ISPP INTERNATIONAL SOCIETY FOR PLANT PATHOLOGY

PROMOTING WORLD-WIDE PLANT HEALTH AND FOOD SECURITY

INTERNATIONAL SOCIETY FOR PLANT PATHOLOGY

ISPP NEWSLETTER

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17TH CONGRESS OF THE MEDITERRANEAN PHYTOPATHOLOGICAL UNION HELD IN BARI, ITALY, 6–10 JULY 2025

LAURA MUGNAI, ISPP VICE PRESIDENT, 4 OCTOBER 2025

The 17th International Congress of the Mediterranean Phytopathological Union (MPU) was headlined as addressing "New Phytopathology Frontiers of Research and Education for Plant Health and Food Safety". The Congress was organised by the Mediterranean Phytopathological Union (MPU), and the Mediterranean intergovernmental organisation CIHEAM Bari, International Centre for Advanced Mediterranean Agronomic Studies.

The Congress Plenary Session was opened with welcoming remarks by Dr Biagio Di Terlizzi, Director of CIHEAM Bari; Prof. Dimitri Tsitsigiannis, President of MPU; and Dr Ugo Della Marta, Director General of the Directorate for Food Hygiene, Safety and Nutrition (DGISAN) of the Italian Ministry of Health.

The Congress was attended by more than 350 participants from 38 countries: 19 countries in the Mediterranean region (Albania, Algeria, Croatia, Egypt, France, Greece, Israel, Italy, Jordan, Lebanon, Montenegro, Morocco, Palestine, Portugal, Slovenia, Spain, Syria, Tunisia, Turkey), eight elsewhere in Europe (Belgium, Germany, Hungary, Latvia, Lettonia, North Macedonia, Serbia, The Netherlands), and 11 other countries (Australia, Chile, Congo, Georgia, New Zealand, Pakistan, Reunion Island, South Africa, United Arab Emirates, United Kingdom, United States of America).

The congress was aimed to promote knowledge exchange and dialogue between science, institutions, industry and civil society, reinforcing a vibrant, connected, and forward-looking scientific community. Among these, beside researchers of the 15 National Plant Pathology or Plant Protection societies that are MPU members, people also attending included representatives from: IPPC-FAO, FAO-RNE, EUPHRESCO, Ministry of Agriculture, Food Sovereignty and Forests (MASAF), Directorate General for Food Hygiene, Food Safety and Nutrition (DGISAN), EPPO, EFSA, the National Research Council (CNR), the Apulia Region, the European Commission, and numerous universities and research centers.

Papers presented at the Congress included: 14 Keynote lectures, 36 Session Keynote papers, and research papers as 88 oral and 180 poster presentations, in a total of in 18 Congress sessions. Beyond its scientific scope, the Congress was a platform to strengthen existing partnerships and forge new collaborations across borders and research disciplines. This included links with the International Society for Plant Pathology, the International Society for Mycotoxicology, EUPHRESCO, and CIHEAM Bari, supporting advancements in plant health sciences as a pillar of the One Health approach recognizing the links between human, animal, plant, and environmental health.

CIHEAM Bari took active steps to make the Congress accessible to young researchers, especially from non-European regions. This included reduced registration and accommodation fees for students (including PhD candidates) and early career scientists.

An all-day field trip on 10 July included observations of ancient olive trees infected by *Xylella fastidiosa* and the characteristic sites of Alberobello, providing a unique opportunity to connect field and territory observations with the latest research and disease mitigation strategies.

To recognise scientific excellence of the early career researchers, MPU presented awards for the oral presentations by Marah Abukhmaish (Palestine), Serafina Amoia (Italy) and Marco Crudele (Italy), and the poster papers of Martini Florian (Belgium), Luiza Sánchez-Pereira (Spain), and Aleksandra Susnjar (Republic of Serbia). The Congress also hosted the award ceremony for the 4th edition of the video competition Plant Health TV: Promoting the Importance of Plant Health Research. Organized by EUPHRESCO III, CIHEAM Bari, the Plant Biosecurity Research Initiative (PBRI), IPPC, and CABI, this competition highlights global efforts in plant health research. The award recipient was Spyridoula Dimitropoulou, for the video "Saving Greece's plane trees: digital technologies for early detection of *Ceratocystis platani*". The award included a 2-week internship in Australia, sponsored by the PBRI.

