worm may bore in, too, but it also feeds on the outer surface, causing irregular, unsightly scars. Some of these may heal.

In experimental work at the Central Florida Experiment Station, during a five-year period, a number of insecticides have been tested for control of these insects. These included dust formulations of DDT, lindane, parathion, aldrin, methoxychlor, cryolite and dilan, and emulsifiable concentrate formulations of dilan and lindane. Both the dust and liquid forms of dilan caused severe injury. Over the five-year period, the best control of aphids, pickleworms and melonworms was obtained with a 1½ percent lindane dust or 1 pint of 20 percent lindane emulsifiable concentrate. The dust should be applied at the rate of 30 to 35 pounds per acre and the emulsifiable concentrate diluted in the amount of water required by the type of sprayer used.

Aphids are most injurious during the first weeks of plant growth and the field should be watched closely for signs of attack. Application of the insecticide should begin at the first indication of their presence and be repeated as required. Control of pickleworms and melonworms should begin when the first blossoms open and continue at seven day intervals for five or six weeks.

Cantaloupes are very susceptible to nematode injury, the most apparent being root knot. Aside from the long advocated fallowing, flooding or growth of immune crops, all that can be recommended, at present, is soil fumigation prior to planting. Root rots quite generally become factors after the primary injury. The nematode problem is far from being solved.

Producing a good melon in the field is only half the battle. Crews must be trained to pick them at just the proper time. Each variety will have to be studied carefully. Color, net, and ease of separation from the vine are all indications of degree of maturity. Some can be picked a little less mature than others and ripen enroute to market, without loss of flavor. Others must be fully mature but possess the characteristic of retaining good quality long enough to permit distribution.

Handling from the time of picking should be as gentle as possible. Melons reaching the packing house early in the day will not have become heated as much as those that arrive later. Grading should separate degrees of ripeness as well as size and general perfection. This will permit sending to each market those that will reach their destination in the best possible condition. Frequent routine tests for dissolved solids will go a long way towards eliminating poor quality. Results of these practices, employed in California and elsewhere, indicate that they are satisfactory and economical.

Cantaloupe production in Florida is on the increase. With further development of new and more prolific varieties better adapted to our climate, it may well be that Florida will recapture the position in cantaloupe production it held in 1910.

In conjunction with this paper, pictures were shown. The kindness of Homer L. Osborne of Kilgore Seed Company, Sanford, Florida, and the U. S. D. A. Horticultural Field Station, La Jolla, California, is gratefully acknowledged for furnishing the slides.

RECENT DEVELOPMENTS IN THE CONTROL OF THE MAJOR DISEASES OF UNSTAKED TOMATOES GROWN ON THE SANDY SOILS OF SOUTH FLORIDA

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The four major foliage diseases which regularly occur on unstaked tomatoes grown on the sandy soils of southern Florida are late blight, *Phytophthora infestans* (Mont.) DBy., gray mold, *Botrytis cinerea* Fr., bacterial spot, *Xanthomonas vesicatoria* (Doidge) Dows, and gray leaf spot, *Stemphylium solani* Weber. Another disease or condition of tomato to become a threat in recent years is known as ghost spot. This paper includes a brief discussion of either the effect of various fungicides on the above diseases or the suggested spray program for their control. A description of the symptoms of late blight is not included since this disease is quite common.

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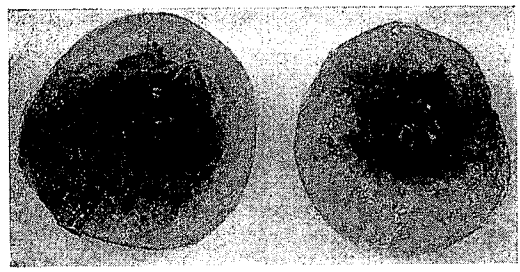
Gray Mold

Gray mold attacks the tomato foliage and fruit, causing a watery soft rot. It usually starts on the lower leaves underneath the plant and works upward. Conditions become favorable for its development in late fall and continue through early spring. Spraying with nabam or zineb (Dithane, Parzate, etc.) as recommended for late blight control has not controlled this disease. The organism causing gray mold has been known for a number of years. It attacks many plants during periods of excessive moisture, including strawberries, beans, lettuce, gladioli, and lilies. It is a weak parasite which does not ordinarily attack growing tissue directly but may invade it after becoming established on dead tissue.

