The Pipeline

Editor: Mrs. Isabel Zucker, 708 West Long Lake Rd., Bloomfield Hills, Michigan, 48013

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REPRINT: The following article is reprinted from Vol. 30, No 4 of the Brooklyn Botanic Garden's Plants & Gardens, with permission of Frederick McGourty, Jr., the editor. For those of you who live in cities, the list of "resistant" lilacs should prove useful. The lucky folks who live in the country might consider placing highly susceptible lilacs well back from the road.

LILACS FOR CITIES

C. R. Hibben and J. T. Walker

THOSE old-time garden favorites, lilacs, are in trouble in the northeastern United States, particularly around cities. The peculiar malady that is afflicting them may be recognized late in the summer by several characteristics: a rolling or curling of the foliage; scorch marks between the veins of the leaves and on the leaf edges; browning of the undersides of the leaves; and the early dropping of the foliage. Shrubs losing their canopy of leaves sometimes produce a second flush of leaves and flowers late in the growing season. Because of the characteristic symptoms, we have named this the leaf roll-necrosis of lilacs, abbreviated LRN. There is strong evidence that this malady is a result of air pollution.

Members of the Kitchawan Research Laboratory of the Brooklyn Botanic Garden, Ossining, New York, have completed an investigation into the causes of LRN of lilacs. The ultimate health of lilacs, not to mention other forms of plant and animal life, depends on our willingness to cleanse the air in cities and suburbs. Until that occurs, however, a partial solution to the problem is to plant certain kinds of lilacs that are now known to resist air pollutants.

From our early studies it was learned that microbial disease agents, insects and mites, nutrient deficiencies, herbicide injury, graft incompatibility, soil acidity and water shortages were not primary causes of LRN. However, as our research progressed, injury by air pollutants was suspected because some of the leaf markings on lilacs were typical of those caused by pollutants on other kinds of plants. Previous tests at the Botanic Garden in Brooklyn confirmed that plant-injurious air contaminants indeed occur in New York City, as they do in most urban areas.

Several experiments showed that air pollutants were likely contributors to LRN of lilacs. For example, current-year stem cuttings were harvested in Brooklyn from cultivars known to be susceptible to LRN. The cuttings were rooted and grown the next year at Kitchawan, which is in a rural location about 25 miles north of New York City. Whereas

the parent shrubs in Brooklyn continued to show the effects of LRN, their vegetatively propagated — hence genetically identical — offspring recovered completely in the new environment. However, when transplanted back to the Garden, they again developed LRN symptoms. In another experiment, single branches of lilac shrubs exposed to city air were enclosed for 2 to 4 months in clear plastic filter chambers, designed to exclude air pollutants. Foliage on the protected branches remained healthier than portions of the same shrub continually exposed to the atmosphere.

Despite the annual recurrence of LRN, after 1968 we noticed a slight yearly decrease in its severity on lilacs at the Garden, and in several arboreta near Philadelphia. During the same time span, data from air-quality monitoring stations located in New York and Philadelphia showed a trend of decreasing levels of ozone and sulfur dioxide, the two air pollutants which probably cause more plant damage than any others. If this correlation is valid, we can expect an increase in LRN severity if current pollutant emission standards are relaxed.

We attempted to identify the pollutants which were injurious by exposing potted lilacs to ozone, sulfur dioxide, or the gases simultaneously, in laboratory growth chambers. Only some of the LRN symptoms could be reproduced with these toxicants. The diversity of LRN symptoms suggests that additional, as yet unidentified, air contaminants are also damaging lilacs in cities. This might be expected when one considers the many types of gaseous and particulate pollutants which are generated in urban areas.

Diversity of Lilacs

The lilac that gardeners are most familiar with is the intensely fragrant common lilac (*Syringa vulgaris*), of which more than 1,000 cultivars have been recorded. This species, which has its origins in the mountains of Eastern Europe, has also been hybridized with other lilacs, most notably the early lilac (*S. oblata*), a native of China and Korea. All told, there are about 25 true species of lilacs found in the wild in various parts of the world. Rather few of these others are widely grown in gardens, although some have been employed by breeders to create hybrid groups with their own cultivars.

From our observations of LRN at several locations, it became apparent that certain cultivars and species were obviously affected less than others. This suggested a hereditary character or genetic basis for the differences. To determine if there were true resistance to the causes of LRN, the symptoms were rated yearly, beginning in 1968, for about 500 lilac cultivars and species in the following locations: Brooklyn Botanic Garden; Arboretum of the Barnes Foundation, Merion Station, Pennsylvania; Arthur Hoyt Scott Horticultural Foundation, Swarthmore, Pennsylvania; John J. Tyler Arboretum, Lima, Pennsylvania; Arnold Arboretum, Jamaica Plain, Massachusetts; Howard Taylor Memorial Lilac Arboretum of Rosedale Gardens, Millbrook, New York.

The magnitude of the resulting data necessitated their transfer to punch cards for computer analyses to determine the statistical significance of apparent correlations among symptoms, location and year. Through the American Horticultural Society's Plant Records Center and the University of Georgia Computer Center, a multivariate analysis of the data enabled us to rate numerically each cultivar and species according to its sensitivity to LRN. We were particularly interested in those selections which occurred at all six study locations.

A final list of cultivars and species was grouped into three categories; least injured, or resistant; moderately injured; and severely injured, or susceptible. The list in the accompanying table includes a few of the more familiar resistant or susceptible lilacs. It is noteworthy that non-*vulgaris* cultivars and interspecific hybrids showed greater resistance to LRN than the *vulgaris* cultivars.

