The pathogenic strain of *Agrobacterium tumefaciens* (Smith & *Townsend*) Conn. used in these tests was isolated by the authors from naturally infected chrysanthemum growing in Florida. The antagonist was a non-pathogenic Agrobacterium, *A radiobacter* (Beijerinck & Van Delden) Conn. var *radiobacter* biotype 2 supplied by Dr. A. Kerr, Waite Agricultural Research Institute, University of Adelaide, Glenn Osmund, Australia.

In one series of tests the soil was infested with a macerated agar culture of the chrysanthemum strain of *A. tumefaciens*. One lima bean agar slant of the organism was used per pot. The roots on the plant were clipped and the crowns were injured by needle punctures just before planting in the infested soil. After planting, the soil and plant roots were drenched with the avirulent strain of the organism or by the antibiotics oxytetracycline HCl (Uri-Tet, Key Pharmaceuticals Inc., Miami, Florida) and Vancomycin (Vancocin HCl, Eli Lilly & Co., Indianapolis, Ind.). Drenching was done immediately after planting or 24 hrs later as indicated in Table 1. The concn of the avirulent strain used for drenching was 10^8 cells per ml. Oxytetractcline was used at the rate of 400 ppm and Vancomycin at the rate of 500 ppm (Table 1).

All above ground inoculations in the following tests using either the virulent or avirulent strain were made by hypodermic needle injections into the crowns, stems and leaves of the test plants. The pathogenic organism was used at approximately 10^5 cells per ml.

The antibiotic oxytetracycline was sprayed on the plants at the rate of 400 ppm either immediately before or 24 hrs before needle injections with the virulent strain. The avirulent and virulent strains in a 3:1 ratio were injected into host plants. Also, the avirulent strain was used either as a soil drench on plants following root injury, or a preplant root soak following root injury, or needle injected into chrysanthemum plants. The treatments were followed by needle injection with the virulent strain either immediately or 24 hrs. later.

The tests were read 39 days after treatment. A disease index was obtained by multiplying the average number of galls/plant times the average gall size in mm.

Results and Discussion

All treatments caused a highly significant ($p=0.01$) reduction of crown gall when compared to the control, according to Dunnett's test (Table 1). Six treatments were highly significantly better ($p=0.01$) than the other treatments according to Duncan's multiple range test. These were; oxytetracycline used as a spray or drench when the plants were inoculated either immediately or 24 hrs later with the virulent strain of the pathogen, Vancomycin when used as a soil drench on plants in infested soil, and the avirulent strain when drenched into infested soil planted with injured chrysanthemum plants or when injected into plants inoculated with the virulent strain 24 hrs later.

It is interesting to note that treatment with the biological agent was more effective when the plants were subjected to the pathogen 24 hrs later rather than immediately. This appears to indicate that some time lag is necessary to allow the inhibiting agent to become trans-located into the plant to protect it from subsequent nfection. Results obtained from other tests not reported here indicated that the crown gall inhibiting agent was present in the plant roots and stems before becoming concentrated in sufficient amounts in the leaves to protect them from infection.

Chemical control of crown gall with oxytetracycline appears to be very effective and economically feasible.

Drenching the soil with the avirulent strain at the time of planting also was effective and appears to be a potential method to control crown gall of chrysanthemum.

Literature Cited

1. Kerr, A. 1972. Biological control of crown gall: seed inoculation *J. Appl. Bacteriol.* 35:493-497.
2. Kohn, S. 1974. *Agrobacterium tumefaciens* as a causal agent of tumors on leaf and stem of chrysanthemum. Nachrichtenbl. *Deut. Pflanzenshutzdienstes.* 26(7):97.
3. Miller, H. N. 1975. Leaf, stem, crown and root galls induced in chrysanthemum by *Agrobacterium tumefaciens*. Phytopathology. 65: 805-811.
4. ————, J. W. Miller, and G. L. Crane. 1975. Relative susceptibility of chrysanthemum cultivars to *Agrobacterium tumefaciens*. *Plant Dis. Rep.* 59:576-581.
5. Moller, W. J. and M. N. Schroth. 1976. Biological control of crown gall. *Calif. Agri.* 30(8):8-9.
6. Smith, E. F. and C. O. Townsend. 1907. A plant tumor of bacterial origins. *Science.* 25:671-673.

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SPHAEROPSIS WITCHES' BROOM OF NERIUM OLEANDER[1]

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Abstract. Sphaeropsis tumefaciens **was isolated from witches' broom and galls of oleander,** Nerium oleander. **Inoculations of branch terminals reproduced the symptoms of this disease within 4 months. The fungus was isolated consistently from inoculated, diseased plants.**

Oleander, *Nerium oleander* L., is a popular ornamental shrub grown in subtropical areas. One of the most serious diseases of oleander in southern Florida is witches' broom which kills entire branches. The disease usually occurs on older, flowering plants. In 1937, West (2) reported the causal agent as *Sphaeropsis* sp. but provided no experimental evidence concerning pathogenicity. The fungus *Sphaeropsis tumefaciens* Hedges, reported to cause galling of *Callistemon viminalis* G. Don (1), has been isolated consistently from witches' broom of oleander in several locations of Florida. This paper reports the pathogenicity of this fungus to oleander.

Materials and Methods

The isolate of *Sphaeropsis tumefaciens* was cultured on

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potato dextrose agar (PDA) from pieces of infected subepidermal tissue in stem galls of witches' broom-affected branches previously surface-treated with flaming 95% alcohol. Inoculum consisted of 3-week-old PDA fungal cultures fragmented in a blender. Two-year-old plants about one meter tall of a white cultivar were selected for inoculation.