In its concluding session, the congress identified key frontiers and pressing challenges in plant pathology that must be addressed, including:

- The integration of Plant Health within the One Health framework
- The role of climate change in driving the emergence and spread of new pests and diseases
- The urgent need for predictive tools and early warning systems
- The integration of digital technologies, genomics, and field ecology into plant health research and practice
- The necessity of addressing biosecurity vulnerabilities and regulatory gaps
- The imperative of safeguarding global food security and biosecurity in increasingly complex and interconnected supply chains

To respond effectively to these developments and challenges, interdisciplinary and collaborative educational models across all professional levels are essential. Such models are crucial for training a new generation of plant pathologists equipped with the necessary skills, technological expertise, and cross-sectoral understanding.

Furthermore, strong support for early career researchers is vital to ensure continuity, innovation, and the advancement of knowledge in the field.

In this context, the Mediterranean Phytopathological Union (MPU), in collaboration with national, regional, and international networks, aims to significantly strengthen interdisciplinary and cross-border cooperation in the field of plant health, while fostering meaningful dialogue among the scientific community, regulatory bodies, and society at large.

The abstracts of the Congress have been published in Phytopathologia Mediterranea and are available in open access at https://oajournals.fupress.net/index.php/pm/article/view/16678/15178. Photographs from the Congress are available at: https://ciheambaricongressmpu2025.org/photo-gallery/.

PLANET FUNGI – A PHOTOGRAPHER'S FORAY. DISCOUNT CODES

Catherine Marciniak, Stephen Axford, and Tom May (2025). Planet Fungi – A Photographer's Foray. CABI. 320 pp.

CABI Discount code for Europe, Middle East, Africa and Asia addresses:

Use the code **SOC25** at checkout to save 25% on individual (non-trade) print book purchases on CABI Digital Library. This offer is limited to a maximum of 10 copies per order. The discount is available on all orders placed before **31st December 2025**. Please note that this promotion cannot be combined with any other discounts or offers.

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Use the code **ISPP25** to recieve an exclusive 25% discount on a print copy of Planet Fungi to be mailed to Australian and New Zealand addresses. This discusount is available on all orders placked before **31st December 2025**. The discount is only available on print copies ordered direct from CSIRO Publishing using the promo code for delivery to addresses within Australia and New Zealand. It does not apply to eBooks and cannot be used in conjunction with other promo codes. Please do not share this offer with others, it is for personal use only.

13TH INTERNATIONAL WORKSHOP ON GRAPEVINE TRUNK DISEASES, HELD IN ENSENADA, BAJA CALIFORNIA, MEXICO, 20–24 JULY 2025

LAURA MUGNAI, ISPP VICE PRESIDENT, 4 OCTOBER 2025

The 13th International Workshop on Grapevine Trunk Diseases (IWGTD), one of the Subject Matter Committees in ISPP, was chaired by Dr Rufina Hernández-Martínez, and was organised by the Center for Scientific Research and Higher Education of Ensenada (CICESE). The Workshop was supported by the Ministry of Science, Humanities, Technology and Innovation of Mexico (SECIHTI), and the International Organisation of Vine and Wine (OIV). The ICGTD Council meeting took place on 20 July, prior to the Workshop welcome reception.

The Workshop scientific programme was opened by Dr Philippe Rolshausen (University of California, Riverside, USA), who outlined recent advances in pathogen genomics that have deepened understanding of grapevine trunk diseases, enabling improvements in vineyard practices, nursery standards, and development of biocontrol strategies. The other Keynote speakers were Dr Catarina da Cunha Maia Leal (Instituto de Ciencias de la Vid y el Vino, Spain), who discussed how grapevine-associated microbial communities shape disease, host defense, and biocontrol, highlighting sequencing-based tools for sustainable vineyard management, and Dr Akif Eskalen (University of California, Davis, USA), who outlined integrated nursery and vineyard disease management strategies, combining prevention, sanitation, and biocontrol, to reduce grapevine trunk diseases and extend vineyard longevity.

The Workshop was attended by 105 participants from 14 countries. A total of 35 oral and 29 poster papers were presented, across the ten Workshop sessions. The papers covered pathogen characterisation, detection and disease epidemiology, host plant interactions, and disease management.

