

Progress Report of

INVESTIGATIONS ON DISEASES OF VEGETABLE AND ORNAMENTAL PLANTS

By

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Tomato Wilt

Mississippi Agricultural Experiment Station

A. & M. College, Mississippi

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The purpose of this paper is to report the progress of the investigations on vegetable and ornamental plant diseases carried on by the Department of Plant Pathology of the Mississippi Agricultural Experiment Station and the Mississippi State Plant Board. More detailed results of some of the 1928 experiments mentioned herein have been published previously in bulletin or circular form by this Station.

TOMATO WILT AND BLOSSOM-END ROT STUDIES

The studies on tomato wilt and blossom-end rot in 1928 were conducted along the same general plans as those in 1927. In 1928, nineteen varieties of tomatoes were planted on soil heavily infested with the wilt organism, *Fusarium lycopersici*, and also on wilt-free soil.

The seed of the various varieties used in these tests were sown in greenhouse flats on February 20. The plants were transplanted to cold frames on March 15 and to the field on April 26. The soil in the field was of a light sandy loam type and had received a uniform application of about 1200 pounds of an 8-4-4 (P-N-K) fertilizer per acre in the drill about two weeks before the plants were transplanted to the field. The wilt-infested soil used in 1927 was used again for the wilt-infested soil test in 1928. In addition to the fungous inoculum already present in the soil, a mixture of about twenty-five grams of sand and a pure culture of the wilt fungus which had been grown for about five weeks on a culture medium made of one part of cornmeal and two parts of sand, was placed in each hill as the plants were being transplanted. The test on the wilt-free soil was conducted in a field that had never been planted to tomatoes before and no wilt symptoms were apparent on any of the plants at any time during the season. The plants in both tests were set twenty-eight inches apart in rows three and one-half feet wide and fifty feet long. Four series, arranged in such a way as to overcome soil variations, were planted in each test. The plants were staked

and pruned to one main stem until about the middle of July at which time they were topped.

Apparent wilt readings were made at intervals of about three weeks during the growing season. The fruits were harvested as soon as ripe, sorted into marketable and culls, and weighed in the field. The cull fruits from the wilt-free test were also sorted into various classes depending upon the cause of the cull; namely, blossom-end rot, cat-faces, puffs, etc. The summarized results from these tests are given in tables 1 and 2.

TABLE 1
Test for Wilt Resistance of 19 Varieties of Tomatoes in 1928*

Name of Variety	Apparent wilt in percentage				Rank in resistance	Pounds of marketable fruit per acre
	June 2	June 21	July 16	Aug. 4		
La. Red	0.0	1.2	10.7	22.6	2	7,925
La. Pink	1.2	2.4	11.9	23.8	3	7,431
Norton	3.6	3.6	13.1	23.8	4	5,823
Marvana	2.4	14.3	19.0	27.4	5	5,475
Globe "L"	4.8	13.1	27.4	77.4	8	5,132
Globe "R"	3.6	14.3	31.0	83.3	11	4,983
Globe "SS"	7.1	13.1	28.6	81.0	9	4,830
Marvel	1.2	3.6	9.5	17.9	1	4,806
Kanora	4.8	14.3	17.9	45.2	6	4,475
Globe (Liv.)	8.3	20.2	35.7	86.9	12	4,350
Perfection	15.5	35.7	52.4	88.1	14	4,197
Marglobe	3.5	17.5	35.3	75.2	10	4,069
Gulf States	20.2	56.0	70.2	94.0	16	3,864
Richard's	11.9	29.8	48.8	84.5	13	3,640
Marvelosa	1.2	4.8	22.6	57.1	7	3,344
Bryan's	8.3	41.7	67.9	90.5	15	2,684
Crystal S. Mkt.	51.2	92.9	95.2	97.6	17	1,311
Stone	66.7	95.2	97.6	98.8	19	802
Detroit	50.0	92.9	96.4	100.0	18	646

*Average of 4 plats.

The results given in table 1 again demonstrate that there is a marked difference in the susceptibility of various varieties of tomatoes to *Fusarium* wilt. Due to the fact that resistance to wilt is coming to be the most important prerequisite for a successful tomato variety for Mississippi conditions, too much stress cannot be put upon selecting a good resistant variety best suited to a given locality. During the past two years, the Louisiana Red and the Louisiana Pink have ranked near the top in resistance to wilt and in yield of fruits. The Marglobe during 1924, 1925,

and 1927 was a very outstanding variety but in 1928 it was quite susceptible to wilt and was not as productive as in former years. No explanation can be given for its poor behavior during 1928. It is still to be considered, however, as one of the leading wilt-resistant varieties of tomatoes. The Marvana is an outstanding, early, wilt-resistant variety of the Earliana type. The Norton continues to be a good, medium late-season, resistant variety. The

TABLE 2

Comparison of the Yields of Wilt-Resistant and Non-Resistant Varieties of Tomatoes on Wilt-Free Soil and Notes on Other Varietal Characteristics During 1928*