From this investigation, we recommend that growers consider the LRN disorder when choosing lilacs for city or suburban gardens. Some of the lesser known species and hybrids are not yet widely available from nurseries but may be worth the search if they have low numerical ratings in the table. Although not all have the strong scent or very large flower clusters of the common lilac, they have their own interesting traits and should perform better in polluted air. As an aid to sources for the less frequently encountered species, the grower may consult Brooklyn Botanic Garden Handbook No. 63, *1200 Trees and Shrubs—Where to Buy Them.*

In addition, gardeners should know about a group of enthusiastic plantsmen —the International Lilac Society. It is a membership organization which issues a regular bulletin and periodic newsletter, and an annual convention is held. Particulars are available from the Society's secretary, Walter W. Oakes, Box 315, Rumford, Maine 04270.

INJURY INDEX

The lowest numerical rating indicates greatest resistance to air pollution injury to foliage. Flowers are single, except where noted. An *asterisk* denotes cultivars of the common lilac (*Syringa vulgaris*). This is a condensed list. Readers seeking air-pollution ratings for additional lilacs may turn to our forthcoming article in the *Journal of the American Society for Horticultural Science.*

Slightly Injured (Resistant)

Peking lilac (*Syringa pekinensis*). Flowers creamy white, late. A shrub or multi-stemmed tree growing to 12 or 15 feet and similar to the Amur tree lilac.	1.1
Meyer lilac (*S. meyeri*). Now considered by some botanists as a form of *S. patula.* Flowers lilac-colored.	1.3
x *hyacinthiflora* 'Lamartine' (*S. oblata* x *vulgaris*). Flowers pinkish. *S. hyacinthiflora* selections are the closest substitutes for *S. vulgaris;* most have fragrant, conspicuous flowers and bloom a few days earlier than the common lilac.	1.4
x *hyacinthiflora* 'Buffon'. Flowers pinkish.	1.5
Himalayan lilac (*S. emodii*). Flowers lilac-colored.	1.5
x *hyacinthiflora* 'Esther Staley'. Magenta.	1.5
* 'Macrostachya'. Flowers pinkish. The most resistant *vulgaris* selection in our tests.	1.6
velutina 'Excellens'. Flowers lilac-colored. *S. velutina* is now considered part of the *S. patula* complex, which includes the lilac known in the trade as S. "palibiniana".	1.6
x *hyacinthiflora* 'Montesquieu'. Magenta.	1.6
* 'Montaigne'. Flowers double, pinkish.	1.7
* 'Mrs. W. E. Marshall'. Purple.	1.7
x *hyacinthiflora* 'Assessippi'. Flowers lilac-colored.	1.7
Little-leaf lilac (*S. microphylla*). Flowers lilac-colored to pink. Fragrant. Growth habit is spreading; some shrubs are twice as wide as tall. Occasional recurring bloom in autumn.	1.8
* 'President Fallieres'. Flowers double, lilac-colored.	1.8
Late lilac (*S. villosa*). Pinkish.	1.8
x *henryi* 'Lutece' (*josikaea* x *villosa*). Violet, late.	1.8
x *hyacinthiflora* 'Pocahontas'. Purple.	
* 'A.M. Brand'. Purple.	1.9
Nodding lilac (*S. reflexa*). Pinkish. Flower clusters small, more-or-less drooping.	1.9

Moderately Injured

* 'Congo'. Magenta.	2.0
Hungarian lilac (*S. josikaea*). Fragrant, lilac-violet flowers.	2.1
* 'Lucie Baltet'. Pinkish.	2.2
* 'President Grevy'. Blue-flowered.	2.2
Persian lilac (*S.* x *persica*) (parentage: *S. laciniata* x *vulgaris*). Fragrant, pale lilac blossoms. Lower growing than most of its kin, and the leaves are smaller, too.	2.2
* 'Charles X'. Magenta.	2.3
* 'Primrose'. Flowers yellowish-white.	2.3
S. velutina. Pale lilac to lilac pink. Now considered part of the *S. patula* complex. Height varies, but usually lower and more compact than *S. vulgaris*.	2.3
* 'Alphonse Lavallee'. Double, lilac-colored flowers.	2.4
* 'Charles Joly'. Double, purple.	2.4
* 'Mme. Florent Stepman'. White-flowered.	2.4
* 'Leon Gambetta'. Double, lilac-colored.	2.5
* 'Ludwig Spaeth'. Purple.	2.5
* 'Marechal Lannes'. Double, bluish.	2.5
* 'Michel Buchner'. Double, lilac-colored	2.5
* 'Jan Van Tol'. White.	2.6
* 'Ellen Willmott'. Double, white.	2.7
* 'Vestale'. White.	2.8
* 'Maurice Barres'. Bluish.	2.9

Severely Injured

* 'Boule Azuree'. Bluish.	3.0
* 'Edith Cavell'. Double, white.	3.0
* 'Katherine Havemeyer'. Double, pinkish.	3.0
* 'Leopold II'. Lilac-colored.	3.0
'William Robinson'. Double, lilac-colored.	3.0

Freek Vrugtman has sent a copy of Naming and Registering New Cultivars, published by the American Association of Nurserymen in cooperation with the National Association of Plant Patent Owners. Copies are available from the AAN, 230 Southern Building, Washington, DC 20005. No price is printed in the leaflet.

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The July, 1975 issue of Flower and Garden lists the top six lilacs from the survey at Hamilton published in an earlier Pipeline in its column, It's What's Happening--- in and about American gardens.

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