Aster

- ✧ **Botanical Name:** *Callistephus chinensis*
- ✧ **Common Name:** Aster
- ✧ **Family:** Asteraceae
- ✧ **Type:** Annual ornamental flowering plant
- ✧ **Origin:** Native to China, widely cultivated globally for cut flowers and garden decoration.

Aster is popular for its vibrant, daisy-like flowers that come in a variety of colors such as purple, pink, red, white, and blue. It is highly valued in floriculture due to its long-lasting blooms and aesthetic appeal.

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2. Plant Characteristics

- ✧ Height: Typically 30–90 cm depending on variety and cultivation conditions.
- ✧ Leaves: Simple, lance-shaped, arranged alternately on the stem.
- ✧ Flowers: Composite flowers with central disc florets and surrounding ray florets.
- ✧ Blooming Period: Generally blooms in late summer to autumn (8–12 weeks after planting).
- ✧ Life Cycle: Short-lived annual, completing its life cycle in one growing season.

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3. Uses:

- ✧ **Cut Flower Production:** Stems are long and sturdy, suitable for bouquets and floral arrangements.
- ✧ **Ornamental Gardening :** Ideal for beds, borders, and containers.
- ✧ **Research Crop:** Due to its predictable growth, it is used in floriculture experiments and hydroponic research.

Aster in Hydroponics

- ✧ Aster (Callistephus chinensis) is a **popular cut-flower crop**.
- ✧ It grows well in **soilless culture**, but requires careful nutrient and EC management.
- ✧ Hydroponics helps get **uniform flower size, better stem length, and controlled flowering**.

1. Best Hydroponic Systems for Aster:

1. **NFT (Nutrient Film Technique):** Good for leafy crops, but not ideal for long-term flowering plants like Aster (roots need more stability).
2. **DWC (Deep Water Culture):** Roots may become too waterlogged → fungal risk.
3. **Drip Irrigation / Dutch Bucket (recommended):**Provides stable root support (using cocopeat, perlite, or rockwool). Controlled nutrient supply.Best suited for flowering crops like **Aster, Gerbera, Chrysanthemum**.

Aster in DWC Hydroponics

Possible

- In DWC, roots stay directly in the nutrient solution → allows fast nutrient uptake.
- Aster can grow if proper aeration is provided.

Challenge:

- **Risk of Root Rot** – Flowering crops like Aster have a long growth cycle, and since roots remain continuously in water in DWC, the chance of fungal infections (Pythium, Fusarium) is high.
- **Plant Support** – Aster needs strong stems and support; in DWC, only net pots with Hydroton/coco chips provide support. For large flowering plants, this may be somewhat unstable.
- **Nutrient Fluctuation** – For long-term crops, maintaining a stable solution is difficult; EC and pH need frequent monitoring.

Precautions if using DWC

- **Strong Aeration:** 1–2 air stones in tank
- **Water Temperature:** 20–24 °C (warm water increases disease risk)
- **Use Net Pots with Media:** Hydroton + cocopeat/perlite mix for stem support.
- **Disinfect System Regularly:** Use H_2O_2 or other sterilizers for the root zone.
- **Change Solution:** Every 7–10 days.

Growing Media for Aster (Hydroponics)

Media	Ratio / Mix	Features	Notes
Cocopeat + Perlite	70:30	Water retention + aeration balance	Most common and easy to manage
Cocopeat + Vermiculite + Perlite	50:25:25	Better moisture + oxygen balance	Suitable for seedling to flowering stage
Perlite + Vermiculite	1:1	Very light & good drainage	Use if system continuously nutrient flow (like NFT or drip)
Rockwool	Pure or with perlite	Sterile, pH neutral	Best for nursery but costly
LECA (Clay balls)	100% or with cocopeat (50:50)	Reusable, high aeration	Best for DWC or Dutch bucket system

Aster – Hydroponic Environmental Requirements

Parameter	Ideal Range	Notes
pH	5.8 – 6.2	Keep stable; check regularly; outside this range nutrient uptake decreases
EC (Electrical Conductivity)	2.0 – 2.5 mS/cm	Too high → leaf burn; too low → poor flowering

