THE EFFECT OF PROPAGATION METHOD ON FORCED POTTED PLANTS AND ON PATHOGEN RESISTANCE IN *SYRINGA VULGARIS*

HENRY LIMA, JR., AND ROBERT TICKNOR

Department of Horticulture
Oregon State University
Corvallis, Oregon 97331

Abstract. Production of *Syringa vulgaris* as forced potted plants is significantly affected by the cultivar and its method of propagation. Few flower buds were set on one-year-old plants from tissue culture and none were set on one-year-old plants from cuttings. Plants from tissue culture were significantly taller and wider than plants from cuttings. Scanning electron microscopy revealed fewer stomates on plants from tissue culture. A count of stomates per unit area of leaf indicated 21 to 32% more stomates on plants from cuttings. Damage from *Pseudomonas syringae* was greater in *S. vulgaris* 'Mme. Lemoine' than in 'Michael Buchner,' and greater in plants from cuttings than in plants from tissue culture.

REVIEW OF LITERATURE

Lilac sprays have been produced for sale in Europe for over 200 years by forcing large bushes and cutting their flowering branches (1). McKelvey authored a thorough review of the European lilac industry in 1928 (2). Although there has been heightened interest in lilac sprays since about 1970, their high price and short vase life of 3 days limits demand (1).

Much research has recently been done to extend the vase life of cut lilac sprays by adding nutrient solutions and phenol inhibitors to the vase water (3,4). Vase life has been increased from 3 days to 10 days with these methods (3). However, potted plants of *S. vulgaris* 'Michael Buchner' have been known to bloom for up to 3 weeks at Oregon State University.

Potted lilac plants have been produced in Europe and the U.S. for forced flowering (6). After 1919, when Quarantine 37 was enacted, all importation of European lilac plants was stopped (5).

Flowering potted lilac plants were produced in the U.S. until 1940 (6). At this time, lilac plants were produced by budding or grafting. These plants took 3 years to produce well-branched flowering plants, which were then too large for the average home (7). Improved methods for rooting lilac cuttings have reduced the time to produce flowering plants (11,12,13,14). Production of large numbers of lilac plants throughout the year is now possible using tissue culture (8,9,10). At the North Willamette Experiment Station (NWES), Aurora, Oregon, lilac plants from tissue culture grew faster and flowered at a younger age than lilac plants from rooted cuttings.

One of the difficulties in growing lilac plants has been a blight caused by *Pseudomonas syringae*. Cultivars in the Pacific Northwest have shown a wide range of damage believed to be caused by this pathogen (19).

MATERIALS AND METHODS

Lilac plants grown from cuttings (Wedge Nursery, Minnesota) and from tissue culture (Briggs Nursery, Olympia, Washington) arrived in February and April, 1985, at the NWES. Tissue culture plants from 2-in. pots and bare root cutting plants were potted into 6-in. pots using a fertilized 90% conifer bark and 10% sand mix. These plants were grown in a heated polyethylene covered hoop house at a temperature range of 50–70°F with lighting from 10 pm to 4 am until April 15. These plants were moved outside on April 20 and were fertilized with Osmocote 18-6-12. Water was applied by overhead irrigation. These plants remained in the nursery, unprotected throughout the winter of 1985.

The lilac plants were arranged in a randomized block design. Variables tested were propagation method, i.e., either tissue culture or rooted cuttings, and lilac cultivar, i.e., either 'Mme. Lemoine' or 'Michael Buchner.' Each of four treatments had 5 replications of 5 plants.

Treatments were evaluated by counting the number of branches and flower buds on each plant, and measuring plant height (cm) and width (cm). These results were recorded on December 9, 1985.

All lilac plants in each treatment showed various degrees of damage from a naturally occuring infection, probably caused by *Pseudomonas syringae*. Diseased leaf segments were macerated in test tubes with 5 to 10 ml of sterilized distilled water. The suspension of plant tissue was inoculated onto petri plates containing Kings B media (15). After 36 to 48 hours, fluorescent colonies were observed. These colonies were tested for their reaction to an oxidizing reagent (16), and it was concluded that the damage was, indeed caused by *P. syringae*.

