HYDROPONICS · NUTRIENTS · KNOWLEDGE

Understanding EC, pH & Lighting

The three invisible factors that decide whether your hydroponic crop thrives or struggles — how to measure them, what ranges to target, and how to fix them when they drift.

EC / TDS / PPM
Nutrient Strength

pH 5.5–6.5
Nutrient Availability

PPFD / DLI
Light Intensity & Duration

Contents

Three fundamentals that govern nutrient uptake and photosynthesis in every hydroponic system.

NUTRIENT STRENGTH

Electrical Conductivity (EC)

01

The single most important number for knowing how much nutrient your plants are actually getting.

Electrical Conductivity measures a solution's ability to conduct an electrical current. Pure water conducts almost no electricity — but the moment mineral salts (like calcium nitrate, potassium sulphate, or the ions in your nutrient concentrate) dissolve into it, those charged ions become carriers for electrical current. The more dissolved nutrient ions present, the higher the EC reading. In short: **EC is a direct proxy for how concentrated your nutrient solution is.**

Why EC matters

Too little EC starves the plant of nutrients, causing slow growth and pale leaves. Too much EC can burn roots, cause leaf-tip scorch, and force the plant to fight osmotic stress just to draw in water — a condition growers call nutrient lockout or salt stress.

EC, TDS and PPM — What's the Difference?

These three terms are often used interchangeably, but they measure slightly different things:

1. **EC (Electrical Conductivity)** is measured directly with a probe, in millisiemens per centimetre (mS/cm) or microsiemens per centimetre (μS/cm). It is the primary, most reliable measurement — independent of meter brand or calibration assumptions.
2. **TDS (Total Dissolved Solids)** estimates the weight of dissolved minerals in the water, expressed in parts per million (ppm) or mg/L. It is calculated from the EC reading using a conversion factor.
3. **PPM (Parts Per Million)** is simply the unit TDS is expressed in — the two terms are often used to mean the same thing.

The scale trap — Not all meters convert EC to PPM the same way. Some use the "500 scale," others the "700 scale" — the same EC 1.8 mS/cm reads as 900 ppm on one meter and 1260 ppm on another. Whenever possible, work directly in EC (mS/cm) to avoid this confusion entirely.

Converting Between Scales

EC (mS/cm) × 500 = PPM (500 scale)

Also common: EC × 700 = PPM on the "700 scale." Always check which scale your meter uses.

YOUR READING	500 SCALE (PPM)	700 SCALE (PPM)
EC 1.0 mS/cm	500 ppm	700 ppm
EC 1.8 mS/cm	900 ppm	1,260 ppm
EC 2.5 mS/cm	1,250 ppm	1,750 ppm

How to Measure EC Correctly

1. **Test your source water first.** Tap water often starts at EC 0.3–0.8 mS/cm before you add anything — always subtract this baseline for accurate dosing.
2. **Use a meter with ATC** (Automatic Temperature Compensation). Warmer water conducts electricity better, so temperature swings can distort readings on cheaper meters.
3. **Calibrate regularly** using a calibration solution of known EC — meter drift is one of the most common causes of "unexplained" nutrient problems.
4. **Adjust gradually.** Change EC by no more than 0.2–0.5 mS/cm per day to avoid shocking the root system.

Rule of thumb — A typical hydroponic reservoir runs between EC 1.2 and EC 3.5 depending on crop and growth stage. Seedlings and leafy greens sit at the lower end; fruiting crops in full flower sit at the higher end.

