Use of Processed Biofuel Crops for Nursery Substrates

Growing interest in bio-energy has greatly reduced availability and increased price for pine bark. This is a growing concern among nursery producers and an alternative to pine bark is needed. One potential alternative is the use of biofuel or biomass crops that can be grown locally on farmlands, harvested, and processed into a suitable substrate. The objective of this research was to assess the suitability of several biofuel crops as alternatives to pine bark in nursery substrates using annual vinca (*Catharanthus roseus*) as a model crop.

Across two experiments, switchgrass (*Panicum virgatum*), willow (*Salix spp.*), corn (*Zea mays*) stover, and giant miscanthus (*Miscanthus ×giganteus*) were processed through a hammermill equipped with a 0.95 cm (0.375 in) screen. Pine bark was used as a control. Substrate materials were used either alone, amended with 20% (v/v) sphagnum peat moss, or amended with 20% (v/v) sphagnum peat moss and 10% (v/v) municipal solid waste compost.

Biofuel-based substrates tended to have greater air space and less container capacity than pine bark substrate (Table 1 and 2). Amending with peat moss or peat moss and municipal solid waste compost reduced air space and increased container capacity of all substrates. Substrate pH of biofuel-based substrates was higher than pine bark substrates, and was neutral to slightly alkaline. Amending with peatmoss reduced pH of biofuel substrates to levels considered more ideal for annual vinca growth. Foliar calcium, magnesium, and iron levels were low across all treatments, although visual foliar deficiency symptoms were not apparent. Shoot growth was greatest in switchgrass and pine bark substrates. Plant growth differed among biofuel and pine bark substrates. Plant growth was acceptable in all biofuel-based substrates; however, chemical and physical properties for each substrate will require some modification.

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Table 1. Physical properties, substrate pH, and shoot dry weight (SDW) of annual vinca (*Catharanthus roseus* 'Pacifica Blush') growing in substrates composed of ground biofuel materials after being processed through a hammermill with 0.95 cm screen and amended with 0 or 20% peat moss (v/v) in Expt. 1

Substrate[z]	Peat moss	Air space	Container capacity	Total porosity	Bulk density	Substrate pH 2 WAP[y]	4 WAP	8 WAP	Shoot dry weight
	(%)	%	%	%	(g/cm³)				(g)
Switchgrass	0	51	39	91	0.08	7.4	7.3	6.8	4.3
Willow chip		50	38	87	0.10	6.8	7.1	7.2	2.4
Corn stover		57	31	87	0.05	6.9	7.1	7.1	2.1
Pine bark		39	40	79	0.15	4.1	4.2	4.1	3.6
Switchgrass	20	45	45	89	0.07	6.2	6.4	6.1	3.1
Willow chip		41	45	86	0.09	5.6	6.2	6.4	3.7
Corn stover		52	38	89	0.05	5.6	6.2	6.1	3.0
Pine bark		33	47	80	0.15	4.0	4.1	4.5	3.8

Table 2. Physical properties, substrate pH, and shoot dry weight (SDW) of annual vinca (*Catharanthus roseus* 'Pacifi ca Blush') growing in substrates composed of ground biofuel materials after being processed through a hammermill with 0.95 cm screen and amended with 10% municipal solid waste compost and 20% sphagnum peat moss (v/v) in Expt. 2.

Substrate[z] parent material	Air space	Container capacity	Total porosity	Bulk density	Substrate pH 2 WAP[y]	4 WAP	7 WAP	SDW[x]
	%	%	%	(g·cm⁻³)				(g)
Switchgrass	28	61	88	0.10	5.3	6.0	6.3	8.4
Willow chips	41	48	89	0.11	5.1	6.0	6.5	6.2
Corn stover	42	44	86	0.06	5.1	5.8	6.6	7.3
Miscanthus	58	34	93	0.07	5.1	5.6	6.1	6.6
Pine bark	19	60	79	0.17	4.2	4.7	5.2	10.2
$LSD_{0.05}$	8	8	2	0.01	0.2	0.3	0.7	1.4

[z]Switchgrass (*Panicum virgatum*), willow (*Salix* spp.) chips, corn (*Zea mays*) stover, and giant miscanthus (*Miscanthus ×giganteus*) were processed through a hammermill equipped with a 0.95 cm (0.375 in) screen.

[y]Weeks after potting.

[x]Shoot dry weight.

Altland, J.E. 2010. Use of Processed Biofuel Crops for Nursery Substrates. Journal of Environmental Horticulture. 28:129-134.