2021 GEORGIA PLANT DISEASE LOSS ESTIMATES

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UNIVERSITY OF GEORGIA
EXTENSION

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2021 plant disease losses, including control costs, amounted to an estimated $889 million. The value of the crops used in this estimate was approximately $7.69 billion, resulting in an 11.6% relative disease loss across all crops included in this summary.

Most crops' estimated values used to compute these disease losses are summarized in the UGA Center for Agribusiness & Economic Development's 2021 Georgia Farm Gate Value Report (AR-22-01). Some estimates for fruits, ornamentals, and turf rely on specialists' knowledge of the industry and industry sources for information.

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2021 PLANT DISEASE CLINICS ANNUAL SUMMARY

Extension Plant Pathology maintains plant disease clinics in Athens and Tifton to aid county Extension faculty in diagnosing and correcting disease-related plant problems. Additionally, a nematode analysis laboratory is maintained in Athens. The Plant Disease Clinic in Athens is operated by Ansuya Jogi. Samples analyzed in this clinic include homeowner samples, commercial fruit and ornamentals, forestry, forages, turfgrass, and small grains. The Plant Disease Clinic in Tifton analyzes row crops, pecans, and commercial vegetables. Specialists associated with the clinics are Phillip Brannen, Bhabesh Dutta, Bob Kemerait, Elizabeth Little, Alfredo Martinez-Espinoza, Jonathan Oliver, and Jean Williams-Woodward. The Extension Nematology Lab is operated by Ganpati Jagdale and Katherine Martin. Soil and plant samples are processed there for nematode analysis.

The clinics maintain an online database of samples and diagnoses. From January–September 2021, those systems were Distance Diagnostics through Digital Imaging (DDDI) and Nematode Assay Results System (NARS). In September 2021, the clinics switched from DDDI and NARS to PClinic and NClinic. In 2021, 1,117 physical and digital commercial and home samples were processed for plant diseases, leading to an estimated 1,462 diagnoses. A total of 5,240 samples were received for nematode analysis. Specialists return the diagnoses and educational recommendations to county faculty.

2021 PLANT DISEASE CLINIC SAMPLE SUMMARIES

PHYSICAL AND DIGITAL SAMPLES			
Crop	**Commercial Samples**	**Homeowner Samples**	**Total**
Field Crops	116	0	116
Fruits and Nuts	163	30	193
Miscellaneous	1	1	2
Ornamentals and Trees	196	199	395
Turf	113	71	184
Vegetables	196	31	227
Total	**785**	**332**	**1117**

NEMATODE SAMPLES (Prepared by the Extension Nematology Lab)	
Crop	**Grower and Research Samples**
Field Crops	3094
Fruits and Nuts	706
Miscellaneous	194
None	316
Trees	69
Turf	245
Unknown	19
Vegetables	597
Total	**5240**

APPLE

In 2021, approximately 735 acres of apples were harvested for a farm gate value of $8.7 million. Summer rots and fire blight are the major diseases consistently associated with economic losses to apple production in Georgia. Although other diseases generally are controlled with good agricultural practices and fungicides, the cost of production is increased substantially to provide control of these less-aggressive diseases. Fire blight, a bacterial disease, was observed in 2021 but it was not prevalent during bloom. Cold damage during bloom was much more of an issue than fire blight, and cool conditions likely decreased this disease. Glomerella leaf spot caused significantly more losses than average because of wet conditions and expanded disease levels in multiple orchards. In fact, as in 2020, Glomerella was the most damaging disease observed in 2021 and continues to expand its range. Disease losses and expenditures for controlling rot diseases were above average in 2021, as rainfall was prevalent throughout the growing season, allowing for significant disease establishment. There is still a strong need for more efficacious fungicides, especially for control of bitter rot and Glomerella leaf spot. Cost of control included pesticide usage for fire blight, pruning costs, and summer rot control measures.

Disease	% Reduction in Crop Value	Damage *($ Thousands)*	Cost of Control *($ Thousands)*	Total *($ Thousands)*
Fire Blight	0.25	26.0	50.0	76.0
Bitter Rot/Glomerella	15.0	1560.5	180.0	1740.5
Bot Rot	0.03	3.1	52.0	55.1
Black Rot	0.02	2.1	33.0	35.1
Alternaria Leaf Spot	0.01	1.0	0.0	1.0
Powdery Mildew	0.01	1.0	12.0	13.0
Sooty Blotch*	0.01	1.0	0.0	1.0
Fly Speck*	0.10	10.4	0.0	10.4
Cedar Apple Rust*	0.01	1.0	0.0	1.0
Scab*	0.01	1.0	0.0	1.0
Other Diseases	1.0	104.0	5.0	109.0
Total	**16.5**	**1711.1**	**332.0**	**2043.1**

* Controlled with fungicides applied for other diseases.

