



GENERAL HYDROPONICS®

FLORAPRO®

CALCIUM + MICROS • GROW • BLOOM



USAGE GUIDE

WATER-SOLUBLE FERTILIZERS FOR COMMERCIAL GROWERS

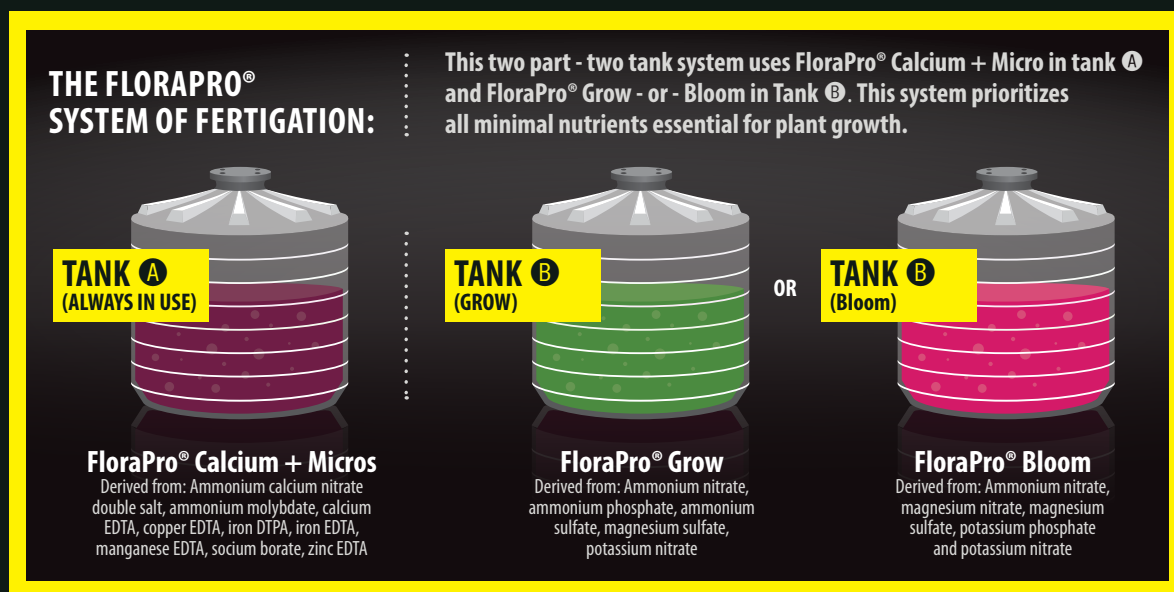


HOW TO USE FLORAPRO®

The FloraPro® system is easy-to-use and efficient for the commercial production of a wide range of indoor-and greenhouse-grown plants. As a two-component system (also known as an A/B system), it is made up of two parts: A fertilizer containing Nitrogen, Calcium, and micro elements (we call it A, part A, tank A or Calcium + Micros) and an NPK plus magnesium and sulfur component (we call B, part B, tank B or NPK). This two-part system provides robust and effective nutrient delivery to plants.

FIGURE 1.

SCHEMATIC OF A TWO-PART OR "A/B" FERTILIZER INJECTION SYSTEM



As shown in Figure 1. The FloraPro Product system includes the use of FloraPro Calcium + Micros in Tank A and either FloraPro Grow or FloraPro Bloom in Tank B, depending on the growth stage of the crop. When plants are in a vegetative stage, use our FloraPro Grow formulation. When plants are in their flowering stage, use the FloraPro Bloom formulation.

HOW TO DISSOLVE FLORAPRO® FERTILIZERS FOR COMMERCIAL USE

FloraPro®, is a water soluble fertilizer, meaning it is concentrated powder and must be dissolved in water prior to use. Depending on the cultivator, there are a few general approaches:

