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TRI-OLOGY

A PUBLICATION FROM THE DIVISION OF PLANT INDUSTRY, BUREAU OF ENTOMOLOGY, NEMATOLOGY, AND PLANT PATHOLOGY

Division Director, Trevor R. Smith, Ph.D.

BOTANY

Providing information about plants: native, exotic, protected and weedy

ENTOMOLOGY

Identifying arthropods, taxonomic research and curating collections

NEMATOLOGY

Providing certification programs and diagnoses of plant problems

PLANT PATHOLOGY

Offering plant disease diagnoses and information

Florida Department of Agriculture and Consumer Services • Division of Plant Industry

***Canavalia rosea*, baybean or seaside jackbean**
Photo by Marcia Stefani, wikimedia

ABOUT TRI-OLOGY

The Florida Department of Agriculture and Consumer Services-Division of Plant Industry's (FDACS-DPI) Bureau of Entomology, Nematology, and Plant Pathology (ENPP), including the Botany Section, produces TRI-OLOGY four times a year, covering three months of activity in each issue.

The report includes detection activities from nursery plant inspections, routine and emergency program surveys, and requests for identification of plants and pests from the public. Samples are also occasionally sent from other states or countries for identification or diagnosis.

HOW TO CITE TRI-OLOGY

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Copies of TRI-OLOGY are kept on the FDACS website for two years. To obtain older copies, contact the FDACS-DPI Library at (352) 395-4722 or PlantIndustry@FDACS.gov.

ACKNOWLEDGEMENTS

The editors would like to acknowledge the work of all those who contributed information and explanations by providing data, photographs or text, and by carefully reading early drafts.

We welcome your suggestions for improvement of TRI-OLOGY. Please feel free to contact the helpline with your comments at 1-888-397-1517.

Thank you,

Gregory Hodges, Ph.D.
Editor
Assistant Director, Division of Plant Industry

Patti J. Anderson, Ph.D.
Managing Editor
Botanist, Division of Plant Industry

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Cover Photo

***Leucoptera coffeella*, coffee leafminer moth.**
Photo by James Hayden, FDACS-DPI

HIGHLIGHTS

1 ***Heterotheca subaxillaris*** **(Lam.) Britton & Rusby (camphorweed)** is native to Mexico and across the United States from California to New York and Florida, where it grows in coastal dunes, roadsides and disturbed areas. Although this species is native, it is often encountered in weedy areas with non-native species growing nearby. In Florida, it has been documented in most counties throughout the state, but this is a **new County record** for Santa Rosa.

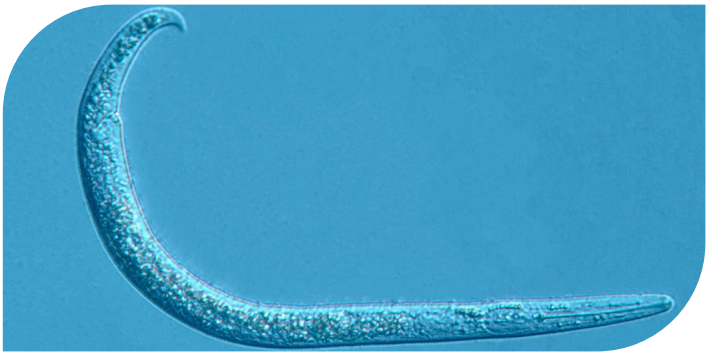
2 ***Leucoptera coffeella*** **(Guérin-Méneville & Perrottet), coffee leafminer, a new Continental USA record.** *Leucoptera coffeella* has been deemed one of the worst pests of coffee in the New World. The larvae make large blotch mines in leaves of *Coffea* species, impeding photosynthesis, causing defoliation and depleting the plant's energy resources, resulting in lower berry production.

3 The pin nematode, ***Paratylenchus straeleni*** **(De Coninck, 1931) Oostenbrink, 1960,** was detected in the rhizosphere of live oak trees (*Quercus virginiana* Mill.), **a new County record,** in Ocala, Florida. Molecular and phylogenetic analyses, still in progress, have shown the Florida population clusters in the same phylogenetic clade as other *P. straeleni* populations from Belgium and California.

