

Hemp Pest Survey 2021

Project Leader(s)

Marion Zuefle New York State Integrated Pest Management Program

Cooperators

The two cooperating growers that participated in this project.

Funding Sources

This work was supported by the USDA National Institute of Food and Agriculture, USDA-NIFA project 2017-70006-27142.

Project Location(s)

Tioga and Tompkins Counties

Abstract

Paragraph Year two of the hemp insect pest and disease survey was conducted at two farms in 2021. Eleven different potential insect pests and six different diseases were observed at the two farms. This was down from 2021 when twenty potential insect pests and eight diseases were observed. None of the insect pests observed in 2021 reached levels high enough to cause economic impact. Two of the diseases, Septoria and Cristulariella, were of much greater concern with Cristulariella causes a nearly 50% loss in yield for one of the growers. In total, only two new insect pests and one new disease were added to the potential pest list in 2021.

Background and Justification

In 2015, the Industrial Hemp Agricultural Research Pilot program started in NY which allowed a limited number of educational institutions to grow and research hemp. In 2017 the program expanded to allow farmers and businesses to apply for permits to grow and process hemp. Since 2015, when only 30 acres of hemp were planted, the number of licenses and the number of planted acres has increased in NY. In 2020 there were 2,547 planted acres of hemp in NY and 2,282 planted acres in 2021. The total number of acres planted nationwide decreased in the last year including in NY. This was primarily due to uncertainty in regulations, limited available processors and oversupply in some market segments. However, new hemp growers continue to apply for licensing and hemp production has the potential to resurge when regulations are clarified.

In 2020 a thorough survey of hemp insect and disease pests was conducted by the NYS IPM program, at two farms in Ontario and Monroe counties, to determine what pests were present and what pests were of greatest concern. In 2021, that survey continued with two new farms one in Tioga County and one in Tompkins County.

Objectives

1. Work with CCE field staff to identify farmers to host sites for hemp scouting to generate an inventory of insect pests and diseases affecting hemp in western NY.
2. Interview growers to establish pre-season expectations.
3. Place one European corn borer (ECB)-E, ECB-Z, and corn ear worm (CEW) pheromone trap at both sites and begin weekly monitoring.

4. Scout hemp weekly at both farms to create an inventory of potential hemp pests.
5. Provide growers with weekly scouting reports.

Procedures

1. Two growers participated in the demonstrations, one in Tioga County and one in Tompkins County.
2. Growers were interviewed prior to the start of the field season to determine their typical pest management practices and pest damage levels.
3. Heliiothis traps for corn ear worm (CEW) and European corn borer (ECB) - E and Z were set up in a grassy area near the edge of one of the hemp fields at both farms. Traps were checked weekly and pheromone lures, from Trécé Inc., were replaced every two weeks.
4. Two hemp fields were scouted at the Tioga County farm and two at the Tompkins County farm. The stems, leaves, and flowers of 25 randomly selected plants at each field were scouted weekly for any insects and diseases. Presence/Absence data was recorded for all potential pests. In addition, 5 leaves were inspected on each plant for aphids to determine total number of cannabis aphids per leaves, 5 flower buds on each plant were inspected to determine number of buds with botrytis as well as total CEW larvae per 5 buds, and percent disease severity (percent of plant leaves covered with disease) for each plant was taken every week.
Unknown disease samples were brought to the either Gary Bergstrom's (field crops pathologist) lab or to Chris Smart (vegetable pathologist) both in in the School of Integrative Plant Science Plant Pathology and Plant-Microbe Biology Section at Cornell for identification.
5. Growers were provided with weekly scouting reports.

Results and Discussion

Site descriptions:

Tioga County

In 2021, the Tioga farm primarily grew hay and hemp for CBD. The site consisted of two hemp fields. Field 1 was approximately 0.5 acres and planted to Suver Haze and Sour Space Candy on June 6, 2021. The field was bordered by hay fields to the north and east, a drive lane to the south, and a lawn and home to the west. Field 2 was approximately 1.5 acre and planted to Lifter, Special Sauce, Stem Cell, CBG White, Elektra, and Hawaiian Haze on June 6, 2021. The field was bordered to the north by a drive lane and stream, to the east by a stream, and a hay field to the south and west.

