# Relative Growth Rate and Plant Habit of Linden Taxa[1]

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## Abstract

Many cultivars of *Tilia cordata* Mill. and other Linden taxa have been evaluated at the University of Minnesota Landscape Arboretum. This paper provides data on relative growth rate and photographs illustrating differences in plant habit.

**Key Words:** *Tilia*, linden, basswood, growth habit, plant form

## Introduction

Lindens are popular shade trees in much of the northern hemisphere. Their popularity seems to be increasing for use in many landscape situations. They are reasonably well-adapted to a broad range of soil and climatic conditions and are relatively free of major disease problems that may threaten survival or landscape value of established trees. Several new cultivars of *Tilia cordata* have been introduced into the nursery trade in recent years. Information on relative growth rate, regional adaptation, and plant growth habit of *Tilia* cultivars is not readily available in the literature.

## Materials and Methods

Starting in 1979, an effort was initiated to acquire and plant new cultivars of *Tilia cordata* and other taxa of Lindens at the University of Minnesota Landscape Arboretum. Five trees of each cultivar were acquired from production nurseries and planted out in the shade tree evaluation plots. They were acquired from several different nursery sources and were not always of the same initial nursery grade. Thus statistical comparisons of size would not be valid and size data only provides some indication of trends in regard to relative growth rate. Plants were watered at time of planting and during extended dry periods during the first summer of establishment. No irrigation has been provided after the first growing season. Competing vegetation was controlled in a two meter (6 ft) strip in each row by use of the herbicide glyphosate at the rate of 1.15 l/ha (3 qt/acre). The trees have not been fertilized and only minimal corrective pruning has been done to remove double leaders. Trees have been observed for winter injury and measurements of height and trunk diameter have been made.

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## Results and Discussion

Trees planted in 1979 have now reached a size to permit some early observations of adaptation, growth rate and habit of growth of young trees. Table 1 lists date planted, nursery grade of trees planted, and average current height and trunk diameter. Figures 1–3 illustrate growth habit of various *Tilia* taxa. Considerable differences in growth habit exist among the different cultivars of *Tilia cordata* ranging from Greenspire's very dense formal pyramidal habit, Chancellor's dense upright oval shape to Fairview's more open informal oval habit. As can be observed in the photographs, other cultivars are similar to or intermediate among the three cultivars previously mentioned. Leaf size also varies considerably as illustrated by Figure 4. These differences in growth habit

**Table 1. Year and nursery grade planted, and current height and trunk diameter for various Linden taxa.**

| Taxa | Year Planted | Nursery Grade | Mean Height (m) | Mean Trunk Diameter (cm) |
|---|---|---|---|---|
| *Tilia americana* | 1979 | 1¼″ | 7.6 | 12.9 |
| *Tilia americana* 'Pyramidalis' | 1979 | 1¾″ | 7.6 | 17.0 |
| *Tilia americana* 'Redmond' | 1979 | 1¼″ | 5.8 | 12.7 |
| *Tilia cordata* | 1979 | 1½″ | 5.7 | 12.9 |
| *Tilia cordata* 'Bicentennial' | 1979 | 8–10′ | 4.8 | 11.1 |
| *Tilia cordata* 'Chancellor' | 1979 | 1½″ | 5.5 | 11.8 |
| *Tilia cordata* 'DeGroot' | 1979 | 8–10′ | 5.1 | 12.9 |
| *Tilia cordata* 'Fairview' | 1979 | 8–10′ | 6.0 | 14.2 |
| *Tilia cordata* 'Glenleven' | 1979 | 8–10′ | 5.8 | 11.9 |
| *Tilia cordata* 'June Bride' | 1979 | 5–6′ | 5.0 | 9.9 |
| *Tilia cordata* 'Morden' | 1979 | 8–10′ | 4.3 | 8.2 |
| *Tilia cordata* 'Olympic' | 1979 | 1¼″ | 5.0 | 12.7 |
| *Tilia cordata* 'Rancho' | 1979 | 8–10′ | 5.2 | 11.2 |
| *Tilia cordata* Sheridan Hybrids | 1979 | 8–10′ | 5.8 | 12.5 |
| *Tilia xeuropaea* 'Pallida' | 1979 | 6–8′ | 5.6 | 12.3 |
| *Tilia xeuropaea* 'Wratislaviensis' | 1979 | 8–10′ | 3.7 | 8.0 |
| *Tilia platyphyllos* 'Laciniata' | 1978 | 6–8′ | 4.2 | 7.9 |

