Leaf Crinkle Disease of *Aphelandra* in Texas

M. KAMP, Visiting Assistant Professor, and A. E. NIGHTINGALE, Associate Professor, Department of Horticultural Sciences; and R. W. TOLER, Professor, Department of Plant Sciences, Texas A&M University, College Station 77843

ABSTRACT

Kamp, M., Nightingale, A. E., and Toler, R. W. 1981. Leaf crinkle disease of *Aphelandra* in Texas. Plant Disease 65:687-688.

Zebra plants (*Aphelandra squarrosa*) exhibiting varying degrees of leaf crinkle, shortening of internodes, and axillary bud proliferation have been found in Texas. The disease was most severe on plants grown under high temperature and greater light intensity.

Aphelandra squarrosa Nees 'Apollo,' 'Leopoldii,' 'Louisae,' 'Fritz-Prinsler,' and 'Dania' are attractive ornamental plants that remain popular despite the difficulty of growing them. The shiny, dark green leaves have striking white veins, and the golden bracts remain long after the plant has finished flowering.

A. squarrosa plants produced commercially often exhibit various degrees of leaf crinkle. The problem was first reported in 1970 in studies of the effects of light intensity on plant growth and development. Hiroi (1) found that the leaves become more rugose as light intensity increases. Similar results were reported in 1976 by Kerbo and Payne (2), who reduced flowering time in *Aphelandra* with high-pressure sodium lighting. Leaf crinkle of *Aphelandra* has been reported by domestic zebra plant producers as well as by those in the tropical regions that export to the United States (S. Desdier, *personal communication*). Several large producers of *Aphelandra* have had to destroy their stock plants because of leaf crinkle disease (J. Carmichael, *personal communication*).

The disease is characterized by crinkling of both old and young leaves (Fig. 1), which becomes so severe that the plant is unmarketable. Other symptoms are a shortening of internodes, resulting in a rosette at the terminal, and axillary bud proliferation. The symptoms can be confused with those of pesticide phytotoxicity or mite infestation.

This study investigated the etiology of leaf crinkle of *Aphelandra*, a disease that has substantially reduced the quality of *Aphelandra* plants being commercially produced in Texas.

Accepted for publication 2 June 1981.

0191-2917/81/08068702/$03.00/0

MATERIALS AND METHODS

Experiments were conducted in a glass-covered greenhouse with temperature and humidity controlled by a pad and fan system, a fan jet system, and thermostatically controlled steam heat. Greenhouse benches were covered with welded wire with a 2.45-cm^2 mesh to support the pots and allow adequate air circulation around each container.

The incidence and development of leaf crinkling was determined at three levels of light: 5.4, 16.2, and 86.4 klux. A wooden framework supported the combinations of polypropylene fabric and muslin used to achieve the desired light intensity at plant level. Light intensities were measured with a General Electric light meter corrected for color and cosine. Light quality was determined with an International Light IL 150 Plant Growth Photometer. Temperature and humidity were monitored under each light level with a Foxboro recorder.

Well-established plants in 15-cm plastic pots were selected for uniformity in size, conformity, and condition. The growing medium was a mixture of equal parts of horticultural-grade vermiculite and peat moss. All plants were fertilized at each watering with a Merit Commander proportioner (1:128 ratio), receiving 200 ppm each of nitrogen, phosphorus, and potassium, plus a trace element combination of $Na_2B_4O_7$, $MnCl_2$, $ZnSO_4$, $CuSO_4$, H_2MoO_3, and NeFe EDTA. The growing medium had a pH of 6.8–7.0. The soluble salt level was maintained within a satisfactory range of 150–180 mhos $\times 10^{-5}$ using a 1:2 water dilution measured with an RD-15 solubridge. The pots were flushed with water at weekly intervals to prevent salt buildup.

Six plants were used for each light treatment and the experiment was repeated three times. Degree of crinkle was rated on a five-point scale with 1 = no crinkle and 5 = severe crinkle.