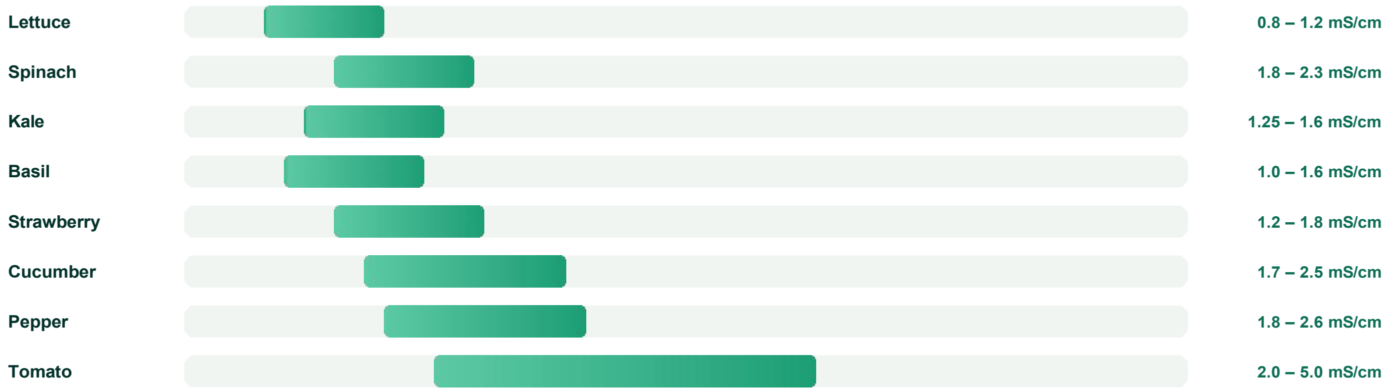
REFERENCE CHART

EC by Crop & Growth Stage

02

Feeding all crops from one reservoir? Group plants with similar EC needs together for best results.

Feed lettuce with an EC meant for tomatoes and it turns bitter; feed tomatoes with an EC meant for lettuce and the fruit tastes watery and thin. Matching EC to the crop — and adjusting as it moves from seedling to vegetative to flowering — is one of the highest-leverage habits a grower can build.



Growth Stage Matters Too

- **Seedling stage:** start at the low end of the crop's range, or lower — young roots are more sensitive to salt concentration.
- **Vegetative stage:** The crop's standard/mid-range EC applies as the plant builds leaf and stem mass.
- **Flowering/fruiting stage:** Many fruiting crops tolerate — and benefit from — the higher end of their range to support fruit development.

With neoKesan — neoFolix and neoPonic are formulated for the leafy-green EC range; neoBloom's higher-strength formulation (X2 + X3) is built for the flowering/fruiting range.

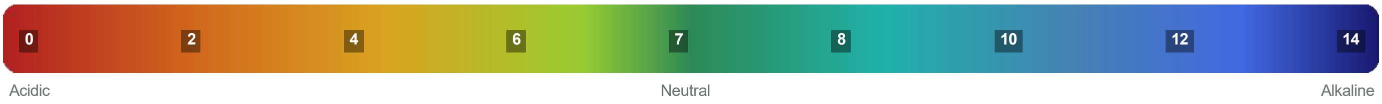
NUTRIENT AVAILABILITY

Understanding pH

03

The right EC means nothing if the nutrients aren't chemically available for the roots to absorb.

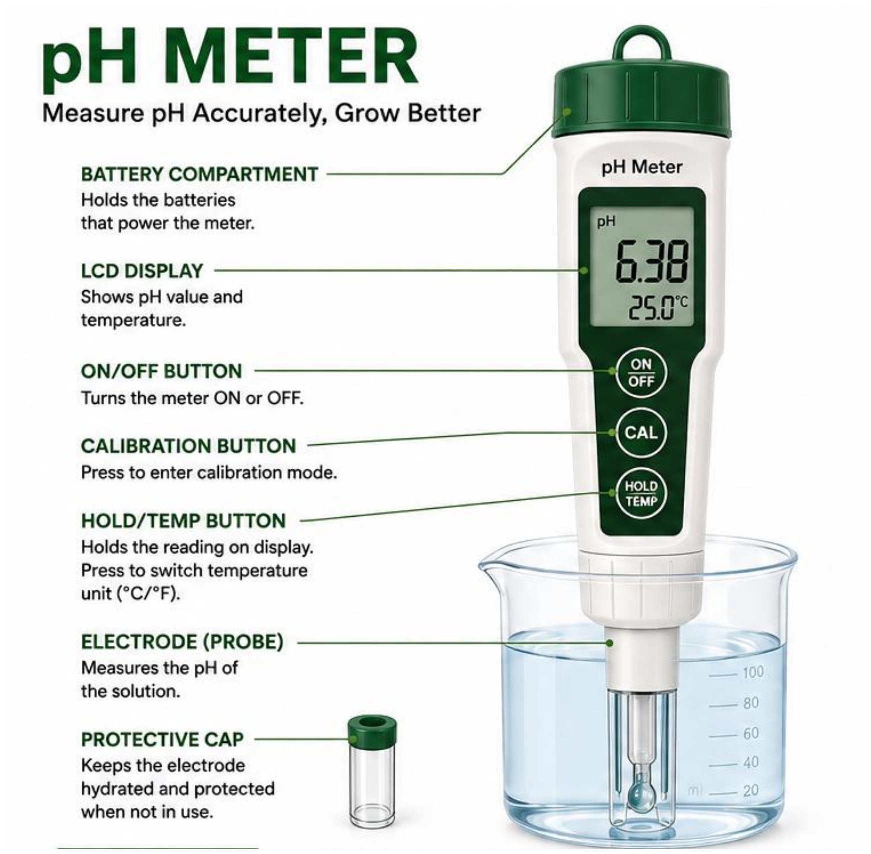
pH measures how acidic or alkaline a solution is, on a scale of 0 (most acidic) to 14 (most alkaline), with 7 as neutral. In hydroponics, pH directly controls which nutrients are chemically available in a form roots can absorb — even a perfectly-dosed nutrient solution becomes useless to the plant if pH pushes those nutrients out of reach. This is called **nutrient lockout**.



