

ha⁻¹ and at 0.426 kg a.i. ha⁻¹ with Pennant (3.409 kg a.i. ha⁻¹). *Syringa vulgaris* exhibited slight herbicide damage due to initial foliar contact. At 10 WAT, injury to *Hemerocallis* and *Liriope* was still evident, with chlorosis of tissue greatest when high rates of sulfentrazone were applied (> 0.426 kg a.i. ha⁻¹) or when sulfentrazone at 0.426 kg a.i. ha⁻¹ was applied with Pennant. Necrosis in *Syringa* was not apparent by 10 WAT and injury due to initial leaf contact was temporal. However, injury to *Abies* was highly visible at 10 WAT and was greater where higher rates of sulfentrazone were applied and in all sulfentrazone combinations. Chlorosis and necrosis of the foliage was likely due to postemergence contact, as evidenced by enhanced injury within the spray pattern at 10 WAT. It is not clear whether injury would be overcome with time.

In conclusion, sulfentrazone (>0.426 kg a.i. ha⁻¹) provided consistent and long-term weed suppression of difficult-to-control weeds. Combinations of sulfentrazone plus Pennant or Treflan also provided consistent control. Use of shielded applicators to prevent postemergence contact of sulfentrazone with ornamental foliage could minimize injury.

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Hemerocallis (Daylily) Propagation

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INTRODUCTION

Numerous *Hemerocallis* (daylily) cultivars are introduced each year that never make it to the consumer market because of limited supplies. The dramatic increase in the number of daylily cultivars and the preference for named cultivars has resulted in daylily propagation being limited to vegetative propagation, except in the case of hybridizers use of seed propagation to grow-out and evaluate the plants produced from their crosses. It has been stated that it can take 20 years for an outstanding cultivar to move from the enthusiast (connoisseur) market to the mass market (Pounders and Garton, 1996). The shortage and subsequent rapid nursery production of 'Happy Returns' introduced in 1986 indicated that even if the cultivar forms a relatively large number of divisions per year, it can take 10 years or more to have adequate plants to meet market demand.

Hybridizers have often been caught short of plants when a new introduction proves popular leading some to postpone introductions for several years (Schott, 1995). The recent introduction of patented daylily cultivars and the continuing efforts by hybridizers to breed cultivars for use by the landscape industry has resulted in the

need for rapid build-up of stocks in order to have sufficient supplies available. Current demand for daylilies for use in mass plantings, some containing tens of thousands daylilies, has further strained already limited supplies of desirable cultivars. The use of all available propagation techniques will be needed to provide adequate supplies of desirable cultivars.

SEED PROPAGATION

Seed propagation can start with seed collected from the capsules found on the scapes or from seed produced from selected crosses that can be purchased from daylily hybridizers/propagators. Seed is collected as the capsule matures, dries, and is beginning to split at the distal end (Munson, 1989). Seed collected from dormant daylilies benefits from cold stratification at 32 to 45F; following stratification the seed can be dried and stored at room temperature until sown (Griesbach, 1956). Seeds resulting from evergreen parents can be directly sown or, handled, and stored the same as described above for seeds from dormant parents (Benzinger, 1968; Munson, 1989).

DIVISION

Dividing the daylily clumps by pulling or cutting apart is the most common form of daylily propagation. Division is relatively easy to do, plant survival is excellent and the resulting plants are identical. It is recommended that division be done during early spring or late summer with harvest season defined by the area. In Kentucky daylilies are commonly divided from February through April and late July through the mid-September with Autumn Equinox considered the latest possible day for dividing and transplanting. Fall is the dominant harvest season in Kentucky, but numerous small growers field divide from February to October in order to make retail and mailorder sales.

While division is the most popular form of propagation, some limitations do exist. The most common limitation is the slow progress in producing adequate numbers of plants of a popular cultivar to satisfy the market demand. A very high increase ratio would be 25 : 1, new plants : original, the average might be closer to eight, with a minimum ratio for commercial production being 3 : 1 (Apps, 1995). There are cultivars that take a year to produce a single division and therefore cannot be introduced even if it has many desirable characteristics (Dunwell et al., 1995).