1. DIRECT ADDITION

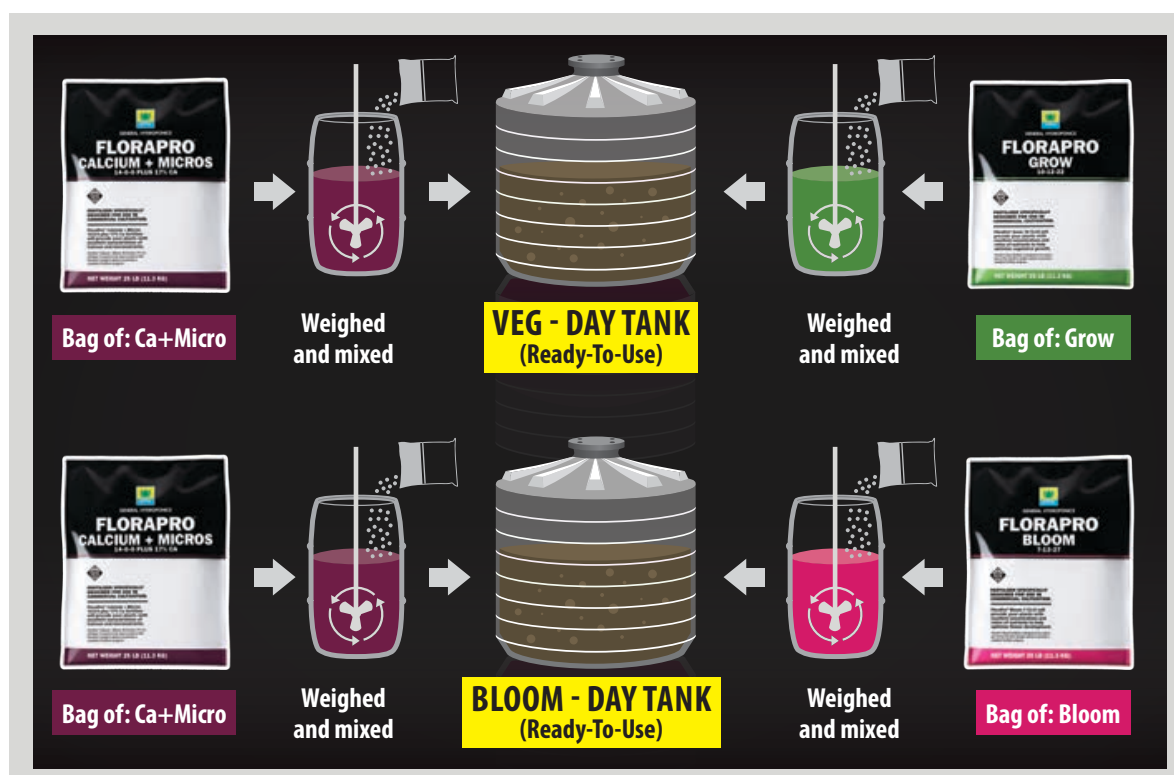
Preparing “ready-to-use” nutrient solutions stored in a tank system. This is often called a “day tank” system. The FloraPro® product is dissolved directly into solution in the day tanks. Typically, there are day tanks for specific growing areas in the operation OR for various stages of the crop. At the simplest form, there may be a day tank for the vegetative stage and a day tank for plants in the flowering stage. This would require the usage of the ‘Direct Addition’ feed charts which are in grams per liter or grams per gallon.

TIPS FOR DIRECT ADDITION:

- It is very important to accurately weigh the amount of fertilizer to be added each time.
- For best results in large day tanks (>150 gal), dissolve the FloraPro to be added in a smaller container or bucket and then add this solution to the larger day tank.
 - Never mix any of the FloraPro products together in a concentrated solution
 - Always triple-rinse the container used between products, or have dedicated containers for each product.
- As with other methods, using warm water to dissolve the product will speed up the process.

FIGURE 2.

DIRECT ADDITION



Note: Always mix each individual FloraPro® product in its own tank prior to adding to the 'day tank'

A NOTE ABOUT USING DAY TANKS IN AN OPERATION

As mentioned above, it is common to have more than one day tank in a facility. The number of day tanks will often depend on the complexity of the system and size of the facility. There are two main ways that growers will break down how their day tanks are laid out:

Often in smaller operations, there may be **one day tank per room or bay area**. This means that the recipe in that tank will change as the crop progresses and grows. This gives growers great control over knowing exactly what is going into a given room at any time as it is a simple 1:1 ratio of rooms to tanks.

