PLANT DOCTOR 405 • FIELD ASSESSMENT

# Module 8 Review: Low-Friction Growing Systems

**Course Track:** Phase 3 — Applied Living Soil & Low-Friction Growing

**Evaluation:** 10 Diagnostic Inquiries • Container Physics, Air-Pruning & SIPs

**Instructions:** Apply Module 8 container root dynamics, sub-irrigated planter (SIP) mechanics, and living soil formulation principles to each scenario. Select the single most scientifically and culinarily accurate deduction.

## Low-Friction Growing Inquiries (Questions 01–10)

**01. In the context of home food production, what is the core bottleneck of the "agrarian trap"?**

**A)** Purchasing heirloom seeds that lack commercial patent tags.

**B)** Tilling large native plots that create weeds, compaction, and burnout.

**C)** Using drip irrigation instead of overhead high-pressure hoses.

**D)** Growing leafy greens during early spring cold-temperature windows.

**02. Why does growing high-Brix vegetables in standard rigid plastic nursery pots consistently fail?**

**A)** Impermeable walls force root circling, strangling terminal feeder hairs.

**B)** Plastic reacts chemically with peat moss to lower soil pH below 3.0.

**C)** Plastic emits ethylene gas that forces premature apical flowering.

**D)** Drainage holes in plastic pots allow beneficial mycorrhizae to escape.

**03. What physiological phenomenon occurs when a root tip reaches the dry, breathable boundary of a fabric pot?**

**A)** The root tip rots, sending systemic ethylene signals through the stem.

**B)** Air-pruning terminates the lead tip, triggering dense lateral feeder branching.

**C)** The root pierces through the fabric to search for open groundwater.

**D)** The plant converts its root carbohydrates into woody structural lignin.

**04. How does air-pruning multiply a plant's capacity to synthesize secondary metabolites and high Brix?**

**A)** Thick encircling taproots are forced to store massive amounts of free water.

**B)** Fine lateral feeder hairs—which house mycorrhizae—multiply 5× to 10×.

**C)** It prevents the plant from absorbing trace silicon and volcanic minerals.

**D)** It stops root exudate secretion, keeping all sugars inside the upper fruit.

**05. In midsummer heat, why do porous fabric containers protect root microbiology better than plastic pots?**

**A)** Dark plastic absorbs radiant heat (>45°C), while fabric permits evaporative cooling.

**B)** Fabric containers completely block ambient oxygen from entering soil pores.

**C)** Plastic containers allow excess wind to chill soil below biological thresholds.

**D)** Fabric walls attract subterranean worms directly from patio concrete.

**06. How does a Sub-Irrigated Planter (SIP) deliver moisture to the root zone without overhead watering?**

**A)** High-pressure pneumatic pumps spray mist into an open air chamber.

**B)** Soil wicking columns draw water upward by capillary action like a sponge.

**C)** Gravity pulls water downward through perforated surface tubes daily.

**D)** Plant roots submerge entirely in a standing, unoxygenated water bath.

**07. What critical role does the perforated air screen and overflow drain port serve in a SIP?**

**A)** Creates an oxygen buffer gap to prevent saturation and anaerobic root rot.

**B)** Allows synthetic liquid fertilizer salts to concentrate at the base.

**C)** Drains 90% of soil minerals out of the system after every rainfall.

**D)** Seals the water reservoir from absorbing any atmospheric air.

**08. Why is native garden topsoil or heavy clay strictly prohibited in container living-soil mixes?**

**A)** Native soil contains microscopic insects that eat through fabric pots.

**B)** In enclosed pots, fine clay particles compact into an airless, suffocating brick.

**C)** Native clays lack parent minerals required for vegetable growth.

**D)** Topsoil carries volcanic basalt dust that prevents capillary wicking.

# Module 8 Answer Key & Agronomic Explanations

**01 • B The Agrarian Trap Breakdown**
Most home growers fail by assuming food production requires sprawling tilled in-ground plots. They become trapped battling native soil compaction, weed pressure, and erratic watering, turning what should be a culinary asset into exhausting labor.

**02 • A Root Circling & Vascular Strangulation**
When roots encounter the slick, impenetrable wall of a plastic pot, they deflect downward and spiral into an entangled perimeter knot. Circling roots thicken and constrict one another, preventing terminal branching and choking nutrient transport.

**03 • B Air-Pruning Physiology**
When a root tip reaches permeable fabric, exposure to ambient air naturally dehydrates and prunes the apical tip. This removes apical dominance within the root system, triggering a surge of cytokinins that forces explosive lateral feeder branching throughout the interior.

**04 • B Feeder Hair Surface Area Multiplication**
Nutrient ingestion and microbial carbon exchange occur exclusively along microscopic root-tip hairs, not thick woody taproots. Air-pruned fabric systems generate 5× to 10× more active feeder root tips, dramatically increasing Brix synthesis.

**05 • A Thermal Dissipation & Evaporative Cooling**
Dark plastic containers absorb radiant heat, pushing midsummer root-zone temperatures past 45°C (113°F), which kills beneficial microbes and induces root dormancy. Porous fabric sidewalls breathe, dissipating heat via evaporative cooling.

**06 • B Capillary Wicking Dynamics**
Sub-Irrigated Planters utilize capillary draw. Soil wicking feet extend into a bottom water reservoir, drawing moisture upward against gravity like a sponge to maintain a constant, steady 50% to 60% field moisture capacity without surface compaction.

**07 • A The Oxygen Buffer Gap**
A SIP incorporates a perforated screen and overflow port to maintain an air gap above the reservoir. This ensures roots never sit in stagnant, saturated standing water, preventing anaerobic fermentation while allowing roots to breathe freely.

**08 • B Perched Water Tables in Containers**
Native garden topsoil and heavy clays lack the macro-pore structure required in containers. Without open biological aggregation, fine clay platelets settle into a dense, impermeable block that suffocates root respiration and traps standing water.

**09 • C The 1/3 Container Architecture**
A resilient container living soil requires 1/3 coarse aeration (pumice, perlite, rice hulls) to guarantee permanent void spaces, 1/3 water retention (peat moss or coco coir) for capillary wicking, and 1/3 biological charge (thermal compost and worm castings).

**10 • A Patio High-Density Solar Mapping**
Placing tall, trellised crops (climbing tomatoes, pole beans) at the rear captures vertical southern and western solar radiation without casting shade over mid-tier SIP greens or front-border herb containers, maximizing culinary output per square foot.

**MODULE 8 MASTERY TAKEAWAY**
Culinary food security and high-Brix produce do not require acreage or backbreaking field labor. By deploying air-pruning fabric containers and sub-irrigated wicking systems charged with mineral-dense living soil, a compact patio footprint can consistently outperform an unmanaged garden plot with only minutes of weekly care.