Modification of Switchgrass Substrate pH Using Compost, Peatmoss, and Elemental Sulfur

Switchgrass (*Panicum virgatum*) biomass is being evaluated as a potential alternative to pine bark as the primary potting component in containerized nursery crops. However, grass-based substrates like switchgrass tend to have a higher pH (7 to 7.5) than what is considered desirable in container substrates (4.5 to 6.5). Based on other studies, substrate pH can be lowered by amending with other physical and chemical components such as sphagnum moss and elemental Sulfur (S). The objective of this research was to determine the effect of sphagnum moss, municipal solid waste compost (MSC), and elemental S as amendments for reducing substrate pH and buffering it against large changes over time and subsequent plant growth.

Three experiments were conducted; the first two experiments were conducted using annual vinca (*Catharanthus roseus* 'Pacifica Blush') to quickly assess how pH was affected by the three amendments, and the final experiment was conducted with blueberry (*Vaccinium corymbosum* 'Duke') to assess the long-term effects of substrate amendments.

Elemental S was effective in reducing substrate pH although rates greater than 1 lb/yd^3 reduced pH below the recommended level of 5.5 and lower S rates did not maintain lowered pH over time (Table 1 and 2). Care should be taken when applying elemental S based on species being grown and pH requirement. Sphagnum moss and MSC together at 20% and 10% (v/v), respectively, were effective at reducing substrate pH and buffering against change. Sphagnum moss and MSC provided the additional benefit of improving physical properties of the switchgrass substrates. Peatmoss and MSC improved plant growth, quality and physical properties of switchgrass substrates by decreasing airspace and increasing container capacity and decreased substrate pH of switchgrass to a level more conducive to annual vinca production. Combinations of peatmoss and MSC were more effective in buffering pH against changes than either component alone, and may be due to an additive effect from their chemical properties or reduced the percent volume of switchgrass lower than either component alone. When using switchgrass substrates, addition of up to 20% peatmoss and 10% MSC is recommended for improving physical properties, moderating and buffering pH, and improving crop growth.

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Table 1. Substrate pH, chlorophyll content and SDW of annual vinca grown in substrate composed of switch grass amended with MSW, sphagnum moss and elemental S.

MSC (%)	Peatmoss (%)	S (lb/yard^3)	Substrate pH 1 WAP[z]	Substrate pH 4 WAP	Substrate pH 6 WAP	Chlorophyll content[y] at 6 WAP	SDW at 6 WAP (g)[x]
0	0	0	7.7	7.7	7.5	46.7	2.4
		1	6.6	4.3	4.3	38.9	2.8
		4	5.6	2.9	2.6	32.1	1.7
	20	0	5.3	6.0	6.0	59.8	4.0
		1	3.6	3.0	2.6	22.9	2.2
		4	5.1	3.5	3.5	20.4	2.2
10	0	0	6.1	6.5	6.9	54.5	3.7
		1	4.8	4.8	5.0	47.6	3.0
		4	3.3	3.1	2.9	29.7	1.2
	20	0	5.5	5.6	5.7	58.3	5.1
		1	4.1	4.2	4.2	46.7	2.9
		4	3.3	3.1	3.0	22.7	1.9

Table 2. Substrate pH, chlorophyll content, SDW, and root ratings of blueberry growing in pine bark and switchgrass substrates amended with elemental S.

Substrate	S (lb/yard^3)	Substrate pH 1 WAP[z]	Substrate pH 4 WAP	Substrate pH 12 WAP	Substrate pH 20 WAP	Chlorophyll content[y] 12 WAP	Chlorophyll content[y] 20 WAP	SDW (g)[x] 12 WAP	SDW (g)[x] 20 WAP	Root rating[w] 12 WAP	Root rating[w] 20 WAP
Switchgrass	0	5.6	6.4	6.4	6.3	48.9	38.8	18.7	34.2	4.7	5.3
	0.25	5.3	6.0	6.0	5.9	48.2	40.7	23.0	32.2	6.0	6.3
	0.5	5.1	5.6	5.9	5.9	49.8	41.8	18.1	33.6	5.3	6.3
Pine bark	0	4.6	5.3	6.1	5.9	51.2	44.1	25.3	37.2	5.2	6.3
$LSD_{0.05}$[v]		0.1	0.1	0.2	NS	NS	NS	4.5	NS	NS	NS

[z]Weeks after potting.
[y]Chlorophyll content measured with a chlorophyll meter (SPAD-502; Minolta, Ramsey, NJ).
[x]1 g = 0.0353 oz.
[w]Root ratings estimate the percentage of substrate–container interface covered by roots and are on a scale from 0 to 10, where 0 = no roots visible and 10 = complete coverage of the substrate–container interface.

Altland, J.E., Krause, C.R. 2010. Modification of switchgrass substrate pH using compost, peatmoss, and elemental sulfur. Hort Technology. 20:950-956.