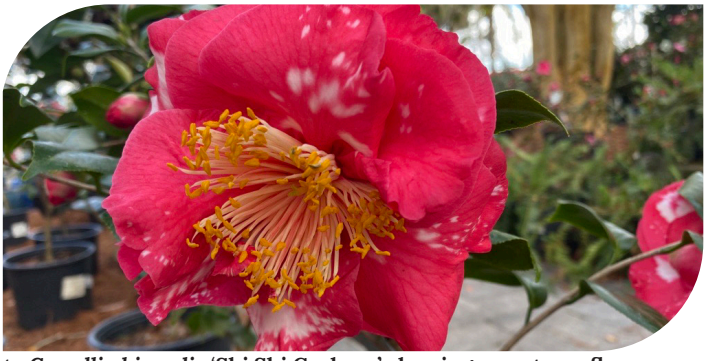
4 **Apple fruit crinkle viroid, a new Host record; Camellia ringspot associated viruses 1, 2 and 3,** and **Camellia associated Badnavirus, new State records;** and ***Camellia japonica*** **associated Emaravirus 1 and 2,** and **Camellia yellow ringspot virus, new Continental USA records**, were all found on a *Camellia japonica* 'Dixie Knight Supreme' plant collected from a garden center in Alachua County. Camellia ringspot associated virus 2 and 3 and Camellia yellow ringspot virus were also found on a *Camellia hiemalis* 'Shi Shi Gashura' plant collected from the same garden center. The discovery of biodiverse viromes occurring naturally in horticultural hosts is becoming the new norm in plant virology through the use of next generation sequencing.

1 - *Heterotheca subaxillaris*, camphorweed.
Photo by Frank Soltes, Atlas of Florida Plants

2 - *Leucoptera coffeella*, coffee leafminer moth.
Photo by James Hayden, FDACS-DPI



3 - The pin nematode, *Paratylenchus straeleni*.
Photo by Silvia Vau and Scott Burton, FDACS-DPI



4 - *Camellia hiemalis* 'Shi Shi Gashura' showing symptoms flower color breaking.
Photo by Maria Velez-Climent, FDACS-DPI

BOTANY

Compiled by Patti J. Anderson, Ph.D. and Alex de la Paz, B.S.

This section identifies plants for the Division of Plant Industry, as well as for other governmental agencies and private individuals. The Botany Section maintains a reference herbarium with over 15,000 dried plant specimens and 1,400 vials of seeds.

QUARTERLY ACTIVITY REPORT

	OCTOBER-DECEMBER	2021 - YEAR TO DATE
Samples Submitted by Other DPI Sections	320	**5,205**
Samples Submitted for Botanical Identification Only	69	**636**
Total Samples Submitted	389	**5,841**
Specimens Added to the Herbarium	46	**775**

1 - *Canavalia rosea*, baybean or seaside jackbean, flowers and leaves.
Photo from Shutterstock

Some of the samples submitted recently are described below.

1 *Canavalia rosea* (Sw.)DC. (baybean; seaside jackbean), from a genus of 60 mainly tropical species in the plant family Leguminosae (Fabaceae). The species is native to coastal areas from Florida to Texas in the United States and tropical and subtropical beaches and coastlines around the world. In Florida, this vine is found on beaches and strands in almost all of our coastal counties from Dixie County around the state to Volusia County, but this is a new record for Pasco County. This creeping or twining vine is perennial with a stem up to 10 m long. The leaves are alternate, tri-foliate (having three leaflets), 4-12 cm long and 2.5-6 cm wide with entire (no teeth) margins. The petioles (leaf stalks) are 2-5.5 cm long. The flowers are papilionaceous (like sweet-peas), are held in a raceme-like inflorescence and have lavender to rosy-pink petals. The calyx has two unequal lips: one with two larger lobes and one with three smaller lobes. Each flower has 10 stamens fused into a single column. The woody fruit is an elongated legume, 10-15 cm long, with prominent ribs, containing four to eight seeds. Seeds are about 1.5 cm long, red to reddish brown, mottled with darker shades. The vine is sometimes used as an ornamental and for erosion control in beachfront landscapes, partly because it is quite salt-tolerant and produces flowers year-round. Although the flower is lovely and the leaves are interesting, the uncooked seeds and dry seed pods are thought to be toxic to humans. (Pasco County; 20211207-3667; Shanelle Mulrooney; 7 December 2021.) (Acevedo-Rodríguez, 2005; Hammer, 2002; Mabberley, 2017; Perkins and Payne, 1978; Wunderlin and Hansen, 2011; Wunderlin and Hansen, 2016; Canavalia rosea (Sw.) DC. GRIN-Global (ars-grin.gov) [accessed 4 January 2022]; Canavalia rosea - Species Page - ISB: Atlas of Florida Plants (usf.edu) [accessed 4 January 2022]; IRC - Natives for Your Neighborhood (regionalconservation.org) [accessed 4 January 2022].)