PROLIFERATIONS

Proliferations are small plants that grow on the scapes of daylilies. Proliferations can be cut from the scape and if a multiple proliferation can be further divided by cutting before being stuck in a well-drained media. The proliferations will expand roots out into the media in approximately a week. Daylily growers frequently miss the opportunity to produce plants from proliferations because summer shearing and late summer division remove the scapes with proliferations and remove some scapes on which proliferations would have formed. I have had success producing plants from proliferations (Table 1). Considering the value of each plant of a recently introduced cultivar propagation by rooting proliferations can increase the number of plants produced from a single mother plant and, ultimately, increase the income from that plant. Unfortunately, a single plant of 'Lisa My Joy' that had four scapes which produced a total of 14 proliferations in 1996 might not produce any proliferations in 1997.

TISSUE CULTURE

Scientists have successfully grown daylilies from tissue culture (Apps and Heuser, 1975; Heuser and Apps, 1976; Heuser and Harker, 1976; Krikorian and Kann, 1979a, 1979b, 1980; Krikorian et al., 1981; Meyer, 1976, 1979; Pounders and Garton 1996; Smith and Krikorian 1991; Stoutemyer 1976a, 1976b) but it has not become a favored method of propagation because some propagators had difficulty producing identical plants from a single source in early attempts to tissue culture daylilies and to some extent the demand for new daylily cultivars was not at levels that would justify changing propagation techniques. Krikorian and Kann (1980) and Krikorian et al. (1981) showed they could produce identical plants from aseptically cultured tissues. The demand for new cultivars and large numbers of a single cultivar for mass planting now has several growers propagating plantlets by tissue culture.

Basic procedures for tissue culturing daylilies are illustrated in the publications of Krikorian and Kann (1979a) and Meyer (1976, 1979). Once the plantlets are produced in tissue culture they can be rooted relatively easily using standard conditions provided for daylily proliferation rooting.

OTHER TECHNIQUES

There are other techniques that can be used to propagate daylilies. Individual ramets can be cut into pieces that have some shoot and some root tissue. If handled in a sanitary manner these ramet cuttings will grow and after approximately 6-months growth can be made into cuttings (Foret and Nelson, 1967). Traub (1936) reported that the ramets should not be cut into "divisions" or "cuttings" smaller than 1/4 the original ramet.

Another technique is to cut the top off crowns and apply growth regulator compounds to force production of offshoots that can be excised and rooted. Apps and Heuser (1975) and Kirby-Smith and Kasha (1981) experimented with applying kinetin and kinetin-auxin mixtures respectively. They both had success, but care is

Table 1. Cultivars produced by rooting proliferations.

Best of Friends	My Son Bob
Cantique	Octavian Exotic Marble
Coral Crab	Octavian Marble Model
Evening Bell	Open Hearth
Fairy Tale Pink	Prairie Blue Eyes
Granite City Toehead	Purple Oddity
Jambalaya	Ruffled Magic
Janice Wendell	Siloam Sunburst
Lavender Patina	Siloam Red Toy
Lisa My Joy	Siloam Toddler
Lullaby Baby	Spectacular
Mad Max	Stella de Oro
Mary Shadow	Sun Flare
Milady Greensleeves	White Temptation
Milano Maraschino	Winds of Peace
Milano Violet Mark	

required in carrying out the procedure and the method has not found favor with commercial propagators.

It should be noted that the standard "Ditch Lily", *Hemerocallis fulva* and its cultivars are stoloniferous. Those wishing to propagate *H. fulva*, or any of its relatives, can cut the rooted offshoots that occur at the end of the roots.

While division will continue to be the most popular form of propagation for daylilies, tissue culture will make a significant contribution in the future by ensuring that deserving new cultivars get to the marketplace and the large numbers of plants used by the landscape industry are available.

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