

## Ohio Vegetable & Small Fruit Research & Development Program

### Final Report

2024

**Project Title:** Vegetable and Fruit Disease Diagnosis

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**Why was this project funded?** This diagnostics project is primarily a service to commercial vegetable and fruit growers in Ohio. We request funding each year to help support OSU Vegetable and Fruit Pathology Laboratory efforts to assist growers in diagnosing crop diseases, particularly in the case of unusual or difficult-to-diagnose cases and diseases that have explosive potential and require early detection on a regional scale.

#### Impacts.

In 2024, we diagnosed a total of 315 samples. The estimated cost of providing the basic service to growers, considering labor and supplies, is \$70 per physical sample. This does not include the cost of advanced diagnostics necessary in some cases or overhead costs. We estimate that the cost of diagnosing electronic samples is \$30/sample. Therefore, the value of this service in 2024 to Ohio fruit and vegetable growers is at least \$22,870 ***This represents a 4.2:1 return on grower's investment in this project*** (Table 1).

Table 1. Total number of the samples received by the C. Wayne Ellett Plant and Pest Diagnostic Clinic

Sample Type	Commodity			Estimated Value (\$)
	Vegetable	Fruit	Cut Flower	
Physical	205	94	12	\$21,770
Electronic	25	30	0	\$1,100
<b>Total</b>	<b>225</b>	<b>124</b>	<b>12</b>	<b>\$22,870</b>

### What was discovered?

Neopestalotiopsis disease was one of the major issues affecting strawberries (Figure 1). Other important diseases were black root rot complex, anthracnose, and Phytophthora root rot. A total of 24 Neopestalotiopsis strains exhibiting diverse morphological traits were collected, suggesting the presence of multiple species. Among these species, PCR and molecular fingerprinting confirmed the presence of an aggressive pathovar recently reported in Florida strawberry fields (Figure 2).

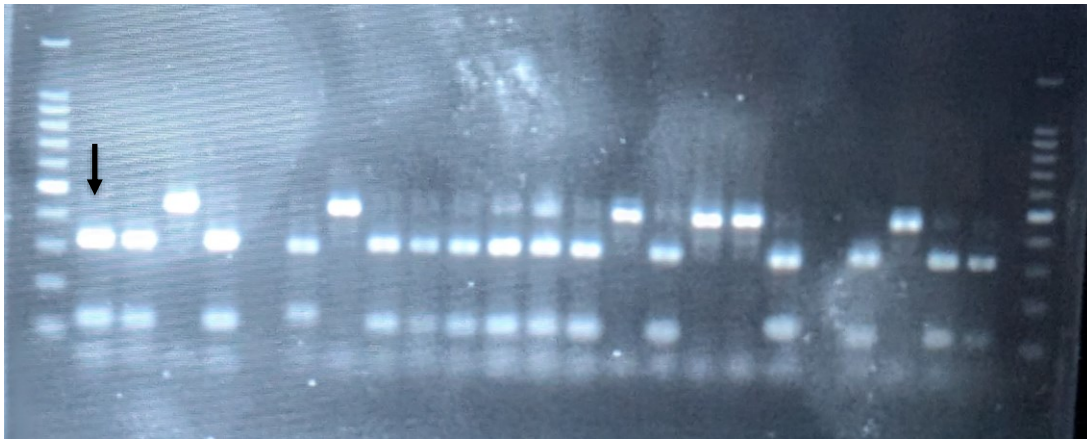
Disease X caused by *Phytoplasma pruni* Ca. was diagnosed affecting a peach orchard in Wayne County and led to the following fact sheet publication: PLPATH-FRU-0013.

Gummy stem blight on cucurbits was frequently reported and diagnosed in the northern part of the State. Yellow vine decline on cucurbits was also widely diagnosed.