Estimate by Phil Brannen, Extension Plant Pathologist

BLACKBERRY

In 2021, approximately 1,187 acres of blackberries were harvested for a farm gate value of $18.44 million. Diseases are typically a major reason for losses observed in blackberry production. There is limited research information available for the expanding market for blackberries because they are still a relatively new commodity for Georgia. In 2021, disease losses were moderate, as higher than normal rainfall led to significant issues with cane blight and leaf spots in some locations. Fungicidal applications generally decreased losses. Viruses, many of which are difficult to detect, caused significant losses. The most frequently observed diseases on blackberries in 2021 were cane dieback (cane blight and Botryosphaeria), orange cane blotch, Pseudocercospora leaf spot, and cane and leaf rust.

Disease	% Reduction in Crop Value	Damage *($ Thousands)*	Cost of Control *($ Thousands)*	Total *($ Thousands)*
Botrytis	0.10	19.3	364.6	383.9
Orange Rust	0.01	1.9	45.6	47.5
Cane and Leaf Rust	0.02	3.9	155.0	158.8
Double Blossom	0.01	1.9	91.2	93.1
Viruses	2.00	385.0	45.6	430.6
Phytophthora Root Rot	0.20	38.5	9.1	47.6
Cane Blight	1.00	192.5	91.2	283.7
Leaf Spots	0.50	96.3	63.8	160.1
Botryosphaeria	0.40	77.0	45.6	122.6
Total	**4.2**	**816.3**	**911.7**	**1728.0**

Estimate by Jonathan Oliver, Extension Plant Pathologist

BLUEBERRY

In 2021, approximately 25,191 acres of blueberries were harvested for a farm gate value of $348.75 million. Several diseases had a significant impact on blueberry production in 2021. Above average rainfall during the production season exacerbated disease issues. Significant losses occurred because of fruit rots, although less than there were during the prior growing season. Phytophthora root rot and dieback caused by Botryosphaeria stem blight caused significant plant mortality in some plantings. In addition, algal stem blotch was observed in multiple locations, probably in part because of the extremely wet growing conditions. Foliar diseases, including Septoria leaf spot and blueberry leaf rust, also were frequently observed, but fungicide programs were generally effective for controlling these diseases. In addition, where good fungicide programs were implemented, Phomopsis dieback, mummy berry, and *Exobasidium* were well-controlled by most producers during 2021. Viral problems were rarely found on blueberry, but bacterial leaf scorch continued to damage numerous plantings, resulting in significant plant mortality.

Disease	% Reduction in Crop Value	Damage *($ Millions)*	Cost of Control *($ Millions)*	Total *($ Millions)*
Mummy Berry	0.10	0.37	5.07	5.44
Botrytis Blight	0.10	0.37	1.91	2.29
Foliar Disease	1.50	5.62	1.46	7.09
Fruit Rots	4.00	14.99	1.46	16.46
Bacterial Leaf Scorch	0.30	1.12	0.45	1.57
Dieback	0.15	0.56	0.45	1.01
Phytophthora Root Rot	0.80	3.0	0.45	3.45
Total	**7.0**	**26.0**	**11.3**	**37.3**

Estimate by Jonathan Oliver, Extension Plant Pathologist

BUNCH GRAPE

In 2021, approximately 1,134 acres of bunch and wine grapes were harvested for a farm gate value of $27.12 million. Excessive rainfall provided ideal conditions for fungal disease development in bunch grapes, and disease losses were substantial in many vineyards. Virtually all vineyards lost some production to downy mildew and various fruit rots and cane diseases, especially Botrytis, powdery mildew, and downy mildew. Sour rot also was prevalent at the end of the season. Fungicide resistance is a major issue in multiple pathogens of wine grapes, including Botrytis, downy mildew, and powdery mildew. North Georgia is on the southern edge of the region where one can grow *vinifera* (European) wine grapes. The limiting factor is Pierce's disease, a bacterial disease that is vectored by sharpshooter insects. Cold winter temperatures kill the insect that transmits the disease, and low temperatures may prevent the bacteria from surviving from year to year in the plant. Therefore, cold temperatures allow for production of *vinifera* wine grapes, whereas warm winters result in increased disease. Pierce's disease losses continued to increase in 2021 in part because of warmer temperatures the previous few winters. However, more aggressive vector (insect) management, combined with destroying infected plants, has helped to stem rapid vineyard demise.