The two fields were on bare ground with trickle irrigation. Heliiothis traps for ECB-E, ECB-Z, and CEW were set up on this June 9th in the lawn to the west of Field 1, monitored weekly and lures replaced every two weeks. Weekly scouting began on June 9th and continued until September 15th, for 15 weeks, at which time all plants were harvested.

Tompkins County

The Tompkins farm grew hemp for CBD, alfalfa, buckwheat, sweet corn, peas, strawberries, and some other mixed vegetables. The site consisted of one 25-acre hemp field separated by a grassy drive lane into two 12.5 fields, Field 1 and Field 2. Both fields were planted from June 19th to June 27th to cultivars LeFav, Cherry Bubble Gum, The Grand, and Titan. Field 1 was bordered to the north by Field 2, to the east by a large pond, to the south by a small hedge row followed by alfalfa, and to the west by a hay field. Field 2 was bordered to the north by woods, to the east by woods and the large pond, to the south by Field 1, and to the west by a hay field.

The two fields were on bare ground with trickle irrigation. Heliiothis traps for ECB-E, ECB-Z and CEW were set up on this June 23rd in the grassy drive land that separated the two fields. Traps were monitored weekly, and

lures replaced every two weeks. Weekly scouting began on June 23rd and continued until October 6th, for 15 weeks, at which time all plants were harvested.

Scouting and Pest Survey Results:

Survey results for the two farms were combined and presented below unless otherwise indicated. Data were combined because either no difference was seen between the two farms or sample sizes were too small to present them separately. In cases where the pest only occurred at one farm, or the data were very different between the two farms then results were kept separate.

Insects

ECB pressure was very low at the Tioga farm with only one ECB-Z caught the entire season on July 21st. A total of four CEW were caught in Tioga over three consecutive weeks beginning on August 20th. The Tompkins farm had higher ECB and CEW pressure. With a total of 62 ECB-Z caught for the entire season. The highest count, 53, occurred on August 11th, which was also the first catch of ECB-Z at this site. ECB-E was much lower with only 11 moths caught over the season. CEW moths total 98 for the season with the first catch of two moths occurring on July 21st and peak catch of 49 moths occurring on September 15th. Despite these high CEW numbers, neither CEW nor ECB larvae were found at either the Tioga or Tompkins site.

A total of 12 different potential insect pests were found at the two farms (Table 1). In addition to these potential pests there were also several other incidental insects as well as beneficials observed at both farms.

Table 1. List of potential insect pests observed at the Tioga and Tompkins County farms in 2021.

Pest	Scientific name	Tioga	Tompkins
Potato leaf hopper	<i>Empoasca fabae</i>	X	X
Grasshopper spp.	<i>Orthoptera</i>	X	X
Red headed flea beetle	<i>Systema frontalis</i>		X
Fourlined plant bug	<i>Poecilocapsus lineatus</i>	X	
Ebony bug spp.	<i>Thyreocoridae</i>		X
Tarnished plant bug	<i>Lygus lineolaris</i>	X	X
Japanese beetle	<i>Popillia japonica</i>	X	X
Brown marmorated stink bug	<i>Halyomorpha halys</i>	X	X
Cannabis aphid	<i>Phorodon cannabis</i>	X	X
Spotted cucumber beetle	<i>Diabrotica undecimpunctata</i>	X	X
Two-spotted spider mite	<i>Tetranychus urticae</i>		X
Whitefly	<i>Trialeurodes vaporariorum</i>	X	X

The first insect pest detected was spotted cucumber beetle on June 16th at the Tioga farm (Figure 1). Spotted cucumber beetles (Figure 6) were observed at both farms until August 20th and caused obvious feeding damage but no economic loss. This pest was not observed the previous season, 2020, at either of the farms monitored.

Another new pest observed this year was the whitefly (Figure 9). This was seen, in relatively low numbers, at both farms. The first observation occurred on July 7th. White flies were only present for three weeks, until July 21st. The cannabis aphid was present for most of the season beginning on June 23rd and persisting until the last scouting day, October 6th. Numbers were much lower than in 2020, with a high of only 14 aphids on 5 leaves as compared to 490 aphids on 5 leaves as a high in 2020. Both high counts for 2021 and 2020 occurred on the last day of scouting