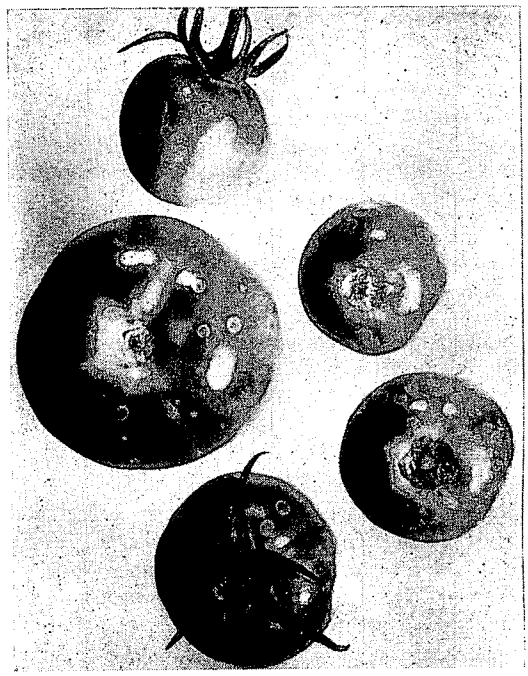
The question immediately arises why it should suddenly attack tomato. No damage was reported before 1946 in the Indian River Area. It has just recently become serious in the Immokalee Area. Nabam and zineb came into widespread use just after World War II because these fungicides gave a better control of the leaf diseases then important. As a result, plants retained more foliage than they did when copper fungicides were used. The increased shade, lack of ventilation, and the resulting higher humidity underneath plants sprayed with nabam or zineb made conditions more favorable for the development of gray mold. Since organic fungicides are not effective against bacterial spot, there is often dead foliage underneath tomato plants caused by this disease. These dead leaves provide an excellent opportunity for gray mold to develop. Once established under these conditions, it proceeds up the plant and attacks actively growing foliage, stems, and fruit.

During the past two years, four fungicide trials have been conducted at Ft. Pierce. Several treatments in each test were designed to control gray mold. The most effective control has been obtained by spraying with Phygon XL. It has given good commercial control when 20 applications of ¾ of a pound per 100 gallons of water were used on one crop. The least number of applications necessary to obtain a satisfactory control has not been determined, but it is obvious that the timing of applications is of critical importance.

Phygon XL will not control gray mold after the disease has become established in the lower, hard-to-spray leaves. In order to obtain satisfactory control it is necessary to begin applications before the plants have reached the stage when the lower leaves are shielded by the upper ones. Two or three applications are necessary to completely cover these lower leaves before they become inaccessible to the spray. The nozzles on the "drops" of the spray boom should have large orifices so that larger spray droplets will be formed. These larger droplets will aid in pushing aside the outer leaves and reaching more of the susceptible inner leaves.



A photograph of tomatoes showing gray mold in the advanced stage.



Tomatoes of various sizes showing typical ghost spots.