During the Workshop field trip to the Guadalupe Valley, delegates visited vineyards affected by GTD pathogens, where local growers shared their perspectives and key challenges in managing vineyards under semiarid conditions, as well as the strategies they have adopted. The field trip concluded with a wine tasting at Mexico's largest vineyard, L.A. Cetto.

Student competitions for best oral and poster paper presentations included contributions from 16 students. The best student poster paper award was presented to MSc student Grecia Paniagua Pérez (CICESE, Mexico) for her paper "Comparative cellular morphology and stress tolerance of *Botryosphaeriaceae* fungi affecting grapevines in Mexico. Second place went to PhD student Angelos Floudas (Aristotle University of Thessaloniki, Greece) for paper "Evaluation of selected fungal biological control agents for the protection of grapevine pruning wounds against *Diplodia seriata*". Third place was awarded to MSc student Yessica Osorio Sánchez (CICESE, Baja California, Mexico) for her paper "Evaluation and characterisation of the biological activity of secondary metabolites from actinobacteria of the genus *Streptomyces*".

In the oral student competition, first place went to PhD student Isidora Silva Valderrama (University of British Columbia, Vancouver, Canada) for her presentation "Host phylogenetic diversity and virulence in *Botryosphaeriaceae*". Second place was awarded to PhD student Karen Andrea Corrales Adame (Institut des Sciences Analytiques et de Physico-Chimie pour l'Environnement et les Matériaux, France) for her paper, "Limited influence of pruning practice on the fungal community of asymptomatic Esca-infected grapevines", and third place went to PhD student Martín Puebla (University of California, Riverside, USA) for his paper "Evaluation of commercial bioinoculant products on the health of potted nursery vines".

The 14th IWGTD will be held in Greece in 2026.

The abstracts of the congress will be published in the Open access journal *Phytopathologia Mediterranea* in the December issue. You can soon download the pdf in the ONLINE FIRST section:

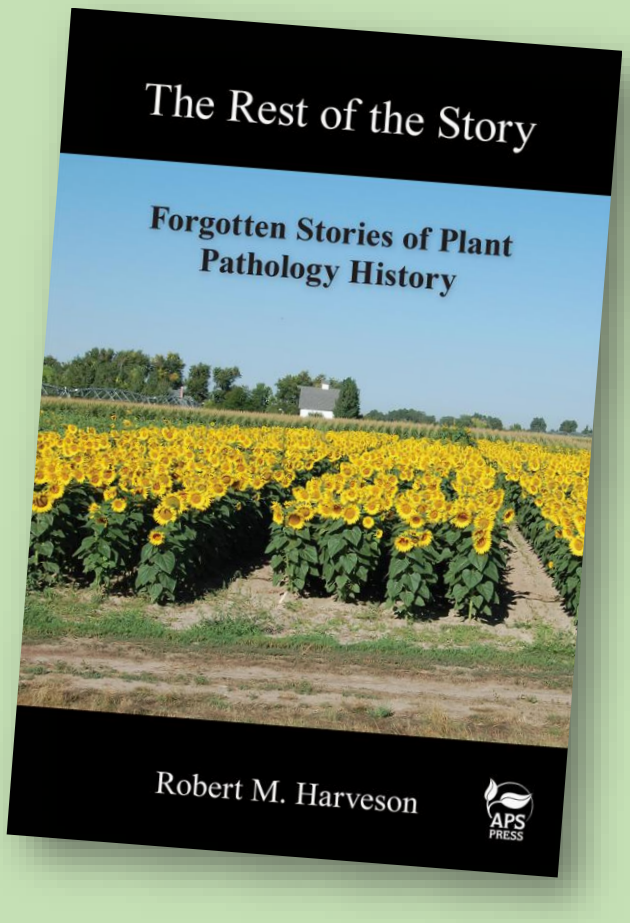
https://oajournals.fupress.net/index.php/pm/issue/view/573

Delegates attending the 13th International Workshop on Grapevine Trunk Diseases, in Ensenada, Baja California, Mexico.

THE REST OF THE STORY: FORGOTTEN STORIES OF PLANT PATHOLOGY HISTORY. NEW BOOK

Robert M. Harveson (2025). The Rest of the Story: Forgotten Stories of Plant Pathology History. The American Phytopathological Society (APS) Press. 213 pp.

