

ASPERGILLUS ROOT-STALK ROT OF SANSEVIERIA
(*SANSEVIERIA LAURENTII*, WILDEM)

L. A. ALVAREZ GARCÍA ¹

and

MIGUEL A. DÍAZ ²

INTRODUCTION

The occurrence in Puerto Rico of a serious root-stalk disease of *Sansevieria Laurentii*, Wildem, a bud variation of the common species *S. Zeylanica* Willd. (Bowstring hemp), has been found to hamper the exportation of slips to the United States market.

The disease hindered the exportation of this crop to such an extent, that Puerto Rican nurserymen requested technical help from the Agricultural Experiment Station and from the Agricultural Extension Service of the University of Puerto Rico.

The outcome of the technical findings is presented here as a contribution to the knowledge of ornamental plant diseases in Puerto Rico and their control.

ECONOMIC IMPORTANCE

Sansevieria plants are highly esteemed as house plants. They are characterized by a beautiful yellow band bordering the edge of the leaf blade. It is claimed that the plants are very hardy and well adapted to a great variety of environmental conditions, thriving even in extreme dry or wet conditions and under low or high light intensity.

During the early part of this century, the exportation of Sansevierias to the United States market was of relatively economic importance. The year 1920 was a boom year, but a gradual decline was then felt until 1930, when a new fad for Sansevierias revived the local industry. Then in 1936, a marked drop in exportations was felt, due to a preference for desert plants, principally from California. The local nurserymen looked for new markets and exported their crop to England, France and Belgium.

¹ Plant Pathologist, Agricultural Experiment Station, Río Piedras, P. R.

² Assistant Horticulturist, Agricultural Extension Service, Río Piedras, P. R.

During the Second World War exportation of *Sansevierias* to the United States received great attention. At present there is a great demand for the crop.

SYMPTOMS OF THE DISEASE

Aspergillus root-stalk rot, following spontaneous or artificial infection of wounded tissues of slips of *Sansevierias*, is characterized by a rapid invasion of the succulent tissues of the root-stalk and leaf petioles. The slips are obtained usually by cutting, but sometimes by "snapping" the brittle stems. The slips which are snapped off are known as "knock-off" slips.

Injured infected tissues become water-soaked and permeated by the profuse mycelial growth of the causative fungus. Once the parasite has gained a foothold, its growth and invasion of the host tissues is very rapid. The epidermal tissues of the root-stalk usually keep their firmness even in cases of advanced rotting of the inner tissues.

In a warm, humid environment, the percentage of diseased slips is very great, and the amount of infections is very high. In such an environment the parasite works rapidly, causing a complete rot of the root-stalk in a few days. This correlates with the behavior of the parasite when grown in artificial substrates in a warm, humid environment.

Rotting of the root-stalk advances a long way up the stalks, the leaf petioles are invaded, and the result is the abscission of the diseased leaves. Infected tissues of *Sansevieria* plants appear moldy and covered with a profuse superficial mycelium, which spreads readily developing masses of black spores.

THE CAUSAL AGENT

The black-mould fungus responsible for the root-stalk rot and leaf of *Sansevierias* belongs to the *Aspergillaceae*. Microscopic examination revealed it to be *Aspergillus niger* van Tiegham.

