Developing Sterile Plants for the Nursery Industry

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Mutation breeding is applicable to seed-grown and vegetatively propagated plants. The use of mutagens is an attractive approach for modifying one or two traits without disturbing the basic genotype. Ionizing radiation such as gamma-rays are preferred because there are few disposal problems, application is easy, reproducibility is high, penetration is good, and the rate of mutation frequency is high. Seeds are the most commonly treated materials, but mutations can also be induced on vegetatively-propagated plants. In India mutation breeding has been used to produce almost 100 cultivars of vegetatively-propagated plants.

For seed and vegetatively propagated plants, the following characteristics have been improved by mutation breeding: flowering and ripening time, adaptability, photoperiod insensitivity, changes in growth habits, disease and pest resistance, improved quality and yielding ability, as well as pollen abortion and sterility. Higher rates of gamma-irradiation lead to more chromosomal abnormalities. Gamma-irradiation may be a useful technique for creating sterile selections of species considered invasive.

Seed from several cultivars of *Buddleja* were irradiated with 150, 200, and 250 Gy using a Cobalt-60 irradiation source in March of 2005. Seedlings were germinated in a greenhouse under mist and were shifted to #1 containers in late July and placed outside. In November, all remaining seedlings treated with 200 or 250 Gy were planted in the field in Tifton. Plants from the 150 Gy treatment were taken to CANR and were shifted into #7 containers for further evaluation. Plants have been evaluated since fall of 2006 for survival and seed set. Open-pollinated seed from field-grown plants that flowered in fall of 2005 were collected in January of 2006. This M2 population was brought to CANR for further evaluation in spring of 2007.

Seed from *Euonymus alatus* and *Berberis thunbergii* 'Atropurpurea' were irradiated with 50, 100, and 150 Gy in 2005. *Euonymus* seedlings were grown for one season in Tifton and were planted in the field at the Atlanta Botanical Garden site in Gainesville, GA. Seeds from M1 plants were collected in fall of 2007. Barberry seedlings were grown in Tifton and were then transferred to CANR in 2007. Seed was collected from M1 plants which produced fruit in 2008.

For the M2 generation of Buddleja, only one plant from ~ 150 seedlings appears to be sterile in 2008. All others were discarded as no new ornamental traits were noted. *Euonymus* seedlings (M1 and M2) are very vigorous plants. One variegated plant was found in the M1 population while several shorter plants have been noted in the M2 population. Seedlings will be evaluated in 2009 for sterility and ornamental characteristics. With barberry, ~20% of the plants flowered and set seed in 2008. Seed from these plants has been collected and will be grown out in 2009.

In summary, progress has been slow towards developing sterile plants for the nursery trade using gamma irradiation. Much larger seedling populations will be required to discover recessive traits that will bring about new morphological characteristics or sterility. More research needs to be conducted. Clones that appear sterile will be rooted and evaluated further.

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