Parameter	Ideal Range	Notes
	Young seedlings	1.8–2.0 mS/cm
	flowering plants	2.3–2.5 mS/cm.
Water Temperature	20 – 24°C	Cooler water improves root oxygenation; warmer water → disease risk
Air Temperature	18 – 24°C	Aster prefers mild, cool conditions; avoid frost
Humidity	50 – 70%	Too high → fungal infection (Pythium, Fusarium) risk
Light	12–14 hours/day	200–300 µmol/m²/s (LED or sunlight); sufficient light promotes flowering
Other Notes	–	Long photoperiod helps uniform flowering; heat stress >26°C may reduce stem strength and flower quality

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EC (Electrical Conductivity) – 2.0–2.5 mS/cm

1. What EC Means:

- ✧ EC measures the **total concentration of dissolved salts/nutrients** in your hydroponic solution.
- ✧ Higher EC = more nutrients; Lower EC = fewer nutrients.
- ✧ Units: **mS/cm (milliSiemens per centimeter)**.

2. Ideal Range for Aster:

- ✧ **2.0 – 2.5 mS/cm** is ideal for hydroponic Aster.
- ✧ Ensures the plant gets enough nutrients for **healthy stem growth, leaf development, and flowering**.

3. Effects of Too High EC (>2.5 mS/cm):

- ✧ **Leaf Burn / Tip Burn:** Excess salts cause osmotic stress; water moves out of leaf cells → burning at leaf tips.
- ✧ **Stunted Growth:** Roots may be damaged; nutrient uptake becomes inefficient.
- ✧ **Reduced Flower Quality:** Flower size and stem length may decrease.

4. Effects of Too Low EC (<2.0 mS/cm):

- ✧ **Nutrient Deficiency:** Plant doesn't get enough macro- and micronutrients (N, P, K, Ca, Mg, Fe).
- ✧ **Poor Flowering:** Stems may be weak, fewer blooms, delayed flowering.
- ✧ **Leaf Yellowing or Poor Leaf Development:** Leaves may turn pale due to nitrogen or iron deficiency .

5. Managing EC in Hydroponics:

- ✧ **Monitor Daily:** Use a reliable EC meter.
- ✧ **Adjust Nutrients Gradually:** Add concentrated nutrient solution to raise EC or dilute with water to lower EC.

- ✧ **Account for Crop Stage:** Young seedlings may need slightly lower EC (1.8–2.0 mS/cm), while flowering plants can handle 2.3–2.5 mS/cm.
- ✧ **Temperature Factor:** Warm water increases nutrient uptake; adjust EC accordingly to avoid over-fertilization.

Aeration in DWC

- ✧ In a DWC (Deep Water Culture) system, the plant roots stay directly in the water (nutrient solution).
- ✧ If there is no oxygen in the water → the roots will "suffocate" and root rot will occur.
- ✧ Therefore, it is essential to maintain dissolved oxygen (DO) in the water.

What is an Air Stone?

- ✧ A small porous stone or mesh-like device commonly used in aquariums.
- ✧ It is connected to an air pump.
- ✧ Air comes from the pump → tiny bubbles come out of the stone.
- ✧ These bubbles dissolve oxygen into the nutrient water.

Aster in NFT System (Nutrient Film Technique)

Advantages :

- ✧ The nutrient film is continuously in contact with the roots → faster nutrient uptake.
- ✧ Saves water and nutrients.
- ✧ Clean and low-maintenance system.

Challenges for Aster :

- ✧ **Plant Size & Growth Cycle** – Aster is a long-duration crop (90–120 days), whereas NFT is mainly suited for short leafy greens (like spinach, lettuce, basil). In long crops, roots can block the NFT channels.
- ✧ **Support System Needed** – Aster stems and flowers are heavy, so extra plant support is required in NFT pipes.
- ✧ **Root Space** – Aster needs a deep and stable root zone. In NFT, roots stay in a thin nutrient film, which can form dense root mats and block the channels.