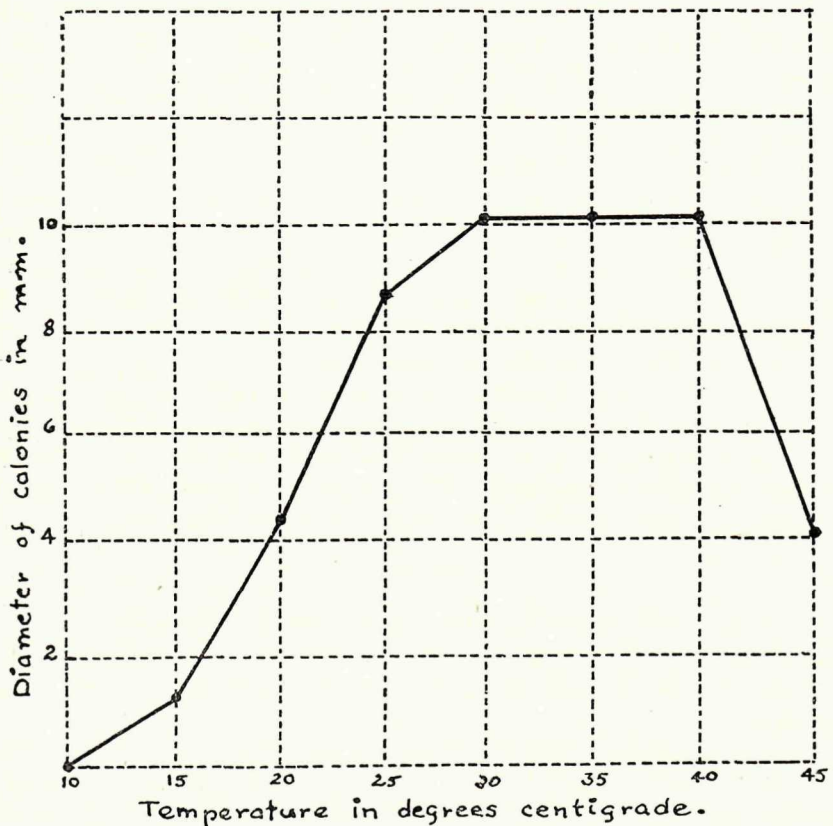
In Puerto Rico the senior author has found *A. niger* causing decay of garlic (*Allium sativum*) in storage. *A. niger* has been reported from Brazil, by Viegas,¹⁰ causing bulb rot of onions (*Allium cepa* L.). *A. niger* has also been reported causing fruit decay of apples, cotton bolls, corn, and potato tubers.^{6, 8, 9, 12}

The *A. niger*, responsible for the root-stalk of *Sansevierias* in Puerto Rico, is favorably influenced under high humidity and high temperatures, to parasitize wounded, succulent tissues of

these plants. The fungus grows readily in darkness and in few days covers the surface on most artificial media in Petri dishes.

On potato-dextrose-agar, with a pH value of 6.15, *A. niger* covered completely the 9 cm. plate in 4 days, when incubated in a constant temperature range from 25 to 40°C. No growth was obtained at temperatures below 10°C., or above 45°C.

Curve showing growth-temperature relations of *Aspergillus niger* van Tieghen grown on potato dextrose-agar at constant temperatures for five days.



Sporulation was very profuse at all temperatures from 25 to 40°C. The organism was found to grow within a very wide pH range, from pH 2 to pH 8. No efforts were made to determine the limits of growth on the acid or alkaline side of the range. Growth was rapid in media with a high water content.

EPIDEMIOLOGY

Slips of *Sansevierias*, as prepared for shipment, bear from 3 to 5 leaves, and have an approximate perpendicular length of 10 to 12 inches. When the slips are cut or snapped off from the stock plant, a profuse bleeding from the wounded root-stalk occurs.

Parasitism by *A. niger* seems to occur only through wounds on the root-stalk or leaf petioles, as confirmed by artificial inoculation of wounded and unwounded tissues.

Aspergillus root-stalk rot appeared in slips shipped during the summer and winter months. A warm environment with insufficient ventilation keeps the slips warm and moist. These are important factors associated with the serious damages reported on shipped *Sansevierias*.

The material for winter shipment was prepared as follows:

- (1) Pairs of slips were wrapped in newspaper.
- (2) Ten such pairs were wrapped in newspaper to form a bundle.
- (3) The bundles were placed in wooden boxes lined with newspaper. After these operations the bundles were ready for shipment.

Shipments of *Sansevierias* took about 10 days to reach the mainland.

During the summer, the slips are not wrapped in so much paper, nevertheless, great damages are reported in transit, due to root-stalk rot.

CONTROL

The remarkable performance of a number of recently developed synthetic organic compounds for the prevention of plant diseases, suggested the testing of some of them in an attempt to find an effective and practical control measure for the prevention of the *aspergillus* root-stalk rot of *Sansevierias*.

The following organic and inorganic compounds were tested: Spergon, Semesan, Semesan Jr., Dubarry 1155, Arasan, Zinc oxide, cuprous oxide, copper carbonate, mercuric bichloride, boric acid and paraffin.

TECHNIQUE FOR MEASURING EFFECTIVENESS

The fungicidal value of the organic and inorganic compounds under consideration was determined on the basis of the number of diseased slips treated and on the number and the degree of invasion and rotting of the infected tissues of the root-stalks.