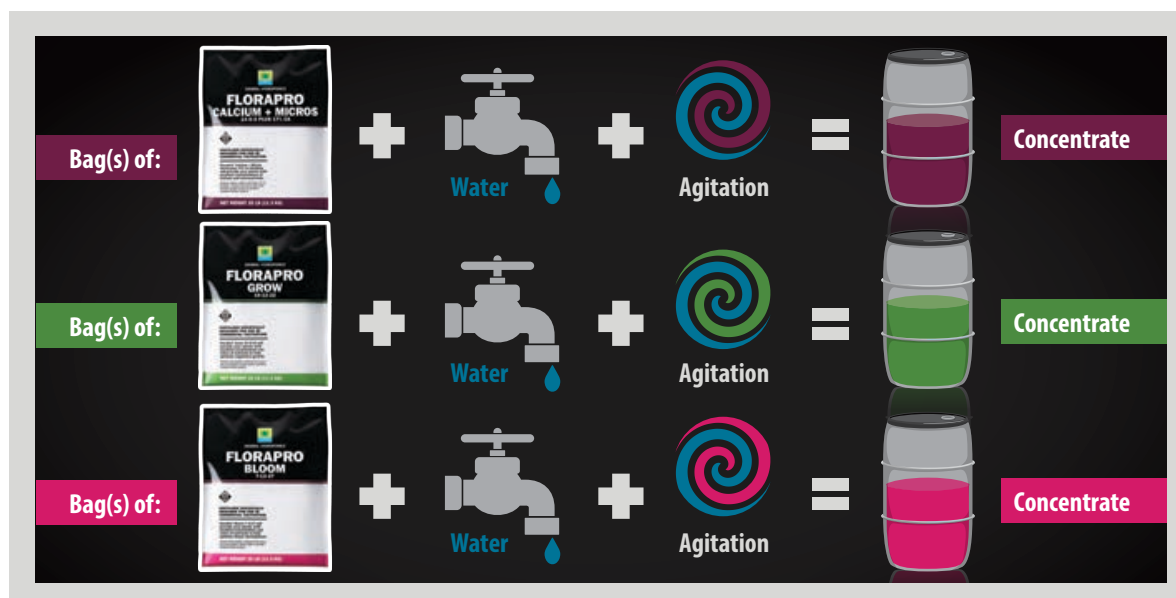
However, as the number of rooms increases, and the stage of crop growth is staggered across those rooms it may become economical to have **one tank per recipe** rather than per room. A common configuration is where there is a day tank for the Vegetative phase, Early Bloom Phase, Mid Bloom Phase, Late Bloom Phase, Ripening and any "Flush" phase. The plumbing will be such that any recipe is able to be fed to any room. While we provide suggestions on recipes for these various stages, it is important that growers monitor their crops to assess if they need to vary the nutrients provided based on their conditions such as crop type / variety, light intensity, duration and quality, temperature and humidity settings, carbon dioxide usage, growing media used, container size and irrigation methods.

2. CONCENTRATE TANKS

This method involves preparing a concentrated "stock solution" for further dilution by hand or using fertilizer injectors or dosing systems. Many cultivators choose to prepare a concentrated stock solution, as this method provides the ultimate in nutrient uniformity and ease in handling. The concentrations used may vary but we recommend a rate of 1 lb of product per gallon of end solution.



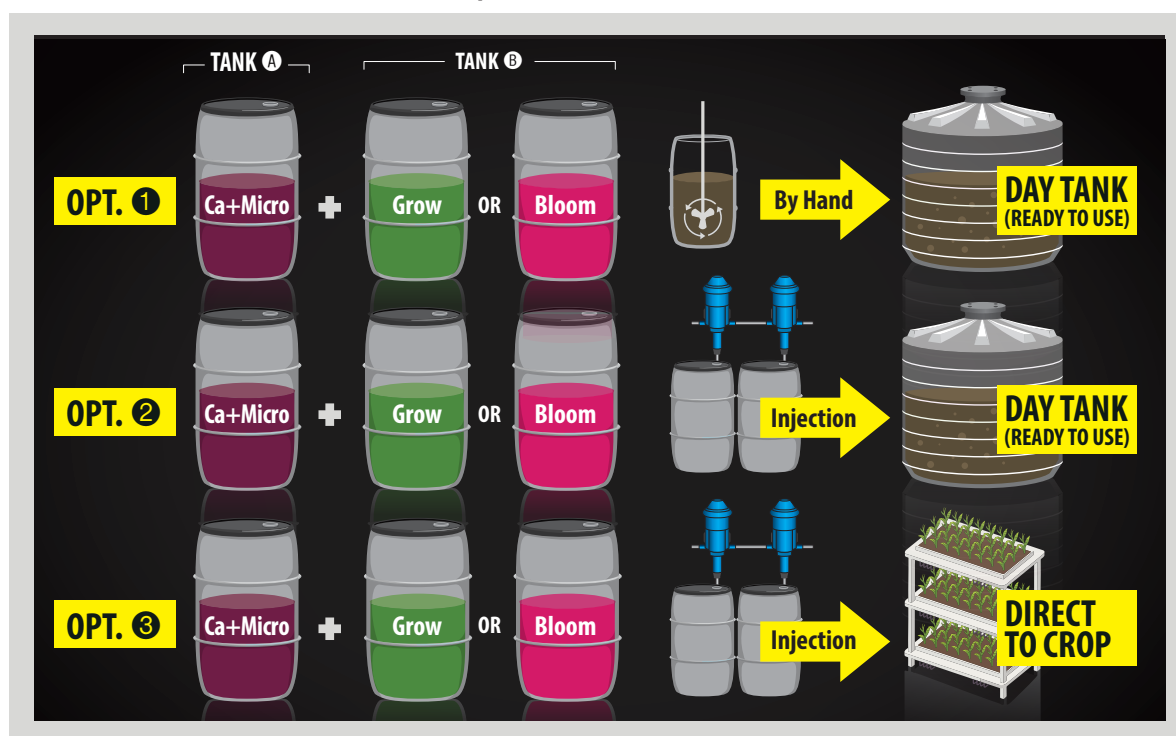
FIGURE 3.
CONCENTRATE TANK PREP (STOCK TANK PREP)