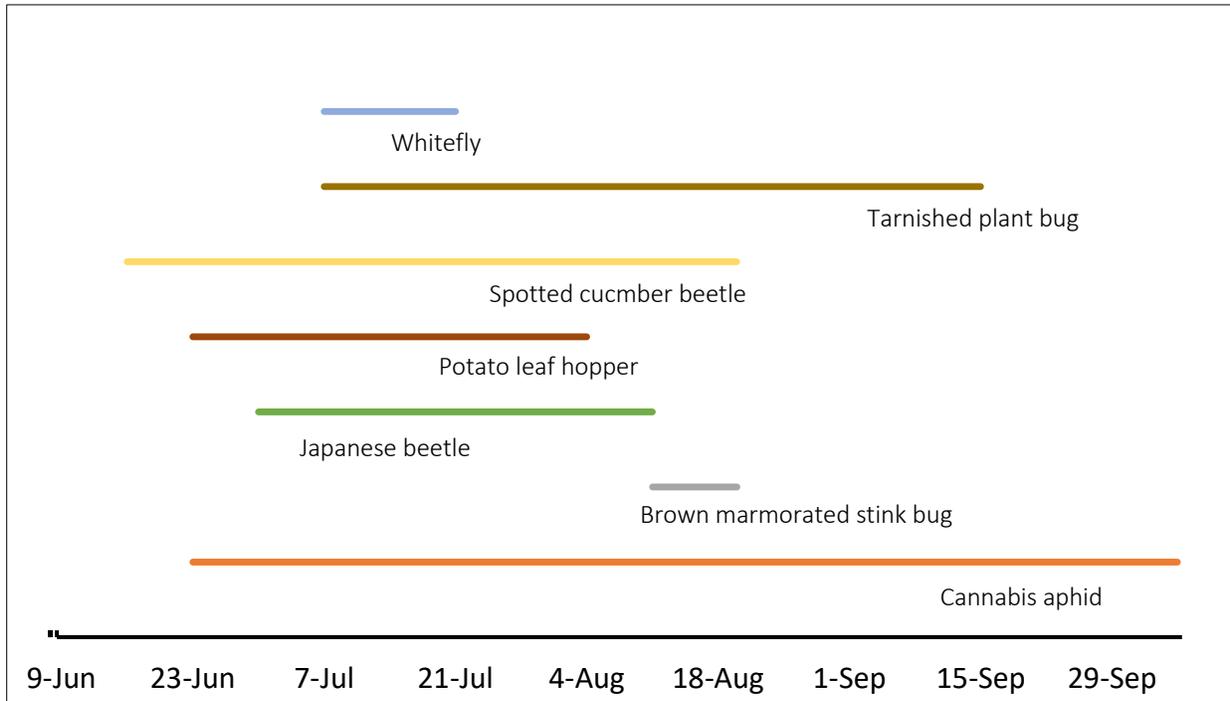


Figure 1. Timeline of first to last detection for potential insect pests of hemp that were present for at least two consecutive weeks during the 2021 growing season.

Potato leaf hopper, a known pest of field and grain hemp, occurred at both farms, but numbers remained extremely low. A total of seven potato leaf hoppers were found at the Tioga site and only five at the Tompkins site.

A few other potential pests were detected at the two farms, but numbers remained very low. Four two-spotted spider mites, another pest of concern, were detected at the Tompkins site on the last day of scouting. 2021 was an extremely wet season which probably contributed to the low number of two-spotted spider mites. In addition to insect pests, snail and slug (Figure 10) damage and slime trails were observed at both sites.

Diseases

Six diseases were found during the 2021 season and caused more damage than any of the potential insect pests (Table 2). The ones of greatest concern were septoria leaf spot, *Septoria spp.*; and cristulariella leaf spot, *Cristulariella moricola*.

Table 2. List of hemp diseases observed at the Tioga and Tompkins County farms in 2021.

Pest	Scientific name	Tioga	Tompkins
Bipolaris leaf spot	<i>Bipolaris gigantea</i>		X
Botrytis gray mold	<i>Botrytis cinerea</i>	X	X
Cristulariella leaf spot	<i>Cristulariella moricola</i>	X	X
Downy mildew	<i>Pseudoperonospora cannabina</i>	X	
Powdery mildew	<i>Golovinomyces spadicus</i>		X
Septoria leaf spot	<i>Septoria spp.</i>	X	X

