

SUSTAINABLE PEAT EXTENDERS FOR HORTICULTURE MEDIA



phytoSERV
SERVING GROWERS

March 31, 2026 COHA Research Meeting

COHA Cluster4 - Project #002

Dr. Jeanine West, PhytoServ

Can a portion of peat be replaced to decrease environmental impact??



What is so special about peat??

What is used by horticulture sector?

- White *Sphagnum* peat moss (H1-H3 grade) – younger, less decomposed, more favourable structure (particle size: fine for prop., med-coarse other), improved aeration
- Some additives (clay, perlite, lime, fertilizer)

Low pH

Water holding capacity (WHC_{max})

>20% air volume content

>25% high water availability

High water buffering capacity

Source, age, extraction method, & processing can influence characteristics

Project Objectives/Scope

- **AAFC/COHA** – C sequestration, decreasing C footprint
 - **Grower** – how to be successful with media when peat content changes?
 - “Deployment Protocols” needed
 - Peat supply inconsistencies
- Research – media & component characterization
- GH and field trials



Official Objectives

1. The investigation of potential peat alternatives/extenders (e.g., wood fibre, CCM, compost, biochar) for availability, sustainability, cost, and consistency as well as the physical, chemical, and biological media properties of the various media; and
2. The evaluation of various extenders on crop yield and crop characteristics (including root morphology and tissue analysis) through trials on at least six plant varieties.

Objective 1 – Extender Options

Actions	Progress
Identify extenders	Primary options identified
Media and component analyses	Submitted/in process
Summarise: <ul style="list-style-type: none"> • Characteristics (physical, chemical) • Availability • Cost • Consistency • Sustainability 	In progress: <ul style="list-style-type: none"> • Media suppliers contacted • Literature ‘survey’ • Analyses • Environmental impact study • Summary report to be completed
Annotated bibliography	Ongoing, shared with TAC
Technical Advisory Meeting	November 26, 2025 Spring 2026 TBD

Objective 2 – Trials with Extenders

Actions	Progress
<p>KPU Trial Design</p> <ul style="list-style-type: none">• Plant species• Media options• Farm collaborator	<p>Plants/Media determined and contract signed</p> <p>Trial initiated February 2026</p> <p>Site & collaborator visit March 2026</p>
<p>U Laval Trial Design</p> <ul style="list-style-type: none">• When to initiate trials?• Farm collaborator• General trial and analyses plan	<p>MSc student (Danielle 😊) selected</p> <p>Site & collaborator visit January 2026</p> <p>Contract signed</p> <p>Ready for summer 2026!</p>
<p>Ontario Trials</p> <ul style="list-style-type: none">• Potential OMAFA collaboration – Hydrangea• Identify additional 2 farms for outdoor/nursery stock trials	<p>Hydrangea - Initial trial layout shared & meeting planned for later this week</p> <p>2 nursery/outdoor growers contacted & were willing to participate</p>

Key Challenges/Risks

- 5-year project in 2.5 years!
- Lots of proprietary research but it's not easily accessible
- Want to be able to give growers something useful at the end – what to expect, how to grow plants in media they may not be familiar with
- Collaboration is our biggest asset 😊



Key Questions Tackled

- Which species to trial?
 - Same Laval & KPU, or different?
 - Minimum 6 species to trial through project
- Which media combinations to trial?
- Where and what physical analyses to do for preliminary media/component testing? How much time is needed to do these?
- Which components & mixes should be tested?

Plant Selections

Key considerations:

- Water needs
- Short/long term crops
- GH grown/Nursery
- Minimum 6 spp.



OPTIONS	Details
Bioassay?	<i>Brassica rapa</i> subsp. <i>Pekinensis</i> <i>Nasturtium officinalis</i> watercress
Annual/bedding plants 2025-26	<i>Hypoestes phyllostachya</i> (10-12w) <i>Pilea</i> , <i>Strobilanthes</i> , <i>Coleus</i> (13-16w)? Seeds vs cuttings <i>Tagetes</i> , <i>Petunia</i> , <i>Pelargonium</i> ?
Longer-term GH crops 2027	<i>Kalanchoe</i> <i>Euphorbia pulcherrima</i> (Poinsettia) Other more sensitive crops? (e.g., <i>Cyclamen</i> ?)
Outdoor & Perennial crops 2026-27	<i>Chrysanthemum</i> (hardy) <i>Hydrangea</i> Perennials? (e.g., <i>Lavandula</i> , <i>Hellebore</i>)
Hardy nursery stock 2026-27	Evergreens – e.g., <i>Taxus</i> Shrubs – <i>Spirea japonica</i> , <i>Amelanchier canadensis</i> , <i>Rosa</i> spp., or other water-sensitive options?