The plants were removed from their containers and the roots carefully washed in tap water; excess moisture was removed from the root system by blotting with paper towels. The entire root system of each plant was then immersed for 1 min in a solution containing 100–150

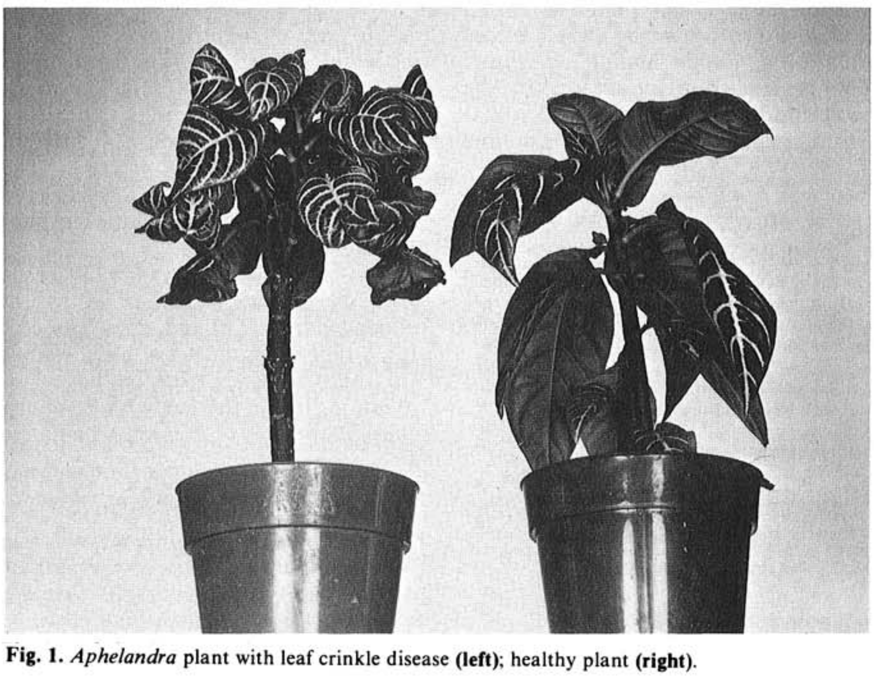

Fig. 1. *Aphelandra* plant with leaf crinkle disease **(left)**; healthy plant **(right)**.

ppm chlortetracycline or tetracycline The plants were repotted and returned to the three light regimes. Plants were retreated every 10 days with 180 ml of the chlortetracycline or tetracycline solution applied as a soil drench.

Sections (1 × 2 mm) of crinkled and uncrinkled leaves were embedded, sectioned (500–700 μm), and examined at ×16,200 with an AEIEM6B electron microscope.

Leaf and stem sections of healthy and diseased plants were periodically plated on culture media to check for presence of bacteria and fungi.

RESULTS AND DISCUSSION

Leaf crinkle was not stabilized or remitted by chlortetracycline or tetracycline treatments under the three light levels. This result suggests that the crinkle was not caused by rickettsialike or mycoplasmalike organisms, which are normally controlled by these antibiotics. No viruslike particles were seen in sections of crinkled or uncrinkled leaves examined with the electron microscope, nor were bacteria or fungi isolated from the sections. The apparent absence of a pathogen indicates that leaf crinkle is a physiologic disorder.

Disease ratings were recorded for each of the three light and temperature treatments at 3-wk intervals. At 5.4 flux and 20 C, the ratings were 1.0, 1.5, and 2.3 at 3, 6, and 9 wk after treatment, respectively; at 16.2 flux and 24 C, ratings were 1.0, 2.7, and 4.0; and at 86.4 flux and 27 C, ratings were 1.0, 3.3, and 4.5. Disease symptoms were more severe on plants grown under higher temperatures and greater light intensity, and thus more red wavelength light, than on those grown under less light intensity and more blue wavelength light. These findings agree with those of Hiroi (1) and Kerbo and Payne (2), and indicate the need for further investigation of the significance of blue light on plant growth and development (3).

LITERATURE CITED

1. Hiroi, T. 1970. Significance of environmental light in the culture and management of ornamental plants. Effects of light intensity on the growth and development of *Aphelandra squarrosa*. Jpn. Soc. Hortic. Sci. 29:269-277.
2. Kerbo, R., and Payne, R. N. 1976. Reducing flowering time in *Aphelandra squarrosa* Nees with high pressure sodium lighting. HortScience 11:368-370.
3. Senger, H., ed. 1980. The Blue Light Syndrome. Springer-Verlag, New York. 625 pp.