‘Echo’ Ornamental Reflowering Blueberry

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‘Echo’ (PI 682654, CVAC 2262) is a new ornamental blueberry (*Vaccinium* hybrid) that is targeted toward the home gardener and ornamental landscape trade. It is from the U.S. Department of Agriculture-Agricultural Research Service (USDA-ARS) breeding program in Corvallis, OR, and was released in cooperation with Oregon State University’s Agricultural Experiment Station. ‘Echo’ is the second strongly repeat fruiting (remontant, off-season, perpetual

flowering) blueberry developed from a northern-adapted germplasm; its parent ‘Perpetua’ (U.S. Plant Patent 24,209) was the first (Finn et al., et al., 2015). When grown in Oregon, this hybrid flowers in April, along with other blueberry cultivars, ripens a crop of small fruit in late June and early July, and then begins flowering on new growth in mid to late July and August. This second crop is heavier than the first, begins to ripen in late August, and continues to ripen until the weather is too cold. The plants are compact and have lustrous dark green foliage. The name ‘Echo’ reflects the repeat flowering of this genotype. ‘Echo’ is patented (U.S. Plant Patent 29,787).

Origin

‘Echo’, tested as ORUS 289-1, was selected in Corvallis, OR, in 2010, from a population grown from a cross of ‘Perpetua’ × ORUS 55-1 [selection of CVAC 21.00 (PI 296397) open pollinated seed]. Both parents are repeat flowering. The plant’s characteristics for fruit size, leaf shape, and leaf size are intermediate to those of *Vaccinium corymbosum* L. (highbush blueberry) and *V. angustifolium* Aiton (lowbush blueberry). The maternal parents of ‘Perpetua’ and ORUS 55-1 were both accessions from open-pollinated populations collected in Maine, where the ranges of *V. angustifolium* and *V. corymbosum* overlap; their paternal parents are unknown. Other species could be present in the ancestry because other species are present in the USDA-ARS, National Clonal

Germplasm Repository (NCGR) collection, where the open-pollinated seed from which the parents were selected was collected.

The origin of this remontant flowering was discussed in the ‘Perpetua’ release notice (Finn et al., 2015) and is briefly recapped here. The commercial industry in the Pacific Northwest requested the development of a small-fruited blueberry cultivar with higher yields than ‘Rubel’ for the processed fruit market. Open-pollinated fruit were collected in the fall at the NCGR from several genotypes with an upright, medium-size habit and small fruit. The origin of these genotypes was seed collected where the *V. corymbosum* and *V. angustifolium* native ranges overlap. The open pollination from which ‘Perpetua’ resulted occurred during NCGR field collection, which included a wide diversity of species and genotypes. Because flowering occurred in late July, the most likely male sources of pollen were nearby material with a similar flowering time and genetic background. These genotypes were from a region of Maine where *V. angustifolium* and *V. corymbosum* native ranges overlap. The resulting populations had a significant number of seedlings with a propensity for producing a second autumn-ripening crop from flowers that opened during summer. This phenomenon has been reported previously, particularly for *V. angustifolium* germplasm associated with the University of Minnesota blueberry breeding program (Fear, 1983; Fear et al., 1985; Luby, 1991). Similar to early work involving primocane fruiting raspberries, this trait was seen as a potential approach to avoiding winter injury in northern Great Plains states (Luby, 1991).

Description and Performance

‘Echo’ has been evaluated most extensively at Oregon State University’s North Willamette Research and Extension Center (OSU-NWREC; Aurora, OR) and in USDA-ARS plots in Corvallis, OR, as well as at a test site in Lowell, OR. Plants were lightly pruned during the trial to remove the least vigorous growth and spent fruiting wood. Plants were fertilized with 90 kg·ha⁻¹ of nitrogen divided into three equal portions applied from the time of the spring bloom to mid-June of each year (Hart et al., 2006). The specifically cited color references are based on the Royal Horticultural Society Color Chart (Royal Horticultural Society, 2007).

Plants of ‘Echo’ were moderately vigorous, small shrubs (0.88 × 0.90 m after 3 years in the field) with attractive, dark green (Green Group 139A), glossy leaves borne on upright shoots. The plant habit is more spreading than that of ‘Perpetua’, and the plant has not shown any susceptibility to foliar diseases such as leaf rust [*Pucciniastrum vaccinii* (G. Wint.) Jørst].

In the spring, the tips of the shoots that bore fruit in the fall dieback to the last bud that did not flower. In mid-March to early April, these floral buds break and begin flowering. The small flowers (0.76 × 0.5 cm) are white (White Group 155A) and have

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a typical urn shape for blueberry. During years with conducive conditions, the spring flowers are susceptible to botrytis blossom blight (*Botrytis cinerea* Pers.:Fr.). In controlled crosses, flowers set fewer fruit when self-pollinated (55.2%) than when pollinated with a bulk pollen sample (95.4%). If ‘Echo’ is the only genotype in the area, then it will set a lighter crop than it would if other genotypes were present for cross-pollination. The vegetative buds break soon after flowering and grow for a few weeks before the first black tip stage. The spring foliage is lush green with a red blush (Fig. 1). During this time in the spring, when the plants are flowering and during the early stages of vegetative budbreak, the plants can be somewhat unattractive because the old, dead fruiting wood is still present (if not removed by pruning); however, this is soon overgrown by the new growth. The fruit from the first flowering cycle ripen early, beginning in late May or early June, during most years. Flower buds form on the new growth and instead of becoming dormant, break bud resulting in a second flowering period that begins in early July (Fig. 2). As with ‘Perpetua’, the chilling requirement, if

Fig. 1. New growth on ‘Echo’ blueberry in April.