Name of variety	Character of fruit			% blossom-end rot	% cat-faces	% puffs	Total % culls	Pounds of marketable fruit per acre
	Color	Av. Wt. in pounds	Order of ripening					
Kanora	Red	.245	12	3.8	3.4	2.5	40.1	8,306
Marvana	Red	.224	1	5.8	6.0	0.4	47.3	7,913
Gulf States	Pink	.292	5	2.5	8.0	5.2	52.0	6,714
Detroit	Pink	.330	9	5.4	8.8	4.6	49.0	6,524
Richard's	Pink	.322	17	3.0	8.7	5.9	56.7	6,509
La. Red	Red	.232	16	9.5	4.1	6.9	59.1	6,334
La. Pink	Pink	.247	10	9.1	3.6	6.5	60.1	6,252
Perfection	Red	.279	8	5.4	16.3	1.3	54.9	5,924
Stone	Red	.329	15	9.2	13.6	1.3	52.2	5,903
Marglobe	Red	.312	6	4.3	9.1	3.7	47.1	5,823
Marvel	Red	.257	3	10.8	10.3	0.6	51.7	5,704
Marvelosa	Pink	.272	4	15.8	12.7	0.5	54.5	5,285
Norton	Red	.323	13	2.0	11.7	1.9	54.8	5,206
Globe "SS"	Pink	.323	18	5.6	5.2	5.2	67.5	5,133
Crystal S. Mkt	Pink	.252	11	17.8	5.4	2.1	54.9	5,062
Globe (Liv.)	Pink	.308	19	9.9	6.0	3.8	63.5	4,769
Globe "R"	Pink	.308	14	6.7	5.0	4.2	67.1	4,578
Globe "L"	Pink	.298	7	7.2	5.7	4.1	65.3	4,559
Bryan's	Pink	.284	2	5.7	6.7	4.3	68.1	4,064

*Average of 4 plats.

Marvel is one of the most resistant varieties but is not quite as productive as some of the other varieties. The various selections of the Globe variety were furnished by Lotterhos & Huber of Crystal Springs, Mississippi, for these tests. The differences in the yield and resistance to wilt of these selections are so small that they may be due to experimental error. Some of the varieties used in these tests have been advertised by various seedsmen as wilt-resistant but have proved to be very susceptible to wilt under the conditions of these experiments.

The data presented in table 2 show that some of the better wilt-resistant varieties are as productive even on wilt-free soil as some of the best commercial non-resistant varieties. The data given in this table also show that there is a marked difference in the susceptibility of the various varieties to blossom-end rot and cat-faces.

A detailed discussion of wilt and blossom-end rot of the tomato together with the results of experiments conducted during previous years on these diseases is given in Mississippi Agr. Exp. Sta. Bul. 247.

IRISH POTATO SEED TREATMENT EXPERIMENTS

In 1927 and 1928, experiments were conducted to compare the effect of various organic mercury disinfectants with that of bichloride of mercury for the control of the common scab of the Irish potato caused by *Actinomyces scabies*. The plans of the experiments for the two years were practically the same. Slightly scabby potato seed of the Triumph variety were divided into lots of equal weight and number. The various lots were then treated according to the outlines given in tables 3 and 4. In 1927, the treatments were made on February 25 and the seed planted February 26. In 1928, the treatments were made on March 19 and the seed planted on March 22. The potatoes were planted one foot apart in rows three feet wide and twenty-five feet long. At harvest the potatoes were sorted into various classes depending upon the amount of scab present, namely; clean (free of all scab lesions), marketable scabby (slightly scabby tubers to those with about $\frac{1}{4}$ of the surface scabby), and unmarketable scabby

TABLE 3
Relative Value of Various Seed Potato Disinfectants for the Control of Scab in 1927.

Treatment	Time of treatment	Per cent clean	Per cent scabby	Bushels per acre	
				Marketable sized tubers	Culls
Bichloride of mercury 1-1000	30 min.	99.4	0.6	63.4	7.1
Bichloride of mercury 1-1000	1 hour	99.2	0.8	58.1	6.4
Bichloride of mercury 1-1000	1½ hrs.	99.7	0.3	57.8	3.9
Dipdust 1-20	Dipped after cut	98.2	1.8	69.5	6.2
Semesan Bel 1-20	Dipped after cut	95.7	4.3		
				67.0	8.1
Untreated	—	89.0	11.0	65.0	6.4

(tubers with more than $\frac{1}{4}$ of the surface covered by scab lesions). Weights were taken on the marketable and unmarketable sized tubers regardless of the amount of scab present. The data from these experiments are given in tables 3 and 4. The

TABLE 4
Relative Value of Various Seed Potato Disinfectants for the Control of Scab in 1928.