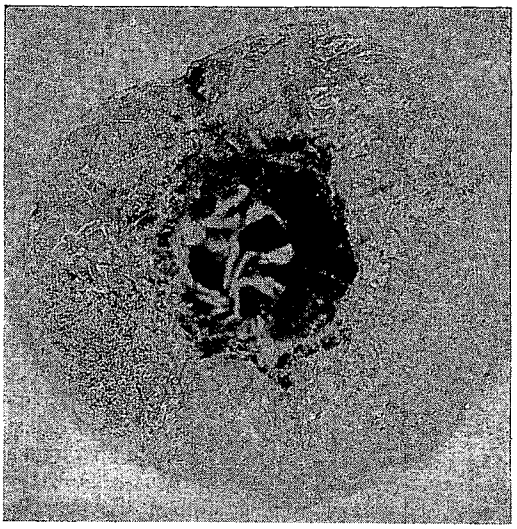
Ghost Spot

At about the same time that gray mold became important in south Florida, another

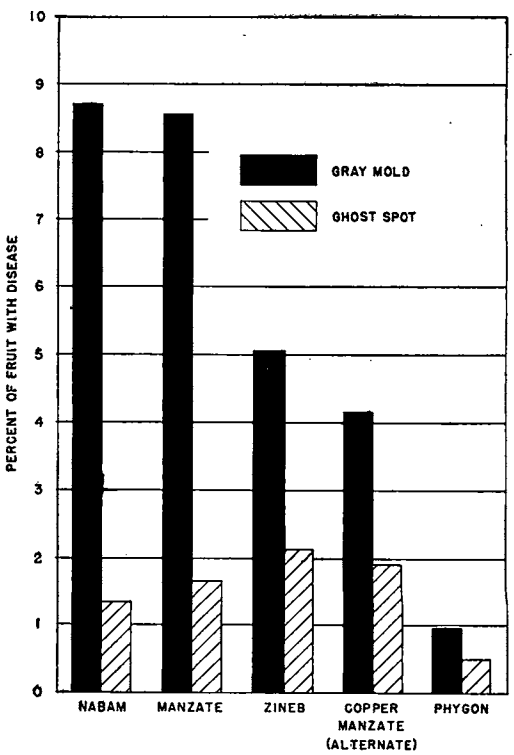
disease or condition of the tomato fruit, appropriately named ghost spot, became a threat. Small whitish rings up to ¼ inch in diameter, which do not extend into the tomato tissue, are formed over the surface of the tomato. Each ring contains a very small brown necrotic speck in or near the center. These rings or halos, usually formed on immature green fruit, may become so numerous that they coalesce and completely cover the tomato. If the demand for tomatoes is poor, these blemished fruits are rejected, but if the demand is good the least severely affected fruits are lowered in grade while the severely spotted fruits are rejected.

The cause of ghost spot is unknown, but it is thought by some to be due to the same fungus that causes gray mold (1). The theory is that when environmental conditions become unfavorable for the development of typical gray mold, instead of producing a rot, the organism produces a ghost spot in the following manner: Spores of Botrytis in dew droplets germinate and penetrate the fruit skin during the night, forming enzymes in the process. The drying action of the sun and wind the following day kills these sporelings and rot does not develop, but the enzymes produced during penetration continue to act and are responsible for the halo. The necrotic speck in the center of the ghost spot marks the point of entry of the organism. This theory is not

A photograph of a tomato showing ghost spot.



Advanced stage of gray mold on tomato showing conidial heads of the fungus.



The percentages of fruit harvested from experimental plots showing gray mold and ghost spot. The difference necessary for significance (at 19 to 1 odds) between the gray mold percentages is 2.28 whereas there is no significant difference between the ghost spot percentages.

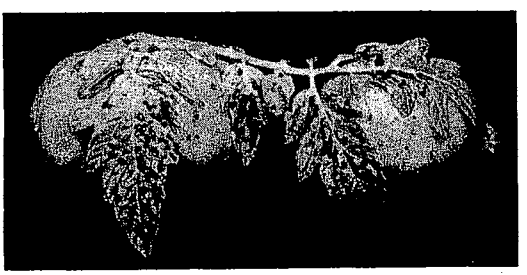
new; the basis for it was presented in 1938 by Ainsworth et al. (1), who produced this condition with spores of Botrytis in England. Preliminary attempts to duplicate their results in Florida have failed.

Two observations do not support the above theory. One is that in small plots sprayed with Phygon at Ft. Pierce the incidence of ghost spot was not significantly reduced although Botrytis rot was controlled. Another is that ghost spot was reported in Dade County in fields that did not have gray mold. On sand lands gray mold has always been found in fields that had ghost spot.

Another theory, without much supporting evidence, suggests that ghost spot results from insect stings. It is hoped that histological studies, now under way at the Indian River Field Laboratory, will determine whether the necrotic speck in the center of the ghost spot is due to an insect puncture or a point of entry for a fungus.

Bacterial Spot and Gray Leaf Spot

Bacterial spot has long been a threat to sandland tomatoes, but it has increased in importance in recent years to the place where it is now a major disease. The symptoms of this disease are very similar to those of gray leaf spot. It is very difficult to distinguish bacterial spot from gray leaf spot on leaves, particularly if the spots have been present a week or more. However, there are certain differences between the two which can be recognized upon close observation. Bacterial spot occurs on leaves, stems, flower parts, fruit pedicels, and fruit, while gray leaf spot is confined to the leaves. Bacterial spots are more irregular in shape and less evenly dispersed over the leaves than are gray leaf spots. Bacterial spots may be quite numerous on one side of the midrib while there may be few or none on the other side. Centers of bacterial spots are usually level with the leaf surface while gray leaf spots are usually slightly depressed, with a more or less circular border.



Bacterial spot on foliage and fruit.

In order to adequately protect tomatoes from diseases a thorough coverage of all foliage is necessary. Above is a power spray in operation at the Indian River Field Laboratory at Ft. Pierce.

