

Table 1. Expected range of values for soilless media parameters analyzed according to SME procedure (Warncke 2011)

Parameter	Range	Nutrient Balance ¹
pH	5.0–6.5	—
EC ²	<300 mhos×10 ⁻⁵ /cm	—
EC	< 3 mS/cm	—
IN-N	40–200 ppm	—
NO ₃ -N	40–200 ppm	8–10%
NH ₄ -N	0–20 ppm	<3%
P	5–20 ppm	
K	30–300 ppm	11–13%
Ca	20–250 ppm	14–16%
Mg	15–150 ppm	4–6%
Na	—	<10%
Cl	—	<10%

¹ Nutrient balance =
[nutrient concentration (ppm) × 100] ÷ EC (ppm)

$$EC \text{ (ppm)} = EC \text{ mhos} \times 10^{-5}/\text{cm} \times 7.0$$

or

$$EC \text{ (ppm)} = \text{mS}/\text{cm} \times 700$$

² The NCDA&CS Agronomic Division measures EC in units of mhos×10⁻⁵/cm.

Additional resources

Warncke D. 2011. Recommended test procedures for greenhouse growth media. In: Sims JT, Wolf A, editors. [Recommended soil testing procedures for the northeastern United States](#). Newark (DE): Univ Del Agric Exp Station. Northeastern Regional Bulletin 493. p 103–10.

Whipker B. 1998. [Submission procedures for root substrate, water, fertilizer solution and plant tissue samples](#). Raleigh (NC): NC State Univ Dept Hort Sci & NC Coop Ext Serv. Horticulture Information Leaflet 560.

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sampling, interpreting agronomic reports or
implementing recommendations,
contact the regional agronomist
assigned to your county.*

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Agronomic Sampling
Folder No. 9

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Soilless Media Analysis: Sampling, Results & Rationale



Floriculture, Nursery & Greenhouse Crops

Soilless media are light-weight substrates used in containerized production of floriculture and nursery crops, greenhouse vegetable and tobacco transplants. Common components of soilless substrates include compost, peat moss, perlite, pine bark, sand and/or vermiculite.

Unlike mineral soils, soilless substrates tend to have little capacity to supply or retain nutrients or to buffer pH. Consequently, container nutrient levels and pH are dynamic. Regular monitoring of pH, electrical conductivity and nutrient levels makes it possible to fine-tune fertilization programs and keep them on track.

Saturated media extract (SME) procedure is used by the Agronomic Division for soilless media analysis. It is preferred over traditional soil testing for laboratory analysis of container substrates (Warncke 1998). The Division offers the SME procedure through its Plant, Waste, Solution and Media laboratory.

Methods and measures

SME measures electrical conductivity (EC), nitrate-nitrogen (NO₃-N), ammonium-nitrogen (NH₄-N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), sulfur (S), sodium (Na) and chloride (Cl). EC units are mhos×10⁻⁵/cm, and nutrient concentration units are parts per million (ppm). pH is measured on a 1:1 sample-to-water (by volume) slurry.

Rationale for sampling

Soiless media can be tested preplant (in bulk) or postplant (in container) for predictive or diagnostic purposes. **Predictive (routine)** results are useful in monitoring effectiveness of fertilizer programs. **Diagnostic (problem)** results can help pinpoint suspected nutrient-related causes.

Predictive sampling is a good way to monitor EC, pH and nutrient-level trends and balances. **To obtain meaningful test results that are comparable over time, be consistent in sampling procedure and timing.** Always collect samples at the same time interval after irrigation or fertigation.

Diagnostic sampling involves the collection of multiple samples for comparison. **When trying to diagnose a suspected nutrient problem, collect separate media samples from “good” and “bad” areas.** Collect and submit other types of comparative samples—plant tissue, source water and/or nutrient solution—from “good” and “bad” areas as you see fit.

Sampling procedures

A **representative** sample consists of a mixture of five to 10 subsamples. Subsamples from dry, bulk substrates should be collected from the center of individual bags or from random areas in a stock pile. In postplant situations, each subsample should

- ▶ be collected from a separate container,
- ▶ represent the same set of conditions (i.e.,

plant species, stresses, appearance and management practices),

- ▶ NOT be taken from containers that are located on the edges of a bench or block, and
- ▶ NOT be taken from the top or bottom ½ to 1 inch of container media.

To collect subsamples from a small pot,

- ▶ remove the root mass, and
- ▶ pinch or grab a wedge of substrate from the center of the root mass.



To collect subsamples from a large pot,

- ▶ brush aside the top one inch of media, and
- ▶ use a probe or trowel to collect substrate from the center of the pot.



Once subsamples are combined and mixed, the **total sample volume should be at least one quart, but two quarts are preferable.**

Samples from dry, bulk loads of substrate should be moistened before submission to the lab. Moisture will activate any lime present and provide a more accurate pH reading. Place sample in a sturdy plastic bag, add ⅓ to ½ cup water and knead it in; or place sample in a pot, water until drainage stops and bag as usual.

Sample submission

Place each sample in a sealable, plastic bag. Using a permanent marker, label it clearly with the sample ID as well as your name and address. Fill out the *Soiless Media Sample Information* form (available at www.ncagr.gov/agronomi/forms.htm). Package sample(s), completed information form and appropriate fee together. Submit to the Agronomic Division’s Plant/Waste/Solution/Media Section.

SME costs \$5 per sample for North Carolina residents and \$25 for out-of-state residents.

The report

Select the **Find Your Report (PALS)** link on the [Agronomic Division home page](#) to access the report-search utility. Reports remain accessible online for about three fiscal years.

Reports, especially those for diagnostic samples, often include comments by an agronomist. These remarks are provided largely in response to details supplied by the client on the sample information form. The more information provided, the more assistance the agronomist is likely to be able to offer.

When interpreting laboratory test results, consider the spectrum of potentially relevant factors, including plant species, fertilizer type, fertilizer rate, irrigation volumes and time into crop production. You may find it useful to compare your report data with some of the commonly expected values listed in Table 1.