Treatment	Time of treatment	Per cent clean	Per cent scabby		Bushels per acre	
			Market-able	Unmar-ketable	Marketable sized tubers	Culls
HgCl ₂ 1-1000	30 min.	94.6	4.8	0.6	62.2	15.4
HgCl ₂ 1-1000	1 hour	92.0	8.0	0.0	58.7	10.4
HgCl ₂ 1-1000	1½ hrs.	92.6	6.9	0.5	49.2	7.6
Semesan Bel 1-20	Dipped after cut	85.2	11.2	3.6	57.0	9.8
Dipdust 1-20	Dipped before cut	89.8	7.3	2.9	67.5	10.2
Dipdust 1-20	Dipped after cut	90.3	8.0	1.7	72.7	12.7
Untreated	—	57.9	22.5	19.6	61.0	16.2

results from the Irish potato seed treatment experiments conducted during 1927 and 1928 indicate that the organic mercury disinfectants are not superior to bichloride of mercury for the control of common scab. These disinfectants did not have any noticeable effect upon germination or upon the total yield of potatoes. By varying the length of time of soaking the potatoes in a 1-1000 solution of bichloride of mercury, it has been shown that a thirty minute treatment is about as effective as treating for longer periods for the control of scab.

IRISH POTATO DUSTING AND SPRAYING EXPERIMENT

The Irish potato dusting and spraying experiment for 1928 was conducted on a very uniform, sandy loam soil. Triumph potato seed were planted March 3 but germination was delayed by the cold, wet weather during March and the early part of April. The experimental field was divided into plats consisting of four rows, each three feet wide and thirty-one feet long. The potatoes were up to almost perfect stand by April 5 but the frequent rains prevented making the first application of fungicides until April 18. Additional applications were made on April 28 and May 7. The fungicides used were a 4-4-50 Bordeaux mixture, eleven pounds of colloidal copper (furnished by the Crop Protection Institute) in fifty gallons of water, and a 20-80 copper-lime dust (furnished by the Niagara Sprayer Company). The sprays were applied with a compressed air spray pump using as

much pressure as could be obtained. The dust was applied with a Root hand gun commonly used for dusting cotton.

A small amount of early blight developed on the potatoes in the latter part of the season but there was not enough to compare the effect of the different fungicides on the control of this disease. During the latter part of the season, tip-burn became quite severe on the untreated plats and also on the plats sprayed with colloidal copper. There were a few leaf hoppers present but apparently not enough to account for all the burning of the leaves. The average yields for the different treatments are given in table 5.

TABLE 5
Effect of Dusting and Spraying Upon Potato Yields. 1928.

Treatment	Bushels per acre		Increase or decrease of marketable potatoes over check
	Marketable	Culls	
Check.....	165.3	20.5	
4-4-50 Bordeaux mixture	179.1	23.7	+13.8
11-50 Colloidal copper	164.2	21.9	-1.4
20-80 Copper lime dust	168.1	23.5	+2.8

The results given in table 5 indicate that Bordeaux mixture decreases the amount of tip-burn and increases the yield of potatoes. Probably a larger number of applications of the fungicides would have given better results. This problem is one that is badly in need of additional study in the Southern States.

CERTIFIED IRISH POTATO SEED TESTS

In 1928, the certified Irish potato seed studies which had been conducted during former years were continued at the Main Experiment Station, the South Mississippi Branch Experiment Station, and the Raymond Branch Experiment Station in cooperation with the Mississippi State Plant Board. The results during 1928 again show that certified seed, as a rule, have much less mosaic, spindle-tuber, and leaf-roll than uncertified seed and produce greater yields. During the past four years, certified potato seed of the Triumph variety averaged 42.8 per cent more marketable potatoes than uncertified seed. Many samples of uncertified seed produced only about one-half the yield of the better samples of certified seed. The results of the 1928 tests have been summarized in Mississippi Agr. Exp. Sta. Cir. 80.

EFFECT OF DEGENERATION DISEASES OF THE IRISH POTATO UPON YIELDS

The results from the studies on the effect of the degeneration diseases on the yields of the Irish potato during 1927 and 1928 have been published in Mississippi Agr. Exp. Sta. Bul. 258.

SWEET POTATO SEED TREATMENT EXPERIMENTS

In the spring of 1927, experiments were inaugurated to test various disinfectants for the control of black-rot, a fungous disease caused by *Ceratostomella* (*Sphaeronema*) *fimbriata*. The sweet potato seed used in 1927 were selected from a storage house that had a large per cent of the potatoes infected with black-rot. Only apparently disease-free seed were selected for this experiment. The same disinfectants used in 1928 and listed in table 6 were used in 1927. Since very little black-rot developed in the checks of this experiment, the data was of little or no value in showing the effect of the various disinfectants on the control of this disease. The potato plants from the various treatments were transplanted to the field in order to study the effect of the disinfectants on the yield of potatoes. Although the average yield of nine replications for each treatment varied slightly from the average of the untreated, the differences in each case were well within experimental error and no significance can be placed upon them.

