12 hours of uninterrupted darkness each night ("12/12"). This must continue until harvest.

When to switch to bloom?

There are 2 main considerations:

- Strong root system:** Cuttings usually need at least 2-3 weeks in veg. "Seedlings" need 6-8 weeks. Growth-XS will accelerate veg and prevent stalled growth.
- Height of plant:** Plants will typically double in size during flowering. So, if 'room' height is limited, switch to 12/12 before the plant has reached 50% of the 'available' height.

Bloom Phase

- 1. Refer to 'Bloom' phase on the FloraMax Dose Chart.** Resin-XS, OrganaBud and Flowering Enhancer are key for maximizing yield and quality. For coco, soil or Rockwool, ensure feeds are frequent and with enough run-off (Table 10.3).



Organic additives are usually very messy (L). **FloraMax OrganaBud 0-0-2** runs extremely clean (R) and produces more bud sites, stacking and weight.

2. **Switch lights off for 12 hours per day.** If interrupted, flowering will be hindered, and plants may revert to veg.
3. **Increase the air-exchange rate.** Gradually lower relative humidity to around 40-60%. This helps avoid rot and mildew, and improves CO2 levels. See Table 10.3 for optimum VPD.
4. **General optimum "daytime" temperature** is 68-82 deg F (20-27 deg C).

5. To avoid stretch and maximize yields:

- i. Ensure optimum PPFd (see Table 10.3). Generally keep plants as close as possible to the lights without causing burning.
- ii. At "night" do not allow the temperature to drop by more than 9 deg F (5 deg C).
- iii. Avoid shading by having too many plants.
- iv. FloraMax Silica will help stems carry fruit weight.

6. **Avoid stressing plants by pruning** during flowering. Major structural pruning should be done during veg.

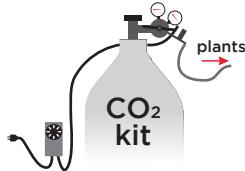


Fig 7.1 CO2 injection can improve growth rates, however higher EC is needed (Table 10.3).

Topping & LST

When growing indoors, higher yields are obtained by training plants into a low, wide and flat canopy. This promotes more flowering sites and positions them in the zone of optimum light intensity (Fig 8.1).

STEP 1. Topping

When and how to 'top'?

Topping is best done when the plant is less than 2-3 weeks old and has only 2-5 nodes in total. Topping is the removal of the plant's 'top' growth just above a node (Fig 8.2). Once topped, the two axillary buds immediately below the cut will form two new branches. Once these new branches develop 1 or 2 leaf sets, they can be topped again (Fig 8.3a). This second round of topping will form four even-sized branches (Fig 8.3b).

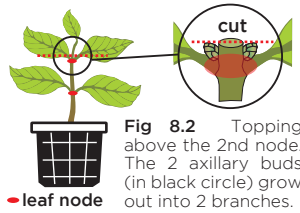


Fig 8.2 Topping above the 2nd node. The 2 axillary buds (in black circle) grow out into 2 branches.

Important points for topping

1. **Topping can be done more than twice** however doing so will increase time in vegetative phase.
2. **Healthy plants usually take 2-3 days to recover** from topping. Never top during flowering as it causes too much stress.

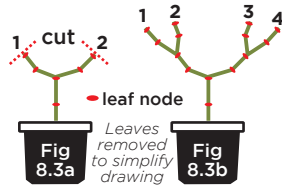


Fig 8.3a A second round of topping will grow out to form 4 even branches (Fig 8.3b).

STEP 2. Low Stress Training (LST)

After topping twice, there are four quality branches growing vertically from what was originally the top node (Fig 8.3b). LST involves pulling these branches downwards until

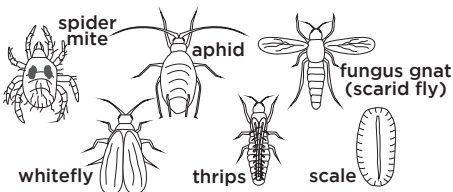


Fig 11.2 Insects spread disease and destroy foliage



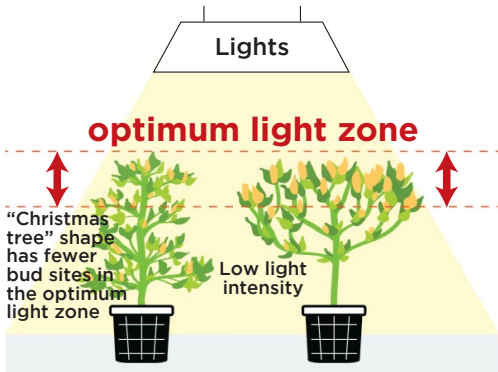


Fig 8.1 Topping and LST positions more bud sites in the optimum light zone

horizontal and outwards into a "star" configuration (Fig 8.4).

Important points for LST

1. When to start and finish LST? LST should be started as soon as possible during the vegetative phase. Flowering phase can commence once all major branches are horizontal and level with each other. LST should continue during early flowering as vegetative growth continues. Aim to maintain a flat, level branch structure.

2. Bending branches: Young growth is easier to bend than older growth. Do not rush to get branches horizontal, do this in stages. When a branch is first bent, growth will be slowed. LST again once it grows another 3 inches or so.