Disease	% Reduction in Crop Value	Damage *($ Thousands)*	Cost of Control *($ Thousands)*	Total *($ Thousands)*
Botrytis	4.0	1304.7	90.0	1394.7
Downy Mildew	8.0	2609.3	205.0	2814.3
Black Rot	1.0	326.2	92.0	418.2
Powdery Mildew	1.0	326.2	32.0	358.2
Phomopsis Cane Blight	1.0	326.2	40.0	366.2
Crown Gall	0.01	3.3	0.1	3.4
Pierce's Disease	1.75	570.8	20.0	590.8
Leaf Roll Virus	0.10	32.6	5.0	37.6
Total	**16.9**	**5499.3**	**484.1**	**5983.4**

Estimate by Phil Brannen, Extension Plant Pathologist

CORN

In 2021, approximately 455,245 acres of corn for grain were harvested with an average yield of 193.3 bushels per acre (bu/A). The 2021 crop was valued at $509.1 million. The winter of 2020–2021 generally was warmer than normal, which likely contributed to increased problems from nematodes. Rainfall was abundant during the season which favored increased yields over the previous season but also increased problems with some leaf disease. Losses associated with southern corn rust were not as severe as in 2020. Aggressive use of fungicides reduced damage from 7% in 2014 to about 4.5% in 2020 and 4.0% in 2021. Tar spot (*Phyllachora maydis*) was found in Georgia for the first time in 2021, but the disease occurred late enough in the season that yield loss was not observed. In 2019, hot and dry conditions were very favorable for aflatoxin, especially in non-irrigated fields. Conditions were much less favorable for aflatoxin in 2020 and 2021.

The importance of damage from nematodes—e.g., sting, stubby root, and southern root-knot nematodes—continues to become more apparent as growers, consultants, and Extension agents are better able to recognize and diagnose symptoms in the field. Abundant moisture early in the 2021 season helped to alleviate some damage from nematodes as did increased use of nematicides by growers. Still, losses to nematodes are largely the result of lack of nematode-resistant hybrids, lack of use of nematicides in affected fields, and an unseasonably warm winter.

Disease	% Reduction in Crop Value	Damage *($ Millions)*	Cost of Control *($ Millions)*	Total *($ Millions)*
Root & Stalk Rot	trace	—	—	—
Nematodes	6.0	30.5	1.0**	31.5
Mycotoxins	0.5	2.5	—	2.5
Southern Corn Rust	4.0	20.4	3.1***	23.5
Northern Corn Leaf Blight	0.1	0.5	--***	0.5
Other Leaf Diseases*	0.01	0.05	--***	0.05
Diplodia Ear Rot	—	—	—	—
Total	**10.6**	**54.0**	**4.1**	**58.1**

* Primarily includes southern corn leaf blight (*Bipolaris maydis*) and tar spot (*Phyllachora maydis*), but also may include gray leaf spot, Northern corn leaf spot, and *Curvularia* leaf spot.

** An estimated 15% of harvested acres of corn were treated with 5 lb/acre Counter insecticide-nematicide or a seed-treatment nematicide (AVICTA Complete Corn and Poncho VOTiVO) for control of nematodes.

*** An estimated 35% of the corn acreage was sprayed with fungicide once and 10% sprayed twice during the 2021 season at a cost of $5/acre for application and $10/acre for cost of fungicide.

Estimate by Robert Kemerait, Extension Plant Pathologist

COTTON

In 2021, cotton was planted on an estimated 1.2 million acres. The average lint yield was 944 lb per acre (lb/A). The crop was valued at $1,003.0 million. The winter of 2020–2021 was generally warmer than normal which likely contributed to increased damage from plant parasitic nematodes. Rainfall was abundant during most of the season, which favored increased yields over the previous season, but also increased problems with seedling disease, boll rot, and some leaf disease. Losses to areolate mildew also increased from 2020 to 2021. Very little, if any, loss was attributed to bacterial blight or the cotton leafroll dwarf virus.

Losses to nematodes (similar to 2018, 2019, and 2020), primarily from southern root-knot nematodes, continue to be one of the most important problems for cotton growers in Georgia. Until growers are able to practice effective crop rotation and increase the number of years between cotton crops in a field, the losses and damage from parasitic nematodes will continue to increase unless growers plant nematode-resistant varieties or use nematicides effectively.

Disease	% Reduction in Crop Value	Damage *($ Millions)*	Cost of Control *($ Millions)*	Total *($ Millions)*
Boll Rot (lint)	6.0	60.2	—	60.2
Nematodes	6.0	60.2	20.4*	80.6
Southern root-knot	5.0	50.1	—	
Reniform	0.5	5	—	
Columbia lance	0	—	—	
Sting	0.5	5		
Seedling Disease	2.0	20	3.2**	23.2
Fusarium Wilt	0.4	4	—	4
Ascochyta Blight	Trace	—	—	—
Stemphylium Leaf Spot	1.0	10	—	10
Target Spot	0.5	5	4.5***	9.5
Areolate Mildew (Ramularia leaf spot)	1.0	10	—***	10
Bacterial Blight	trace	—	—	—
Cotton Leafroll Dwarf	trace	—	—	—
Total	**16.9**	**169.4**	**28.1**	**197.5**

* Based upon an estimation that approximately 30% of the cotton acreage in the state is treated with a nematicide seed treatment (e.g., AVICTA Complete Cotton, BioST, etc.), 25% with AgLogic or Velum Total, and 5% with Telone II.

** Estimate of the cost of additional fungicide seed treatments used to manage seedling diseases. Approximately 33% of the cotton acreage in Georgia is treated with a fungicide in addition to the base seed treatment (or seed-treatment nematicide) to manage seedling disease.