Preliminary work consisted in the treatment of lots of ten pairs of slips, immediately after being cut off from the stock plants, with the fungicidal dusts, or immersed in the solutions. The wounded tissues of the root-stalks were dressed or immersed in the solutions, as the case demanded.

The slips were treated and wrapped for shipment and packed in wooden boxes as if they were to be exported. The treated and packed slips were stored in a dark room and left for 10 days in order to observe the effectiveness of the treatments in conditions similar to those liable to occur in shipments.

The results observed in the experiments conducted during the month of December 1945 and January 1946 are summarized below:

DIPPING

Mercuric bichloride: Slips were immersed in a 1-1000 bichloride solution for 3 minutes and immediately afterward were washed thoroughly with water, so as to remove the residual salt. It proved very effective. This treatment, however, had the disadvantage of being laborious and expensive. Moreover, there was no objective way of detecting treated from untreated slips, which is a handicap if we consider that the worker can make mistakes easily.

Mercuric bichloride without water washing: The previous technique was followed but not water washings were performed. The results were discouraging. Probably because residual salt injured the tissues, which eventually rotted.

Benzoic acid solution (3 percent in 30 percent alcohol): Tissue injury and rapid decay occurred when Sansevieria slips were treated with this solution.

Paraffin (50 to 60°): This treatment was ineffective and expensive.

DUSTING

Spergon:

This treatment proved very effective by checking the disease completely. The ease in operation and the yellow color of the fungicide on treated slips made it most desirable.

Semesan Jr.:

It was very effective, however there was no significant difference in its effectiveness when compared with Spergon, or the bichloride—washing treatment.

Semesan:

Fairly good. It controlled the disease up to 50 percent.

Zinc Oxide:

Ineffective.

Corona Coppercarb:

Ineffective.

Cuprous Oxide:

Ineffective.

Results of these treatments are presented in Table 1.

TABLE NO 1—TESTING FUNGICIDAL CHEMICALS FOR CONTROL OF SANSEVIERIA (*Sansevieria Laurentii* WILDEM), ASPERGILLUS ROOT-STALK ROT

Slips kept after treatment in a dark room at 30° C. for 10 days.

No.	Trade Name	Treatment	Percent of Effectiveness
1.....	Corrosive Sublimate.....	Mercuric bichloride with thorough washings.....	100
2.....	Spergon.....	Tetrachloro-benze-quinone.....	100
3.....	Semesan Jr.....	Ethyl-mercury-phosphate 1%.....	100
4.....	Semesan.....	Hydroxy-mercury-chlorophenol 30%.....	50
5.....	Zinc Oxide.....	Zinc oxide.....	10
6.....	Cuproxide.....	Cuprous oxide.....	10
7.....	Paraffin.....	Paraffin.....	10
8.....	Corona Coppercarb.....	Copper carbonate.....	10
9.....	Corrosive Sublimate.....	Mercuric chloride.....	0
10.....	Benzoic Acid.....	Benzoic acid 3% in 30% alcohol.....	0

The data in Table 1 show the effectiveness of Spergon, Semesan Jr., and mercuric bichloride with water washings in controlling aspergillus root-stalk rot.

The non-phytotoxicity and the bright yellow color of Spergon, which made recognition of the treated slips easy, and its good adhesiveness were considered in selecting it for the final shipping test.

On January 3rd and 4th, 1946, twenty-thousand slips were treated with Spergon, then they were prepared for shipment, as previously explained, and sent to New York in two lots of ten-thousand each. The report of their arrival free from aspergillus root-stalk rot, demonstrated the effectiveness of the Spergon treatment. Untreated checks also shipped, and those kept for 10 days in storage in Puerto Rico, rotted badly.

CONCLUSION AND SUMMARY

The results of the experiments conducted at Mr. Charles Pennok's farm in Río Piedras, (North and South nurseries) during the two-month period from December 1945 to January

1946, to find an effective commercial control for aspergillus root-stalk rot of Sansevieria, revealed the practical fungicidal value of Spergon, Semesan Jr. and bichloride of mercury; the latter followed by thorough washings.

Dusting with Spergon and Semesan Jr. is easy and inexpensive. Spergon, which is easily recognized in treated cuttings by its yellow color, was finally selected for the commercial treatment of Sansevierias slips prior to shipping.

This treatment of root-stalk cuttings also lessens considerably decay in seed beds. It can be used either in powder form or in water suspension.

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