HortScience 27(10):1138. 1992.

Apple Pomace as an Amendment in Container Growing Media

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Additional index words nursery crops, organic by-product, waste usage, recycling

Each year, 1.5 million t of apple pomace, a primary by-product of the juice and cider industry, is produced in North America. Disposal of this organic by-product is becoming increasingly more difficult and costly (Wang and Thomas, 1989). Although composted pomace was shown to be of acceptable quality for plant growth and was especially appropriate for seedlings (van de Kamp, 1986), Parks (1979) reported generally reduced yield and vigor of vegetable crops grown in field plots amended with 16 or 24 t of pomace/ha. This study compared the growth and nutrient status of four nursery species in container media amended with various amounts of apple pomace.

On 15 May 1989, liners of silverleaf dogwood *(Cornus alba* L. 'Argenteo-marginata'), euonymus, *[Euonyms fortunei* (Turcz.) Hand.-Mazz. 'Emerald Gaiety'], Andorra juniper *(Juniperus horizontalis* Moench 'Plumosa Compacta'), and Emerald cedar *(Thuja occidentalis* L. 'Smaragd') were transplanted to 6-liter (21 cm diameter × 21 cm deep) nursery containers filled with a control medium or media with increasing amounts (25% to 90%) of apple pomace (Table 1).

Plants spaced 45 × 45 cm and arranged by species in separate randomized complete-block designs with five replications and five plants per plot were grown under conditions described by Chong et al. (1991). Dogwood was grown for one season (1989), and the other species were grown for two seasons after overwintering between 1989 and 1990 in a minimally heated (-5C) polyhouse.

Duplicate samples of the unmixed (100%) pomace and each of the five media taken on 15 May were analyzed for electrical conductivity (EC) and pH [1 soil : 2 water extracts (v/v)], mineral nutrients, and selected physical properties (Chong et al., 1991; Ontario Ministry of Agriculture and Food, 1990). EC and pH were also measured on 5 June and 6 July 1989 and 15 Apr., 13 June, 17 July, and 28 Aug. 1990 from medium samples collected (7- to 12-cm depth) from each treatment within each replicate and pooled across species.

Mid-August leaf samples (dogwood in 1989; other species in 1990) were analyzed for total N, P, K, Ca, Mg, Fe, Mn, and Zn (Chong et al., 1991). In early October, the shoot dry weight, height and/or width of each plant, and shrinkage in the medium in each container, expressed by depth from the container rim, were measured.

Unmixed pomace had a pH of 7.0 and EC of 0.9 $dS \cdot m^{-1}$, the latter considered safe for plant culture. Except for a slight excess of Cl- (103 $mg \cdot liter^{-1}$), all other analyzed nutrients were present in low or acceptable concentrations ($mg \cdot liter^{-1}$): NO_3, 5; P, 7; K, 243; Ca, 49; Mg, 25; SO_4, 25; Na, 57; Fe, 0.82; Mn, <0.10; Zn, <0.10; Cu, <0.10; B, <0.10. Among the five media, the initial pH (5.4), EC (0.2 $dS \cdot m^{-1}$), and most nutrients were lowest in the control. Compared with the unmixed pomace or the control, corresponding values for pH (5.5 to 7.3), EC (0.3 to 0.8 $dS \cdot m^{-1}$), and nutrients in the pomace-amended media were intermediate but increased with the amount of pomace. Bulk density also increased with the amount of pomace (250 to 474 $g \cdot liter^{-1}$, air-dry weight basis), but aeration (31% to 18%) and moisture retention (60% to 44%) decreased. Corresponding values were intermediate in the control: bulk density (285 $g \cdot liter^{-1}$), aeration (28%), and moisture retention (49%).

Despite these variations, all four species grew well and showed no significant difference in shoot dry weight (cedar 174-189; dogwood 116-139; euonymus 77-106 g/plant) or in leaf nutrient composition (data not shown) due to media, except for significantly higher shoot dry weight of Andorra juniper with 75% or 90% pomace (Table 1) and for moderately increasing leaf Mn content in Andorra juniper (37 to 56 $mg \cdot liter^{-1}$) and Emerald cedar (44 to 57 $mg \cdot liter^{-1}$) with increasing amounts of pomace.

During the 2 years of study, the pH tended to rise in the control medium or in those media with 25% to 50% pomace, remained steady with 75% pomace, and decreased with 90% pomace. The final pH on 29 Aug. 1991 varied only between 6.9 and 7.0. Except on 6 July 1989, when the EC had increased to 1.2 and 1.5 $dS \cdot m^{-1}$ in treatments with 25% and 50% pomace, respectively, EC in all treatments remained low (0.1 to 0.4 $dS \cdot m^{-1}$) thereafter, as in a previous study under similar experimental conditions (Chong et al., 1991).

Apple pomace apparently can be used as an organic amendment for container culture of ornamental nursery species. Notwithstanding the good growth of all species in all pomace-amended treatments, no more than 50% of the volume of the mix should be pomace because of significant shrinkage [>20%) with 75% or more pomace (Table

Literature Cited

Chong, C., R.A. Cline, D.L. Rinker, and O.B. Allen. 1991. Growth and mineral nutrient status of containerized woody species in media amended with spent mushroom compost. J. Amer. Soc. Hort. Sci. 116:242-247.

Ontario Ministry of Agriculture and Food. 1990. Production recommendations for ornamentals and turf. Publ. 383, Queen's Printer for Ontario, Toronto.

Parks, N.J. 1979. Effect of soil amendments on crop yields. Agr. Can. Expt. Farm, Smithfield, Ont., Res. Rpt. p. 8.

Wang, H.J. and R.L. Thomas. 1989. Direct use of apple pomace in bakery products. J. Food Sci. 54(3):618-621.

van de Kamp, M. 1986. Apple pomace can be productive. Biocycle 27(3):39.

Table 1. Shoot dry weight of juniper and shrinkage of apple pomace-amended growing media at the end of the growing season.[z]

Crop	45% Bark 45% Peat 10% Sand (control)	25% Pomace 65% Peat 10% Sand	50% Pomace 40% Peat 10% Sand	75% Pomace 15% Peat 10% Sand	90% Pomace 10% Sand	LSD $\alpha = 0.05$
			Shoot dry wt (g/plant)			
Juniper	240	270	267	285	282	35
			Shrinkage (cm)[y]			
1989	2.5	2.6	2.8	3.5	3.7	0.6
1990	3.1	3.2	3.8	4.3	4.5	0.5

[z]Juniper was harvested 1990.
[y]Depth from container rim averaged over species.

Received for publication 24 Feb. 1992. This research was supported in part by Mori Nurseries, Niagara-On-The-Lake, Ont. The technical assistance of Bob Hamersma, Debbie Norton, Marion Hofstede, and Mark Zolis is appreciated. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked *advertisement* solely to indicate this fact.