*** Based upon an estimate that 25% of the cotton acreage was sprayed with a fungicide ($15/acre) in 2021 to manage foliar diseases.

Estimate by Robert Kemerait, Extension Plant Pathologist

MUSCADINE GRAPE

In 2021, the farm gate value for muscadine grapes was approximately $4.41 million. Disease pressure, especially from fruit rots, was average. Good fungicidal spray programs generally result in minimal losses, but ripe rot, Macrophoma rot, and other diseases were severe in some vineyards. This may have been a result of poor spray programs, but fungicide resistance combined with conducive weather conditions may have been involved. As a native grape, muscadines generally have less disease pressure than European bunch (*vinifera*) grapes, so fungicides are more effective when applied to muscadines. An active fungicide program is required, and where producers are unable to spray effectively, diseases can be significant.

Disease	% Reduction in Crop Value	Damage *($ Thousands)*	Cost of Control *($ Thousands)*	Total *($ Thousands)*
Bitter Rot	1.5	72.1	75.0	147.1
Macrophoma Rot	3.0	144.3	60.0	204.3
Ripe Rot	2.0	96.2	40.0	136.2
Angular Leaf Spot	0.6	28.9	10.0	38.9
Black Rot*	0.6	28.9	0.0	28.9
Phomopsis Dead Arm	0.5	24.0	1.0	25.0
Total	**8.2**	**394.3**	**186.0**	**580.3**

***** Controlled with fungicides applied for other diseases.

Estimate by Phil Brannen, Extension Plant Pathologist

ORNAMENTALS

The farm gate value for ornamental horticulture production (container nurseries, field nurseries, and greenhouses; excluding turf) surpassed $1 billion for the first time in 2021. Farm gate values for ornamental plant and tree production in field nurseries, container nurseries, and greenhouses were $195.74, $211.87, and $635.87 million, respectively, for a total of $1.043 billion in 2021. This was an increase of $113.36 million over 2020. Field (mostly tree) nursery production saw a 30% increase in value over 2020. This may be because of better control of canker diseases (using fungicides) affecting deciduous tree production. The ornamental disease loss estimate includes only commercial plant production and excludes the value-added service landscape industries. Root and crown rot diseases still account for a large percentage of disease loss in commercial ornamental production. Fungal branch cankers on deciduous trees, needle blight diseases on needled evergreens, and fungal leaf spots continued to be a problem in ornamental production. Fungicide applications with a bark-penetrating adjuvant applied in the fall have reduced the incidence of branch canker diseases. Rose rosette-associated virus, which causes rose rosette disease, and boxwood blight continue to be of concern for growers and landscapers.

Disease	% Reduction in Crop Value	Damage *($ Millions)*	Cost of Control *($ Millions)*	Total *($ Millions)*
Bacterial Diseases (fire blight, leaf spots)	0.1	1.04	0.90	1.94
Fungal Leaf Spots, Stem Cankers, Needle Blights	2.9	30.26	10.35	40.61
Root and Crown Rots	3.1	32.35	9.55	41.90
Powdery Mildew	0.4	4.17	2.20	6.37
Downy Mildew	0.1	1.04	2.60	3.64
Botrytis Blight	0.1	1.04	1.23	2.27
Viruses (TSWV, INSV, rose rosette, hosta virus X)	0.8	8.35	0.30	8.65
Minor diseases (rusts, nematodes)	0.05	0.52	0.95	1.47
Total	**7.55**	**78.77**	**28.08**	**106.85**

Production Category (2020 Farm Gate Value)	% Reduction in Crop Value*	Damage *($ Millions)*	Cost of Control *($ Millions)*	Total *($ Millions)*
Field Nursery ($195.74 M)	7.41	10.76	3.23	13.99
Container Nursery ($211.87 M)	9.11	17.79	12.20	29.99
Floriculture (Greenhouse; $635.86 M)	8.51	50.23	12.65	62.88
Total ($1,043.47 M)	**7.55**	**78.78**	**28.08**	**106.86**

* This column is not additive because disease losses are weighted according to production category.

Estimate by Jean Williams-Woodward, Extension Plant Pathologist

PEACH

In 2021, approximately 11,582 acres of peaches were harvested for a farm gate value of $84.87 million. Because of excellent and targeted fungicide programs, brown rot and scab diseases were of minimal consequence on peaches in 2021. However, surveys for fungicide resistance indicated that this is still a significant problem for the peach industry. Previous surveys have indicated that brown rot fungicide resistance is prevalent in many locations, but field surveys have allowed for prescription fungicide management (selection of fungicide classes for which resistance was not observed). Bacterial spot was more prevalent than normal, and development of resistance to antibiotics and/or copper bactericides used to control this disease has been confirmed, especially copper resistance. Armillaria root rot continued to be a major, expanding problem in replant peach production. Phony peach, caused by the bacterium *Xylella fastidiosa*, was observed in production orchards. Both Armillaria and phony peach diseases take trees out of production, as diseased trees are destroyed when identified.

