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purple maiden grass 82 and 61% respectively. Flowering data collection until November 1991, when no further flowering occurred, showed that flowering was reduced for the entire growing season and not just delayed until later in the year.

Use of postemergence herbicides will injure ornamental grasses. The extent of injury varies with species, postemergence applied herbicide and application rate. In extreme situations, weed pressure may dictate use of a postemergence applied herbicide. Application early in the year appears to allow ornamental grasses time to recover from the injury. Generally, Poast was the least injurious to pampas grass and dwarf fountain grass and Acclaim was least injurious to the maiden grasses.

(*Ed. note:* This paper reports the results of research only, and does not imply registration of a pesticide under amended FIFRA. Before using any of the products mentioned in this research paper, be certain of their registration by appropriate state and/or federal authorities).

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Microclimates and Tree Growth in Three Urban Spaces[1]

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Abstract

Microclimates characteristic of urban park, plaza, and canyon spaces were related to physiology and growth of even-aged sweetgum (*Liquidambar styraciflua* L.) street trees. Microclimates, tree growth, and physiological responses were characterized diurnally and seasonally. Park and plaza sites received unobstructed sunlight while the canyon was limited to four hours of direct solar radiation in midsummer. Potential seasonal insolation was 44% of the potential maximum at the canyon and over 90% at the park. Afternoon air temperatures and vapor pressure deficits were somewhat greater at the plaza than the other two sites, and potential pan evaporation was nearly 50% greater over the season. Tree growth at the plaza and canyon acclimated physiologically and developmentally to the prevailing environmental conditions. Thinner leaves and less trunk growth when compared with the park were indications of shade acclimation in the canyon trees. This did not, however, appear to affect crown size or shoot growth of canyon trees. In contrast, plaza trees were sparse and stunted, exhibiting diminished crown size and diameter increment when compared with trees at the other sites. Less favorable water relations suggested that chronically higher evaporative demand and limited soil resources restricted growth of the plaza trees. Park, plaza, and canyon designations of urban spaces can provide a useful framework for predicting microclimatic factors that can affect tree growth for an urban site. Long-term growth and development, however, within any of these urban spaces will depend on interactions with existing soil conditions.

Key words: *Liquidambar styraciflua* L., urban microclimate, solar radiation, shade response, evaporative demand

Significance to the Nursery Industry

Soil conditions are often the primary consideration when urban sites are evaluated for tree planting. Results of this study show that microclimate conditions should also be considered. Establishing whether an urban site has park, plaza, or canyon characteristics can assist landscapers and nurserymen in better selecting suitable species for planting or diagnosing problems of established trees. Photosynthesis and growth can be light-limited in an urban canyon, so a shade-tolerant species may be more suitable for such conditions. Sites with extensive paving will have greater evaporative demand possibly requiring a more heat and drought tolerant plant. Species selection has to be evaluated in terms of existing soil conditions to avoid potential interactions with microclimatic conditions that can create greater stresses.

Introduction

While trees are used to improve aesthetics (11) and ameliorate climatic extremes (14) in cities, their growth and longevity are often less than desired (9). This is generally

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attributed to endemic urban-soil conditions unfavorable to growth, such as inhibition of root development from compaction (20) or nutrient and water deficiencies (24, 23). Moreover, urban climates can diverge widely from those in rural areas in terms of radiation, humidity, and temperature because of configuration and properties of buildings and pavement (18). The effect of urban climates on tree growth, however, has been less widely investigated. Extensive paving and low buildings, extensive paving and high buildings, and non-extensive paving (vegetated) and low buildings can be described as plaza, canyon, and park spaces, respectively (7). Altering radiation input in urban canyons or energy partitioning over impermeable surfaces in paved areas would result in characteristic microclimates (18) that could influence tree growth. While there are empirical and simulated data on plant response in individual urban microclimates (17, 25), there is little experimental information on the relationship between tree response and microclimates in park, plaza, and canyon spaces as a unifying conceptual framework. This study characterized microclimates in park, plaza, and urban canyon sites linked to physiological responses and growth of well-established trees.

Materials and Methods

This study was conducted in Seattle, Washington on mature street-tree plantings of sweetgum (*Liquidambar styraciflua* L.). Site selection was based on the high degree of planting-stock and maintenance uniformity of street trees, and the presence of similar-aged, street-tree plantings of sweetgum in Seattle installed during the 1970's. Three sites along major arterial streets were identified as corresponding to park, plaza, and canyon spaces. Each site contained 10–12 sweetgum trees transplanted into the 1 m wide (3 ft) parking strip between the curb and sidewalk during the years 1976–77.