The Rest of the Story: Forgotten Stories of Plant Pathology History, by Robert M. Harveson (Panhandle Research and Extension Center, University of Nebraska–Lincoln), offers a unique and engaging exploration of plant disease epidemics and their often-overlooked influence on world history. Drawing from his popular column in Phytopathology News, "Plant Pathology's Perplexing Past," Harveson compiles 48 short, accessible stories that blend scientific insight with compelling historical narrative.



This collection of stories shines a light on lesser-known plant diseases and the surprising roles they have played in shaping human events—stories that are rarely told yet deeply impactful. Whether it's a forgotten epidemic or a twist in a well-known outbreak, each story uncovers the hidden connections between plant pathology and historical change.

Written for both specialists and curious readers alike, Forgotten Stories of Plant Pathology History is a must-read for anyone interested in plant science or environmental history—or simply looking to explore plant pathology through a new lens.

More information is avialable on APS Press.

DECIPHERING THE COMPLEX SIGNALING NETWORKS IN PHYTOPHTHORA INFECTED PLANTS

A review by R. Arutselvan *et al.* titled "Deciphering the complex signaling networks in *Phytophthora* infected plants: Insights into microbiome interactions and plant defense mechanisms" was published in November 2025 by *Plant Physiology and Biochemistry* (vol. 228, paper 110222). The abstract is as follows:-

Phytophthora species are destructive plant pathogens that cause severe economic losses in agriculture and natural ecosystems, known for their rapid spread through soil and water and resistance to conventional control methods. Understanding the complex signaling networks activated in plants during *Phytophthora* infection is crucial for developing effective management strategies. This review summarizes research findings on *Phytophthora*-plant interactions, with special emphasis on *Phytophthora*-plant microbiome interactions. Initially, molecular mechanisms involved in the plant response to *Phytophthora* infection are discussed, further emphasizing key signaling pathways activated by *Phytophthora* in host plants. The role of phytohormones in imparting resistance to *Phytophthora* infections is explored in depth. Additionally, the interaction and effects of *Phytophthora* and the plant immune system with the plant microbiome are examined, highlighting how these interactions facilitate disease and/or aid in plant defense. Various biotechnological approaches for enhancing plant resistance to *Phytophthora*, including recent technologies like CRISPR-Cas systems, are also reviewed. The conclusion addresses the need for further research into signaling networks within *Phytophthora*-plant-microbiome interactions and their future implications for crop protection.

Read paper.

ENDOPHYTIC FUNGI AS BIOCONTROL AGENTS

A review by Muhammad Faiq *et al.* titled "Endophytic fungi as biocontrol agents: A metabolite-driven approach to crop protection and sustainable agriculture" was published in November 2025 by *Physiological and Molecular Plant Pathology* (vol. 140, paper 102857). The abstract is as follows:-

The growing concerns over pesticide resistance, environmental pollution, and crop losses have increased the demand for sustainable and eco-friendly alternatives to chemical crop protection. Endophytic fungi, symbiotic microorganisms residing within plant tissues have emerged as promising biological control agents due to their ability to produce diverse bioactive secondary metabolites (SMs). These compounds, including alkaloids, terpenoids, polyketides, and peptides, exhibit potent antifungal, antibacterial, and insecticidal activities. This review consolidates current knowledge on the taxonomy, ecology, and colonization strategies of endophytic fungi, as well as their habitat-driven functional diversity. We explore the biosynthetic mechanisms underlying metabolite production, with an emphasis on the role of biosynthetic gene clusters (BGCs) in driving chemical diversity. Key classes of fungal metabolites are summarized based on their structure, biological activities, and role in plant protection. The review also discusses both direct and indirect mechanism through which endophytic fungi enhance plant immunity, including, competitive exclusion, antimicrobial compound production, defense responses activation, phosphate solubilization, siderophore production, and phytohormone modulations. Additionally, the significance of these endophytes in climate-resilient agriculture and post-harvest disease management is addressed. Despite promising advances, challenges such as inconsistent colonization, environmental variability, and regulatory barriers hinder their widespread application. This review aims to provide a comprehensive understanding of fungal endophyte-derived secondary metabolites as viable tools for sustainable crop protection and improved agricultural resilience. Read paper

NEW CLUES IN HOW PLANT MICROBIOMES PROTECT AGAINST BACTERIAL SPECK DISEASE OF TOMATOES

KATIE BOHN, PENN STATE NEWS, 29 SEPTEMBER 2025

Bacterial speck is a common disease affecting tomatoes that can result in lower yields for growers. A new study led by researchers at Penn State gives new clues on how a plant's microbiome can be used to combat the pathogen. The research, published in the journal *Environmental Microbiome*, examined how disease suppressive microbiomes of a tomato plant's phyllosphere, the portion of the plant above ground, differed from the microbiomes of plants that were conducive to bacterial speck.

