

Water Use and Growth of Two Woody Taxa Produced in Varying Indigenous Douglas Fir Based Soilless Substrates

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In the Pacific Northwest (PNW) container crops are grown in soilless substrates that contain different percentages of Douglas-fir bark (DFB), sphagnum peat moss and pumice. Previous research conducted by Gabriel et al. found varying combinations and ratios of these components result in differing physical and hydrological properties. These differences can significantly affect water management and consequently crop growth and water use. Caron et al reported up to 22% water savings by increasing the proportion of peat in soilless substrate while producing *Viburnum odoratissimum*. This was attributed to altering substrate physical properties, primarily increasing substrate available water. The objective of this study was to investigate the effect of conventional PNW soilless substrate mixtures on water use and subsequent crop growth of *Weigela florida* 'Polka' and *Azalea* 'Girard's Fuchsia'. In 2008 plants were potted in 3-gal (11 L) pots using DFB based soilless substrates containing 0%, 15%, 30%, and 45% (v/v) pumice or peat moss. The experiment was conducted as completely randomized block design; 4 blocks with 4 plant replicates that were independently micro-irrigated to maintain 0.2 leaching fraction (LF = effluent ÷ influent). Photosynthetic water use efficiency (PWUE) was calculated for weigela at 1100 and 1600 HRS as the ratio of net photosynthesis and stomatal conductance measured on two plants from each replication 100 days after treatment initiation using an open portable gas exchange system. After 132 days root and shoot dry weight data, in conjunction with influent and effluent data, was used to calculate crop water use efficiency.

Weigela and azalea growth increased linearly 17% and 36%, respectively, when bark was amended with increasing amounts of peat. In addition, increasing peat resulted in increased root and shoot growth of weigela, whereas azalea root dry weight was unaffected by peat addition. The addition of pumice to the bark substrate had no effect on weigela or azalea growth. Weigela PWUE linearly decreased 25% with increasing addition of pumice. Crop water use efficiency was unaffected by substrate regardless of taxa. Weigela leaf length and area (LLA), another indicator of crop water status, linearly increased with increasing peat, whereas weigela LLA responded curvilinearly to the addition of pumice. Additions of pumice greater than 30% (v/v) resulted in decreased LLA. We conclude there is no apparent crop benefit for the addition of pumice to DFB based substrates, however peat addition resulted in increased crop growth and a possible increase in water use efficiency.

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