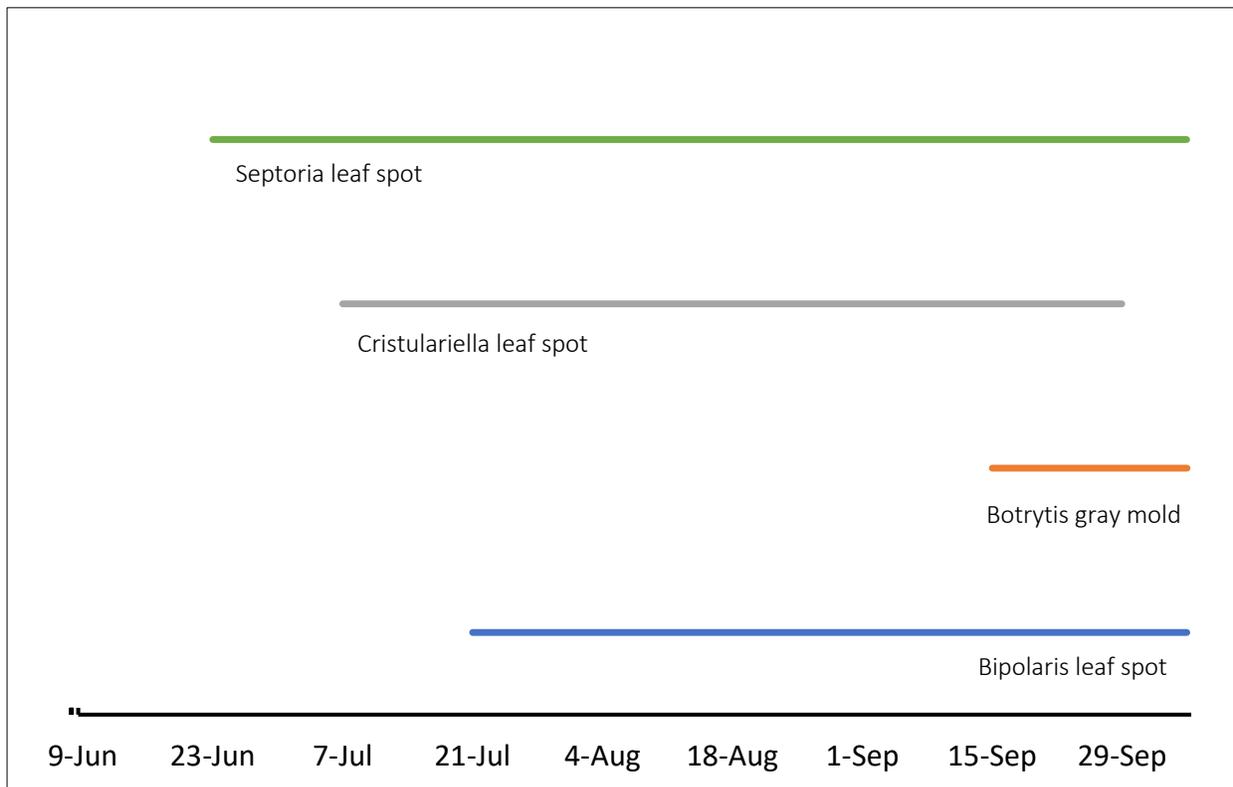


Figure 2. Timeline of first to last detection of hemp diseases that were present for at least two consecutive weeks during the 2021 growing season.

The first disease detected in the field was septoria leaf spot (Figure 2). It was first observed on June 23rd and was found at both farms. The percent of plants with no infected leaves dropped from 98% on June 23rd to around 22% on the September 29th (Figure 3). Septoria was detected a month earlier this year as compared to 2020 but by the end of both seasons the percent uninfected leaves were about the same, at 20% and 22%.