Once a concentrate tank has been prepared for each FloraPro® product it can be used exactly like any other liquid concentrate solution (eg. Flora Series). This means that growers can:

- Dilute the concentrates by hand into a day tank
- Utilize a fertilizer injection system to fill day tanks
- Utilize a fertilizer injection system, inject fertilizer in-line for direct application to the crop with no day tank

FIGURE 4.
AFTER CONCENTRATES ARE MIXED, THREE OPTIONS:





Hemp grown with FloraPro®
in Hawthorne's new state of the
art Nexus Greenhouse facility with
light deprivation capabilities

Image depicted is hemp.

WHEN USING FERTILIZER INJECTION SYSTEMS

Fertilizer injection systems dilute concentrated stock solutions into irrigation water at a set rate (or dilution ratio) during the irrigation process for convenient fertilization of crops.

There are two approaches to using fertilizer injectors:

1. **Setting** the amount of **fertilizer constant** to make a concentrated stock solution and **varying the injection ratio** to achieve the targeted final amount. Most cultivators use either 1 or 2 pounds (lbs) per gallon of concentrated stock solution. This is the most common method for indoor production that requires many fertilizer recipes.
2. **Setting the injection ratio constant and varying the amount of fertilizer** used to make a concentrated solution to achieve the targeted final amount. Most growers use a ratio of 1:100 (1%) or 1:200 (0.5%) in their systems although there are other more sophisticated systems that can vary the rate of dilution over a wide range of dilution ratios either manually or automatically. This is most common in 'traditional' horticulture and greenhouse production.

Use the information in Table 3 to confirm how much FloraPro® fertilizer to dissolve per gallon of stock solution to achieve a desired final nutrient concentration.

A NOTE ON MEASURING CONCENTRATION

You will note that concentration in our charts is expressed in ppm Nitrogen (N). This is because traditionally, most water soluble fertilizers (WSFs) are used in this way, given that nitrogen is the key nutrient driving plant growth. However, we also cross-reference the ppm N level to the **theoretical** conductivity level of that solution, expressed as mS/cm and/or PPM (using the 500 ppm NaCl standard). This is to help the grower easily verify the estimated concentration of the solution made, regardless of the conductivity meter used.

FLORAPRO® IS A TWO-TANK SYSTEM

The great thing about the two-part (or two-tank system) is that either component can be adjusted accordingly to meet the needs of the crop.

However, please be advised that each FloraPro® fertilizer (i.e. Calcium + Micros and Grow or Bloom) MUST be diluted with water **separately** and kept in separate stock tanks for use with direct-injection systems. Refer to Figure 1 for a standard FloraPro® injection configuration. Allowing concentrated solutions of FloraPro Calcium + Micronutrients and FloraPro Grow or Bloom to mix will result in nutrient precipitation, which may clog or damage irrigation equipment.