In 1928, sweet potato seed of the Nancy Hall variety were selected from an apparently disease-free lot of potatoes for the seed treatment experiment. The potatoes were inoculated with the black-rot organism by dipping them into a heavy suspension of conidia, chlamydospores, ascospores, and fragments of mycelium. They were covered with a canvas and allowed to stand in a warm room for about six hours after which they were spread out to dry over night. The seed were divided into twenty-one lots of fifty potatoes each. Each lot of potatoes weighed 3840 grams. Three lots were treated with each disinfectant according to the outline given in table 6. Six lots were left untreated to be used as checks. The potatoes were then bedded in a mixture of sand and leaf-mold. The plants were pulled, counted, and weighed on June 4, June 28, and July 14. The results of this test are given in table 6.

The per cent of plants in this experiment infected with black-rot does not express the total value derived from treating the potatoes with the various disinfectants because the disease

was so severe in the check that only a few plants reached the surface of the soil. No injury was noted from any of the treatments except in the case of formalin for thirty minutes. The seed given this treatment were a little slow in germinating and fewer plants were produced than where formalin was used for ten minutes. The standard bichloride of mercury treatment

TABLE 6
Relative Value of Various Sweet Potato Seed Disinfectants for the Control of Black-Rot During 1928.

Treatment	Time of treatment	Per cent plants infected with black-rot	Average number plants per plat	Average weight per plant
Check	—	51.0	27.5	9.4
Bichloride of mercury 1-1000	10 min.	18.1	236.0	9.4
Dipdust 1-20	dipped	20.6	130.3	10.0
Semesan Bel 1-20	dipped	28.3	74.0	10.1
Formalin 3-400	10 min. washed	15.2	250.0	9.2
Formalin 3-400	30 min. washed	4.8	129.3	11.2

proved to be slightly superior to the Semesan Bel and the Dipdust treatments for the control of black-rot. Formalin seems to be the most promising of the disinfectants used but since it causes injury under some conditions, it will be necessary to study its behavior under varying conditions before definite recommendations can be made. The standard 1-1000 bichloride of mercury treatment for ten minutes seems to be the safest disinfectant at the present time for sweet potatoes.

OBSERVATIONS ON SWEET POTATO MOSAIC

During the summer of 1926, vine cuttings were made from twenty-three hills of sweet potatoes, which showed varying degrees of the mosiac disease, and were transplanted to the field. Five of these selections were used to study the effect of the disease upon the yield and to determine whether the severity of the disease increases from year to year after infection has taken place. Yield records have been taken from four tests conducted over a period of three years and are given in table 7. The first year's yields are of questionable significance because of the small

number of plants used. The results of these tests indicate that the mosaic disease varies in its effect on the yield of sweet potatoes under different conditions.

TABLE 7
Effect of the Mosaic Disease of the Sweet Potato upon the Yields.

Selection	Comparative yields of diseased & healthy plants in per cent			
	1926	1927	1928*	1928*
Healthy	100.0	100.0	100.0	100.0
M-1	71.4	65.7	65.0	56.3
M-2	23.3	—	49.5	58.7
M-6	24.7	57.8	58.0	49.5
M-7	37.5	57.4	59.6	49.5
M-14	25.5	38.6	65.5	58.1

*Two experiments were conducted during 1928.

Although most of the plants from a given line will show symptoms of mosaic similar to their parent plant, a few plants sometimes vary widely in this respect and in some cases the symptoms of mosaic disappear entirely and the plant apparently recovers from the attack of the disease. Whether such plants would show mosaic symptoms under the proper conditions has not been determined. In other cases, the symptoms of mosaic may become more evident. This variation has also been noted in individual plants. For example, during the summer of 1928 a vine about five feet long was noted in the greenhouse on which the leaves for about one foot next to the main stem showed severe symptoms. The leaves on the next thirteen or fourteen inches of the same vine were apparently devoid of mosaic symptoms while the leaves on the rest of the vine showed very severe symptoms of this disease. No explanation for this variation is known.

The transmission of sweet potato mosaic has been given some attention during the past two years. The results of these studies confirm the earlier work of Rosen and Weimer in that attempts at transmitting the disease by grafting and by transferring the sap of a diseased plant to a healthy one by mechanical means have been unsuccessful. Observations on potato fields which have been carefully rogued of mosaic-diseased plants for the past four or five years and which continue to show a small per cent of diseased plants indicate that the disease is transmitted in some way in North Mississippi where the growing period for sweet potatoes is not more than seven or eight months. These observations are not in accord with Rosen's conclusions to the effect that the inoculated healthy plant must have a continuous

growing period of twelve or thirteen months and that the disease "is not capable of being transmitted in healthy plants under natural conditions in the northern sweet potato sections, while in the southern-most regions, as around the Gulf of Mexico, there is ample opportunity for transmission." The question of how sweet potato mosaic is transmitted, if it is a true mosaic, is still unknown.

An interesting observation was made on the yields of roots of mosaic-diseased tops grafted onto healthy roots as compared to healthy tops grafted onto diseased roots. On June 27, 1928, seven plants were grafted according to the procedure mentioned above and transplanted to a bed in the greenhouse which had been filled with thoroughly mixed sandy loam soil. All of the plants were watered and cared for in practically the same manner.