For vine crops, we pinpointed the first appearance of downy mildew in cucumbers, melons, pumpkins and squash in six counties in the state. All first reports were submitted to the multistate cucurbit downy mildew forecasting site (Cucurbit ipmPIPE; <http://cdm.ipmpipe.org/>). Downy mildew was also reported on basil in Wayne County. This year downy mildew in cucurbits appeared in early July. Downy mildew and powdery mildew were the most frequently reported diseases among cucurbits. Through the ePLUS studies we established four sentinel plots in Sandusky, Huron, Wayne and Piketon county to monitor the appearance of downy mildew and the pathogen mating-types (<https://southcenters.osu.edu/horticulture/eplus/study-implementation>)



**Figure 1.** **A.** Strawberry plants were diagnosed with a coinfection of anthracnose and *Neopestalotiopsis*. **B** and **C** show characteristic symptoms of anthracnose on the crown and fruit, while **D** provides a close-up of foliar symptoms caused by *Neopestalotiopsis* disease, where the dark spots are clumps of spores infecting the leaves.



**Figure 2.** The three-band fingerprint profile identifies the aggressive *Neopestalotiopsis* strains cultured by the Clinic from symptomatic strawberry plants. The black arrow indicates a representative profile for the aggressive strains.

## Fruit Diagnostics Report

A total of 94 physical samples were received (Table 2) from 32 Ohio counties, no samples were received from out of State. The highest number of samples were submitted from Wayne County (N= 28) through the IPM program. Strawberry plants were the most frequently submitted samples (N=35) followed by apple (N=22), raspberry and blueberry (N=9). Fungal diseases affecting crown and roots were particularly severe in strawberry crops (Figure C). Fruit trees were negatively impacted by the prolonged drought. Twenty-two samples were diagnosis as abiotic (Table 2).

The majority of the samples were small fruits, while the remaining were tree fruit, and nut. Most of the samples were submitted by commercial growers and extension educators. Fungal diseases (47%) were predominant, followed by abiotic injuries (24 %, mostly chemical damage and environmental issues), diseases caused by oomycetes (11%), insect related injuries (9%) and bacterial disease (6%), viral diseases and phytoplasma (4%) (Table 3).

Table 2. Breakdown pf the physical samples received and diagnosed by the C.W. E. Plant and Pest Diagnostic Clinic.

	<b>Crop</b>	<b>Sample N</b>
<b>Pome Fruit</b>	Apple	22
	Pear	3
<b>Stone Fruits</b>	Peach	8
	Plums	3
<b>Berries</b>	Raspberry	9
	Blueberry	9
	Strawberry	35
	Blackberry	3
<b>Nuts</b>	Chestnut	1
<b>Other</b>	Ground cherry	1
<b>Total</b>		94

Table 3. Diseases, pests and abiotic disorders diagnosed in 2024 in fruit samples. Some of the samples were affected by multiple issues.

	Crop (N)	County (N of samples)	Diagnosis
<b>Pome Fruit</b>	Apple (22)	Butler (2), Columbiana (4) Cuyahoga (2), Fairfield (1) Franklin (2) Geauga (1) Holmes (1), Knox (1), Licking (1), Sandusky (1), Wayne (5), Lucas (1)	Abiotic (environmental, 4), Bitter rot (4), Black rot (suspected, 1), Codling moth suspected (1), Fire Blight (2), Marssonina (suspected,1), Apple scab (2), Mite damage (1), Apple blotch (2), Plum Curculio (1), Spray damage and chemical drift (2), Stink bug damage (2), Wrong cold storage conditioning (1)
	Pear (3)	Licking (1), Summit (2)	Fabrea leaf spot (2), Fire blight (2)
<b>Stone Fruits</b>	Peach (8)	Columbiana (2), Greene (1), Knox (1), Licking (1), Wayne (3)	Agrobacterium positive (1, detected with PCR assay), Abiotic (4), Bacterial shothole (1), Disease X- Phytoplasma (1, detected with PCR assay), Insect damage (1)
	Plums (3)	Columbiana (1), Richland (1), Licking (1)	Bacterial leaf spot (2), Black knot (1)
<b>Small Fruits</b>	Raspberry (9)	Wayne (3), Geauga (1), Greene (1), Pike (1), Wood (1), Jefferson (2)	Herbicide damage (3), Suspected Phytophthora (no roots was submitted, 2), Phytophthora rot root (2), Sunscald (1), Failed pollination due to high temperature (1)
	Blackberry (3)	Licking (1), Washington (1), Wayne (1)	Phomopsis blight (1), Borer damage (1), Abiotic (1)
	Blueberry (9)	Jefferson (1), Knox (1), Lake (1), Lorain (3), Medina (1), Wayne (2)	Phomopsis blight (1), Borer and termites (1), Twig blight (1), Pestalotiopsis leaf spot (1), Abiotic (2), Phytoplasma (suspected, 1), Phytophthora (suspected no roots submitted, 1), Viral disease (suspected, 1)
	Strawberry (35)	Cuyahoga (2), Columbiana (1), Franklin (6), Fulton (5), Geauga (1), Hamilton (1), Holmes (1), Huron (1), Lake (2), Licking (4), Mahoning (1), Stark (1), Wayne (9)	Black root rot (7), Phytophthora (4), Neopestalotiopsis disease (12), Anthracnose (8), Fusarium wilt (2), abiotic (8)
<b>Nuts</b>	Chestnut (1)	Carroll (1)	Post-harvest rots
<b>Other</b>	Ground cherry (1)	Wayne (1)	Fusarium wilt