The team found that a number of populations of *Xanthomonas* and *Pseudomonas* bacteria were present on the plants that had developed a resistance against bacterial speck, suggesting they play a role in suppressing the disease.

Kevin Hockett, associate professor of microbial ecology in the College of Agricultural Sciences and lead author on the paper, said the findings could eventually help lead to new treatments for plants, as well as open up opportunities for further research.

"If we can learn more about which microbes are driving down the disease, it's possible that we could isolate and combine them in the future for growers to use as a treatment," said Hockett, who is also a Huck Early Career Chair for the Penn State Huck Institutes of the Life Sciences. "Additionally, some of the most important crop diseases are fungal, so if we can show that this process works for fungi, that could open up even more research and possible applications."

The study was inspired by the way some soil microbiomes can develop season over season to eventually suppress plant disease. Hockett explained that if a crop is sensitive to a particular disease and a grower plants the crop in the same spot year after year, in some cases microbes in the soil will eventually shift to suppress that pathogen and the disease will go down.

He said that while this process has been observed, its exact mechanisms aren't well known, and it's not clear if this could happen above ground, too.

"We've seen this with soils, which makes sense because the same soil is there year after year," Hockett said. "In the case of the above ground portions of plants — leaves, flowers, fruits — all of that gets harvested and removed from the field or tilled under. So, we were curious about whether we could replicate this process on the plant's leaves."

In a previous paper, the researchers found that yes, a plant's microbiome can changel to suppress the bacteria that causes bacterial speck. But because microbiomes are made up of many types of microorganisms — including bacteria, fungi and viruses — the researchers were interested in learning precisely which microbes were driving this disease suppression.

For the current study, the researchers started by spraying tomato plants with the bacteria that causes bacterial speck. After a few days, they "passaged" the microbiome by choosing the plants that had the least amount of disease, washing the leaves into a solution to collect the microbiome, and then spraying the solution onto a new plant.

The team also included a control group, in which they performed the passaging protocol on different plants that did not have a pathogen applied. Because there was no disease, they chose the leaves to passage at random. They did this process nine times before collecting and analyzing the microbiome of the final passage.

Now that they know more about the composition of the disease-suppressive microbiome, Hockett said they have better clues about which microbes to target for possible future treatments.

"It may be that the whole microbial community is necessary to be effective, but the first thing we want to do is go in and start pulling this community apart to identify who are really the important players for disease suppression," he said. "Because it may be that there are some members that got selected during the passaging but they don't really contribute anything to disease suppression."

EXPLORING SOIL MICROBIAL AND PLANT PARASITIC NEMATODE COMMUNITIES INVOLVED IN THE APPLE REPLANT DISEASE COMPLEX IN NOVA SCOTIA

A paper by Shawkat Ali *et al.* titled "Exploring soil microbial and plant parasitic nematode communities involved in the apple replant disease complex in Nova Scotia" was published on 2 October 2025 by *Scientific Reports* (vol. 15, Article number 34402). The abstract is as follows:-

Apple replant disease (ARD) is incited by a complex of causal agents including various fungi, oomycetes, and plant parasitic nematodes. These causal agents can differ significantly in abundance between orchard sites within a geographic region. Knowledge of the specific etiology of ARD is required in order to develop commercially viable soil management strategies to combat specific/individual components of the pathogen complex. In this study, we analyzed soil from six ARD affected orchard sites to assess the presence and composition of fungal, bacterial and oomycetes communities, as well as the prevalence of plant parasitic nematodes. Five fungal, and 17 bacterial classes were differentially represented in the soil microbiomes across the different locations. Mortierellomycetes was the most abundant fungal taxa represented followed by Sordariomycetes. *Mortierella exigua*, a fungal endophyte, was the most abundant fungal amplicon sequence variant (ASV) in the core microbiome. Among bacteria, Proteobacteria was the most prevalent phylum identified in these orchard soils. Several potential phytopathogenic fungi associated with ARD, as well as endophytes including *Fusarium oxysporum*, *F. solani*, *Nectria ramulariae*, *Ilyonectria robusta* and *Nectriaceae*, were identified in ARD soils. Among oomycetes, *Pythium attrantheridium* (*Globisporangium attrantheridium*), and *P. irregulare* (*Globisporangium irregulare*) were the most abundant taxa. Additionally, six different groups of plant-parasitic nematodes were found across the ARD orchard soils. Root-lesion nematodes, *Pratylenchus* spp., which are commonly associated with ARD, were identified in all orchard soils at population densities range from 12 to 33/100 cm3 soil. This research enhances our understanding of the ARD pathogen complex and provide important insights for developing alternative disease management strategies in the apple industry.