One lilac leaf from each treatment was observed with a scanning electron microscope on June 10, 1986. Initial observation indicated a difference in the profusion of stomates on the underside of leaves from different treatments. On July 20, 1986, ten replicas of the undersides of leaves were made for each of the 4 treatments (17). Each replica was then transferred onto a piece of clear tape which was mounted on a glass slide. Photographs of the 40 replicas were made using a dissecting microscope equipped with a camera. The number of stomates per 0.5 mm^2 was counted. Within each of the 4 treatments, the numbers of stomates per photograph were averaged (Table 1).

Table 1. *Mean number of stomates*[1] *on two cultivars of Syringa vulgaris from two propagation methods*[2]

Cultivars	Propagation methods	
	Tissue culture	Cuttings
Mme. Lemoine	47.4	69.7
Michael Buchner	55.7	70.6

[1]per 0.5 mm^2.
[2]10 leaf samples per treatment.

RESULTS

Statistical analysis of the number of branches, plant height and width of potted lilac plants indicates that the cultivar and method of propagation have a significant affect on the production of lilac plants for flowering potted plants.

No significant difference because of propagation method was observed in the number of branches for *S. vulgaris* 'Mme. Lemoine. Plants from tissue culture had a mean of 6.0 branches per plant and plants from rooted cuttings had a mean of 6.32 branches per plant. However, *S. vulgaris* 'Michael Buchner' had significantly more branches when propagated by tissue culture. Plants from tissue culture had 11.92 branches per plant and plants from rooted cuttings had 3.45 branches per plant (Table 2). Branches on plants from rooted cuttings were less vigorous and narrower in diameter.

Table 2. Mean number of branches on two cultivars of *Syringa vulgaris* from two propagation methods.[1]

Cultivars*	Propagation methods*	
	Tissue culture	Cuttings
Mme. Lemoine	6.00	6.32
Michael Buchner	11.92	3.45

[1]25 plants per treatment.
*Significantly different at probability 0.01.

The average width of lilac potted plants was significantly different because of propagation method, but not because of cultivar. The mean width of *S. vulgaris* 'Mme. Lemoine' from tissue culture was 13.66 cm, and from rooted cuttings was 8.36 cm. The mean width of *S. vulgaris* 'Michael Buchner' from tissue culture was 13.94 cm, and from rooted cuttings was 7.00 cm (Table 3).

Table 3. Mean width of two *Syringa vulgaris* cultivars from two propagation methods[1].

Cultivars	Propagation methods*	
	Tissue culture	Cuttings
Mme. Lemoine	13.66 cm.	8.36
Michael Buchner	13.94	7.00

[1]25 plants per treatment.
*Significantly different at probability 0.01.

The height of lilac potted plants was significantly different because of propagation method, but not because of cultivar. The mean height of *S. vulgaris* 'Mme. Lemoine' from tissue culture was 36.70 cm, and 16.64 cm from rooted cuttings. The mean height of *S. vulgaris* 'Michael Buchner' from tissue culture was 41.22 cm, and 16.12 cm from rooted cuttings (Table 4).

Both lilac cultivars and lilacs from each propagation method were microscopically observed for anatomical differences that may be associated with the degree of damage caused by *Pseudomonas*

syringae. The mean number of stomates per 0.5 mm^2 leaf area from tissue culture plants of *S. vulgaris* 'Mme. Lemoine' was 47.4, and from plants grown from rooted cuttings was 69.7 or 32% more stomates on cutting-grown plants. The mean number of stomates per 0.5 mm^2 leaf area from tissue culture plants of *S. vulgaris* 'Michael Buchner' was 55.7 and from plants from rooted cuttings was 70.6 or 21% more stomates on cutting-grown plants (Table 1).

