Developing Sterile Plants for the Nursery Industry

John M. Ruter

University of Georgia, Dept. of Horticulture, Tifton, GA 31794

Introduction

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. A Cobalt-60 irradiation source is available on the Tifton campus. 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, a gamma-radiation dosage which results in 50% mortality of the seeds (LD_{50}) or reduces growth by 50% is considered ideal. 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.

Materials and Methods

Seed from the following 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. Seedlings 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 were evaluated in 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.

Results and Discussion

Surviving Seedlings as of November, 2005

Cultivar	150 Gy	200 Gy	250 Gy
'Black Knight'	9	25	0
'Petite Indigo'	0	14	3
'Petite Plum'	13	19	5
'Pink Delight'	26	8	1
'Potter's Purple'	13	5	3
'Royal Red'	0	17	1

Why some cultivars had better survival at 200 Gy compared to 150 Gy is not known. The LD_{50} for seed of *Buddleja* occurs between 200 Gy and 250 Gy, as noted by the decreasing in survival among seedlings treated with the different rates of radiation. Only one of the 61 plants at CANR did not produce seed, so the other 60 were discarded.

Of the approximately 100 plants that were planted in the field in Tifton, only 15 are still alive. A majority of the plants did not break bud in spring of 2006, having died during a mild winter (low temperature of 21F). Of the remaining plants, two did not set seed in 2006 or 2007.

For the M2 generation, only one plant from ~ 150 seedlings appeared to be sterile in 2007. All others were discarded as no new ornamental traits were noted.

In summary, little progress was made towards developing sterile butterfly bushes for the nursery trade. 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.