Fig. 2. Young 2-year-old ‘Echo’ blueberry plant in bloom in late July.

any, for flower buds to break is unknown. The second crop begins to ripen in mid to late August and continues through the cool days of September and October until the lack of heat prevents ripening or when severe temperatures occur; this can occur as late as early November during some years (Figs. 3 and 4). The foliage is held well into fall, but plants are not evergreen; the leaves eventually turn a purplish red.

The fruit are small (0.8 g; 1.22 × 1.19 cm height × diameter) and similar to those of *V. angustifolium* (Fig. 5), and they are attractive, with a subglobose shape that is more elongated than those of ‘Perpetua’. The calyx is attractive and the fruit has an attractive blue color (Violet-Blue Group N92C). Fruit are moderately soft, have a mild flavor, and have a wet picking scar, thus making them poorly suited for the commercial fruit market but fine for the home garden. The second crop fruit are borne in a loose, determinate raceme with 6 to 10 berries with acropetal maturation

Fig. 3. Fruiting, young, 3-year-old ‘Echo’ blueberry plants in late August.

Fig. 4. Fruiting and flowering mature ‘Echo’ blueberry plants in late August.

Fig. 5. Fruit cluster on August crop of ‘Echo’ blueberry (mean weight and dimensions: 0.75 g; 1.22 × 1.19 cm).

Table 1. Allelic composition of ‘Echo’ and its parents ‘Perpetua’ and ORUS 55-1 at 10 microsatellite loci (SSR 1–SSR 10) comprising the blueberry fingerprinting set at the USDA-ARS National Clonal Germplasm Repository. Alleles differentiating ‘Echo’ and its parents (106 at SSR1 and 260 at SSR 7) are in bold.

Genotype	SSR 1	SSR 2	SSR 3	SSR 4	SSR 5	SSR 6	SSR 7	SSR 8	SSR 9	SSR 10																			
Perpetua	100	103	114	123	126	157	160	186	212	216	221	227	212	221	224	235	251	257	260	246	269	307	315	321	325	327			
ORUS 55-1	100	103	106	123	126	157	160	186	212	216	221	227	212	227	212	224	235	251	254	257	246	269	304	307	310	313	315	325	327
Echo	103	106	123	126	126	157	160	186	212	216	221	227	212	227	212	224	235	251	257	260	246	269	304	307	313	321	327		

(Fig. 5). The potential yield of a fully mature plant is unknown; 3-year-old plants produced ≈ 1.5 kg.

‘Echo’ was introduced as an attractive ornamental blueberry with repeat flowering and fruiting that should be useful in the landscape, in containers, and for attracting wildlife. ‘Echo’ blueberry is an ericaceous plant and therefore needs acidic and well-drained soils similar to other members of this family, such as *Rhododendron* sp. The ultimate cold hardiness and heat tolerance of ‘Echo’ are not known; however, because it is derived largely from Maine-adapted germplasm, it is expected to have good winter hardiness. ‘Echo’ may be useful to breeding programs looking for additional sources of repeat flowering for low-chill environments (Hancock et al., 2008).

‘Echo’ nuclear stock has tested negative by ELISA for *Blueberry leaf mottle virus*, *Blueberry scorch virus*, *Blueberry shock virus*, *Blueberry shoestring virus*, *Peach rosette mosaic virus*, *Tomato ringspot virus*, and *Tobacco ringspot virus*, and it had negative by RT-PCR assays for *Blueberry green mosaic associated virus*, *Blueberry mosaic virus*, *Blueberry necrotic ring blotch virus*, *Blueberry red ringspot virus*, *Blueberry fruit drop associated virus*, *Blueberry virus A*, *Blueberry stunt phytoplasma*, and *Xylella fastidiosa*.

Parentage of ‘Echo’ was confirmed by using a fingerprinting set of 10 simple sequence repeat (SSR) markers that we developed at the USDA-ARS NCGR to genotype our blueberry collection (Bassil et al., in preparation). All the alleles amplified in ‘Echo’ were found in either parent (‘Perpetua’ and/or ORUS 55-1) (Table 1). One allele, 106, in ‘Echo’ at SSR 1 was only shared with ORUS 55-1, whereas another allele, 260, at SSR 7 came from ‘Perpetua’. This confirms that the pedigree of ‘Echo’ resulted from the cross between ‘Perpetua’ and ORUS 55-1.

Availability

‘Echo’ is patented (U.S. Plant Patent 29,787) and an exclusive license for commercial propagation was granted to Gardens Alive! (Lawrenceburg, IN). This germplasm is available from the USDA-ARS NCGR, where it has been deposited as PI 682654 (CVAC 2262) [USDA, ARS, National Clonal Germplasm Resources Information Network - (GRIN), 2019]. It is available for research purposes, including the development of new cultivars. When this germplasm contributes to the development of a new cultivar, hybrid, or germplasm, we request that appropriate recognition is given to the source. The USDA-ARS and Oregon State University do not sell plants.

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