TABLE 8
Yield of Enlarged Roots from Mosaic-Diseased Sweet Potato Tops Grafted on Apparently Healthy Roots and Vice Versa.

Treatment	Average weight of roots from 7 plants in grams	Comparative weight on percentage basis
Diseased tops/healthy roots.....	128.1	100.0
Healthy tops/diseased roots.....	74.6	58.2

The yields of potatoes which were taken November 1 are given in table 8. The yield of potatoes on the healthy roots and diseased tops was nearly twice as great as that for the diseased roots on the healthy tops. Although the number of plants used in this experiment is too small to permit any significant conclusions to be drawn, the results indicate that the mosaic disease of sweet potatoes has some other effect upon the yield than merely the destruction of chlorophyll in the leaves.

STUDIES ON CABBAGE YELLOWS

In the spring of 1928, studies on yellows-resistant cabbage varieties were inaugurated at this Station in cooperation with Dr. J. C. Walker of the University of Wisconsin.

In one experiment, six varieties of cabbage were planted to test their resistance to yellows and yielding ability under Mississippi conditions. Due to the fact that the inoculum of the yellows fungus (*Fusarium conglutinans*) was not available at transplanting time, no data was obtained on the resistance of the various varieties in this test. The yield records show, however,

that the Marion Market, All Head Select, Wisconsin All Seasons, and Wisconsin Brunswick are well suited for garden varieties under Mississippi conditions.

In the second experiment, several selections of the Jersey Wakefield variety made by Dr. Walker were tested. The seed were sown February 8 in greenhouse flats. The soil in the experimental field was of a light sandy loam type which had received an application of about 1200 pounds of an 8-4-4 (P-N-K) fertilizer per acre. The plants were transplanted to the field on March 26. They were set one foot apart in rows three feet wide and twenty-five feet long. Six series of plats were inoculated by placing a heaping teaspoonful of a mixture of sand and a pure culture of a strain of the yellows fungus, which had been isolated during the summer of 1927 from specimens collected near Houston, Mississippi, and which had been grown for thirty-two days on one part of cornmeal and two parts of sand, in each hill as the plants were being transplanted. Two series of plats were not inoculated. Readings were made on the number of plants infected with yellows at intervals during the growing season. The results of this experiment are given in tables 9 and 10.

TABLE 9
Results from Jersey Wakefield Cabbage Strain Test on Yellows-Sick Soil

Strain	% stand	% plants infected with yellows			% plants not harvested because of yellows	Av. weight per head	Tons per acre
		6-1	6-12	7-3			
Commercial.....	99.3	12.8	23.5	39.6	20.1	1.139	5.84
2027 B.....	98.7	0.7	0.7	0.7	0.0	1.143	8.13
Hg27 A.....	97.3	56.9	69.9	92.5	61.6	1.179	3.65
5H1A.....	97.3	17.1	26.0	35.6	20.6	1.101	5.33
G351 A.....	98.7	18.9	23.0	33.1	15.5	1.185	7.34
2027 A.....	98.7	6.1	11.5	13.5	4.1	1.113	7.49
All Head Select..	96.9	1.4	2.1	4.8	0.7	.997	5.35

Selection 2027 B had been selected as being homozygous for resistance to yellows and Hg27 A as being homozygous for susceptibility to yellows. 2027 A was a heterozygous strain which was quite resistant to yellows and very similar in type to 2027 B. The other selections were crosses between resistant and suscep-

tible strains and were expected to segregate into a ratio of three resistant plants to one susceptible one.

TABLE 10
Results from Jersey Wakefield Cabbage Strain Test on
Yellows-Free Soil. 1928.

	% heads harvested			Av. wt. per head	Tons per acre
	June 12	June 26	July 7		
Commercial.....	39.53	37.21	23.26	1.643	10.26
2027 B.....	98.00	2.00	0.0	1.396	10.13
Hg27 A.....	9.09	50.00	40.91	1.237	7.90
5H1A.....	32.56	51.16	16.28	1.247	7.78
G351 A.....	51.22	34.15	14.63	1.376	8.19
2027 A.....	89.80	8.16	2.04	1.333	9.49
All Head Select.....	26.67	46.66	26.67	1.312	8.57

The results given in table 9 show that the different strains developed the approximate amount of yellows which was expected. The selection 2027 B was very resistant to yellows. A study of this strain in table 10 shows that it is a very promising strain even on non-infested soil. Although the yield of this strain was approximately the same as that of the commercial strain on the non-infested soil, it has a decided advantage over the commercial strain in that all of the heads mature at about the same date, permitting most of the heads to be cut at the same cutting.

OBSERVATIONS ON BEAN BLIGHT AND BEAN MOSAIC

Samples of snap bean seed of the Burpee's stringless green pod variety were secured from various sources and planted in the field May 3, 1928, for the purpose of determining the relative amount of mosaic, and yielding ability of seed from various sources. The seed were planted in hills one foot apart in rows three feet wide and twenty-five feet long. Six replications were made. Four seed were planted per hill and a good stand was secured for each sample. Due to the fact that some of the samples were infected with bacterial blight, which is caused by *Bacterium phaseoli*, and that the weather conditions were unusually favorable for the development of this disease, it was necessary to make mosaic counts quite early in the season. Notes were taken on the relative amount of bacterial blight at the time of making the mosaic readings. A few days after the disease readings were made, blight spread over the entire field and only one picking, July 10, of green beans was made. The notes from these observations are tabulated in table 11.