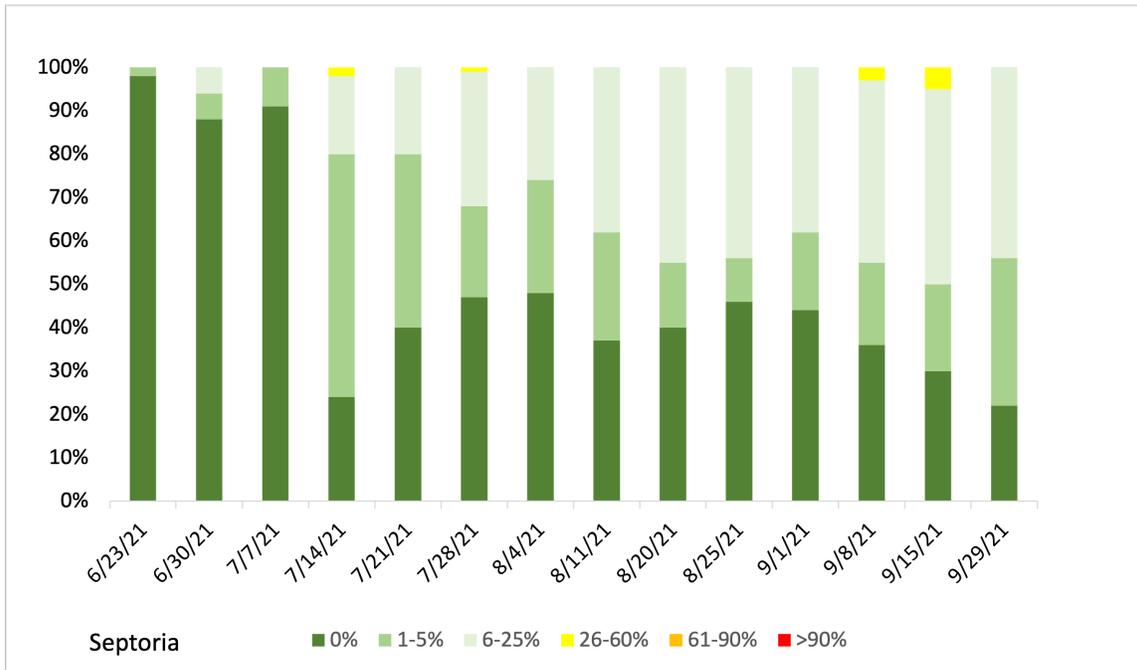


Figure 3. Percent of plants scouted by date with 0, 1-5, 6-25, 61-90, and >90% disease severity of septoria in 2021.

A new disease for 2021, was cristulariella. This disease was initially misidentified as bipolaris leaf spot. Samples were submitted and confirmed to be *Cristulariella moricola*. This is a disease that produces distinct target shaped spots (Figure 11) and its development is known to correspond with periods of extended rainfall, which occurred in 2021. Other hosts include boxelder maple, *Acer negundo*, which was the most likely source of the disease at the Tioga farm A boxelder severely infested with cristulariella (Figure 12) was located along the stream about 20 feet from Field 2 at the Tioga farm. Cristulariella conidia (Figure 13) were observed on the boxelder as well. Even though the disease severity averaged about 15% (Figure 4), one grower had to harvest much of their hemp early and estimate that they lost nearly 50% of the potential yield to cristulariella.