Disease	% Reduction in Crop Value	Damage *($ Thousands)*	Cost of Control *($ Thousands)*	Total *($ Thousands)*
Brown Rot	0.2	173.9	2500.0	2673.9
Scab	0.01	8.7	2000.0	2008.7
Bacterial Spot	0.5	434.9	40.0	474.9
Phony Peach	0.5	434.9	260.0	694.9
Gummosis	0.1	87.0	5.0	92.0
Anthracnose	0.1	87.0	5.0	92.0
Armillaria Root Rot	1.0	869.7	50.0	919.7
Phomopsis Constriction Canker	0.01	8.7	10.0	18.7
Total	**2.4**	**2104.8**	**4870.0**	**6974.8**

Estimate by Phil Brannen, Extension Plant Pathologist

PEANUT

In 2021, 798,054 acres of peanuts were harvested. Yields in 2021 averaged 4104.6 lb/acre for a total production valued at $776.7 million. Disease losses in Georgia were affected by abundant rainfall during the 2020 and 2021 seasons. The winter of 2020–2021 was generally warmer than normal, which likely contributed to increased problems from nematodes and perhaps tomato spotted wilt virus. Rainfall was abundant during the season, which favored increased yields over the previous season, but also increased problems with leaf spot diseases. The early 2021 field season was wet across much of the state and delayed planting for some growers. The severity of leaf spot diseases increased from 2019 to 2021 because of abundant moisture, and because growers were often unable to get in the fields for timely fungicide applications. Cooler temperatures in 2021 compared with 2019 reduced losses to white mold. Loss to tomato spotted wilt virus was estimated to be 3.5%, down from 4.0% in 2020 and 7.0% in 2019.

The peanut root-knot nematode remained a problem in the south-central and southwestern regions of the state. However, availability of Velum Total and AgLogic 15G for management of nematodes helped to reduce this problem. Losses to the lesion nematode are still small, but growers are beginning to report increased damage. Development and spread of Cylindrocladium black rot (CBR) were slight in 2021.

Disease	% Reduction in Crop Value[a]	Damage *($ Millions)*	Cost of Control *($ Millions)*	Total *($ Millions)*
Leaf Spots	4.0	31.1	40.1[b]	71.2
White Mold (*Sclerotium*)	5.0	38.8	34.9[c]	73.7
Limb Rot (*Rhizoctonia*)	trace	—	—[d]	—
Pod Rot	trace	—	—[e]	—
Nematodes	3.0	23.3	8.8[f]	32.1
Cylindrocladium Black Rot	trace	—	—	—
Seedling Disease	0.5	3.8	0.9[g]	4.7
Tomato Spotted Wilt Virus	3.5	27.2	—	27.2
Diplodia Collar Rot	trace	—	—	—
Total	**16.0**	**124.2**	**84.7**	**208.9**

[a] The total value of the crop was $776.6 million according the Georgia Farm Gate Value report.

[b] An estimated 55% of peanut acreage in Georgia receives some irrigation, and most of this acreage was sprayed with fungicides on average 6.5 times during the season. Fungicide treatments for leaf spot control alone are about $10/acre per application. Growers usually sprayed non-irrigated fields less often, perhaps 4–5 times per season at $8/acre. This figure is based upon the approximate cost to growers if they ONLY used fungicides (e.g., chlorothalonil) for leaf spot control.

[c] This figure reflects the additional cost BEYOND control of leaf spot if growers chose to use products such as azoxystrobin, prothioconazole, tebuconazole, solatenol, flutolanil, or others to control soilborne diseases at some point during the season. For non-irrigated fields, four applications were calculated at $8/acre. For irrigated fields, four applications at $14/acre were calculated.

[d] Cost of control for limb rot is included in treatments for white mold.

[e] The cost of gypsum treatments applied to reduce pod rot has not been estimated.

[f] For the cost of nematode management, an estimated 5.0% of the acreage in Georgia is treated at a cost of $85/acre and 20% at $36/acre (Velum Total or AgLogic).

[g] The cost of the fungicide seed treatment is absorbed in the cost of the seed. An estimated 20% of the acreage was treated with azoxystrobin in-furrow at planting at a cost of $6/acre.

Estimate by Robert Kemerait, Extension Plant Pathologist

PECAN

In 2021, Georgia had an estimated 209,129 acres of pecans with a total farm gate value of $383.8 million. The growing season started out relatively dry, with only five rain events of 0.10 in. or more recorded in April and May at the UGA Ponder Farm. These conditions allowed for good management of leaf scab. However, more frequent rains occurred during June, July, and August, with a total of 35 rain events. This is a critical part of the season as the nuts enlarge, and nut scab potential was extremely high.