If we still want to grow Aster in NFT:

- ✧ Use **wide channels** (4–6 inch PVC pipes).
- ✧ Maintain **plant spacing of 20–25 cm** (avoid overcrowding).
- ✧ Add **extra support sticks** for flowers.

- ✧ Maintain **EC range: 2.2–2.3 mS/cm** (same as DWC).
- ✧ **Clean channels regularly** to prevent root clogging.

Standard Nutrient Requirement for Aster (Hydroponic DWC)

Nutrient	Recommended Concentration (ppm)	Target ppm	Role in Aster
Nitrogen (N)	150 – 180 ppm	165 ppm	Vegetative growth, stem length
Phosphorus (P)	40 – 50 ppm	45 ppm	Root growth, bud initiation
Potassium (K)	180 – 220 ppm	200 pm	Strong stems, flower color & size
Calcium (Ca)	140 – 160 ppm	150 ppm	Cell wall strength, disease resistance
Magnesium (Mg)	40 – 60 ppm	50 ppm	Chlorophyll, prevents interveinal yellowing
Sulfur (S)	50 – 70 ppm	60 ppm	Protein synthesis, flower quality
Iron (Fe)	2.0 – 3.0 ppm	2.5 ppm	Prevents chlorosis
Manganese (Mn)	0.5 – 1.0 ppm	0.7 ppm	Enzyme activity
Zinc (Zn)	0.05 – 0.1 ppm	0.1 ppm	Hormone regulation, leaf expansion
Copper (Cu)	0.05 ppm	0.005 ppm	Enzyme activation
Boron (B)	0.3 – 0.5 ppm	0.4 ppm	Flower & seed development
Molybdenum (Mo)	0.05 ppm	0.05 ppm	Nitrogen metabolism

Nutrient Requirement

- ✧ **Vegetative stage:** Higher nitrogen for leaf and stem growth.
- ✧ **Flowering stage:** Higher potassium and phosphorus for bud formation & flower quality.
- ✧ Micro-nutrients like **Fe, Mn, Zn, B, Mo** are essential for color and petal formation .

Link of Nutrient Source for Aster
:https://docs.google.com/spreadsheets/d/1rqk6-aB_zssgVop405Xy473vgkeZ4Lzb/edit?usp=sharing&ouid=113141058233737100131&rtpof=true&sd=true

				Macronutrients						Micronutrients					
sr .no	Nutrient	Fertilizer source		N	P	K	ca	mg	S	Fe	Mn	Zn	Cu	B	Mo
1	Nitrogen	13:00:45	Potassium Nitrate	13%		45%									
		Calcium nitrate		15.50%			19%								
2	Phosphorus	0:52:34	Mono Potassium Phosphate		52%	34%									
3	Pottasium	13:00:45	Potassium Nitrate	13%		45%									
		0:00:50	Potassium Sulphate			50%			17. 5%						
4	calsium	Calcium nitrate		15.50%			19%								
5	magnesium	MgSO4	Magnesium sulfate					9.50%	12%						
6	Sulfur	Magnesium sulfate						9. 5%	12%						
		Potassium sulfate							17. 5%						
7	Micronutrients	Rexolin Combi II								2.50%	1.00%	3.00%	1.00%	0.50%	0.10%

Aster hydroponic Dosing :

Fertilizer (Chemical Name)	Purpose / Element Source	Dose per 1 L (g)	Dose per 20 L (g)
Calcium Nitrate	Nitrogen + Calcium	0.904 g	18.08 g

Fertilizer (Chemical Name)	Purpose / Element Source	Dose per 1 L (g)	Dose per 20 L (g)
Potassium Nitrate (KNO_3) 13:00:45	Nitrogen + Potassium	0.382 g	7.64 g
Monopotassium Phosphate (KH_2PO_4) 00:52:34	Phosphorus + Potassium	0.188 g	3.76 g
Magnesium Sulphate ($MgSO_4 \cdot 7H_2O$)	Magnesium + Sulphur	0.478 g	9.56 g
Rexolin Combi II (EDTA Chelated Micronutrient Mix)	Fe + Mn + Zn + Cu + B + Mo	0.05 g	1.0 g