## Vegetable Diagnostics Report

A total of 205 physical samples were diagnosed in 2024. The majority of the samples were submitted by or on behalf of commercial vegetable producers in Ohio by OSU Extension educators and crop consultants.

Vegetable samples were received from 37 Ohio counties, 10 samples were received from out of State (California and Kentucky). The highest number of samples were submitted from Wayne County (N= 71), Huron County (N=23) and Sandusky County (N=15). The samples from Wayne County were mainly collected by OSU Wayne County Extension IPM Scouting educators, while the samples from Huron County and Sandusky County were in collaboration with the Muck Crops Agricultural Research Station in Willard and the Nort Central Agricultural Station in Fremont, respectively. Five or more samples were received from Columbiana, Hamilton, Butler, Belmont, Pike, Medina and Holmes counties.

Most of the samples received were from solanaceous crops (tomatoes, peppers, and eggplant), followed by cucurbits (cucumbers, melons, watermelon, zucchini, squash, and pumpkins) (Figure 3). Among the solanaceous crops, tomatoes were the most frequently submitted, followed by peppers (Table 4). In cucurbit crops, zucchini and squash were the most common, followed by cucumbers (Table 5).

The drought and higher temperatures that characterized this growing season across Ohio significantly influenced the types of diseases observed. Overall, fewer seedborne bacterial disease-infected samples were submitted to the Clinic. However, insect-vectored bacterial diseases, such as cucurbit yellow vine decline (transmitted by squash bugs) and cucurbit bacterial wilt (transmitted by cucumber beetles), were an issues in many fields. Fungal pathogens predominated in vegetable crops, with common foliar fungal pathogens including *Alternaria*, *Septoria*, *Colletotrichum*, and *Cercospora*.

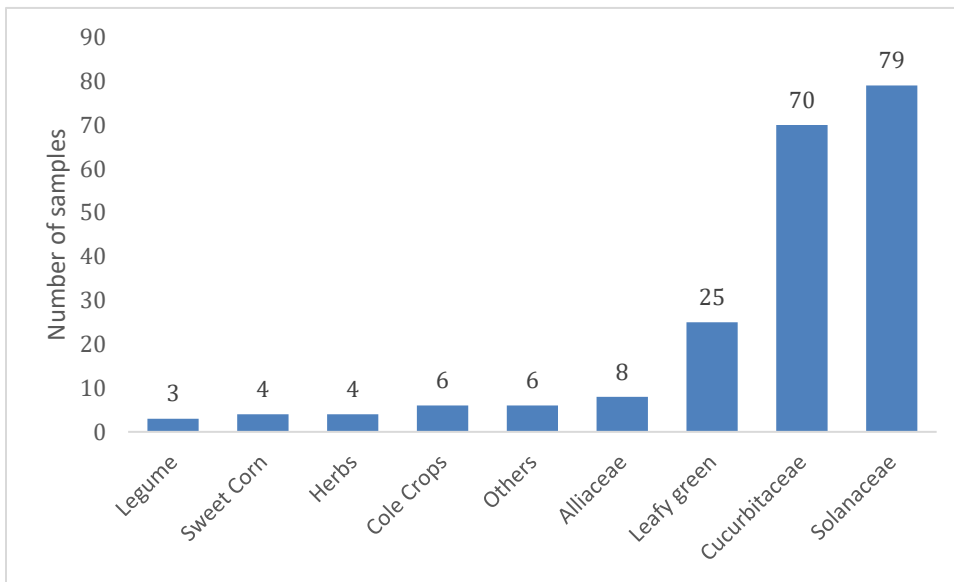
Gummy stem blight on squash was diagnosed twice and was also reported by OSU Extension educators in several counties across the state.