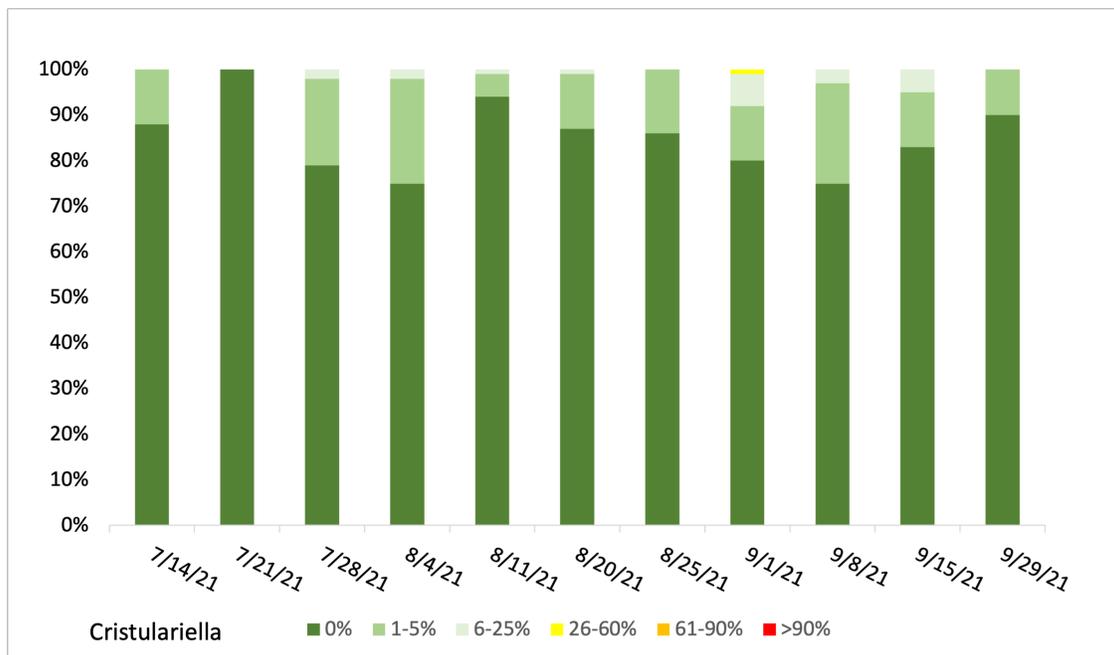


Figure 4. Percent of plants scouted by date with 0, 1-5, 6-25, 61-90, and >90% disease severity of cristulariella in 2021.

Bipolaris leaf spot was detected only at the Tompkins farm. Initially it was thought to also be at the Tioga farm, but the lesions turned out to be the early stage of cristulariella. Though this disease reached nearly 50% infested leaves on August 11th, the plants seemed to grow out of it and by the end of the season only about 10% of the leaves were infected (Figure 5).

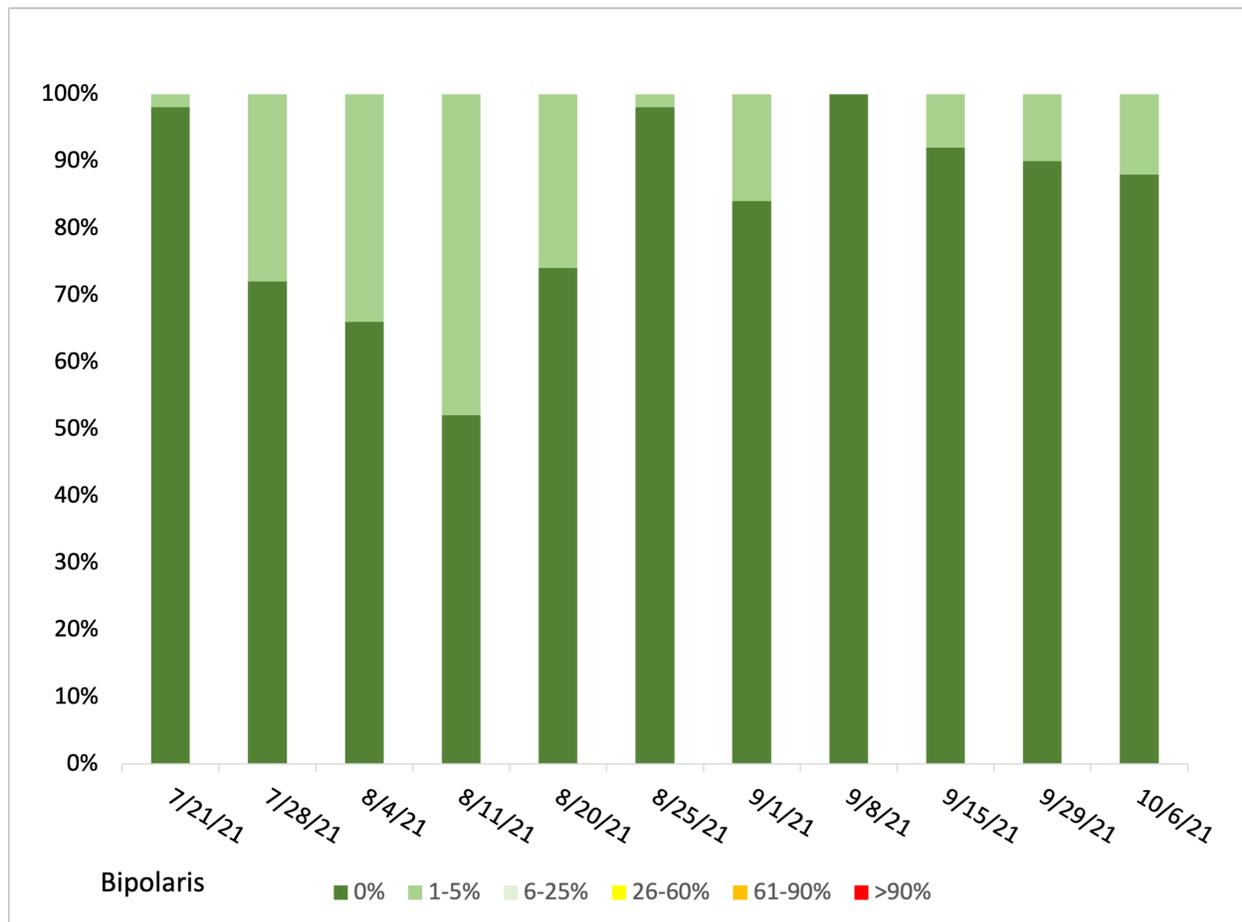


Figure 5. Percent of plants scouted by date with 0, 1-5, 6-25, 61-90, and >90% disease severity of bipolaris in 2021.