Many commercial growers in the southern part of the state made 10 or more fungicide applications to control scab successfully. In University of Georgia fungicide trials in Tift County, nontreated controls of the cultivar 'Desirable' had nut scab severity ratings of 100% in late August. This level of scab potential on the fruit would result in a complete crop loss if not controlled. The widespread use of newer fungicides, such as phosphites in early season and Miravis Top during nut sizing, helped to contain losses that could have been considerably higher. Root knot nematode (RKN) was included this year for the first time, as surveys have shown it to be widespread across the state. RKN can severely impact young trees and is almost certainly damaging to older trees. The loss estimate is a best guess, as the magnitude of this damage is unknown. Some growers now use nematicides either at planting or injected in the irrigation systems.

Disease	% Reduction in Crop Value	Damage *($ Millions)*	Cost of Control *($ Millions)**	Total *($ Millions)*
Scab	9.0	34.5	18.0	52.5
Anthracnose	0	0	0	0
Root Knot Nematodes	1.0	3.8	0.5	4.3
Downy Spot	0	0	0	0
Powdery Mildew	0	0	0	0
Zonate Leaf Spot	0	0	0	0
Phytophthora Shuck and Kernel Rot	0	0	0	0
Total	**10.0**	**38.3**	**18.5**	**56.8**

* Eight treatments on 125,000 acres @ $18/acre (including cost of application), based on the number of sprayed acres and averaging applications on highly susceptible and more resistant cultivars. Scab fungicide programs also are effective against anthracnose, downy spot, brown spot, and powdery mildew.

Estimate by Tim Brenneman, Research Extension Plant Pathologist, and Lenny Wells, Extension Horticulture Specialist

SOYBEAN

In 2021, soybeans were planted on a reported 147,492 acres with an average yield of 47.7 bushels/acre. The total soybean production for Georgia in 2021 was valued at $90.7 million. The winter of 2020–2021 was generally warmer than normal, which likely allowed for earlier reintroduction of soybean rust into the state. Rainfall was abundant during of the season, which favored increased yields over the previous season, but also increased problems with some diseases. Soybean rust was much more of a problem in 2020 and 2021 than it was during the hotter and drier 2019 season.

Disease	% Reduction in Crop Value	Damage *($ Millions)*	Cost of Control *($ Millions)*	Total *($ Millions)*
Soybean Cyst Nematode*	trace	—	—	—
Root-Knot Nematodes	2.0	1.8	—	1.8
Other Nematodes**	0.2	0.2	—	0.2
Asian Soybean Rust*	3.0	2.7	0.8	3.5
Anthracnose*	0.5	0.4	0	0.4
Brown Leaf Spot*	—	—	—	—
Target Spot	0.1	0.1	0	0.1
Charcoal Rot	trace	—	—	—
Diaporthe/Phomopsis Complex	trace	—	—	—
Downy Mildew	trace	—	—	—
Frogeye Leaf Spot*	0.01	0.01	0	0.01
Red Crown Rot	trace	—	—	—
Cercospora Leaf Blight*	1.0	0.9	0	0.9
Pod And Stem Blight*	1.5	1.4	0	1.4
Purple Stain*	0.1	0.1	0	0.1
Seedling Diseases (Rhizoctonia/Pythium/Fusarium)	0.1	0.1	—	0.1
Southern Blight (Sclerotium)	trace	—	0	0
Stem Canker	0	0	0	0
Fusarium Wilt	trace	—	—	0
Virus Diseases	0	0	0	0
Bacterial Diseases	0	0	0	0
Total	**8.5**	**7.7**	**0.8**	**8.5**

* Resistant varieties are used to manage most nematode and disease problems. Fungicides were applied to an estimated 35% of soybean acres for management of foliar diseases and were used as seed treatments to reduce seedling diseases on a small portion of the planted acreage. Each foliar fungicide application is estimated to cost growers $15/acre.

** "Other nematodes" includes reniform, sting, and Columbia lance nematodes.

Estimate by Robert Kemerait, Extension Plant Pathologist

STRAWBERRY

In 2021, approximately 356 acres of strawberries were harvested for a farm gate value of $14.44 million. Neopestalotiopsis, a new disease of strawberry, was first observed in the fall of 2020 and resulted in 100% losses in the spring of 2021 on multiple farms. Some losses were also observed on the new crop that was planted in the fall of 2021. Unfortunately, this disease arrived on nursery plants, and currently registered fungicides do not adequately control the pathogen. Other foliar and fruit disease pressures were severe in 2021, as expected with a wet year. Anthracnose, caused by *Colletotrichum* fungi, increased in prevalence, and resistance to QoI fungicides was confirmed in multiple locations. Phytophthora root rot also increased, and likely fungicide resistance has caused issues with this pathogen. Overall, it was a poor year for strawberry production, as rains contributed to problems with disease management on several farms. There is concern that the pathogens causing anthracnose and Botrytis rots will continue to develop resistance to other fungicides, which would make production more difficult. There is a strong need for fungicides with different modes of action if we are to continue strawberry production in Georgia.