The park site was a city block, 130 m (426 ft) in length along the north side of a major, east-west arterial boulevard in a residential district of single-family housing units approximately 10 m (30 ft) in height, 5 km (3 miles) east of the central business district (CBD). This site was bordered on the north by a municipal park with turf leading to a row of assorted, mature, 10–15 m (30–50 ft) high, conifers and broadleaf trees approximately 10 m (30 ft) from the sidewalk. The study trees were located in a turf parking strip that was irrigated and fertilized at regular intervals. While not completely vegetated, this site offered the largest expanse of surrounding vegetation while still maintaining the advantages of street-tree uniformity. The canyon site was a city block situated on the east side of a major north-south street in the CBD where adjacent building heights on either side ranged from 50 to 100 meters (160–320 feet). The trees were installed in 1.3×1.3 m^2 (18 ft^2) cuts in concrete paving contiguous between the curb and sidewalk. The plaza site was a triangular traffic island in a business district one km (3280 ft) north of the CBD bordered by three major arterials. Adjacent buildings did not exceed 9 m (30 ft) and were no closer than 12 m (40 ft) to the site. The trees were in 1×1 m^2 (11 ft^2) cuts in concrete-and-asphalt paving contiguous over the triangle. While explicit transplanting records were not found for any of the sites, city policy has been to specify stock meeting minimum American Association of Nurserymen standards for street-trees. City maintenance consisted of supplemental watering the first two years after transplanting, followed by one-time removal of lower limbs for pedestrian clearance.

To avoid potential confounding effects, the first three trees in sequence not adjacent to light standards, bus stops, or corners, going from east to west at the park, and north to south at the plaza and canyon, were selected for intensive study. Soil conditions were characterized from 50 mm (2 in) diameter cores collected in 0.15 m (0.5 ft) increments to 0.6 m (2 ft) taken approximately 0.5 m (1.5 ft) away from the tree within the exposed cut. Coarse fragments were separated by sieving and particle size distribution of the resulting fine fraction was determined by settling times in water. Soil pH was measured with a combination electrode, and soil carbon was determined with a high-temperature carbon analyzer. Available soil water between 0.01 and 0.5 MPa was determined from the disturbed soil-core samples using porous-ceramic-plate pressure extractors. Soil variables were averaged by depth to give average values for each tree.

Spot measurements of climatological variables were sequentially taken from dawn to dusk under cloud-free conditions on four dates in 1987, June 18, June 24, July 10, and August 4, and on three dates in 1986, July 21, August 6, and August 21. Global shortwave radiation was measured adjacent to the trees with a silicon cell, cosine-corrected pyranometer leveled at 2 m (6.5 ft). The pyranometer was then inverted to measure reflected surface radiation. Total radiation (long- and short-wave) was measured with a Fritschen-type hemispherical net radiometer. Surface long wave radiation was calculated as the difference between the inverted pyranometer and the bottom hemisphere of the net radiometer. Wet bulb and air (T_a) temperatures were measured at 2 m with a fan-aspirated psychrometer for calculating vapor pressure deficits (VPD). Surface temperatures were measured with a thermistor at three points, one immediately adjacent to the sunlit side of the tree and the others 2 m (6 ft) on either side to form a transect. These values were averaged to give mean surface temperature.

Potential pan evaporation was estimated at the sites using microevaporimeters constructed from 25 ml pipettes (21). They were initially calibrated to a USDA Class-A evaporation pan located on the University of Washington Campus in an irrigated-and-maintained turfgrass enclosure. Following calibration three evaporimeters were attached to a timber light standard at the park and aluminum standards at the canyon and plaza. They were positioned at 5 m height and oriented to the south on arms that extended 30 cm away from the standards to provide adequate ventilation and minimize heating from the light standard. Evaporation was monitored 3–4 times a week, concurrent with Class-A reference pan evaporation, during the summer of 1987. Microevaporimeter water loss was linearly related ($r^2 = 0.95$) to Class-A pan evaporation (Fig. 5, inset). This relationship was used to estimate pan evaporation from the mean of the three readings collected per site per period.