Read paper

AI-POWERED IMAGE GENERATION SHARPENS ACCURACY IN CROP DISEASE SEVERITY ASSESSMENT

CHINESE ACADEMY OF SCIENCES, NEW WISE, 19 SEPTEMBER 2025

Global food production must increase by 50% by 2050 to feed the growing population. Yet plant diseases already cut annual yields by 13%–22%, representing billions in agricultural losses worldwide. Traditional methods of assessing disease severity rely on human expertise or laboratory testing—both costly, time-intensive, and subjective. Advances in machine learning and deep learning have enabled automated recognition of plant diseases, often with over 90% accuracy. However, most models still struggle to distinguish between lesions and background features such as shadows, soil, or healthy tissue, limiting their usefulness for guiding pesticide use. To address this, researchers developed a method that directly targets lesion areas, improving assessment reliability.

A study published in *Plant Phenomics* by Qi Wang's team, Guizhou University, enhances the accuracy and interpretability of plant leaf disease severity assessment, enabling more precise pesticide application and advancing sustainable agricultural management.

The location-guided lesion representation learning (LLRL) framework combines advanced network architectures with robust validation. It integrates three components: an image generation network (IG-Net) using a diffusion model to create paired healthy–diseased images; a location-guided lesion representation learning network (LGR-Net) that isolates lesion areas and produces a dual-branch feature encoder (DBF-Enc); and a hierarchical lesion fusion assessment network (HLFA-Net) that fuses these features for precise severity classification. Researchers built a dataset of 12,098 images of apple, potato, and tomato diseases, plus 10,000 generated pairs, implementing experiments in Python and PyTorch with GPU acceleration. LGR-Net was trained with the Adam optimiser and scheduled learning rate decay across 4,000 iterations, while HLFA-Net trained for 100 epochs at a fixed rate of 0.01, sharing the DBF-Enc module.

Compared with 12 benchmark models across real, generated, and mixed datasets, LLRL consistently outperformed alternatives, achieving up to 92.4% accuracy with pre-training and attention mechanisms. Visualisation confirmed precise lesion localisation (IoU = 0.934, F1 = 0.9615), and Grad-CAM analysis showed attention shifting toward lesions with increasing severity—aligning with pathology knowledge. The framework demonstrated strong generalization across crop species, with particularly robust results for tomato and potato datasets.By enabling accurate grading of disease severity, LLRL provides a powerful foundation for precision pesticide application. Farmers could use smartphone photos of leaves to instantly assess disease progression and receive guidance on dosage and timing. At larger scales, drones and satellite imaging could integrate the system for automated monitoring across entire fields, significantly reducing manual inspection demands. This not only saves costs but also minimizes unnecessary pesticide use, reducing environmental pollution and safeguarding farmer income.

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WHEAT DISEASE LOSSES TOTAL $2.9 BILLION ACROSS THE UNITED STATES AND CANADA BETWEEN 2018 AND 2021

AMERICAN PHYTOPATHOLOGICAL SOCIETY, EUREKALERT, 15 SEPTEMBER 2025

A new multiyear study has revealed that between 2018 and 2021, wheat diseases caused the loss of approximately 560 million bushels—valued at US$2.9 billion, or $18.10 per acre, in farmer revenue—across 29 U.S. states and Ontario, Canada.

Published in *Plant Health Progress*, the study was led by Andrew Friskop (Department of Plant Pathology, North Dakota State University) in collaboration with dozens of university-based specialists and the Crop Protection Network. It represents the most comprehensive survey of wheat-related losses to date. The findings underscore the widespread economic impact of crop diseases and offer critical insights to shape future disease management and research priorities.

