INFLUENCE OF SHADE, MEDIA AND FERTILITY ON GROWTH OF TAXUS

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Abstract. Growth of rooted cuttings of Hicks yew (*Taxus* X *media* cv. 'Hicksii') in selected media at different fertility levels and light intensity was evaluated. Applications of 20-20-20 at 380 ppm N with every watering resulted in a reduced growth compared to 120 to 192 ppm N. Shoot length growth was superior at 50% shading when compared to no shading, regardless of the media and fertility levels.

Taxus is a valuable landscape plant admired by professional and amateur horticulturists alike for its beauty, color, moderate rate of growth and tolerance to shade situations. Shade-grown plants often tend to be "leggy," and have longer internodes, larger leaves, higher chlorophyll and mineral element content. Kelley (1959) reported some ornamental plants made greater growth when grown under shade; however, this increase was species dependent. *Pyracantha coccinea* and *Ilex crenata* grew slightly more under shade than *Berberis juliane.* According to Murray (1961), the foliar N, P and K levels of banana plants grown at four light intensities (20% to full sunlight) increased as the light intensity decreased.

Ornamental plants are usually priced and sold according to their height and/or spread, and quality. A dark green color is associated with quality *Taxus.* Obtaining a greener and larger plant through shade treatment is considered a desirable method for *Taxus* production. Objectives of this study were to determine the growth responses of *Taxus* at different light intensities and to compare the growth under selected media and fertility conditions.

Materials and Methods

Rooted cuttings of Hicks yew (*Taxus* X *media* 'Hicksii') were planted into four liter plastic nursery containers. The growing medium was 3 soil:2 peat:2 perlite (v/v/v) or 2 soil:1 perlite (v/v). The light regimes consisted of (1) the ambient greenhouse light and (2) a 50% shading provided by a lath structure placed above the containers. Nutrient treatments were 120, 192 and 384 ppm N as 20-20-20 applied at each watering. The study was designed as a 2 X 2 X 3 factorial with 12 treatments and three replications.

The experiment was conducted in a greenhouse over two growing seasons. The plants were moved to an outdoor polyhouse for overwintering. After the cold requirement was satisfied they were moved back into the greenhouse in early spring. Root and shoot dry weight and total shoot length were determined upon completion of the study. Soil nutrient analysis was conducted by the Soil Testing Laboratory, University of Guelph.

Results and Discussion

Shading had no effect on dry matter accumulation by root or shoots of *Taxus* but did significantly increase total shoot length (Figure 1).

Root dry weight. Fertilizer rates and the interaction between media and fertilizer were significant at 5% level. Under natural lighting root growth was the same under all nutrient additions in the 2:1 soil:perlite medium. With 3:2:2 soil:peat:perlite medium 380 ppm N additions proved excessive (Fig. 1A) and over 67% of the plants were killed due to high soluble salts levels (Table 1). Soil tests (Table 1), also indicated relatively high soluble salt levels for the 2:1 medium, but all plants survived. The nutrient and water retention capacity of the 3:2:2 medium was greater than that of the 2:1 medium.

Root growth of plants under 50% shade was similar to that under natural lighting (Fig. 1A) where 120 and 192 ppm N was used. The highest rate of 20-20-20 solution also resulted in 66% mortality of plants in soil:peat:perlite. However, plants grown in soil:perlite, which is more easily leached, were not damaged.

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Shoot dry weight. At 50% shading total shoot dry weight was greater than at ambient light (Fig. 1B). Shoot growth was equal in both media at all fertilizer rates, except with the highest application in the 3:2:2 mixture (Fig. 1B). This drastic decline in growth is likely attributed to high soluble salts levels in the root zone (Table 1).

Table 1. Media analysis of Hicks Yew grown in 3:2:2, soil:peat:perlite and 2:1 soil:perlite mixture supplied constantly with various N levels as 20-20-20.

Medium	*N (ppm)*	*pH*[z]	*Conductivity m mhos*
3:2:2 (soil: peat:perlite)	120	7.2	44
	192	6.7	82
	384	6.1	200
2:1 (soil:perlite)	120	7.5	42
	192	6.6	78
	384	6.2	121

[z]Data are means of three replications.

Under 50% and no shading the amount of shoot growth with 120 ppm N was approximately equal (7.9 and 7.57 g) regardless of the soil medium (Fig. 1B). Shoot growth increased as the nutrient levels increased to 192 ppm. With the highest nutrient addition shoot growth declined in both media, but the extent of decrease was greater in soil:peat:perlite.

Shoot length. Statistical analysis of total shoot length indicated a significant interaction between light and fertilizer treatments. Under natural lighting shoots made equal length growth with 120 and 192 ppm applications (Fig. 1C). However, with the 384 ppm application shoot length significantly declined in 3:2:2 but not in 2:1 medium. The sharp decline in the former is likely due to soluble salt build-up (Table 1).

Shoots under 50% shade were longer than those under natural light regardless of the medium or fertilizer treatment (Fig. 1C). Under shade, the shoots grew maximally (213 cm) in 3:2:2 medium with 192 ppm N additions (Fig. 1C).