HOW TO PREPARE A STOCK SOLUTION

1. In clean stock tank, use fresh water to fill roughly to 70% of desired volume. RO water is preferable but not required. Hot water will greatly speed up the dissolution process.
2. We recommend using a paddle mixer or equivalent mixer to agitate stock tanks while adding FloraPro® fertilizer.
3. Slowly add the specified amount (weighed out, or number of bags) of FloraPro® fertilizer for the targeted stock solution volume to achieve your desired concentration.
4. Once the desired mass of FloraPro® fertilizer has been added, fill the stock tank with water to reach the final targeted stock solution volume.
5. Stock solution will be ready to use once the product is dissolved. There may be a slight amount of turbidity at high concentration levels. This is not unusual.
6. Time required to fully dissolve will vary depending on water quality, temperature and agitation.
7. The stock solution does not need to be agitated once FloraPro® is solubilized, although agitation during injection will provide the ultimate in uniformity. Agitation can be done by using a mechanical device or a submersible air or water pump (protect submersible pumps from corrosion).
8. It is generally recommended to cover the concentrated solution to avoid evaporation and keep in a cool, dry place out of direct sunlight. It's recommended to use a concentrate, stored properly, within 2 weeks of preparation.

Example: to mix 2 bags of FloraPro® at 1 lb / gallon of concentrate volume a grower will first fill their clean stock tank to approximately 35 gallons with hot water (remember: 1 bag is 25 lbs, and so the volume at the end will be equal to 50 gallons, because 2 bags x 25 lbs = 50 lbs.). The grower then adds both bags of FloraPro and agitates the solution. After the product has dissolved, they top up the tank to the final volume of 50 gallons.

Tips and tricks when preparing stock solutions

- RO water is preferable but not required.
- Hot water will greatly speed up the dissolution process.
- We recommend using a paddle mixer or equivalent mixer to agitate stock tank while adding FloraPro® fertilizer. Assure the equipment submerged into concentrates are resistant to corrosion.
- It is always a good idea to check that the concentrated stock solution was prepared properly. This can be done by diluting a small amount of concentrated stock solution and checking EC. For example, to dilute the concentrate 1% (1:100), then measuring EC.

- FloraPro® bags are 11.3 kg (25 lbs). For those without the means to weigh a large amount of fertilizer, use this measurement to make stock solution based on the number of bags needed. For example, when using a 55 gallon drum, mix 2 bags (50 lbs) with the required water to obtain a TOTAL of 50 gallons of solution. This will achieve a 1 lb/ gallon concentrated stock solution. Or if you are using 5 pound bags, you may dissolve the contents of a 5 lb bag in a 5 gallon bucket assuring that fertilizer and water make a total of 5 gallons finished concentrate.
- Keep in mind the solubility limits of each Fertilizer. We recommend never exceeding 80% of the max solubility of each fertilizer. The more concentrated the fertilizer, the longer it takes to fully dissolve when preparing the stock solution.

RECOMMENDATIONS FOR STORING FLORAPRO®

FloraPro is a blend of high-quality mineral salts, and is made with internal good management practices to achieve excellent quality standards. To maintain excellent quality, store as follows:

- Store fertilizer in a cool, dry place out of direct sunlight.
- Avoid high temperatures or high humidity to prevent fertilizer from liquifying or clumping.
- Product is hygroscopic. Opened bags should be closed tightly and stored in airtight containers to prevent hardening.

TABLE 3. SOLUBILITY LIMIT OF FLORAPRO® FERTILIZERS

The following represents an example feed program. For expert growers, go to the General Hydroponics® website to customize the perfect feed program for your specific needs.

Fertilizer Product	Recommended Solubility Limit	
	(grams/litre of water)	(lbs/gallon of water)
FloraPro Grow®	420	3.5
FloraPro Bloom®	420	3.5
FloraPro Ca + Micros®	540	4.5
Never combine FloraPro fertilizers in same concentrated stock tank, precipitation will occur		

TABLE 4. EXAMPLE FLORAPRO® DILUTION TABLE USING 1.0 LB/GAL STOCK SOLUTIONS

The following represents an example feed program. For expert growers, go to the General Hydroponics® website to customize the perfect feed program for your specific needs.

FloraPro® 1 lb / gallon Stock Solution Dilution Table		
Fertilizer Product	Stock Tank	Dilution
FloraPro Grow®	A	1.0 lb / gal
FloraPro Bloom®	B	1.0 lb / gal
FloraPro Ca + Micros®	C	1.0 lb / gal
Never combine FloraPro fertilizers in same concentrated stock tank, precipitation will occur		

FloraPro® 1 lb / gallon Commercial Feedchart: For Fertilizer Injectors									
Medium Feed	Grow (18h photoperiod)			Bloom (12h photoperiod)					
Growth Stage	Late Growth Recipe			Early Bloom Recipe			Mid-Late Bloom Recipe		
Total Nitrogen (ppm)	170			135			120		
Approx. EC (mS/cm)	1.6			1.5			1.4		
Approx. PPM (NaCl 500 scale)	800			750			700		
	mL / gal	%	EC	mL / gal	%	EC	mL / gal	%	EC
FloraPro Ca + Micros	20	0.55%	0.7	20	0.55%	0.7	15	0.40%	0.5
FloraPro Grow	26	0.70%	0.9						
FloraPro Bloom				22	0.59%	0.8	24	0.65%	0.9

EC measured in mS/cm using distilled water with no pH modification.