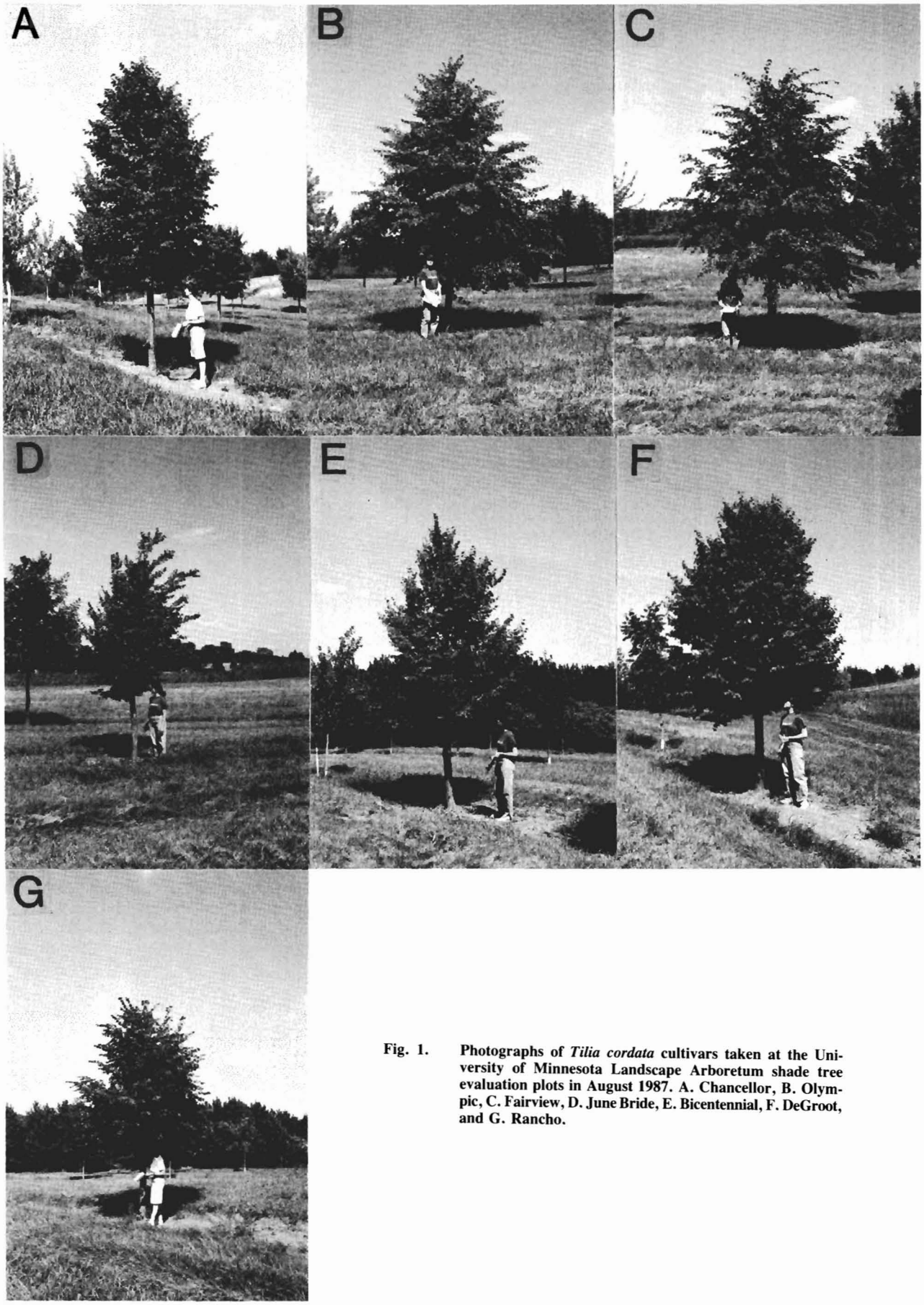


**Fig. 1.** **Photographs of *Tilia cordata* cultivars taken at the University of Minnesota Landscape Arboretum shade tree evaluation plots in August 1987. A. Chancellor, B. Olympic, C. Fairview, D. June Bride, E. Bicentennial, F. DeGroot, and G. Rancho.**