Seasonal radiation for the sites was estimated using a previously-verified computer (8) model that calculated receipt of global shortwave radiation (W m^{-2}) on a horizontal surface (irradiance) for a given latitude and longitude. Hemispherical photographs were taken to the immediate south of the trees at each site with a 10 mm fish-eye lens leveled at 2 m (6 ft). From photographic prints angular position (in degrees) of buildings and trees that could obstruct direct sunlight in the sky hemisphere was measured. The angular elevation of the top of a tree or building above the horizon was determined in 10° azimuthal increments along the horizon from true north. These coordinates defining the horizon topography of a site were used in the model for calculating attenuation of solar radiation. The model was verified by regressing predicted values on shortwave radiation collected during the dawn-to-dusk studies, and the lines forced through the origin. Total daily potential irradiance ($MJ\ m^{-2}\ day^{-1}$) was modeled from April 1 to September 30 for the park and canyon sites, but not for the plaza because of similarity in horizon topography to the park site, and for an unobstructed horizon topography. Average daily irradiance was calculated by month, and in addition daily irradiance was summed to give total potential seasonal irradiance ($MJ\ m^{-2}$). Percent of potential seasonal irradiance was determined by dividing the irradiance for each site by total irradiance from an unobstructed horizon.

Trunk, shoot, and leaf growth of selected test-site trees was measured for two seasons. Two basal increment cores were taken from the trees at each site during the winter of 1987. Each core was attached to a fixed mount, sanded and then stained with phloroglucinol to improve visual expression of the rings, and widths were measured under a microscope with a micrometer. The projected area of the crown normal to direct-beam solar radiation (sunlit crown area) was measured midsummer 1987 from the number of shaded intersections on a grid with 0.2 m (0.75 ft) spacing under each tree at midday. Sunlit crown area was calculated as the product of shaded ground area and sine of solar elevation (16). Current-year's shoot elongation and leaf size was measured on ten, full-sun shoots excised from primary branches of each tree in late summer both years. All leaves from the shoot were harvested and individual leaf areas measured with an area meter. Mean individual leaf area per shoot was calculated, and then average shoot elongation and individual leaf area were calculated for each tree.

Based on differences among the sites, specific physiological measurements were taken to provide mechanistic links between microclimatic conditions and growth responses. For the park and canyon trees internal leaf morphology was evaluated by removing 2 cm^2 (0.3 in^2) leaf disks from a fully mature leaf randomly selected from each of the 10 shoots previously described. The disks were alcohol dehydrated and fixed on a glass slide after the procedure described by Berlyn and Miksche (3), and then photographed and measured under magnification. Water relations were investigated at the park and plaza sites during the dawn-to-dusk studies. Stomatal conductance (g_s) was monitored with a steady-state porometer on five fully sunlit leaves per tree, randomly selected at mid-crown level, three trees per site. Leaf temperature (T_l) was measured with an open-vented, copper-constantin, fine-wire thermocouple. Water potential (Ψ) was measured predawn with a pressure chamber during both seasons on the terminal 10 cm (4 in) of a single shoot from each tree.

Results and Discussion

Physical and chemical characteristics of the soil adjacent to the trees varied among the sites (Table 1). While all three soils were quite sandy, available soil water was most limited at the plaza soil because of high gravel content, low water-holding capacity, and shallow depth. The plaza soil had 0.6 m (2 ft) of soil underlain by compacted, silty glacial till exhibiting minimal root penetration. At the park site there was less gravel and no detectable layers within the measured soil depth that limited root penetration. Physical conditions of the park soil were otherwise generally similar to the plaza. The canyon soil had more favorable physical conditions, as bulk density and percent gravel were lower, the former due to the high level of organic carbon, and the available water content was higher. Soil pH did not vary widely among sites, as it was the highest at the plaza at 6.3 and lowest at the canyon at 5.1. Unlike other reports on street-tree soil conditions, mottling and other characteristics of poor drainage were not evident (2).