Shade grown *Taxus* are produced in commercial nurseries and frequently encountered in the landscape. Native *Taxus* are found in Canada where ample shading by the forest canopy is available. This study indicates greater shoot length will

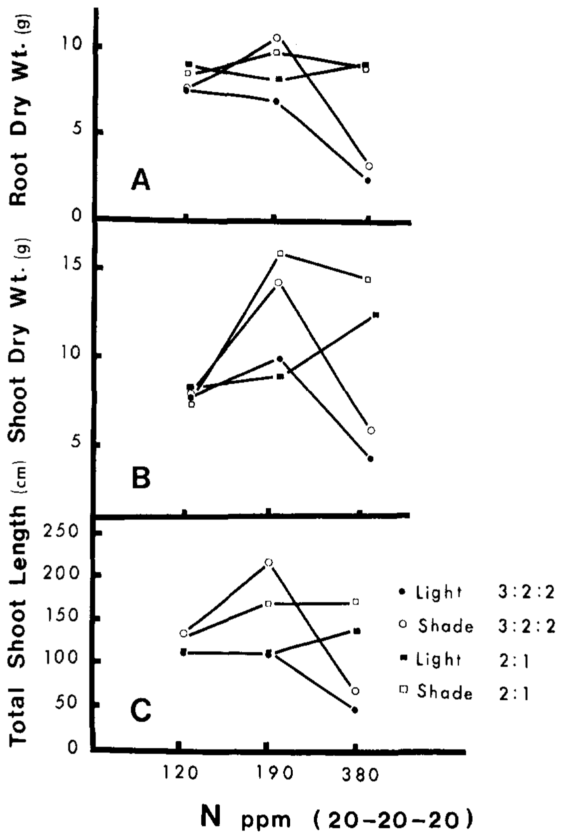

Figure 1. Average root dry weight (A), shoot dry weight (B) and total shoot length (C) of *Taxus × media* 'Hicksii' grown in 2 media, 2 light regimes and at 3 levels of nitrogen.

result from shading regardless of the growing media. Media selection is important, however, to obtain maximum plant growth.

Plants grown in the soil:perlite mixture tolerated the high salt levels arising from the highest fertilizer applications and produced greater amounts of shoot and root dry matter as compared to the soil:peat:perlite mixture. In the latter mixture, some plants were killed due to high soluble salts. Soil test results (Table 1) showed that the total soluble salt content of the soil:peat:perlite mixture was 200 m mhos as compared to 121 m mhos for soil:perlite mixture. The differences in electrical conductivity of the mixtures are related to their texture, leaching ability, moisture holding capacity and pore spaces. The soil:perlite mixture had a coarse texture, more large pores and possessed a greater leaching ability and lower water holding capacity. There was no significant growth differences between the two media with the 120 and 192 ppm N treatments.

Acknowledgments

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ABSTRACTS

Dirr, Michael A. 1982. **The great elm debate — Siberian vs. Chinese.** Am. Nurseryman 155(4): 75-79.

Siberian and Chinese elms represent the greatest case of misidentification since "The Prince and the Pauper." No two trees have been more confused by the American nursery trade than these. The Chinese elm offered by most nurserymen is, in fact, Siberian elm (*Ulmus pumila*), a woefully inferior tree. True Chinese elm (*U. parvifolia*) is infinitely superior as a landscape specimen, but it is not widely available. E.H. Wilson noted this problem in "Aristocrats of the Trees" in 1930. "I fear many years will lapse before the confusion existing between them is straightened out," he said. The American gardening public has been the loser in the great elm debate. *Ulmus pumila* was introduced into North America in the early 1900's. It found wide acceptance among nurserymen who raved about its rapid growth and tolerance of almost any soil. *Ulmus parvifolia* was introduced into cultivattion in the late 1700's, but it has never become a popular landscape tree. Its great beauty resides in its oval to rounded crown of gracefully spreading branches. Its mature height and spread are approximately 40 to 50 feet.

Haller, John M. 1982. **Common tree ailments and what to do about them.** Am. Forests 88(2): 27-30.

What do you do with a sick tree? Sometimes, unfortunately, the answer is "nothing." In many cases, however, the owner can take measures to prevent disease from getting started, or can assist a diseased tree toward recovery. We can call such measures protection, eradication, and immunization. Protection means prevent. Certain practices will prevent the onset of disease. Prominent among these is anticipatory spraying, which prevents many diseases from taking hold. Trees growing in good soil and receiving abundant water are more resistant to disease than trees growing in less favorable situations. Hence the best step in protecting a tree is to improve the soil and to stabilize the water supply. Eradication means the elimination of diseased parts. Eradication also involves cavity repair, treatment of cankers, and other surgical measures. Another form of eradication involves the elimination of an alternate host that is necessary in the life cycle to the pathogen. Immunization means two things: 1) the development of disease-resistant strains that may be planted in infected areas with impunity; and 2) the use of chemical compounds that act inside the plant to increase its resistance to disease.