Inoculations consisted of painting a fungus slurry onto 10 lightly abraded stems more than 1 year old, 10 non-abraded stems, and one tall branch terminal, bearing new growth, not abraded, on each of 10 plants. The non-inoculated controls consisted of 10 branch terminals painted with sterile agar slurry. One-half of the inoculated plants in each of the above treatments were covered with polyethylene bags for 2 days. Plants were examined weekly for symptoms. Temperatures ranged from 25-32 C during the experiment.

Results and Discussion

Stem swelling and the beginning of witches' broom were detected after 4 months incubation on all branch terminals bearing new growth at the time of inoculation. Inoculations of abraded or non-abraded stems failed to produce disease symptoms regardless of the use of polyethylene bags. Non-inoculated controls remained healthy.

Symptoms on stems artificially inoculated were the same as those occurring on naturally infected plants. Infected stems showed a considerable increase in diameter (Fig. 1-B), protuberances 1-6 mm on the stem (Fig. 1-A), and numerous branches arising from a single node. Branches in the witches' broom usually remained less than 25 cm long and did not flower. Eventually these branches and the main stem above them died. (Fig. 1-C). Pycnidia were frequently formed on the surface of dead stems. Isolations from inoculated plants showing these symptoms resulted in the repeated recovery of *S. tumefaciens.*

The identity of the pathogen, *S. tumefaciens,* is the same as that described earlier (1). Measurements of 50 macroconidia gave a mean size of 31 x 4.6 μm which is slightly larger in length than the conidia reported for the isolates from *C. viminalis* (1).

Cross inoculation studies are presently being conducted to determine the specificity and host range of this fungus.

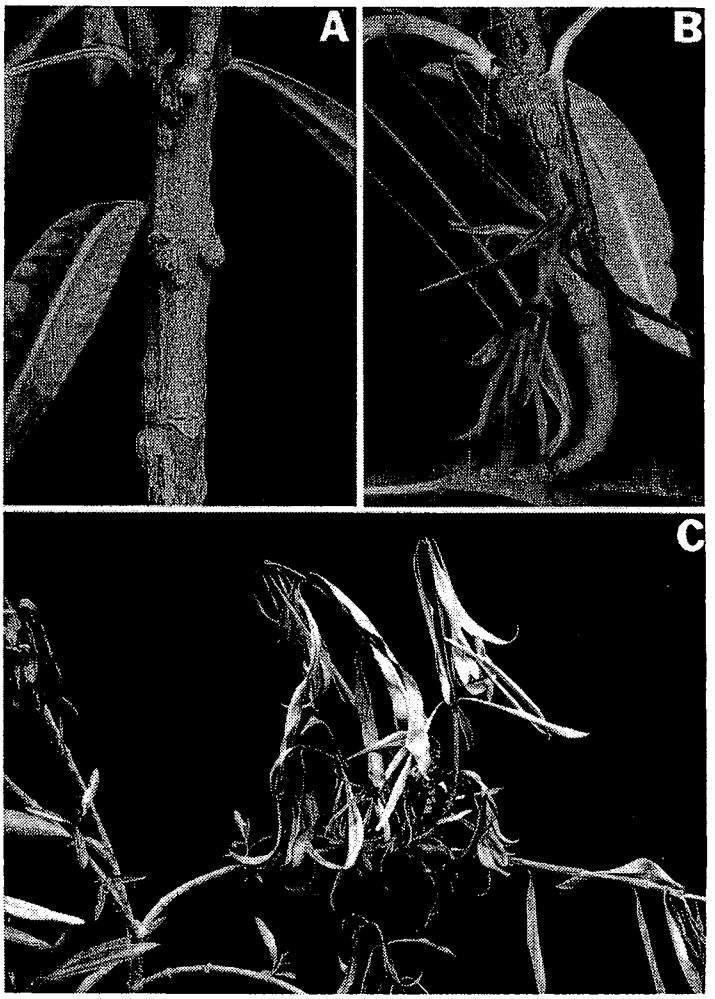

Fig. 1—(A to C). Oleander stems infected by *Sphaeropsis tumefaciens.* A) Protuberances on stem, B) increased stem diameter, and C) dead witches' broom.

Literature Cited

1. Marlatt, R. B., and W. H. Ridings. 1974. Sphaeropsis gall of bottlebrush tree, Callistemon viminalis, a new host. *Phytopathology* 64: 1001-1003.
2. West, E. 1937. Witches' broom of oleander. *Florida Agr. Exp. Sta. Press Bull.* 509. 2 p.

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SALT TOLERANCE OF LIVISTONA CHINENSIS[1]

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Abstract. **Year-old seedling container grown Chinese Fan Palms were transferred to a half-strength Hoagland's solution in August 1974 and grown for 18 months after which 0, 125, 250, 500, 1000, 2000, 3000, 4000, 5000, 7500, 10,000 and 15,000 ppm of a 10:1 ratio of NaCl:$MgCl_2$ was added to the Hoagland's solution. Height measurements and tissue analysis showed increased amounts of Na and Mg in plant tissue but decreased plant growth with increased levels of the 10:1 NaCl:$MgCl_2$.**

Chinese Fan Palm (*Livistona chinensis* Jacq.) is a single stem fan palm attaining a mature height of 30 to 50 feet (10). Native to cool areas of China, Chinese Fan Palm is grown in South, Central and warmer regions of North Florida as a landscape palm. This palm may become more widely used throughout the state since it is not subject to lethal yellowing (7).

Several species of palms are used as ornamentals in Florida's densely populated coastal areas to create tropical and subtropical settings. Chinese Fan Palm has not been planted commonly in the state and its salt tolerance is not known. One reference classified Chinese Fan Palm as not salt tol-

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