It is interesting to note that the western-grown seed were relatively free of blight on June 12 but most of these samples contained quite a large per cent of the mosaic disease. The results of this test are in accord with observations made in various parts of the State during the past two years on commercial

TABLE 11

Summarized Results from Source of Snap Bean Seed Test of the Burpee's Stringless Green Pod Variety. 1928.

Source of seed	State where grown	Relative amount of bacterial blight June 12	Per cent plants infected with mosaic June 12	Pounds of green beans per acre
Geo. Tait & Sons, Norfolk, Virginia.	Utah	trace	17.3	2220
United States Seed Co., St. Louis, Mo.	Idaho	none	14.9	2018
Associated Seed Growers, New Haven, Connecticut	Idaho	slight	11.1	1889
Rogers Bros. Seed Co., Chicago, Illinois	Idaho	trace	20.9	1774
H. G. Hastings Co., Atlanta, Georgia	Unknown	slight	11.4	1748
Vaughan's Seed Store, Chicago, Illinois	Michigan	none	8.0	1742
D. M. Ferry & Co., Detroit, Michigan	Michigan	severe	15.3	1687
Job P. Wyatt & Sons Co., Raleigh, N. Carolina	Unknown	trace	16.2	1601
Leonard Seed Co., Chicago, Illinois	Michigan	very severe	23.7	1549
W. Atlee Burpee Co., Philadelphia, Penn.	Idaho	slight	29.0	1527
Chris Reuter Seed Co., New Orleans, La.	Unknown	none	28.1	1409

*Average of 6 plats.

plantings of beans with seed from different sources.

Additional observations were made upon several varieties of beans for resistance to bacterial blight. The beans had been planted according to the same general plan as the source of seed test. The beans were picked July 10 and the total weights taken. The results are given in tables 12 and 13. The yield of beans as given in these tables may not represent the relative resistance to bacterial blight since the earlier varieties may have had a chance to produce some beans before the disease became so destructive. The ability of a variety of beans to produce a crop un-

der the conditions of these experiments is, however, of much value—at least in certain seasons.

TABLE 12
Yield of Several Varieties of Green-Podded Snap Beans Under an Epidemic of Bacterial Blight.*

Variety	Source of seed	Pounds per acre
Red Valentine	Asso. Seed Growers, Inc. New Haven, Connecticut.	2337
Bountiful	Asso. Seed Growers, Inc., New Haven, Connecticut.	1749
Burpee's Stringless	Wood, Stubbs Company, Louisville, Kentucky.	1497
Black Valentine	Asso. Seed Growers, Inc., New Haven, Connecticut.	1487
Giant Stringless	Asso. Seed Growers, Inc., New Haven, Connecticut.	1411
Fordhook Favorite	Job P. Wyatt & Sons Co., Raleigh, North Carolina.	1077
Tennesse Green-Pod	Wood, Stubbs Company, Louisville, Kentucky.	843
Full Measure	Wood, Stubbs Company, Louisville, Kentucky.	134
Stringless Refugee	Geo. Tait & Sons, Norfolk, Virginia.	90**
Refugee (1-1000)	Chris Reuter Seed Co., New Orleans, La.	53**

*Average of 7 plats.

**The Stringless Refugee and Refugee (1-1000) were slightly more resistant to bacterial blight than the other varieties. The low yields of these two varieties were due in part to their being severely infected with mosaic.

TABLE 13
Yields of Different Varieties of Wax Snap Beans Under an Epidemic of Bacterial Blight*

Variety	Source of seed	Pounds per acre
Dwarf Golden Wax	Wood, Stubbs Company, Louisville, Kentucky.	835
Black Wax	Job P. Wyatt & Sons Co., Raleigh, North Carolina.	303
Surecrop Stringless	Chris Reuter Seed Company New Orleans, La.	156
Currie's Rust Proof	Wood, Stubbs Company, Louisville, Kentucky.	78
Pencil Pod Wax	Chris Reuter Seed Company New Orleans, La.	72

*Average of 6 plats.

OBSERVATIONS ON SEED TRANSMISSION OF PEPPER MOSAIC

In the summer of 1926, twelve pods of pepper which were badly mottled with mosaic were selected from plants showing severe symptoms of the disease. The seed from these pods were saved and planted the following spring in greenhouse flats and were later transplanted to an isolated field where peppers had never been grown before. The plants from all the selections developed normally and did not show any symptoms of mosaic at any time during the season. Seed were saved from these selections during the summer of 1927 and planted in 1928. The results from the study in 1928 were identical with those of 1927.