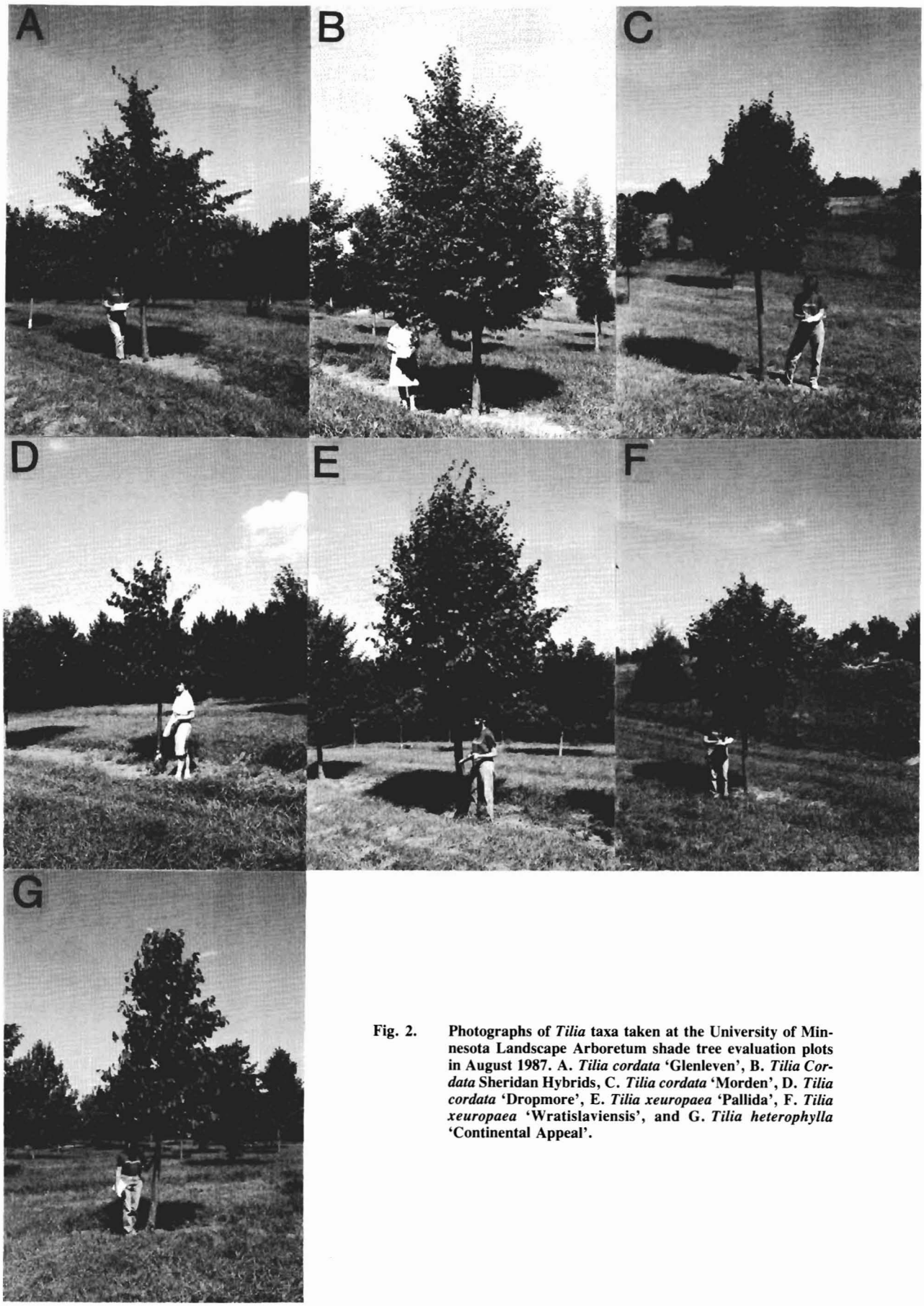


**Fig. 2.** **Photographs of *Tilia* taxa taken at the University of Minnesota Landscape Arboretum shade tree evaluation plots in August 1987. A. *Tilia cordata* 'Glenleven', B. *Tilia Cordata* Sheridan Hybrids, C. *Tilia cordata* 'Morden', D. *Tilia cordata* 'Dropmore', E. *Tilia xeuropaea* 'Pallida', F. *Tilia xeuropaea* 'Wratislaviensis', and G. *Tilia heterophylla* 'Continental Appeal'.**