Environmental conditions varied diurnally among sites (Fig. 1). On a representative date, diurnal radiation was reduced in the canyon, truncated to a four-hour window period in mid-morning and early afternoon due to obstruction by adjacent buildings (Fig. 1a). This pattern had been suggested in computer simulations of different urban-canyon configurations (17), and observed in a less-truncated form in another urban tree study (25). As a result, reflected shortwave, surface longwave radiation, (a strong function of surface temperature), and surface temperature (Fig. 1d) were lower during the shaded periods. Surface temperature and longwave radiation at the canyon briefly reached levels similar to the plaza during exposure to direct sunlight. While peak values were similar, longwave radiation and VPD (Fig. 1b) at the plaza were slightly greater than the park through the afternoon due to increased surface and air temperature. These environmental extremes at the plaza, when compared to the park, were not as great as in similar comparisons (6, 25, 26). Differences may have been attenuated at the plaza by marine air from Puget Sound (less than 1 km to the west), and at the park the adjacent street may have reduced site evaporation and increased surface and air temperatures and VPD. On five of the six other dawn-to-dusk study dates (data not shown), however, maximum daily T_a at the plaza exceeded the park by 0.5–1.5°C (1–3°F), and maximum daily VPD at the plaza exceeded the park on all six dates by 0.15 to 0.5 kPa. The greatest differences occurred when

Table 1. Soil textural class (fine fraction), and average gravel content, available water content (AWC), bulk density, pH, and carbon of soils (n = 3) from 0–660 cm in park, plaza and canyon root zones, plus standard error.

Site	Class	Gravel (%)	AWC ($cm\ cm^{-1}$)	Bulk Density ($g\ cm^{-3}$)	pH	Carbon (%)
Park	Loamy sand	20 ± 1[z]	9.0 ± 1	1.45 ± 0.09	5.7 ± 0.1	0.13 ± 0.02
Plaza	Sandy loam	34 ± 4	8.0 ± 1	1.45 ± 0.17	6.3 ± 0.2	0.15 ± 0.01
Canyon	Sandy loam	22 ± 2	12.0 ± 1	1.09 ± 0.08	5.1 ± 0.1	0.29 ± 0.02

[z] Standard error.