From these observations, it seems safe to conclude that pepper mosaic, like the mosaic disease of many other kinds of plants, is not always transmitted through the seed. In fact, it may not be carried in the seed under any conditions.

EXPERIMENTS ON THE CONTROL OF GLADIOLUS SCAB

The studies on the control of gladiolus scab caused by *Bacterium marginatum* were started in the spring of 1927. The results of the 1927 test together with a brief description of the symptoms of the disease have been published in the Quart. Bul. of the Mississippi State Plant Board 7³: 6-10. 1927.

In continuing these studies in 1928, two experiments were conducted. The first was planned to determine the effect of the various disinfectants on the control of scab. The second experiment was planned primarily to determine the length of time that corms could be treated with various disinfectants without injuring them.

EXPERIMENT I

In this experiment, it was necessary to use ten different varieties of gladiolus because a sufficient number of corms of a single variety was not available. The corms of each variety were divided into thirteen lots of equal number and weight. The husks were removed from all of the corms except three lots of each variety. One lot of each variety was treated with one of the disinfectants as outlined in table 14. Three lots of untreated corms of each variety were used as checks. The corms were planted April 2 four inches apart in rows three feet wide. The corms were harvested September 22 and dried for several days after which the husks were removed and the corms sorted into the various classes according to the amount of scab present.

Weights were taken on corms and cormels. The summarized results from this experiment are given in table 14.

TABLE 14
Effect of Treating Gladiolus Corms with Various Disinfectants on the Control of Scab, 1928*

Treatment	Length of time treated	% clean corms	% scabbed corms		Av. wt. in grams per plat	
			Slightly	Badly	Corms	Cormels
Husks removed						
HgCl ₂ 1-1000	30 min.	69.6	28.6	1.8	198.5	7.7
”	1 hr.	77.1	22.9	0.0	196.4	9.6
”	2 hrs.	81.4	18.6	0.0	184.8	6.3
Uspulun 1-400	2 hrs.	66.4	28.2	5.4	187.2	7.8
”	10 hrs.	70.7	27.5	1.8	194.1	8.7
”	18 hrs.	70.4	29.6	0.0	184.7	8.1
Formalin 3-400	30 min.	45.5	33.9	20.6	197.1	6.8
Untreated	—	24.7	47.6	27.7	184.2	6.5
Husks not removed						
HgCl ₂ 1-1000	1 hr.	78.2	21.8	0.0	201.0	8.5
Uspulun 1-400	10 hrs.	80.0	20.0	0.0	191.7	8.2
Untreated	—	23.7	40.7	35.6	185.7	6.4

*Average of 10 plats.

EXPERIMENT II

In the second experiment, the corms of the Mrs. Frances King variety, which were uniformly badly infected with scab, were divided into fifty-four lots of fifteen corms each. Each lot weighed 266 grams with the husks on. The husks were then removed from thirty-six lots. Eighteen of the lots with the husks removed were used as checks. One lot of corms with the husks on and one lot with the husks removed were then treated for a given length of time with each of the disinfectants mentioned in table 15. The time of treatment varied for bichloride of mercury and Uspulun from two to sixty-four hours and for formalin from one to thirty-two hours in this experiment. The corms were harvested, dried, and sorted as those in experiment I. The results are given in table 15.

The results of these experiments indicate:

1. Bichloride of mercury is probably the best disinfectant for the control of gladiolus scab. Uspulun is also very effective for the control of this disease. One pint of formalin in thirty gallons of water had little or no effect upon the control of this

disease even when used for thirty-two hours. The formalin used in these experiments tested 39.43 per cent by volume of formaldehyde.

2. The removal of the husks without disinfecting the corms had little or no effect upon the prevalence of scab in the resulting crop.

TABLE 15

Effect of Treating Gladiolus Corms for Varying Lengths of Time with Various Disinfectants on the Control of Scab and the Development of New Corms.

Treatment	Length of time treated	Husks removed				Husks not removed			
		% clean corms*	% badly scabbed corms*	Wt. in grams per plat		% clean corms*	% badly scabbed corms*	Wt. in grams per plat	
				Corms	Cormels			Corms	Cormels
HgCl ₂ 1-1000	2 hrs.	56.3	12.5	503.3	3.4	88.2	0.0	407.9	4.8
"	4 "	78.9	0.0	508.3	10.0	89.5	0.0	497.0	4.1
"	8 "	76.5	0.0	517.3	22.1	100.0	0.0	555.2	14.0
"	16 "	95.0	0.0	560.0	3.2	100.0	0.0	521.7	7.1
"	32 "	100.0	0.0	356.9	0.5	100.0	0.0	606.3	3.7
"	64 "	100.0	0.0	294.3	3.3	100.0	0.0	464.8	4.5
Uspulun 1-400	2 "	76.2	9.5	400.2	5.2	74.3	8.9	434.2	13.6
"	4 "	85.7	0.0	518.5	14.4	82.4	0.0	397.8	15.3
"	8 "	64.7	8.7	416.5	23.5	100.0	0.0	462.9	10.0
"	16 "	100.0	0.0	558.7	29.9	87.5	0.0	516.6	15.4
"	32 "	94.1	0.0	593.4	35.0	94.4	0.0	414.0	15.6
"	64 "	92.4	0.0	558.9	30.2	94.4	0.0	584.5	17.5
Formalin 1-240	1 hr.	0.0	80.0	443.3	16.4	0.0	100.0	232.3	6.1
"	2 hrs.	5.0	45.0	449.7	2.3	0.0	100.0	237.3	5.9
"	4 "	0.0	100.0	334.7	6.0	0.0	100.0	216.5	3.1
"	8 "	0.0	100.0	322.7	4.6	0.0	81.3	406.4	10.0
"	16 "	0.0	87.0	426.9	10.4	0.0	91.7	335.8	11.1
"	32 "	0.0	90.5	327.3	3.5	0.0	76.9	226.7	12.9
Untreated**	—	0.3	87.8	350.4	11.7	—	—	—	—