Estimates presented in the study were based on annual surveys completed by Extension specialists and plant pathologists working directly with wheat growers across major production regions. These experts assessed yield losses tied to nearly 30 distinct diseases, offering a rare, field-level perspective of how disease pressure affects productivity across states and regions.

Fusarium head blight, stripe rust, and leaf rust emerged as the top three yield-reducing pathogens, although losses varied significantly from year to year depending on local weather patterns and environmental conditions. In 2019 alone, wheat growers saw approximately 188 million bushels lost to disease—the most severe single-year impact in the study.

Researchers say the multiyear scope and collaborative approach make this work especially valuable for understanding longer-term disease trends and guiding future investment. The data are expected to support decision making across multiple disciplines.

"Farming and food production are incredibly complex," said Friskop. "This research helps us understand just one of the many invisible threats to crop productivity."

Adam Sisson, Extension specialist with Iowa State University and a co-author on the study, emphasized the practical value of the findings: "Having this information helps us make smarter decisions—whether that's guiding research funding, breeding for disease resistance, or advising farmers on management strategies."

To complement the findings, the Crop Protection Network maintains a free online tool, the Field Crop Disease and Insect Loss Calculator, which allows users to explore estimated historical yield loss data for wheat, corn, soybean, and cotton. The interactive platform is updated annually and is increasingly being used by Extension professionals, industry agronomists, commodity groups, educators, and funding agencies to support planning and risk management.

As new disease threats emerge and growing conditions change, ongoing data collection will be critical. This study is just the beginning of an ongoing effort to track, understand, and reduce crop losses in real time—an essential step toward building more resilient agricultural systems.

ROBOT MATCHES HUMANS IN SCOUTING FOR VINEYARD DISEASES

KRISHNA RAMANUJAN, CORNELL CHRONICLE, 8 SEPTEMBER 2025

The latest version of an autonomous robot that can scout for grape diseases in vineyards in near-real time, with an accuracy that matches highly trained human scouts, will one day help track crop-killing pathogens with minimal labor.

The robot's capabilities were reported in a paper, "PhytoPatholoBot: Autonomous ground robot for near real-time disease scouting in the vineyard," published in the *Journal of Field Robotics*.

The development of the robot is critical as managing such diseases as powdery and downy mildews in vineyards is the top concern for grape growers and viticulturists.

"It is by far ranked as the highest and most potent threat to the sustainability and viability of viticulture in New York, as well as broadly on the East Coast," said Katie Gold, a grape pathologist and a senior author of the paper, along with colleague Yu Jiang, an applied roboticist, both at Cornell AgriTech in Geneva, New York.

The outlook for grape diseases offers little relief, due to pressures from climate change that favor grape pathogens, regulations that make it harder to get chemicals for treatments, increasing pathogen resistance to fungicides and labor shortages.

While disease is the major concern for viticulturists, declining labor has been the main challenge more broadly within the agricultural food industry for the past two decades, with even worse projections.

"That's been a motivation for us: How we can use robots to do this very skilled job?" said Jiang, assistant professor in the Horticulture Section in the School of Integrative Plant Science (SIPS) in the College of Agriculture and Life Sciences (CALS). "Disease scouting is not something that just anyone can do, [but now our robot] will be able to identify those critical stresses for our food systems."

"In the past, I have regularly hired teams of scouts – four or five people – to sweep the vineyards and do the work of one robot," said Gold, assistant professor and the Susan Ekert Lynch Faculty Fellow in the Plant Pathology and Plant-Microbe Biology Section of the SIPS in CALS. "Now the robot can do it on its own, with just one person babysitting it."

The robot, called a PhytoPatholoBot, can self-navigate between vineyard rows of trellised grape plants.

"While it rolls, it takes side view canopy images and then uses an AI model to infer within the image which pixels belong to the canopy and which pixels indicate disease symptoms," Jiang said.

Information from different image frames is then compared with NASA remote sensing, GPS data and computer modeling that incorporates remote sensing images, to infer disease risk by analyzing the spectral signatures coming off the plants. Plant pathologists and vineyard managers may then receive the robot's calculations in near-real time that reveal the type of disease, locations and infection severity within a vineyard.