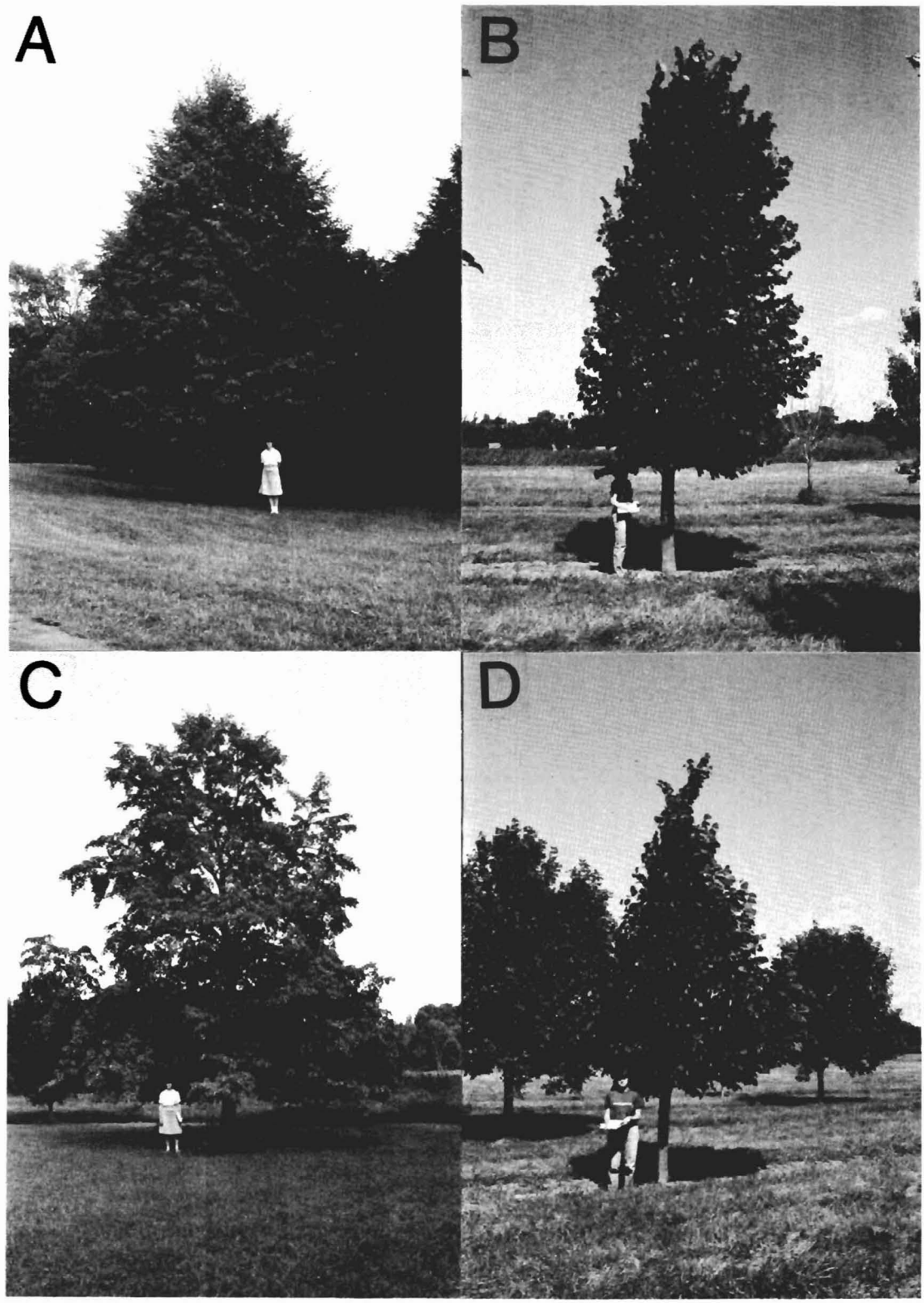


**Fig. 3.** **Photographs of *Tilia* taxa taken at the University of Minnesota Landscape Arboretum in August 1987. A. *Tilia cordata* 'Greenspire' (planted 1967), B. *Tilia americana* 'Pyramidalis', C. *Tilia mongolica* (planted 1958), and D. *Tilia americana* 'Redmond'.**

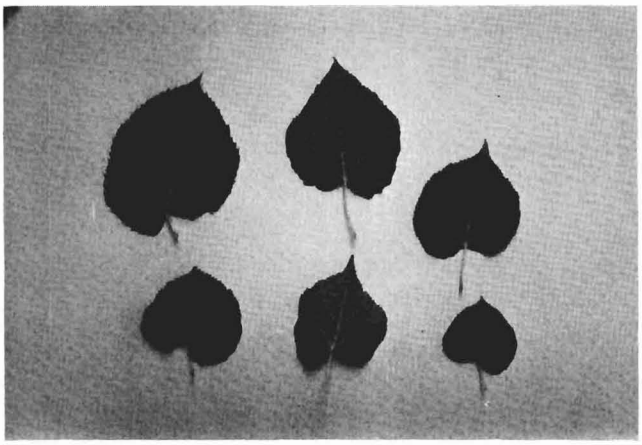

**Fig. 4.** **Photograph of leaves of *Tilia* taxa illustrates size differences. Taxa from top left to right are: *Tilia americana* 'Pyramidalis', *Tilia cordata* 'Glenleven', *Tilia xeuropaea* 'Pallida', *Tilia cordata* 'Fairview', *Tilia cordata* 'DeGroot', and *Tilia cordata* 'June Bride'.**

and foliage texture provide an opportunity to choose appropriate cultivars for different landscape effects. Unfortunately, a new planting of Greenspire was not included at the time other cultivars were added since excellent specimens were already growing in the arboretum. Thus comparison of growth rate cannot be made between Greenspire and cultivars established in later plantings.

*Tilia mongolica* Maxim. planted in 1958 have developed into attractive trees with a more open informal habit than most other Lindens as exhibited in Fig. 3. Foliage is approximately equal in size to that of *Tilia cordata*. *Tilia mongolica* has interesting, slightly exfoliating bark that adds interest in the winter season, however, it is a relatively slow grower and, as indicated by Dirr (1), is difficult to train and grow in the nursery.

Data on adaptation to Minnesota winters has been published previously (2). There has not been any significant amount of winter injury since then. Insect and disease problems have been very minimal with no differences noted among the taxa observed.

## Significance to the Nursery Industry

Shade trees are an important component in plant inventories of landscape nurseries. Clonal materials of adapted species are becoming more widely used when good selections are available because they result in plants of uniform trees with a known plant habit and quality. Cultivars of a given species are not uniformly adapted to different regions within the potential range. Regional evaluation of each cultivar is needed to determine its potential for widespread use in that region.

Very little written information is available describing relative growth rate and plant habit of many of the newer Linden cultivars. Data and photographs presented in this paper provide some indication of plant habit of many of the Linden cultivars and also provide some insight into relative growth rate of the taxa listed when grown in the upper midwest. Relative performance of the same cultivars may differ considerably in other regions.

## Literature Cited

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