Plant Morphology and Leaf Anatomy of Sun and Shade Grown Plants©

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Little is known to what extent sun plants can adapt to shade and shade plants adapt to bright sunlight. Research have shown that mature leaves show much less adaption to shade or sun than growing leaves, but adaption of whole plants of some species to either condition during development is considerable, especially adaption to shade (Salisbury and Ross,1992; Björkman and Holmgren, 1963). For example, Broschat, Donselman, and McConnell (1989) reported that *Ptychosperma elegans*, a sun-grown palm, required a minimum of 8 months to replace all sun-grown leaves under low light conditions. In addition, Fails, Lewis, and Barden (1982) found that *Ficus benjamina* (weeping fig) replaced its foliage in 6 weeks of acclimatization with shade leaves. Nevertheless, according to Salisbury and Ross (1992), one must consider that there are genetic limits to the extent of adaption. For example, some plants seem to be obligate shade plants (e.g., *Alocasia*), whilst others are obligate sun plants (e.g., *Helianthus*) and therefore will not adapt to either condition.

Most species are facultative shade or sun plants which adapt somewhat to shade by decreasing their light compensation points (mainly because they respire more slowly), they photosynthesize much more slowly, and photosynthesis is saturated at lower irradiance levels. They gradually develop the ability to grow in shade, but this growth is slower. All these physiological processes are achieved by producing morphological and anatomical characteristics similar to those of shade plants (Björkman, 1981). The reverse adaption from shade to sun conditions is according to Salisbury and Ross (1992) less common. Shade plants cannot be moved to direct sunlight without inhibited photosynthesis and eventual chlorosis and death of older leaves within several days. Shade and sun adaption, therefore, ultimately depends upon the efficiency with which light is intercepted and utilized for photosynthesis.

The objectives of this paper are to characterize plant morphology and leaf anatomy of sun- and shade-grown plants and to address the horticultural implications it may hold for the grower.

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