The robot not only saves on labor, but also allows growers to target treatments. The information can augment baseline treatment plans by indicating where to target spraying with stronger chemicals, which are in limited supply. "By having an accurate way of knowing where disease is popping up, we could mostly rely on gentler chemicals and only go with the heavy hitters when absolutely necessary," Gold said. Limiting blanket spraying may also help reduce fungicide resistance.

In addition, the ability to gather accurate data on the ground allows scientists to more easily train remote sensing models to passively and more accurately surveil disease.

In the study, the research team deployed and tested the robot across 10 Cornell pathology vineyards, which Gold oversees, as well as commercial vineyards. The PhytoPatholoBot has previously been tested across the U.S. in California, South Dakota, North Dakota, Minnesota, New York and West Virginia. Experimental results have shown the robot's disease detection and severity analyses, while comparable to experienced human scouts and advanced computer vision models, were highly efficient computationally and ran on low power, which is needed for field robots, according to the paper.

A startup in California, co-founded by the paper's first author, Ertai Liu, M.S. '20, Ph.D. '24, a postdoctoral researcher at Cornell Tech, aims to produce the PhytoPatholoBots for commercial use.

The technology is also transferrable to other specialty crops and diseases. "We're really interested in expanding to apples," Gold said.

CURRENT VACANCIES

Assistant Professor of Plant Pathology and Fungal Biology, The University of California, Davis

The Department of Plant Pathology at the University of California, Davis is seeking applications for a full-time, tenure-track Assistant Professor position in Mycology, with a focus on plant pathogenic, symbiotic, or mycotoxigenic fungi and fungal-like organisms (e.g., oomycetes). Please visit the Plant Pathology website at UC Davis for further information and https://recruit.ucdavis.edu/JPF07339 to apply.

To ensure consideration, applications should be received by 1 December 2025.

https://www.isppweb.org/ads/California_Davis_PPFB_AP.pdf.

ACKNOWLEDGEMENTS

Thanks to Grahame Jackson and Greg Johnson, and Laura Mugnai for contributions.

COMING EVENTS

Conference of the IOBC/WPRS Working Group "Integrated Protection in Viticulture"
13 October – 15 October, 2025
Mikulov, Czech Republic
Website: event.fourwaves.com/ipvc/pages

14th Arab Congress of Plant Protection Sciences
3 November – 7 November, 2025
Algeria city, Algeria
Contact and Email: info@acpp-aspp.com
Website: acpp-aspp.com

Plant-Parasitic Nematode Identification Course
12 December – 19 December, 2025
Clemson, South Carolina
Contact Email: ckhanal@clemson.edu
Website: www.clemson.edu/cafls/nematology

Plant and Animal Genome Conference (PAG 33)
9 January – 14 January, 2026
San Diego California, USA
Website: https://intlpag.org/PAG33/

8th International Bacterial Wilt Symposium (IBWS)
22 March – 26 March, 2026
Wageningen, the Netherlands
Website: event.wur.nl/ibws2026

21st Reinhardsbrunn Symposium 2026 – Modern Fungicides and Antifungal Compounds
19 April – 23 April, 2026
Friedrichroda, Germany
Website: event.wur.nl/ibws2026

25th Annual Fusarium Laboratory Workshop
21 June – 26 June, 2026
Manhattan, Kansas, USA
Contact: John Leslie jfl@ksu.edu

Plant Health 2026
1 August – 4 August, 2026
Providence, Rhode Island, USA
Website:
www.apsnet.org/meetings/annual/PH2026/Pages/default.aspx

Plant Pathology 2026
8 September – 10 September, 2026
John Innes Centre Conference Centre, Norwich, UK
Website: Not yet available

International Plant Protection Congress
Dates not announced yet, 2027
Christchurch, New Zealand
Website: www.plantprotection.org

International Congress of Plant Pathology 2028
19 August – 25 August, 2028
Gold Coast, Queensland, Australia
Website: reinhardsbrunn-symposium.de/de/


ICPP2028
13th International Congress of Plant Pathology
19-25 August, Gold Coast Convention & Exhibition Centre, Queensland, Australia

INTERNATIONAL SOCIETY FOR PLANT PATHOLOGY (ISPP)

WWW.ISPPWEB.ORG

The ISPP List is an e-mail list server which broadcasts messages and announcements to its subscribers. Its goal is to facilitate communication among members of the International Society for Plant Pathology and its Associated Societies. Advertised vacancies in plant pathology and ISPP Newsletter alerts are also sent to members of the ISPP List.

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