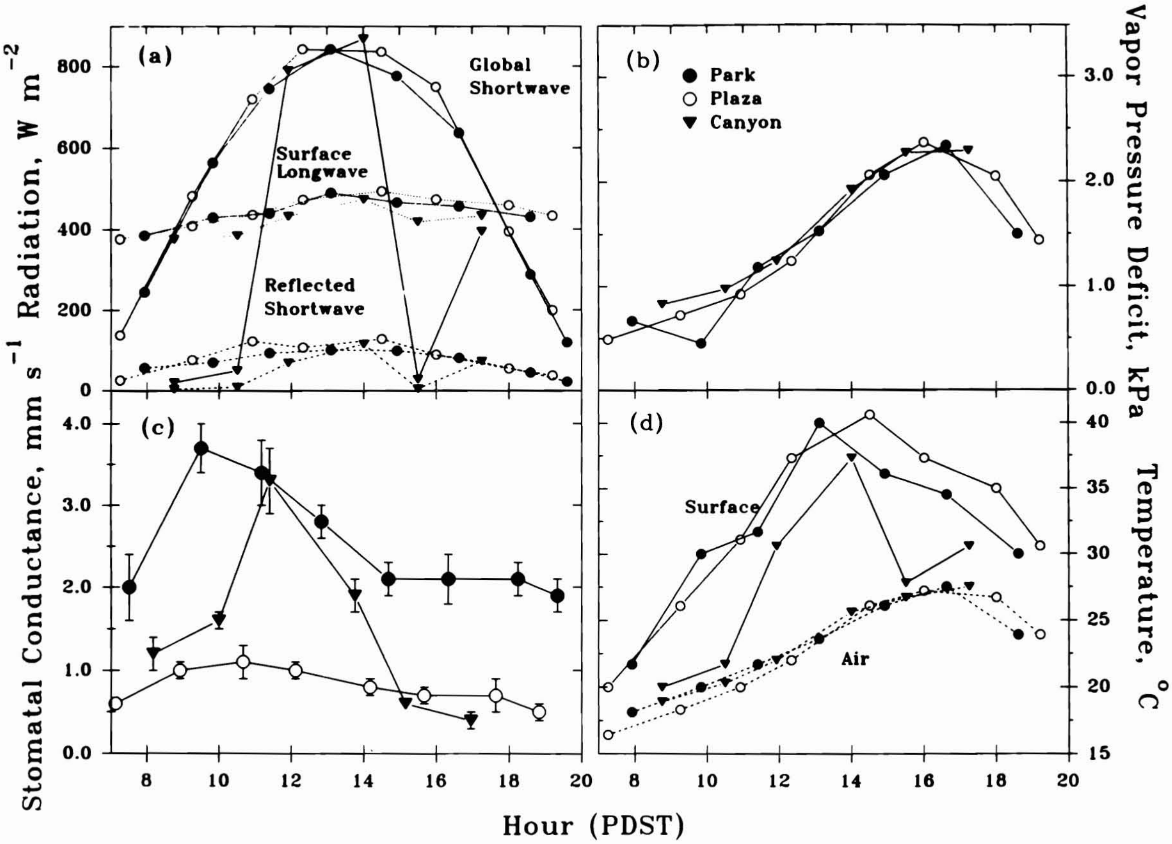

Fig. 1. **Environmental conditions and stomatal conductance of sweetgum at park, plaza, and canyon sites on August 4, 1987; (a) global shortwave, reflected surface, and long-wave reflected radiation fluxes (W m^{-2}), (b) vapor pressure deficit (kPa), (c) stomatal conductance (mm s^{-1}) the average of three trees per site, and (d) surface and air temperature (°C).**

plaza T_a exceeded 30°C (86°F), which may account for the similarity of conditions in Fig. 1.

Seasonal environmental conditions at the sites reflected the diurnal patterns (Fig. 2). Truncation of diurnal radiation at the canyon was translated into consistently lower receipt of irradiance than the park as estimated over the growing season. Average daily irradiance was greatest in late June during maximum day length at both sites, decreasing earlier and later in the season with shorter days. Modeled average daily irradiance was consistently over 90% of unobstructed levels at the park by month, while the canyon was just 50%. Again, these reductions were consistent with the simulations

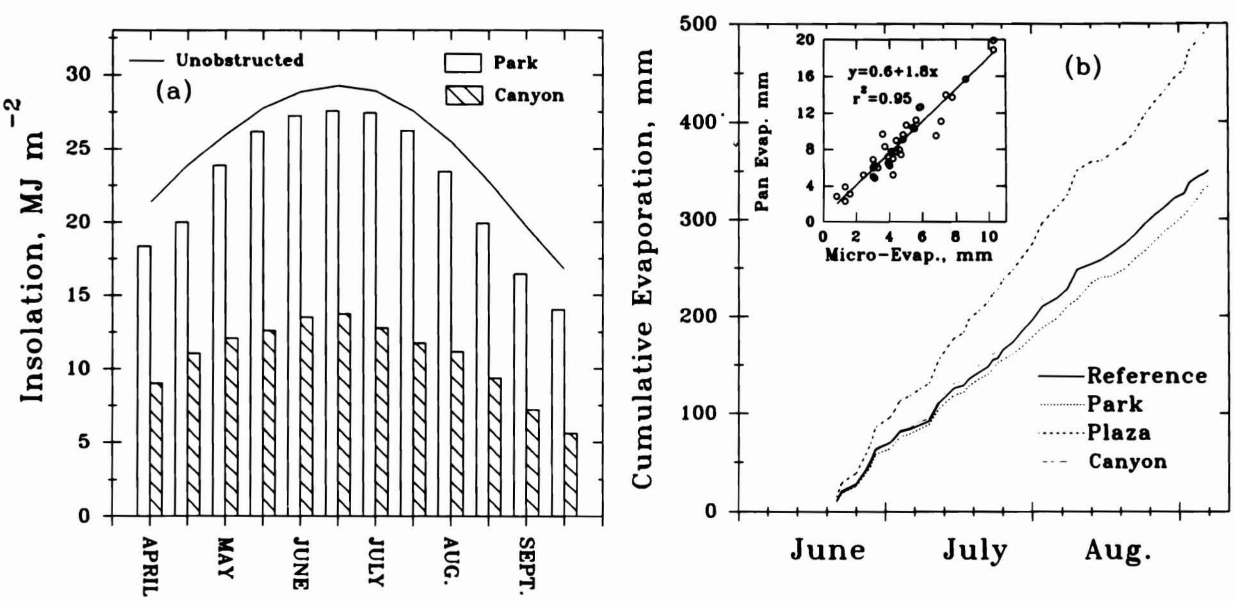

Fig. 2. **(a) Seasonal irradiance at park and canyon sites (bars) and unobstructed horizon (line) modeled from April 15 to September 15. (b) estimated pan evaporation at park, plaza, and a USDA Class-A reference site, from June 17 to September 3, 1987. Inset: calibration of microevaporimeters to Class-A pan evaporation at the reference site.**

by O'Rourke and Terjung (17). Summing over the six-month period April 1–September 30, the total modeled irradiance at the park site was 94% of the possible maximum, while the canyon estimate was only 44%.