Phytophthora infections in peppers and squash have been limited this year, with the source of infections traced to pond water.

Leafy greens and herbs were primarily affected by root rot caused by oomycetes. Downy mildew was not reported on basil this year.

Cole crop samples exhibited abiotic disorders and foliar pathogens, such as *Alternaria* leaf spot.

Many garlic samples were diagnosed with bulb mite infestations and waxy breakdown, both of which appear to be related to storage conditions. Basal rot and bacterial soft rot were also identified.



**Figure 3.** Number of samples received in 2025 listed by family crops. The category Others included okra, carrot, celery, ginger, tomatillo, sweet potato.

### Cut Flower Diagnostics Report

Many vegetable farms in the State has started cut flowers and ornamental cultivation as new source of profit. We received a total of 12 ornamental/cut-flower samples. For this commodity, diseases caused by fungal root rot (Pythium root rot, Phytophthora root rot, Fusarium wilt and Rhizoctonia root rot) were the major issues. We also diagnosed downy mildew and bacterial basal rot.





Table 4. Diseases, pests and abiotic disorders diagnosed in 2024 in solanaceous crops. Some of the samples were affected by multiple issues.

Crop (N)	County (N of samples)	Diagnosis
Tomato (48)	Wayne (37), Holmes (10), Ottawa (5), Lake (2), Cuyahoga (2), Seneca (2)	Bacterial spot (5), Bacterial speck (1), Septoria leaf spot (4), Early blight (3), Alternaria canker (1), Fusarium Wilt (3), Verticillium wilt (2), Corky root rot (2), Buckeye rot (2), Stink bug damage (2) Sunscald (5), Blossom end rot (2), Herbicide drift (4), Ethylene damage (2), Environmental stress (6), Phosphorus deficiency (2), Chemical burn (2)
Pepper (14)	Wayne (12), Huron (5), Sandusky (4), Columbiana (5)	Bacterial spot (5), Bacterial canker (1), Anthracnose (4), Fusarium wilt (2), Phytophthora blight (1), Broad mites(1)
Potato (7)	Wayne (4), Highland (1), Columbiana (1), Holmes (1)	Fusarium wilt (2), Fusarium dry rot (2), Scab (2), Black heart (1)
Eggplant (3)	Wayne (1), Huron (2)	Verticillium wilt (1), Stemphylium leaf spot (1) Abiotic (2)

Table 5. Diseases, pests and abiotic disorders diagnosed in 2024 in cucurbits samples. Some of the samples were affected by multiple issues.

Crop (N)	County (N of samples)	Diagnosis
Cucumber (18)	Wayne (10), Huron (2), Sandusky (4), Holmes (2)	Angular leaf spot, Downy mildew, Anthracnose, Bacterial wilt, abiotic
Squash/ Zucchini (21)	Wayne (12), Huron (5), Sandusky (4),	Powdery mildew (5), Bacterial wilt (2), Yellow vine decline (2), Squash borer (2), Squash bug damage (1), Drought heat stress (2), Phytophthora blight (2), Gummy stem blight (2), Bacterial leaf spot (2), Abiotic (1)
Cantaloupe (6)	Wayne (2), Huron (1), Sandusky (1), Pike (2)	Downy mildew (2), Powdery mildew (2), Alternaria leaf spot (2)
Pumpkin (15)	Wayne (5), Huron (1), Sandusky (4), Pike (2), Lake (3)	Downy mildew (suspected, 1), powdery mildew (5), Plectosporium blight (3), Bacterial leaf spot (6)
Watermelon (10)	Wayne (2), Pike (1), Sandusky (2), Fayette (2), Holmes (3)	Cercospora leaf spot (2), Alternaria leaf spot (1), Anthracnose (2), Fusarium wilt (1), Herbicide damage (1), Abiotic (3)