Bacterial spot is caused by a bacterium while gray leaf spot is caused by a fungus. Gray leaf spot is effectively controlled by nabam or zineb, but there is no material on the market which will adequately control bacterial spot under all conditions.

Fixed coppers are the most effective commercially available materials for the control of bacterial spot. These, in turn, are most effective when applied just before and immediately after rains. The disadvantage in using copper compounds lies in the fact that they are not satisfactory for control of late blight or gray leaf spot. For this reason farmers are reluctant to use copper, and rightly so. Copper compounds are not chemically compatible with nabam or zineb.

Excellent control of bacterial spot of tomatoes was obtained in the spring of 1953 at the Indian River Field Laboratory by using a spray consisting of a commercial grade of streptomycin at the rate of approximately 2 pounds per 100 gallons of spray. (720 p.p.m.). The cost of this material at present is rather high. Indications are that a fraction of a pound might also be effective. If used in quantity the manufacturers predict a considerable reduction in cost. Tests are now in progress at Ft. Pierce using various concentrations of streptomycin and terramycin in the form of a spray. In addition, the roots of tomato transplants have been dipped in several concentrations of streptomycin before transplanting them to the field.

Ark (2) obtained a good commercial control of fire blight, a bacterial disease of pear, by the use of four applications of bentonite dust

impregnated with 240 parts per million of streptomycin base. Successful control of many bacterial leaf spotting diseases depends upon proper timing of the applications. Since dusts may be applied quickly and economically by airplane, this method of control was investigated. Tests were conducted at Ft. Pierce in the fall of 1953 comparing dusts containing 250 and 1000 p.p.m. of streptomycin, calculated as a free base, with copper dust for the control of bacterial spot. The plants were dusted seven times between September 1 and October 13. A total of 35.58 inches of rain was recorded between September 1 and October 20, 1953. There were no differences between the treatments at any time during the test. The streptomycin dusts as well as the copper dust failed to control bacterial spot.

Recommended Spray Schedule

The suggested fungicide program for unstaked tomatoes grown on sandy soils of southern Florida is as follows: Begin applications on a weekly schedule with either 2 pounds of zineb or 1½ to 2 pounds of Manzate per 100 gallons of water. After the young plants have reached six to eight inches in height, 2 quarts of nabam plus ¾ pound of 36 per cent zinc sulfate (or its equivalent) may be substituted or used as an alternate with zineb or Manzate. If bacterial spot becomes a threat, a suitable form of copper (Copozim, Tribasic Copper Sulfate, Copper A etc.), used at a rate to include 1½ pounds of metallic copper per 100 gallons of spray, may be alternated with one of the above materials if late blight is not in the area.

The first application of Phygon for the control of gray mold should be made just before "laying by" the tomatoes. Another application of Phygon should be made immediately after "laying by." For the next four to six weeks a program alternating nabam plus zinc sulfate and Phygon on a five-day schedule should be followed. The total number of Phygon applications necessary for good control of gray mold has not been determined, but indications are that a minimum of six is necessary. After this period, if late blight or gray leaf spot are not in the area, intervals between sprays may be lengthened to one week. A thorough coverage of all foliage is very important. On mature plants a minimum of 250 to 300 gallons of spray per acre is necessary to adequately cover the foliage.

The program outlined above should result in better control of all diseases and consequently higher yields should be obtained than if a single fungicide were applied on a straight schedule.

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PERFORMANCE OF NEW TOMATO TYPES IN THE GULF COAST AREA

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It is the object of this paper to report our evaluations of several tomato varieties that have been introduced in recent years. These new varieties have been compared with established standard varieties such as Grothen's Globe and Rutgers in numerous trials involving replicated plots. It is our intention to point out the salient features, desirable as well as undesirable, of these varieties as observed during these trials. Some of the observations and conclusions, of course, are dependent upon information furnished by other Experiment Station workers, growers, and shippers.

The new varieties considered in this report include Manahill, Manasota, W. R. Grothen Globe, Jefferson, Homestead, Manalucie and Queens.

The first of the wilt-resistant varieties to be tried by commercial growers was Pan America, which was bred by tomato specialists in the United States Department of Agriculture laboratories at Beltsville. The second release in the series from the United States Department of Agriculture was Southland, which was developed at the Southeastern Regional Vegetable Breeding Laboratory at Charleston, South Carolina. Those of you who are tomato-growers will remember that, after one or two trials, both Pan America and Southland were aban-