Nonchemical Weed Control in Nursery Containers©

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INTRODUCTION

In a previous Easter Region I.P.P.S. poster, we described and commented on various types of weed discs and other nonchemical methods of container weed control (Chong and Purvis, 1999). We herein present results from two experiments which compared selected "new generation" weed discs [Tex-R Geodisc (fabric) and Enviro LID (plastic)], "old generation" weed discs [ITML Weed Guard (plastic) and Mori-Guard (fabric)], and a weed sleeve [Mori Weed Bag (plastic)] with mulches (2.5-cm thick sawdust and paper mill sludge) and/or herbicides (Devrinol and Ronstar).

LINERS

Plug-rooted liners (6- to 8-cm) of forsythia (*Forsythia* ×*intermedia* 'Lynwood Gold'), potentilla (*Potentilla fructicosa* 'Pink Beauty'), and weigela (*Weigela florida* 'Red Prince') were potted and grown for one season in #2 nursery containers filled with pine bark and municipal waste (1 : 1, v/v) compost. Six applied weed control treatments and an unweeded control (Fig. 1) were arranged separately by species in a complete randomized block design with 10 replications of each treatment and two plants per plot. Top (leaves + stem) of each plant and all weeds in the container were removed, dried, and weighed at the end of the season.

All six weed control strategies (Treatments 2-7; Fig. 1) reduced weed growth substantially and in varying degrees in liner-planted containers compared with unweeded containers (Treatment 1), although, inversely, the weeds also affected plant growth. Top dry weight and weed dry weight were negatively correlated: $r = -0.70^{**}$, -0.66**, and -0.66** for forsythia, potentilla, and weigela, respectively; $^{**}P \leq 0.01$, n = 70. Enviro LID (Treatment 6) and Tex-R Geodisc (Treatment 7), were as effective or better than weekly hand weeding (Treatment 2), herbicides (Treatments 3 and 4), or the Mori-Guard weed disc (Treatment 5).

Older Plants. One-year-old spirea (*Spiraea* 'Froebelii' (syn. *S.* ×*bumalda* 'Froebelii'); 36 cm wide, 2 per container), viburnum (*Viburnum dentatum*; 30 cm high, 2 per container), and 3-year-old yew (*Taxus* ×*media* 'Densiformis'; 17 cm high, one per container) were repotted from #1 to #2 containers and grown for two seasons. There were six applied weed control treatments and an unweeded control (Table 1) in a split-plot design with species as mainplots (4 replications) and both weed treatments and frequency of hand-weeding (weekly, mid-season, and end-of-season) as subplots. Measurements were: weed count and dry weight per container; height and width of each plant (each season); and foliar nutrients (N, P, K, Ca, Mg, Fe, Mn, and Zn), and top dry weight (second season only).

Weed growth in containers with these older plants was sparse during the first season due to relatively dry prevailing conditions and to denser plant canopies, and negligible during the second season due primarily to the increased plant canopies. Weed discs, mulches, and different frequencies of hand-weeding had marginal or no influence.

Table 1. Effect of weed control treatments on end-of-season growth and foliar Mn and Zn concentrations of three species in weed-free containers[z].

Treatment	Growth		Foliar nutrients	
	Growth index[y]	Top dry wt. (g)	Mn (ppm)	Zn (ppm)
		Spirea		
Unweeded control	78 a[v]	233 a	244 a	8 a
Tex-R Geodisc	79 a	281 a	226 a	7 a
ITML Weedguard disc	81 a	270 a	231 a	8 a
Mori-Guard disc	81 a	238 a	222 a	7 a
Mori Weed Bag	79 a	246 a	249 a	9 a
Sawdust mulch[x]	83 a	236 a	224 a	8 a
Paper mill sludge mulch[x]	83 a	228 a	83 b	9 a
		Viburnum		
Unweeded control	91 a	380 a	201 a	80 a
Tex-R Geodisc	96 a	339 a	164 a	79 a
ITML Weedguard disc	89 a	330 a	200 a	54 a
Mori-Guard disc	96 a	450 a	163 a	62 a
Mori Weed Bag	94 a	406 a	194 a	82 a
Sawdust mulch	91 a	330 a	182 a	86 a
Paper mill sludge mulch	98 a	336 a	51 b	67 a
		Yew		
Unweeded control	67 a	241 abc	165 a	53 bc
Tex-R Geodisc	72 a	266 a	214 a	49 bcd
ITML Weedguard disc	71 a	260 ab	211 a	44 cd
Mori-Guard disc	69 a	224 bc	207 a	56 abc
Mori Weed Bag	71 a	236 abc	223 a	60 ab
Sawdust mulch	74 a	207 cd	210 a	68 a
Paper mill sludge mulch	57 b	174 d	58 b	38 d

[z]Weekly hand-weeded subplots.
[y]Growth index = (height + width)/2.
[x]2.5-cm thick layer.
[v]Means within columns and species with different letters are significantly different at $P \leq 0.05$.