The Hydroponic Sweet Spot

For most hydroponic crops, the ideal pH range is **5.5 to 6.5** — most nutrients reach peak solubility in this slightly acidic band. Commercial growers using automated pH controllers often narrow this range further to 5.8–6.0 to reduce the frequency of corrections and maintain tight nutrient availability.

Outside the range — Above pH 6.5, iron and zinc become harder to absorb. Below pH 5.5, calcium and magnesium become unavailable, while copper and iron can reach toxic concentrations. Small pH swings cause outsized nutrient-uptake problems compared to small EC swings.



DIAGNOSTIC REFERENCE

pH & Nutrient Lockout

04

Which nutrients disappear at which pH extremes — and how to read the symptoms.

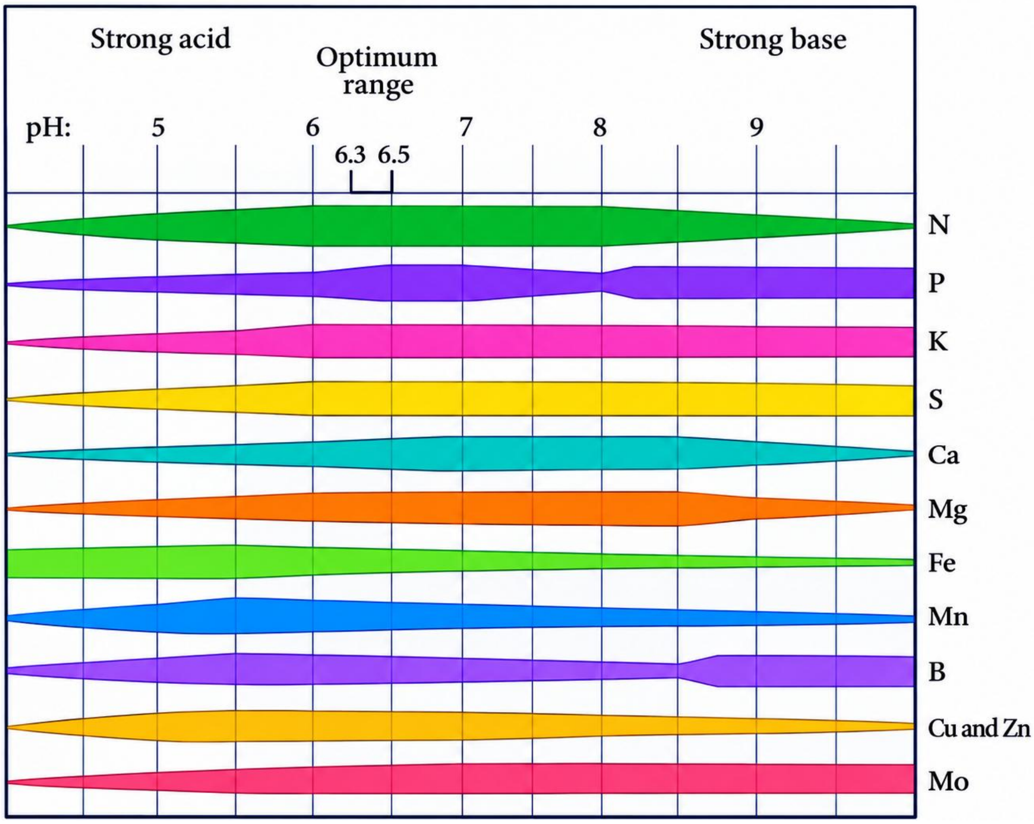
NUTRIENT	PEAK AVAILABILITY	LOCKS OUT WHEN
Nitrogen (N)	pH 6.0 – 8.0	Rarely an issue — wide availability window
Phosphorus (P)	pH 6.0 – 7.0	Below 5.5 (binds with iron/aluminum); above 7.5 (binds with calcium)
Potassium (K)	Broad range	Very acidic conditions with competing ions
Calcium & Magnesium	pH 6.0 – 7.5	Below pH 5.5 — can trigger blossom-end rot in tomatoes/peppers
Iron & Zinc	pH below 6.5	Above pH 6.5 — causes interveinal yellowing (chlorosis)
Sulphur (S)	Broad range	Slight decrease in very alkaline conditions