Table 4. Mean height of two *Syringa vulgaris* cultivars from two propagation methods[1].

Cultivars	Propagation methods*	
	Tissue culture	Cuttings
Mme. Lemoine	36.70 cm.	16.64
Michael Buchner	41.22	16.12

[1]25 plants per treatment.
*Significantly different at probability 0.01.

DISCUSSION

After one year at the NWES, taller and wider plants with more branches were produced from lilac plants propagated by tissue culture than from rooted cuttings.

The significant difference in number of branches between *S. vulgaris* 'Michael Buchner' and *S. vulgaris* 'Mme. Lemoine' indicates that some cultivars branch more profusely, which may make them more attractive plants for commercial production of forced flowering potted plants. Also, plants from tissue culture had significantly more branches than plants from rooted cuttings in *S. vulgaris* 'Michael Buchner' (Table 2). This suggests that propagation method would be important for production of flowering lilac potplants.

The height and width of both lilac cultivars evaluated were significantly greater on plants from tissue culture (Tables 3 and 4). Both cultivars were of similar height and width when propagated by the same method.

More flowers on a forced potted lilac would make it more attractive for commercial purposes, but plant size and branching habit affect flowering. At the NWES, flowering occurred only on plants with very vigorous stems. Lilac plants with many stems of little vigor did not form flower buds. Lilac plants with 5 to 10 vigorous branches were most likely to flower. Only lilac plants from tissue culture were sufficiently vigorous to produce flower buds after one year from propagation.

After 2 years, these same plants from tissue culture produced many flower buds, but were too tall for commercial forced potted plants. After two years, many lilac plants from rooted cuttings have not formed flower buds and are still very small.

Research at the NWES is now being conducted using the

growth regulators, succinic acid-2, 2-dimethyl hydrazide (B-Nine) and (2-chloroethyl) trimethylammonium chloride (Cycocel). These chemicals will be evaluated to determine whether treated plants will be shorter and produce more flowers on a more compact plant after 2 years of growth (18).

The pathogen, *Pseudomonas syringae*, may impede the commercial production of lilac plants as forced potted plants. At the NWES, the degree of damage to lilac plants from this pathogen varied depending on the cultivar and its method of propagation. All lilac cultivars propagated from rooted cuttings suffered more damage than the same cultivar from tissue culture. *S. vulgaris* 'Mme. Lemoine' suffered more damage than *S. vulgaris* 'Michael Buchner.' At least one source has indicated that some lilac cultivars are less susceptible to *P. syringae* (19).

P. syringae enters plant tissue through stomates and cracks in the plant's cuticle (20). Although in our trials there were 21 to 32% less stomates on plants from tissue culture, it is not known whether the number of stomates generally has a role in the extent of infection and damage from *P. syringae*.

Further trials are needed to investigate several other interesting questions. These include whether all lilac plants from tissue culture have less stomates than those from rooted cuttings, and whether stomatic proliferation is influenced by environmental or somaclonal variation (21).

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DWARF CONIFERS FROM WITCHES'-BROOMS

SIDNEY WAXMAN

Department of Plant Science
University of Connecticut
Storrs, Connecticut 06268

The project I have been working on at the University of Connecticut is the development of new forms of dwarf conifers. The dwarf plants that I have developed are not the result of hybridization, but originate from seed obtained from mutations found on various conifers. These mutations, called witches'-brooms, occasionally produce seed which give forth plants of which half are dwarf and half are normal.

We have at our nursery over 20,000 plants that range from two to 22 years of age. Although a graft taken from a broom would provide a dwarf plant, I prefer to collect seed because of the variability that occurs among the dwarf seedlings.

We have found that not only do the individual seedlings within a progeny exhibit variability, but differences also occur among progenies obtained from different brooms. Seedlings obtained from two red pine (*Pinus resinosa*) witches'-brooms, for example, have exhibited two different forms of growth.

In one, the plants are all upright while in the other, the branches are horizontal. We are, therefore, on the constant alert for new