FloraPro® Feedchart for Day Tanks or Reservoirs						
Medium Feed	Grow (18h photoperiod)		Bloom (12h photoperiod)			
Growth Stage	Late Growth Recipe		Early Bloom Recipe		Mid-Late Bloom Recipe	
Total Nitrogen (ppm)	170		135		120	
Approx. EC (mS/cm)	1.6		1.5		1.4	
Approx. PPM (NaCl 500 scale)	800		750		700	
	grams / 100 gallons water	EC	grams / 100 gallons water	EC	grams / 100 gallons water	EC
FloraPro Ca + Micros	250	0.7	250	0.7	180	0.5
FloraPro Grow	320	0.9				
FloraPro Bloom			270	0.8	290	0.9

EC measured in mS/cm using distilled water with no pH modification.

Feeding charts are recommendations only. Adjustments may be needed based upon environmental conditions, individual grow structure, and use of additional products. Actual results may vary.

When using another injection ratio, the amount of FloraPro will need to be adjusted to reach the correct targeted final nutrient values. For example, if a 1:200 ratio is used, then you will need to double the amount of fertilizer dissolved to prepare the concentrated stock solution.

WATER QUALITY IS THE KEY!

The first step is to determine the rate of FloraPro® Calcium + Micros. To do this, the first step is to consider the water quality intended to be used on the crop. Experienced indoor growers know to use RO (reverse osmosis) treated water to consistently minimize the mineral content of the water and filter out unwanted contaminants. However, some cultivators may be using untreated municipal or well water sources. In this case, a water quality analysis is recommended since water will contain various elements such as calcium, magnesium, sodium, chloride or boron and also, components that will affect growing medium pH control such as bicarbonate and carbonates which may be expressed as alkalinity.

If water quality is poor, a Hydro-Logic® RO system can help to ensure filtered water is delivered to your plants. However, waters having a mild amount of minerals and alkalinity may just require an adjustment in the use rate of FloraPro Calcium Plus Micronutrients compared to standard rates using RO water (which are described in our feed charts). Regardless, please contact Hawthorne and we can assist with having your water tested and any recommendations based on the analytical results.



Hyperlogic System by Hydrologic

Recommended Specialty Nutrients

Hawthorne manufactures other General Hydroponics® nutritional products that may be used in combination with a FloraPro® program. Table 5 lists the various products available, along with their recommended rates of application. Refer to the products' specific labelling directions for further information. For additional support, contact Hawthorne Technical Support or Professional Technical Services.

TABLE 5. RECOMMENDED SPECIALTY NUTRIENTS

Specialty GH Nutrients	Application Rate		Appropriate Growth Stage	Purpose
	(mL/L)	(mL/gal)		
Rapid Start®	0.25-0.5	1-2	Propagation through early flower stages	Helps to promote root growth while enhancing plant vigor and yield
Floralicious® Plus	0.25-0.5	1-2.5	Vegetative through late flower stages	Helps improves plant vitality
CaliMagic®	0.65-1.3	2.5-5	As needed	Prevents common calcium and magnesium deficiencies
Armor Si®	0.25-0.65	1-2.5	Vegetative through late flower stages	Delivers the benefits of Silica and Potassium; helps increases plant strength and stress resistance
Liquid Koolbloom®	0.25-0.65	1-2.5	Early to late flower	Helps enhance production of robust blooms as well as essential oils and fragrance
Dry Koolbloom®	1.25 g/4L Mild	.25 tsp/gal Mild	last 2 weeks of flowering stage	promotes abundant flowering and facilitates ripening in annual flowers and herbs
	2.5 g/4L Aggressive	.5 tsp/gal Aggressive		
Terpinator® / Purpinator®	1.25-2.5 Grow	5-10 Grow	Vegetative through late flower stages	Helps improve overall plant vigor, growth, and encourages strain specific traits
	2.5-7.5 Bloom	10-30 Bloom		
Diamond Nectar™	1.0-2.0	4.0 - 7.5	All stages of growth	High quality nutrient additive



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