The modest differences in afternoon temperature and VPD at the plaza were apparently amplified. Estimated potential pan evaporation was consistently 50% greater than the park, canyon, and reference sites over the season (Fig. 2b). Total potential evaporation for the measurement period of June 19 to September 3 was 495, 334, 368, and 350 mm (19.5, 13.1, 14.5, and 13.8 in) for the plaza, park, and reference Class-A pan sites, respectively. Greater afternoon T_a and VPD at the plaza suggested that stored heat from the paving was convected and re-radiated longer during the day and contributed to the higher evaporation. Increased evaporation in paved areas has been reported elsewhere (26, 15). Similarly, stored heat from adjacent buildings at the canyon during the shaded periods probably increased the canyon evaporation rate on par with the reference site despite reduced irradiance. Consequently, a plaza site adjacent to a south-facing building, depending on latitude, would likely have higher evaporation rates, as suggested elsewhere (12), than an open paved site such as in this study.

The diurnal pattern of stomatal conductance varied widely among sites (Fig. 1c). At the park, g_s rose through early morning to a maximum, then declined by mid-afternoon to a lower level through early evening. Since the park trees received supplemental water concurrent with turf irrigation, stomatal closure of this pattern is commonly associated with sensitivity to high VPD rather than water deficits (13). Patterns at the canyon and plaza, however, were more restricted over the day. Canyon g_s was a truncated reflection of the park; an initial sharp increase at mid-morning exposure to direct sunlight was followed by a rapid decline through the window period to near closure during the afternoon shade. A similar response for photosynthesis might be expected, as receipt by the canyon trees of less than 10% of full sun during shaded periods would be well below light-saturation observed elsewhere for sweetgum (22). This would restrict maximum potential gas exchange to the brief window period (17). It was, however, limited there also. The decline in g_s through the window period suggested VPD sensitivity since it coincided with increased air temperature and VPD. In contrast, stomata at the plaza were non-responsive. There was partial morning opening at rates less than a third of the other sites followed by slight-but-progressive closure through the day. One might expect greater stomatal sensitivity of trees to VPD at paved, non-vegetated sites where radiation loading of the foliage would increase leaf-to-air temperature differences (26). While this may have been the case at the canyon, the nominal VPD differences between the park and plaza suggested that factors other than short-term meteorological conditions may have been restricting g_s at the plaza site.

Sweetgum growth ten years after transplanting could be linked to characteristic site conditions (Table 2). Despite limited light and g_s, canyon trees had the most crown development. In terms of crown production, canyon trees had approximately 30–65% greater leaf size, sunlit crown area, and shoot growth than the park, but was upwards of 400% greater than the plaza trees. Diameter increment of the park trees, however, was 24–34% greater than the canyon trees and 160–270% greater than the plaza trees. Lower diameter increment, thinner internal leaf morphology (mesophyll and palisade layers), and greater specific leaf area when compared with park trees were evidence that the canyon trees had acclimated to reduced sunlight by altering carbohydrate partitioning (4). Thinner leaves, greater specific leaf area, and reduced trunk growth are typical acclimation responses commonly observed in plants grown under heavy shade (4, 1). Shade acclimation is fully consistent with increased crown development that favors production of photosynthesizing area per unit weight of leaf over woody tissue such as trunk and root growth (1). This apparent re-allocation of resources to the crown made foliage density and apparent vigor of canyon and park trees indistinguishable. Sweetgum is considered to be a shade-intolerant species (10), and the morphological acclimation of the canyon trees were clearly a developmental response to low-light stress. A more tolerant species may have shown few if any acclimation features under the canyon light regime.

Overall growth of the plaza trees—leaf area, shoot elongation, and diameter increment—was substantially lower than the park and canyon trees (Table 2). Lower predawn Ψ and diminished maximum g_s in comparison with park trees over two years (Fig. 3), in addition to reduced dawn-to-dusk g_s (12) (Fig. 1c), indicated that water stress may have been limiting growth. Predawn Ψ at both sites declined during periods of low rainfall during both years. Early-season levels were similar between sites, but fell more rapidly in the plaza trees during dry periods to lower levels, as maximum differences ranged from 0.03–0.05 MPa. Given the coarseness and low water-holding capacity of the plaza soil, the plaza trees may have depleted the limited soil moisture more rapidly. Maximum daily g_s fell to lower levels than park g_s concurrent with decreases in predawn Ψ. Declining predawn Ψ and stomatal closure during low-rainfall periods has been observed other tree species (13) and in sweetgum (19) as a means of conserving water. Both predawn Ψ and g_s of the plaza trees, however, did not always recover to park levels following rainfall, such as the first date in 1987 and the last in 1986.