*The per cent of slightly scabbed corms equals the difference between the sum of the per cent of clean plus the badly scabbed corms and 100.

**Average of 18 plats.

3. Disinfecting corms with the husks on seemed to be slightly more effective for the control of this disease than the same treatment on corms with the husks removed. This may be due to the fact that the husks absorb more of the disinfecting solution than the surface of the corms and upon the evaporation of the water a larger quantity of the disinfectant is carried with the husks of the corms which gives some protection after the corms are planted.

4. *Gladiolus* corms can be treated for long periods of time with a 1-1000 solution of bichloride of mercury or 1-400 solution of Uspulun without apparent injury. Uspulun did not cause any noticeable injury even when the corms were soaked for sixty-four hours. The soaking of the corms for thirty-two hours in a 1-1000 solution of bichloride of mercury caused noticeable injury to corms with the husks removed. Corms treated for sixty-four hours in the bichloride of mercury solution caused severe injury to the corms which resulted in a poor growth of



Fig. 1. Effect of treating *Gladiolus* corms for sixty-four hours in a 1-1000 solution of mercuric chloride on plant growth. Left, treated; right, untreated.

the plants (Fig. 1) and a smaller yield of new corms and cormels. When the husks were not removed the corms were not injured as much as with the same treatment when they were removed. Little can be said about the injury caused by formalin because scab was so severe on all lots treated with this solution that the disease may have reduced the yield of new corms.

5. Treating *gladiolus* corms for eight hours in a 1-1000 solution of bichloride of mercury without removing the husks seems to be the most promising disinfectant for the control of scab. (Fig.2).

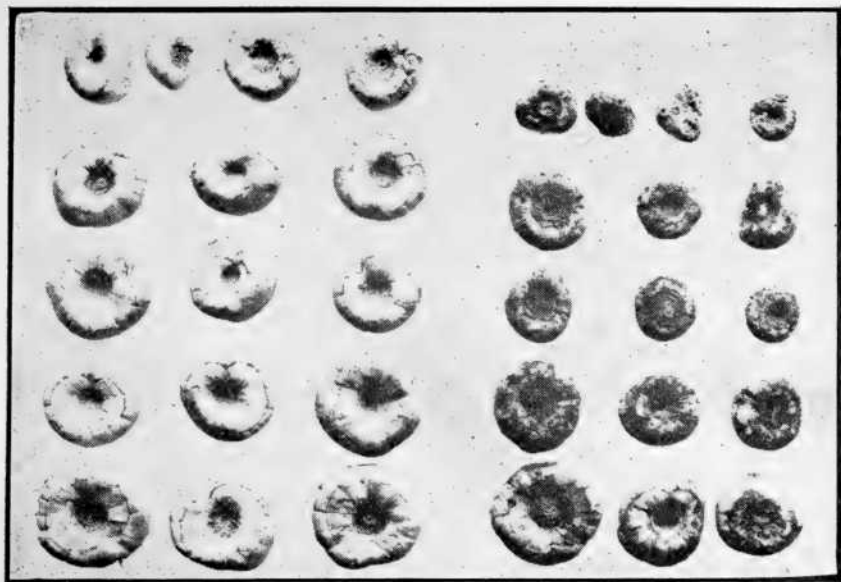


Fig. 2. Effect of disinfecting Gladiolus corms before planting on the control of scab. Left, treated for eight hours in a 1-1000 solution of mercuric chloride; right, untreated.

EXPERIMENTS ON THE CONTROL OF A NARCISSUS ROOT-ROT

Experiments on the control of a narcissus root-rot were conducted during the spring of 1928. The disease caused a rotting of the roots, the basal plate, and sometimes the entire bulb. The disease is apparently caused by a *Fusarium* sp. and is very much like, if not identical with, the basal-plate rot prevalent in the eastern part of the United States. Excellent control was obtained by treating the bulbs for six hours in a 1-400 solution of Uspulun or for one hour in a 1-1000 solution of bichloride of mercury. The results of this experiment have been published in Mississippi Agr. Exp. Sta. Cir. 79: 1-4. 1928.