Disease	% Reduction in Crop Value	Damage *($ Thousands)*	Cost of Control *($ Thousands)*	Total *($ Thousands)*
Gray Mold	1.0	159.0	480.6	639.6
Fungal Leaf Spots	0.1	15.9	53.4	69.3
Anthracnose	1.0	159.0	149.5	308.5
Root Rots & Nematodes	2.0	318.0	53.4	371.4
Angular Leaf Spot	0.1	15.9	10.7	26.6
Neopestalotiopsis	5.0	795.1	320.4	1115.5
Total	**9.2**	**1462.9**	**1068.0**	**2530.9**

Estimate by Phil Brannen, Extension Plant Pathologist

TURFGRASS

In 2021, the turfgrass industry sectors (golf courses, sport fields, sod production, lawn care in residential and commercial landscapes) accounted for an estimated 2.82 million acres, with a maintenance value of $1.99 billion. Sod/stolon production reached 25,544 acres with a farm gate value of $126.4 million. Common nondisease problems found in all turf species included cultural and environmental issues, nutritional deficiencies, excessive thatch layer, poor root system, and soil compaction. Dollar spot, caused by *Clarireedia montheithiana* and *C. jacksonii*, was common in warm- and cool-season grasses. Infections started early in the spring and continued through the summer. Large patch of warm-season grasses caused by *Rhizoctonia solani* was one of the most common diagnosed problems, especially in zoysiagrass. *Pythium* was commonly diagnosed in samples submitted to the plant disease clinic. Similar to 2020, leaf spots caused by *Bipolaris* spp. and *Drechslera* spp. were persistent on bermudagrass and cool-season grasses during the spring of 2021. *Gaeumannomyces* spp. (causal agent of take-all root rot, root decline of warm-season grasses, and bermudagrass decline) continued to be prevalent throughout the state. Gray leaf spot (*Magnaporthe grisea*) was severe on St. Augustinegrass. Minor incidences of sheath and leaf blight (mini ring) caused by *R. zeae* were observed. Slightly cooler than normal temperatures (at least compared with conditions observed in the previous two years) during spring and summer alleviated plant stress in bentgrass and tall fescue. Therefore, the incidence of anthracnose (*Colletotrichum cereale*) and Pythium root and crown rot (*Pythium* spp.) were minor on bentgrass. Minor infections of rust and fairy ring were observed. *Ophiosphaerella* spp. (SDS-spring dead spot) infections on *Cynodon* spp. (bermudagrass) in golf courses were minimal because of preventative care in the fall. Plant parasitic nematodes, based on sample submissions, were abundant on bent and bermudagrass golf greens.

Disease	% Reduction in Crop Value	Damage *($ Millions)*	Cost of Control *($ Millions)*	Total *($ Millions)*
Soil-borne and Crown Diseases	1.2	23.88	9.95	33.83
Foliar Diseases	0.5	9.95	5.97	15.92
Nematodes	1.0	19.90	9.95	29.85
Total	**2.7**	**53.7**	**25.9**	**79.6**

Estimate by Alfredo Martínez-Espinoza, Extension Plant Pathologist

VEGETABLES

About 150,000 acres of vegetables were grown in Georgia in 2021 with a farm gate value of $1.34 billion. Fusarium wilt of watermelon (*Fusarium oxysporum* f. sp. *niveum*) and Phytophthora fruit rot (*Phytophthora capsici*) caused greater losses than normal in spring and summer crops. Phytophthora blight and fruit rot also caused economic losses in other cucurbits (cucumber, squash, cantaloupe). Sour skin (*Burkholderia* spp.), center rot (*Pantoea* spp.), and postharvest rot (bacterial and fungal origin) were observed in onion, resulting in economic losses. Alternaria leaf blight in brassica and anthracnose in pepper and cucurbits were problematic and resulted in considerable economic losses. Losses that were due to whitefly-transmitted viral diseases were comparatively lower than losses incurred during 2020. Southern blight (*Sclerotium rolfsii*) and root-knot nematodes continue to be a problem in tomato production and regularly cause economic losses.

Major Vegetable Crops	% Reduction in Crop Value*	Damage *($ Millions)*	Cost of Control *($ Millions)*	Total *($ Millions)*
Watermelon	11.0	20.5	6.8	27.3
Squash (yellow + zucchini)	9.0	3.5	5.2	8.7
Tomato	4.0	1.6	9.8	11.4

Other Vegetable Crops	% Reduction in Crop Value*	Damage *($ Millions)*	Cost of Control *($ Millions)*	Total *($ Millions)*
Pepper (bell and specialty)	4.0	4.8	3.6	8.4
Cucumber	5.0	3.7	2.3	6.0
Snap Bean	3.5	0.8	0.6	1.4
Greens (brassica and nonbrassica)	10.0	6.2	6.4	12.6
Headed brassica (cabbage, broccoli)	10.0	7.2	10.5	17.7
Onion (field and storage)	8.0	8.2	9.4	17.6
Cantaloupe	5.0	0.8	1.6	2.4
Eggplant	1.0	0.2	0.7	0.9
Total	**8.7***	**57.5**	**56.9**	**114.4**

* Columns are not additive because disease losses are weighted according to production category.