Media Options

Key considerations:

- Low C footprint
- Cost
- Availability
- Consistency

OPTIONS	Notes
Pure Peat	100% Latvian used by some Kalanchoe growers
Compost	Consistency a concern, various supply/characteristics
Engineered Wood Fibre	The common 'standard' for extender
Centrifuged Cattle Manure (CCM)	Abundant supply BC Fraser Valley, parts of ON, QC; ReFeed (BC) and ON supply Unknown qualities!
Biochar (Bella Biochar – coarse and medium)	Useful for C sequestration within media blends, various suppliers/characteristics
<i>Miscanthus</i> /switchgrass fibres (biomass & agfibres) <i>Phragmites</i> (can it be seedless?)?	Mahendra T (OMAFRA), Jeb Fields/James Atland/Brian E Jackson/Qinglan Wu (US) High pH, low WHC, C-rich/high N immobilisation capacity
Other...	Cellular glass, etc



Environmental Assessment and Ranking

- Based on methods from Hui et al., 2002.
- "An Environmental Impact Scoring System for Manufactured Products"
- Six weighted manufacturing stages, each with three weighted sub-categories.

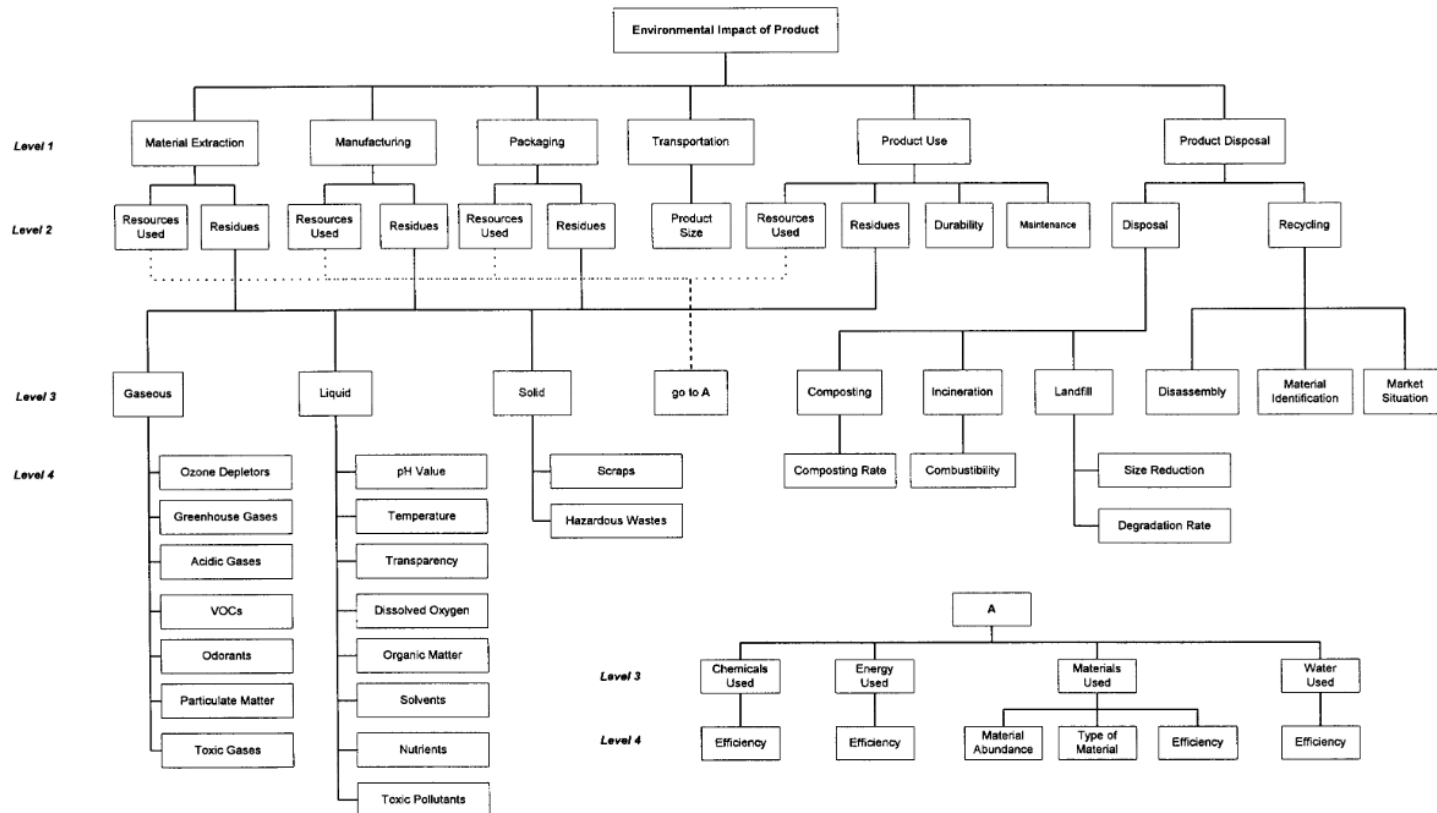


Fig. 1. The hierarchy of the scoring system.

Media & Component Characterization

What are the accepted/standardized protocols?

- Leiber-Sauheitl, Bohne and Böttcher 2021
 - i. nutrient analyses (NPK, C:N, pH, salts, heavy metals, etc.)
 - ii. physical capacity (particle analysis, WHCmax, porosity, water retention curves, wettability)
 - iii. in-trial performance (physical stability/decay, phytotoxicity, saleable yield, nutrient analyses, etc.)

OR...

- Physical testing first – key for growers is how the media perform...then look at nutrients and other key parameters

SAMPLING/CRITICAL PARAMETERS

Physical/hydrological

- Porosity (air/total)
- Water holding capacity
- Saturated hydraulic conductivity
- Moisture content range
- Particle size distribution (and shape distribution?)
- Decay resistance
- Bulk density
- Wettability

Biological

- Active carbon
- Microbial respiration
- Bacterial and fungal CFU
- Presence of indicator beneficial microbes

Emissions/ Leaching

- N, C
- Life cycle assessment

Chemical

- Nutrient content
- N immobilisation
- pH buffering capacity
- Phenolics
- Fatty acids
- Tannins
- Cellulose
- Hemicellulose
- Lignin
- Etc.!!

Crop Assessments

- Germination rate
- Saleable yield
- Height & habit
- Root structure
- Bloom time/amount