Why pH Drifts

- As plants absorb nutrients, they release H^+ or OH^- ions, gradually shifting the solution pH
- Ammonium-based nitrogen sources acidify the solution over time
- Calcium-heavy formulations tend to raise pH
- Evaporation concentrates the solution and can shift the pH in small reservoirs
- Growing media (especially inorganic ones like gravel) can buffer or raise pH

Correcting pH

Adjust gradually and re-check — don't chase a single exact number. If your reading falls between 5.8 and 6.5, most crops are fine and no correction is needed. Use dedicated pH-up or pH-down solutions rather than household acids like vinegar, which are too weak to hold pH long-term and add unwanted compounds to the solution.



The effect of soil pH on the availability of plant nutrients.

PHOTOSYNTHESIS FUEL

Lighting Fundamentals

05

EC and pH control what's available to the roots — light determines how fast the plant can use it.

Indoor and greenhouse hydroponic growers must replace what the sun does for free outdoors. Two metrics govern this: **PPFD**, the intensity of usable light hitting the canopy at any given moment, and **DLI**, the total accumulated light a crop receives across a full day. Spectrum — the mix of wavelengths — shapes how the plant grows, not just how fast.

PPFD — Photosynthetic Photon Flux Density

Measures the number of photosynthetically active photons landing on a given area each second (μmol/m²/s). Think of it as light "intensity" at plant level — a snapshot reading, not a daily total.

DLI — Daily Light Integral

The total photosynthetically active light a crop receives over 24 hours (mol/m²/day) — calculated as PPFD × photoperiod (in hours) × 0.0036. A high PPFD reading means little if the photoperiod is too short to accumulate the DLI a crop needs.

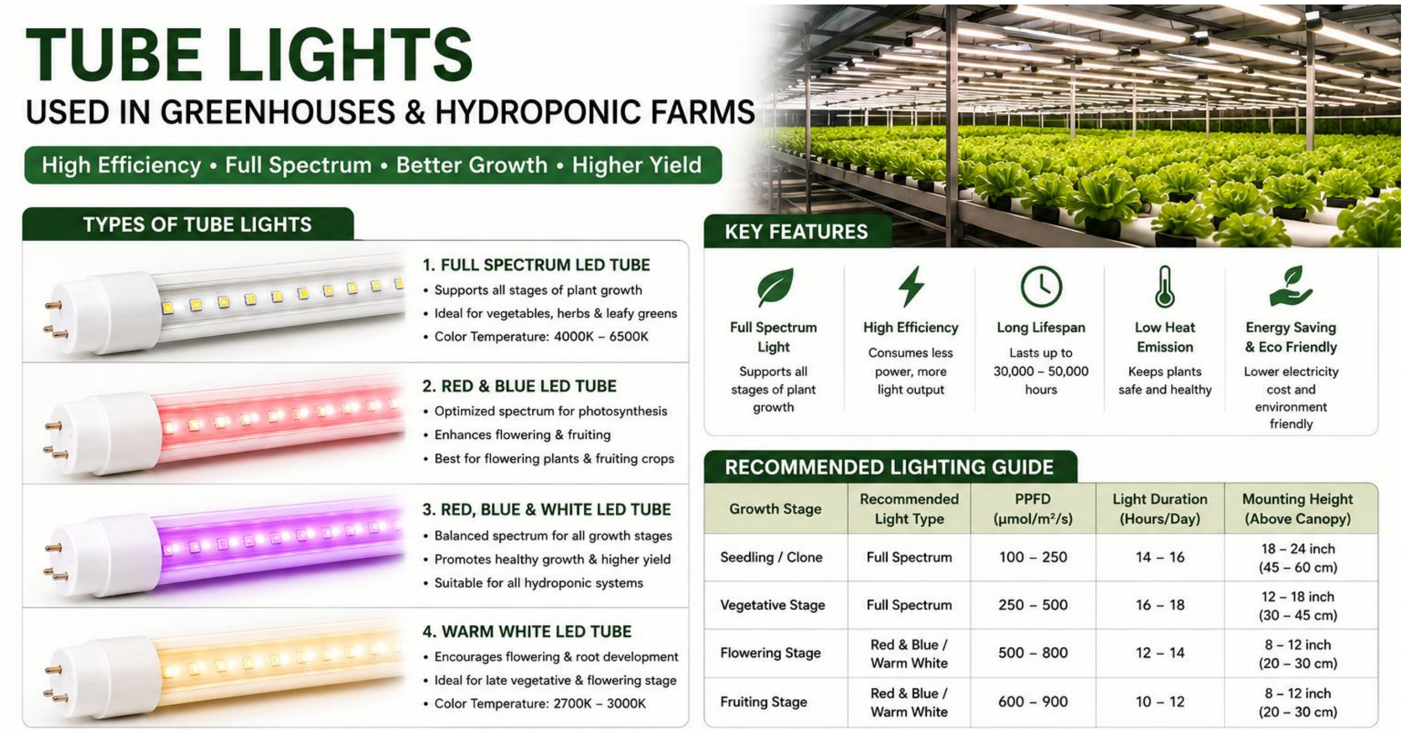
$$DLI = PPFD \times \text{Photoperiod (hrs)} \times 0.0036$$