Powdery mildew was detected only at the Tompkins farm and only on one day, July 7th. It did not develop beyond a few initially spots. Botrytis gray mold was detected late in the season at both farms but remained very low. Only one flower bud was observed to have Botrytis at the Tioga farm on September 15th. At the Tompkins farm 2 flower buds were observed with botrytis on September 15, two on September 29th, and one on October 6th. Three plants appeared to have downy mildew on July 7th at the Tioga farm, but it was never seen again, and no confirmation was made.

Outcomes and Impacts

Year two of the hemp pest survey added additional insects and diseases to the list of potential pests of hemp in NY. Two additional insect pests, spotted cucumber beetle and whitefly, were added to the list from 2020 bringing the total potential insect pests observed in hemp to 22. However, none were at high enough levels to cause economic impact in either year, but monitoring should continue based on their potential to cause economic loss seen in other states. The diseases detected both this year and in 2020 had a much greater impact

on the hemp and are ones the growers are very concerned about. Cristulariella, a new disease for the hemp survey in 2021, was very severe at one of the farms and caused the grower to lose an estimated 50% of his total harvest. The results of this survey have already led to a funded grant to develop a production and management profile for hemp in NY.

Images

Pest images



Figure 6. Spotted cucumber beetle



Figure 7. Japanese beetle



Figure 8. Adult corn earworm



Figure 9. Whiteflies



Figure 10. Slime trail of snail or slug



Figure 11. Cristulariella



Figure 12. *Cristulariella* on boxelder

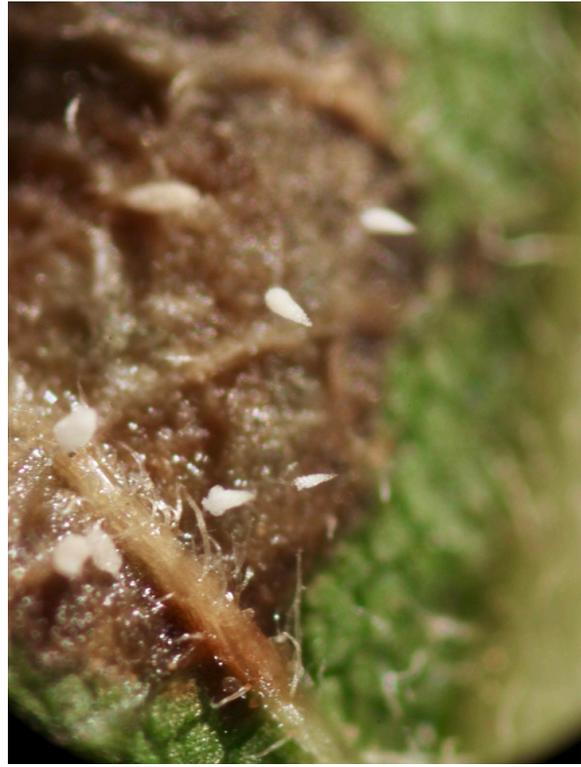


Figure 13. *Cristulariella* conidia

Publications

Zuefle, M.E. 2021. Hemp Insect Management. Hemp Grain and Fiber: Production, Pests, Processing, and Policy in NY State. Zoom.

Zuefle, M.E., Grab, H., Crawford, J., Stack, G., and L. Smart. 2021. Developing pest management recommendations for NY hemp. Eastern Branch ESA. Zoom.

Grants Funded

Zuefle, M.E. and H. Grab. Production/Management Profile for Hemp in New York State. Marion Zuefle and Heather Grab. NEIPM Center PMP Grant. \$5,000.

References

Zuefle, M.E. 2021. [Hemp Pest Survey 2020](#). NYS IPM project report. August 9, 2021. Web.