While the plaza trees exhibited water stress symptoms,

Table 2. Mean leaf size, shoot elongation, diameter increment, and sunlit crown area of sweetgum street trees (n = 3) growing in park, canyon, and plaza sites, and thickness of internal leaf layers of specific leaf area at park and canyon sites, plus standard error.

	Leaf Size		Shoot Elongation		Diameter Increment		Sunlit Crown Area	Thickness of Internal Leaf Layers		Specific Leaf Area
	1987 (cm^2)	1986 (cm^2)	1987 (cm)	1986 (cm)	1987 (cm)	1986 (cm)	(m^2)	Palisade (mm)	Mesophyll (mm)	(cm^{-2} g)
Park	85 ± 14[1]	66 ± 15	18.6 ± 3.0	12.7 ± 0.8	1.58 ± 0.05	1.58 ± 0.04	15.5 ± 1	0.10 ± 0.01	0.08 ± 0.01	101 ± 3
Canyon	121 ± 9	110 ± 19	32.7 ± 2.3	16.8 ± 0.9	1.18 ± 0.10	1.27 ± 0.13	20.0 ± 2	0.08 ± 0.01	0.05 ± 0.01	127 ± 6
Plaza	66 ± 7	40 ± 8	6.6 ± 1.0	3.1 ± 0.5	0.60 ± 0.08	0.42 ± 0.07	4.7 ± 1			