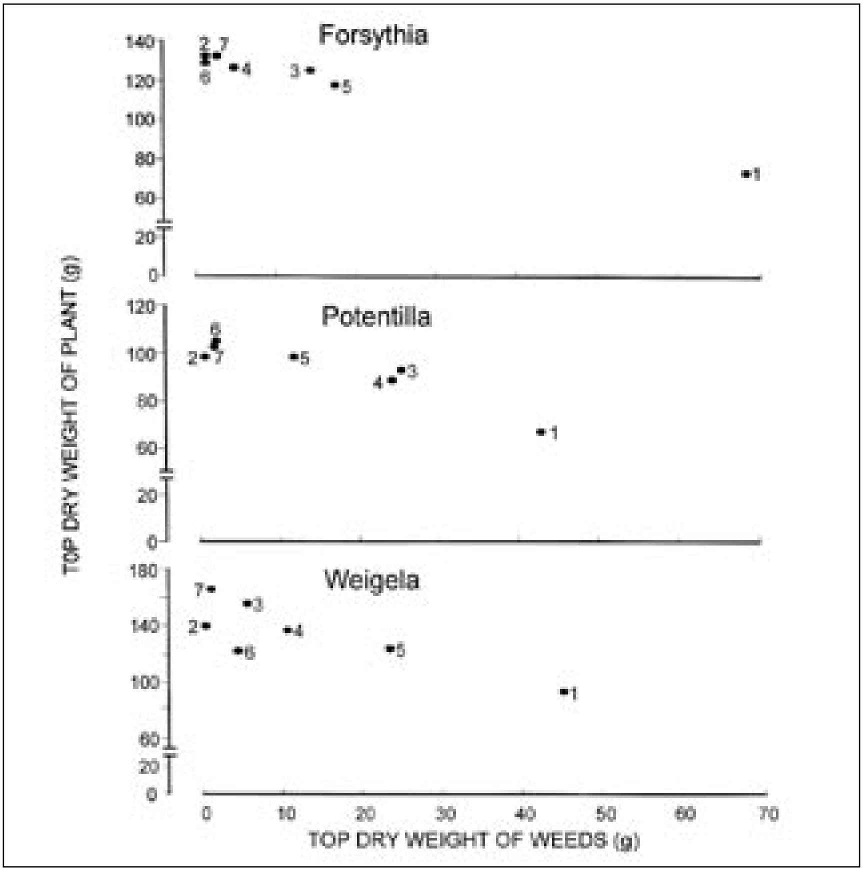

Figure 1. Relationship between plant growth (end-of-season top dry weight) and corresponding weed growth in containers with different weed control strategies. Treatments are: (1) Unweeded control; (2) Weekly hand-weeding; (3) Devrinol and Ronstar herbicides surface-applied together at rates of 0.16 and 0.57 g/container, respectively, at potting; (4) Devrinol and Ronstar applied at potting plus Ronstar only 6 weeks later; (5) Mori Guard weed disc (Mori Nurseries, Niagara-On-The-Lake, ON); (6) Enviro LID weed disc (Enviro LID, Langley, B.C.); and (7) Tex-R Geodisc with copper-coated underside (Texel Inc., St.-Elzear Beauce, Quebec).

In weed-free (weekly-weeded) containers, yew had notably reduced top dry weight in the sawdust mulch, the paper mill sludge mulch, and the Mori Weed Bag treatments (Table 1). Growth was unaffected by the other treatments. Both viburnum and yew in the paper-mill-mulched containers developed a micronutrient-deficiency-induced chlorosis which persisted in the upper portions of the foliage during the 2-year trial period. Mn contents in leaves of all three species grown with the paper mill mulch were decreased (Table 1). With yew (not the other species), the foliar Zn content also tended to be the lowest in this treatment (Table 1). The contents of other foliar nutrients were influenced little, inconsistently, or not at all (data not presented).

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LITERATURE CITED

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Bark Versus Municipal Compost in Paper Mill Waste Substrates for Container Culture©

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Paper mill biosolids (Tripepi et al., 1996) and municipal waste composts (Maynard, 1999) are increasingly being advocated for use in container nursery substrates. Previously, I used paper mill biosolids mixed with bark, peat, and/or sand (Chong, 1999).

Results of another study (Chong, 2002), herein summarized in part, compared the response of dogwood (*Cornus alba* 'Sibirica'), forsythia [*Forsythia* ×*intermedia* 'Lynwood' (syn. 'Lynwood Gold')], common ninebark (*Physocarpus opulifolius*), and weigela [*Weigela florida* 'Nana Variegata' (syn. 'Variegata Nana')] grown from liners through one season in #2 containers filled with one of 16 waste-derived substrates, classified into four groups. Each group had 0%, 20%, 40%, or 60% (by vol) paper mill biosolids in binary mixtures with municipal leaf and yard waste compost (PC group) or pine bark (PB group), and quaternary mixtures with compost, topsoil, and sand (PCTS group) or bark, topsoil, and sand (PBTS group). There was a control mix of bark, peat, and topsoil (80 : 15 : 5, by vol). Table 1 shows the chemical analyses of the unamended paper mill biosolids and waste compost. Sierra 17-6-10 (17.0N - 2.0P - 8.7K) controlled-release fertilizer with micronutrients was incorporated into each substrate (6 kg$\cdot$m^{-3}). Plants were arranged by species in separate randomized complete block designs with four replications of each treatment and four plants per plot. Each plant received 1 liter of trickle-irrigated water per container twice daily.

Regression analysis showed that all four species grew more in the compost-amended than in the bark-amended groups, regardless of the rates of paper mill biosolids (Fig. 1). Growth of forsythia, dogwood, and weigela increased with increasing rates of biosolids up to 60%. Growth of ninebark increased with rates of biosolids up to 30% where amended with compost (PC/PCTS) or up to 55% where amended with bark (PB/PBTS). While none of the weigela plants attained (marketable) size comparable to that of the control mix, top dry weights of the other species reached or exceeded their control counterparts in the compost-amended substrates over most rates of biosolids (Fig. 1).

The electrical conductivity [EC, a measure of the soluble salts level, expressed in terms of dS/m, using substrate and water (1:2, v/v) extracts] at potting were: PC 1.1-1.5; PCTS 0.8-0.9; PB 0.6-0.7; PBTS 0.5-0.9; control mix, 0.5. During the season, EC values maintained the same relative order among groups, while within groups, values generally increased with increasing rates of biosolids. Values averaged over the last two sampling dates (30 July and 26 Aug.) were positively correlated with