Genome Sizing and Ploidy Estimations of Weigela Species and Cultivars

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Introduction and Objective
Weigela is a genus of spring flowering shrubs native to China, the Korean peninsula, and Japan. In the last 20 years, weigelas have regained popularity in the green industry thanks to a surge of new cultivars with characteristics including reblooming, larger flowers, smaller growth habit, fall color, and interesting foliage color and variegation. One reblooming cultivar with pink, red and white flowers on the same plant, Weigela ‘Courtalor’ Carnaval®, is widely advertised as being a reblooming polyploid. In some plant species, variations in ploidy between individuals exists. Polyploid plants can have altered phenotypes such as broader and thicker leaves, larger flowers, more compact stature, greater tolerance to environmental stress and disease, sterility, and flowering time variation (Dewitte et al., 2012). In other ornamental species like Hydrangea paniculata, it appears that polyploids have been preferentially selected for use in horticulture (Beck and Ranney, 2014). In this project we investigated 1) Does polyploidy occur naturally in wild weigela populations? 2) Are plant breeders unknowingly selecting for polyploids when selecting for novel traits such as reblooming?

Methods
74 accessions representing 11 species and 48 cultivars of weigela were sampled from The Morton Arboretum, the Chicago Botanic Garden, and the Arnold Arboretum. Genome sizes were determined by using a flow cytometer (CyFlow® Ploidy Analyzer; Partec, Münster, Germany) and with materials and protocols from CyanStain P absolute P Test Kits (Partec, Münster, Germany). Tissue samples were collected from expanding leaves and co-chopped with an internal standard, Pismum sativum ‘Citrud’, which has a known genome size of 8.76 pg (Doležel et al., 2007). After chopping, the sample solution was filtered through a 30-micron mesh filter (CelLytic®, Partec, Münster, Germany) and then stained with the Propidium Iodide from the test kit. Samples were then immediately counted for the internal standard, and CVs were maintained at <5%

Table 1. Genome size and estimated ploidy levels for Weigela cultivars and species.

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Discussion
• All surveyed wild collected and cultivated species of Weigela were diploid. If polyploidy does occur naturally in Weigela it is not common. Although the Weigela collections at the Arnold Arboretum and The Morton Arboretum are impressive, it would be informative to be able to sample a greater number of populations over each species’ native range.
• Of the cultivars investigated, only one, Carnaval® was triploid. In our literature review we discovered that it was bred by crossing a colchicine-induced tetraploid with a diploid (Duron and Decourtye, 1990).
• It also appears that plant breeders are not preferentially selecting for polyploidy in Weigelas. The novel traits that many of the new cultivars possess, including reblooming, are not due to polyploidy.

References