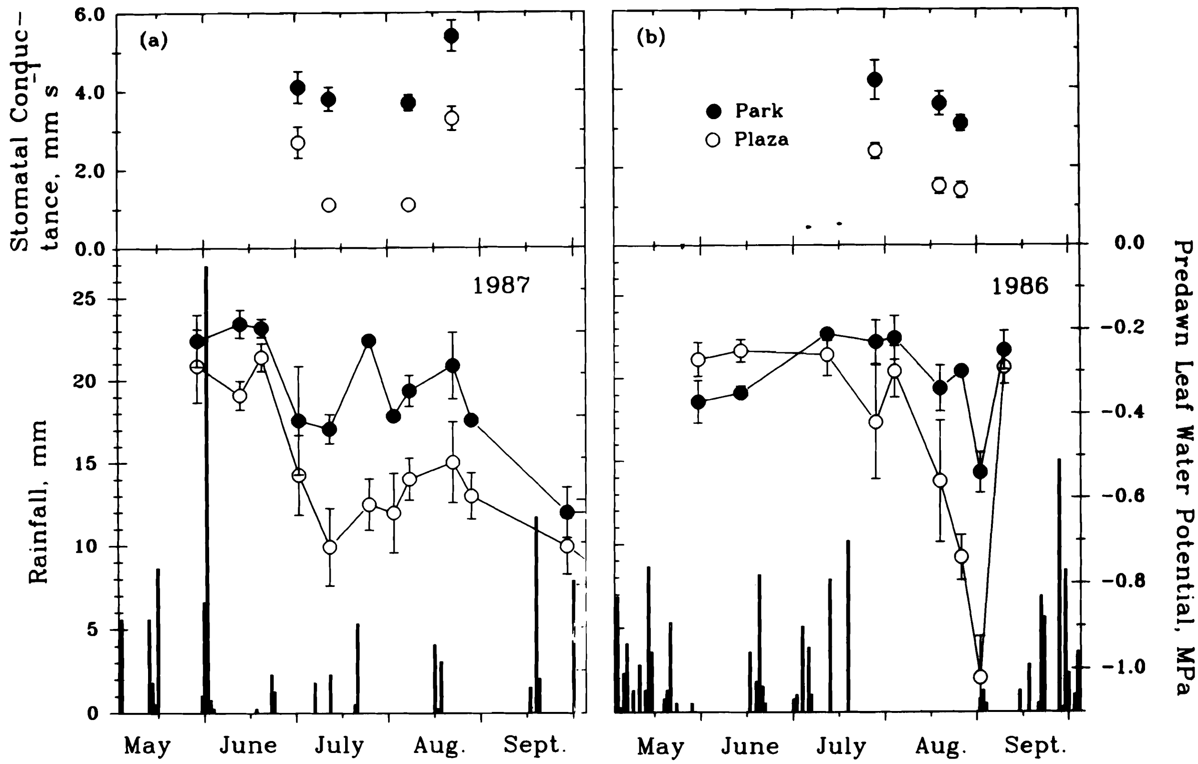

Fig. 3. **Seasonal water relations at park and plaza sites for 1987 (a) and 1986 (b). Predawn leaf water potential (MPa) and rainfall (mm) in bottom graphs, and stomatal conductance (mm s^{-1}) in top graphs. Each value represents the average of three trees per site plus standard error; for some days error bars are not shown because size of drawn data points exceeded range of standard error.**

this did not appear to be a result of high rates of transpiration related to greater evaporative demand at the plaza. Transpiration calculated from the data (incorporating T_l for calculation of the leaf-air vapor-pressure gradient) in Figure 1 was 1.66 mm m^{-2} day^{-1} for the park trees but only 0.56 for the plaza. This was 54% versus 13% of potential evaporation for the park and plaza trees, respectively, on that date (data from Figure 2b). Multiplying transpiration rates by sunlit crown area gave an approximate whole-tree transpiration rate that was nearly 10-fold greater in the park trees (25.8 versus 2.7 liters $tree^{-1}$ day^{-1}). This reduction in transpiration, together with the paved plaza surface that may have acted like a mulch, would delay depletion of soil water and onset of water stress. Low predawn Ψ despite this complete control over depletion of soil moisture indicated that poor soil conditions must have been severely limiting growth. Interaction with the plaza microclimate may also have contributed. Initially, higher evaporative demand probably resulted in increased transpiration (26, 15) as compared with trees at the park site. As the plaza trees became established in soil where moisture was limited by texture and depth, periods of water stress due to rapid moisture depletion were likely to be more frequent and prolonged. The observed minimal growth and g_s of the plaza trees was probably the dynamic equilibrium that conserved water and allowed long-term survival in a resource-limited space. Reduced vegetative growth and transpiring leaf area is a common negative-feedback response to chronic water stress (8). Were water the only factor, however, one might have expected this equilibrium to allow similar stomatal behavior and Ψ between park and plaza trees during periods of high soil-moisture availability. Since this was not the case, other factors, such as low soil-nutrient availability, may also have contributed to limiting growth of the plaza trees.

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Factors Affecting Fungicidal Control of Entomosporium Leaf Spot of Photinia[1]

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Abstract

Entomosporium leaf spot of photinia (*Photinia* × *fraseri* Dress) was epidemic throughout most of Georgia and much of the Southeast during the spring of 1991. It has been endemic for many years. The relatively high minimum temperatures recorded in December–March 1990–91 in concert with 52 days of rain during this period were conducive to disease development. Currently recommended fungicides are effective for control if they are applied on a weekly basis. Newer fungicides were effective against the fungus in laboratory culture, but labels are not approved for application to landscape or nursery plants. Spray nozzle types (flat or full cone) delivering 5 to 7 ml per second of fungicide were as effective for disease control as spray nozzles delivering four to five times more volume.

Index words: *Photinia* × *fraseri, Entomosporium mespili*, red-tip photinia, fungicides, benomyl, chlorothalonil

Significance to the Nursery Industry

The recent increased incidence and severity of photinia leaf spot in the Southeast may be attributed to mild, rainy winter months. The outbreak in 1991 certainly created a greater public awareness of the disease and raised questions about the future use of this plant in landscape plantings. The research described suggests several approaches for disease control, including the timing and frequency of fungicide applications, effect of lower spray volumes, and the activity of fungicides against the causal fungus in laboratory tests. Nurserymen should make every effort to control the disease before the point of sale by monitoring disease incidence relative to weather conditions and applying most effective fungicides early and frequently enough to minimize disease development.

Introduction

Severe leaf-spotting and defoliation of two Photinia species, *P. glabra* (Thunb.) Franch. & Sav. and *P. serrulata* (Desf.) Kalkman (= *P. serrulata* Lindl.), were reported in Louisiana as early as 1957 (21). The causal fungus was identified as an Entomosporium indistinguishable from *Entomosporium maculatum* Lév. (*Fabraea maculato* (Lév.) Atk.), the cause of pear and quince leaf blight. It is also known to occur on other hosts (18, 19). The anamorphic stage has been named *E. mespili* (DCex Dirby) Sacc. (10).

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