Example: PPFD 300 μmol/m²/s over a 16-hour photoperiod ≈ 17.3 mol/m²/day

Light Spectrum

UV | Blue 400–500nm | Green | Yellow | Red 600–700nm | Far-Red

Blue light promotes compact, sturdy vegetative growth. **Red light** drives flowering, fruiting, and biomass accumulation. Full-spectrum LEDs deliver both, which is why they work across crop types without needing to switch fixtures between growth stages.



REFERENCE CHART

Light by Crop & Growth Stage

06

Target PPFD and DLI ranges, drawn from controlled-environment horticulture research.

CROP / STAGE	PPFD (MMOL/M²/S)	DLI (MOL/M²/DAY)	TYPICAL PHOTOPERIOD
Seedlings (all crops)	50 – 150	8 – 12	16 – 20 hrs
Leafy Greens (lettuce, spinach)	150 – 350	12 – 17	14 – 16 hrs
Herbs (basil, mint)	200 – 400	14 – 18	14 – 16 hrs
Strawberry	300 – 350	15 – 20	16 – 18 hrs
Vegetative (tomato, pepper, cucumber)	500 – 700	20 – 30	16 – 18 hrs
Flowering & Fruiting	600 – 900	25 – 35	12 – 16 hrs

Fruiting crops need darkness too — At least 4–6 hours of uninterrupted darkness per day prevents physiological stress and supports normal flowering. Chasing a higher DLI by extending the photoperiod indefinitely can backfire.

Signs of Poor Lighting

Too Little Light

- Pale, yellowing leaves
- Leggy, stretched stems reaching for light
- Slow growth, delayed flowering

Too Much Light

- Leaf bleaching or scorching
- Heat stress at the canopy
- Reduced photosynthetic efficiency

PRACTICAL ROUTINE

Putting It All Together

07

A simple monitoring rhythm keeps EC, pH, and light working in your favour instead of against it.

Daily

1. Check the reservoir EC and pH — top up or correct if they have drifted beyond your crop's range.
2. Visually inspect the canopy for stretching, scorching, or discoloration — early light or nutrient stress shows here first.

Weekly

1. Fully replace the nutrient solution in small reservoirs to avoid concentration drift from evaporation and uneven uptake.
2. Recalibrate EC and pH meters against a known reference solution.
3. Check light distance from canopy and adjust as plants grow, especially in fast-growing DWC and NFT setups.

At Each Growth Stage Transition

1. Step EC up gradually (0.2–0.5 mS/cm per day) as you move from seedling to vegetative to flowering.
2. Adjust light photoperiod and intensity to match the new stage's PPFD/DLI targets.
3. Switch nutrient formulation where appropriate — e.g. from a vegetative-stage to a flowering-stage blend.

With neoKesan — Every neoKesan product guide includes a recommended TDS/EC range for that formula and growth stage — pair it with the pH guidance here for a complete feeding routine.

GROW WITH US

Write to neoKesan

We're an education-first brand — beyond the bottle, we guide our growers through the intricacies of growing, from first sprout to full harvest. Master EC, pH, and light, and the rest follows.

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