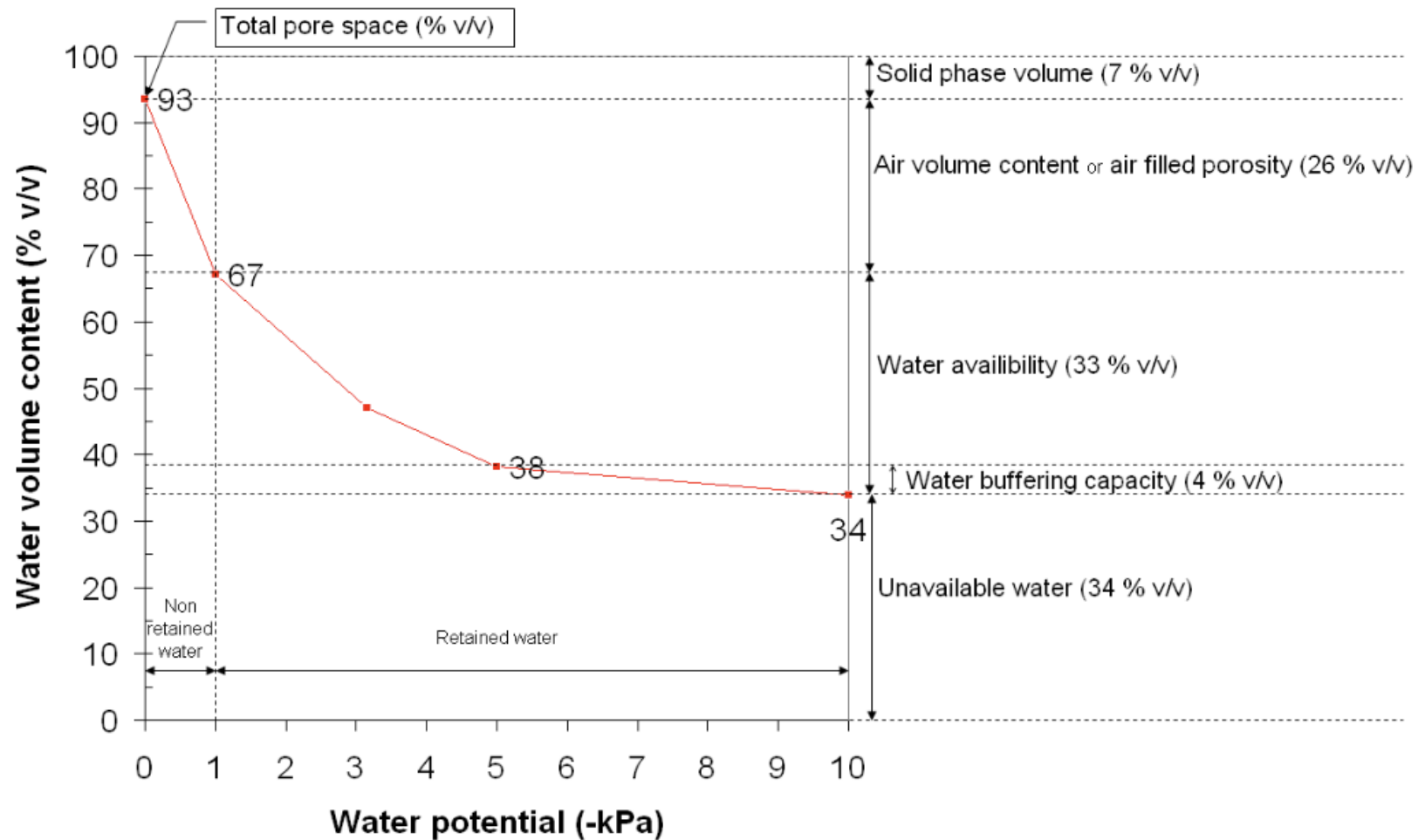


Figure 1. Key features of an example water retention curve.

Testing Options



1. Porometer Testing

2. Nutrient Analyses

- i. Quick in-lab testing
- ii. Saturated paste standard media testing (plant available nutrients)

But this is NOT enough – growers need to know what is the easily available water...so need 2nd Level Physical Testing

- i. Saturated hydraulic conductivity
- ii. Particle size analyses
- iii. Water retention curves



Porometer

- Based on methods from (Fonteno & Harden, n.d.)
- Known substrate volume of each cell, saturated with water, then drained.
- Information we can gather:
 - Total Porosity
 - Container Capacity
 - Air Space
 - Bulk Density

Trial Crop Assessments

During Growth Cycle

- Emergence date
- Pour-through nutrient/EC/pH analysis
- First flower date
- Fertilizer and watering requirements

End of crop

- Tissue – sap (young vs old) or mineral nutrient of mature only
- Yield
- Bloom count
- Final height, colour, habit, marketability
- Root structure
- Root/shoot dry mass
- Media –
 - Porosity, WHC
 - Microbial activity/respiration (?)
 - Active Carbon (?)
 - Bacterial/Fungal NGS/DNA





KPU Greenhouse Trial Design

- Media combinations (5 + standard/grower)
- Species selection – *Hypoestes* & *Coleus*
- Expt Unit # plants = 9
- Blocks = 4
- Crops = 2
- 108 plants per block, 432 total
- HPS lighting
- Sensor-based drip fertigation (EC 0.9) on demand



KPU Preliminary Media Selections

1. GH standard mix Sunshine Mix #1/pumice
2. 5% CCM (Refeed)
3. 10% CCM
4. 5% biochar (Supreme)
5. 5% biochar + 5% CCM
6. 5% biochar+10% CCM



Future Trial Considerations

- Layering/stratification (upper or lower strata) vs blended
- Peat replacement...difficult to do if comparing to a 'blend' that is patented – can't separate out the peat
- How media is 'compacted' during potting can influence physical and hydrological parameters
- Hydraulic conductivity measurements for peat and coarse media (e.g., for nursery stock) require 'correction factor'

Upcoming Milestones

- Q - What is so unique about peat/Latvian peat?
- Complete environmental assessment
- TAC meeting #2
- MSc starting May 2026
- Ontario and Québec trials summer 2026...and connecting with growers!



Questions/Discussion

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