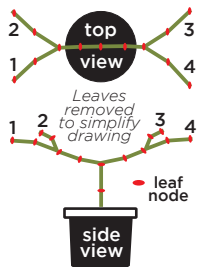


Fig 8.4 LST applied to plant in Fig 8.3b

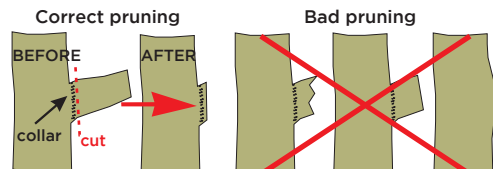
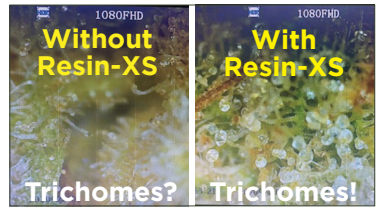


Fig 13.4 Correct pruning technique: The "collar" mark is usually visible on woody growth. Cut immediately in front of this. This cut will heal quicker and minimize the risk of pest attack and disease ingress.



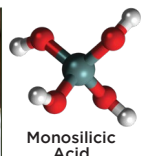
FloraMax Resin-XS has an huge impact on trichome size, resin and oil. Resin-XS also aids PGR recovery.

Foliar Spraying

Foliar sprays are useful for delivering fertilizers, fungicides and pesticides to plants.

- 1. A wetting agent** ("wetter") should be added to foliar spray solutions. This increases the sprays capacity to "wet" and penetrate foliage. **NOTE:** FloraMax Clone Spray has an inbuilt wetting agent - NEVER add more.
- 2. Test-spray a small patch of leaves** and observe for at least 2 weeks.
- 3. The best time to spray** is usually about 1 hour before "daylight".
- 4. Avoid spraying when air temperature** is above 25°C (77°F) as absorption is usually poor.
- 5. Spray a 'fine' mist.** Drenching foliage can restrict the stomata's ability to absorb. A fine mist will achieve maximum surface coverage, especially on the underside of leaves where the majority of stomata are located.
- 6. Spray when wind is minimal** - to avoid waste.
- 7. Use low salinity/ soft water.** This will reduce the risk of leaf staining and burning.

© Andrew M Taylor (Head Chemist - FloraMax)



FloraMax Silica contains Monosilicic Acid. This forms a quartz-like structure in plant cells which prevents leaf wilt and improves stem rigidity.

FloraMaX

Your harvest is our priority

For Commercial Growers

Veg-1 & VegaFlora A+B *Base Nutrients for Hydro/Coco/Soil*



1. ONE formula for veg and bloom.
2. No "cal-mag" required, even with coco and RO.
3. Industry-leading pH-buffering.
4. Fewer blockages and longer reservoir stability.
5. Powdered version is fully soluble.

Flowering Enhancer *PK + Cal-Mag-Iron + pH stabilizer*



1. "PK": Establishes the baseline PK levels for bloom.
2. Cal-mag + iron: Prevents deficiencies and bud rot.
3. Helps maintain pH below 6.5. pH maintenance is rarely required in coco and soil.

Root-XS *Organic root accelerant*



1. Faster root development.
2. Minimizes transplant stress and stall.
3. No biofilms, pH fluctuation or blockages.

OrganaBud *Organic enhancer for structure and quality*



1. Promotes branching, shortening, bud-sites and stacking.
2. Increases potency, terpene profile and pistil vibrancy.
3. No biofilms, pH fluctuation or blockages.

Resin-XS *Organic resin & oil enhancer*



1. Increases frosting, resin, oil and potency.
2. Improves swell, density and final mass.
3. Replaces PK additives, bloom boosters and "finishers".
4. No biofilms, pH fluctuation or blockages.

Growth-XS *Organic veg accelerant*



1. Helps halve veg phase duration when applied in veg week-1. This lowers running costs and enables an extra crop each year.
2. Prevents transplant shock and stall.
3. No internodal stretch, biofilms, pH fluctuation or blockages.

Pythoff PLUS *Eliminates toxic buildups*



1. Nutrient solutions: Prevents root browning, pests and blockages.
2. 'Weekly' flush: Restores the rootzone and substrate.
3. Stored water (e.g. RO): Keeps water free of toxins.
4. Post harvest cleanup: Cleans hardware and substrate.

Silica *Monosilicic Acid - Improves stress resistance*



1. Contains silica as monosilicic acid. 100% bio-available.
2. Fully soluble - no blockages or deposits.
3. Highly concentrated and stable - 10-year shelf-life.

Ca-Mg-Fe *Cal-Mag-Iron plus Cu-Mn-Zn-Mo-B*



Contains cal-mag PLUS iron, copper, manganese, zinc, molybdenum and boron. This is necessary because most deficiencies are caused by one or more of these 8 elements, not just cal-mag!

System Maintenance *Organic preventative for biofilms*



Prevents the growth of biofilms in nutrient solutions. Compatible with organic additives, beneficial bacteria, enzymes and mycorrhiza.

Clone Spray *Organic foliar spray*



1. Promotes rapid root development in cuttings.
2. Prevents transplant stress, wilting and deficiencies.
3. Absorption is optimized via foliar specific ingredients and plant-specific wetting agents.