Estimate by Bhabesh Dutta, Extension Vegetable Pathologist

WHEAT

In 2021, wheat was produced on 134,468 acres with a farm gate value of $487 million. The area planted with wheat in the state was up from previous years. The average yield was 57.19 bushels/acre, which was slightly higher than in 2020. Overall, disease incidence was low in 2021. Stripe rust (*Puccinia striiformis*) was reported in several counties in south and central Georgia. Leaf rust (*Puccinia triticina*) remained sporadic and at low levels of severity. Powdery mildew (*Blumeria graminis*) was observed throughout the state and was found at low levels at the UGA CAES Southwest Georgia Research and Education Center in Plains. An untimely frost in early April 2021 caused damage across the state, affecting early headed varieties. Unfavorable environmental conditions for the development of Fusarium head blight (FHB/scab; *Fusarium graminearum*) resulted in few samples diagnosed with the disease. Stagonospora spot blotch (*Stagonospora nodorum*), tan spot (*Pyrenophora tritici-repentis*), and barley yellow dwarf virus (BYDV) were observed at low levels across the state. Soilborne wheat mosaic virus was observed in a few areas of the state. Oat crown rust (*Puccinia coronata*) occurrences were numerous, and severity was high in commercial fields. Crown rust was observed at Plains and Tifton in the oat variety trial. There currently is little resistance to this disease available in production varieties.

Diseases	% Reduction in Crop Value	Damage *($ Millions)*	Cost of Control *($ Millions)*	Total *($ Millions)*
Leaf Rust / Stripe Rust	0.1	0.049	0.243	0.292
Glume Blotch	0.1	0.049	0.00	0.049
Powdery Mildew	0.0	0.0	0.00	0.00
Fusarium Head Blight	0.1	0.049	0.49	0.536
Barley Yellow Dwarf Virus	0.1	0.049	0.049	0.098
Soilborne Wheat Mosaic / Spindle Streak Mosaic Virus	0.0	0.0	0.0	0.0
Total	**0.4**	**0.20**	**0.78**	**0.98**

Estimate by Alfredo Martínez-Espinoza, Extension Plant Pathologist

SUMMARY OF TOTAL LOSSES DUE TO DISEASE DAMAGE AND COST OF CONTROL IN GEORGIA – 2021

Crop or Commodity	Estimated Crop Value *($ Millions)*	% Reduction in Crop Value[1]	Value of Damage *($ Millions)*	Cost of Control *($ Millions)*	Total Disease Loss *(Damage & Control; $ Millions)*	Total % Loss[1,2]
Apple	8.7	16.5	1.71	0.33	2.04	23.45
Blackberry	18.44	4.2	0.82	0.91	1.73	9.4
Blueberry	348.75	7.0	26.0	11.3	37.3	10.7
Bunch Grape	27.12	16.9	5.50	0.48	5.98	22.05
Corn	509.05	10.6	54.0	4.1	58.1	11.4
Cotton	1,003.03	16.9	169.4	28.1	197.5	19.7
Muscadine Grape	4.41	8.2	0.39	0.19	0.58	13.15
Ornamentals	1,043.47	7.6	78.8	28.1	106.9	10.2
Peach	84.87	2.4	2.1	4.90	7.0	8.25
Peanut	776.68	16.0	124.2	84.7	208.9	26.9
Pecan	383.8	10.0	38.3	18.5	56.8	14.8
Soybean	90.7	8.5	7.7	0.8	8.5	9.4
Strawberry	14.44	9.2	1.46	1.07	2.53	17.5
Turfgrass	1,990.0	2.7	53.7	25.9	79.6	4.0
Vegetable	1,338.0	8.7	57.5	56.9	114.4	8.55
Wheat	48.7	0.4	0.2	0.78	0.98	2.0
Totals	**7,690.16**		**621.78**	**267.06**	**888.84**	**11.56**

[1] This column is not additive.

[2] Total percent loss for each crop and the grand total is figured on the basis of the value of damage + cost control/crop value

ATTENTION!

Pesticide Precautions

1. Observe all directions, restrictions, and precautions on pesticide labels. It is dangerous, wasteful, and illegal to do otherwise.

2. Store all pesticides in original containers with labels intact and behind locked doors. ***Keep pesticides out of the reach of children.***

3. Use pesticides at correct label dosage and intervals to avoid illegal residues or injury to plants and animals.

4. Apply pesticides carefully to avoid drift or contamination of nontarget areas.

5. Surplus pesticides and containers should be disposed of in accordance with label instructions so that contamination of water and other hazards will not result.

6. Follow directions on the pesticide label regarding restrictions as required by state or federal laws and regulations.

7. Avoid any action that may threaten an endangered species or its habitat. Your county Extension agent can inform you of endangered species in your area, help you identify them, and through the Fish and Wildlife Service, identify actions that may threaten endangered species or their habitat.

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