2 ***Heterotheca subaxillaris*** **(Lam.) Britton & Rusby (camphorweed)**, from a genus of about 28 or 50 species native to North America (botanists disagree on the number), in the plant family Compositae (Asteraceae). This species is native across the United States from California to New York and Florida and south into Mexico, where it grows in coastal dunes, roadsides and disturbed areas. Although this species is native, it is often encountered in weedy areas with non-native species growing nearby. In Florida, it has been documented throughout the state, with only Baker, Bradford, Dixie, Monroe and Union counties without vouchers documenting its presence. The sample submitted for identification this reporting period is a new county record for Santa Rosa County. Plants are annual or biennial (rarely perennial) herbs with erect to sprawling stems. The leaves begin as a basal rosette with stem leaves becoming gradually smaller as the plant grows upward with age. The basal and lower leaves often wither before or during flowering, from July through January. The leaves are ovate to elliptic or lanceolate with coarsely serrate to entire margins and scabrous, often glandular-pubescent, surfaces. The flowers are of two types, disc and ray florets, grouped together in a compact head subtended by an involucre of bracts (called a capitulum). The disc florets are tubular, yellow and found in the center of the head. The ray florets are also yellow, but strap-shaped, and found along the outer edge of the head. The fruit (cypsela) is dry, single-seeded and indehiscent, with an adnate calyx (pappus) on top. The pappus of the disc florets consists of an outer ring of scales and an inner ring of bristles while the ray florets lack a pappus entirely. The cypselas of the disc and ray florets are also different, hence the name *Heterotheca*, from the Greek *heteros*, different, and *thece*, container, alluding to the dimorphic cypselas. Plants often have a camphor-like odor when fresh. (Santa Rosa County; B2021-562; Ethan Kelly; 16 November 2021). (Semple, 2006; Weakley, 2020; Wunderlin and Hansen, 2011).

2 – ***Heterotheca subaxillaris*****, camphorweed.**
Photo by Allen Boatman, Atlas of Florida Plants

REFERENCES

Acevedo-Rodríguez, P. (2005). *Vines and climbing plants of Puerto Rico and the Virgin Islands***.** National Museum of Natural History. Washington, DC.

Hammer, R. (2002). *Everglades wildflowers.* Falcon Press. Guilford, Connecticut.

Mabberley, D.J. (2017). *Mabberley's plant-book: a portable dictionary of plants, their classification and uses* (4th edition). Cambridge University Press. New York, New York.

Perkins, K.D. and Payne, W.W. (1978). *Guide to the poisonous and irritant plants of Florida.* Florida Cooperative Extension Service. University of Florida, Gainesville, Florida.

Semple, J.C. (2006). *Heterotheca*. In: Flora of North America Editorial Committee, eds. 1993+. *Flora of North America North of Mexico* [Online]. 22+ vols. New York and Oxford. Vol. 20. http://floranorthamerica.org/Heterotheca [accessed 11 January 2022].

Weakley, A.S. (2020). *Flora of the southeastern United States*. University of North Carolina Herbarium, North Carolina Botanical Garden. Chapel Hill, North Carolina.

Wunderlin, **R.P. and Hansen, B.F. (2011).** *Guide to the vascular plants of Florida* (3rd edition). University Press of Florida, Gainesville, Florida.

Wunderlin, R.P. and Hansen, B.F. (2016). *Flora of Florida, Volume III.* University Press of Florida, Gainesville, Florida.

BOTANY IDENTIFICATION TABLE

The following table provides information about **new county** records submitted in the current volume's time period. The table is organized by collector name. The full version with more complete data is downloadable as a PDF or an Excel spreadsheet organized by collector name, except new county records are listed first.

NEW RECORD	COLLECTOR NAME	COUNTY	SAMPLE NUMBER	COLLECTION DATE	PLANT NAME
	Alex Tasi	Indian River	2780	2021-10-25	*Ipomoea imperati*
	David Brown	Putnam	8008	2021-12-15	*Commelina diffusa*
	David Brown	Putnam	3532	2021-12-20	*Phragmites berlandieri*
	David Brown	Flagler	8875	2021-12-14	*Richardia grandiflora*
	David Brown	Flagler	4818	2021-12-14	*Spermacoce verticillata*
	Deann Hansen	Volusia	3810	2021-09-30	*Atalantia buxifolia*
	Ethan Kelly	Santa Rosa	7442	2021-11-17	*Ambrosia artemisiifolia*
	Ethan Kelly	Escambia	3476	2021-12-27	*Gaillardia pulchella*
	Ethan Kelly	Santa Rosa	9169	2021-11-17	*Helianthus floridanus*
	Ethan Kelly	Santa Rosa	6156	2021-11-23	*Heterotheca subaxillaris*
	Ethan Kelly	Okaloosa	6747	2021-12-14	*Paulownia tomentosa*
	Ethan Kelly	Okaloosa	2180	2021-12-14	*Sonchus asper*
	Lisa Tyler	Nassau	8252	2021-12-14	*Indigofera spicata*
	Mark Laurint	Clay	3214	2021-12-03	*Ardisia crenata*
	Mark Laurint	St. Johns	9227	2021-10-27	*Crinum americanum*
	Ray Jarrett	Volusia	3339	2021-12-21	*Ageratum conyzoides*
	Shanelle Mulrooney	Pasco	3667	2021-12-07	*Canavalia rosea*
	Shanelle Mulrooney	Pasco	3796	2021-12-07	*Ipomoea pes-caprae*

ENTOMOLOGY

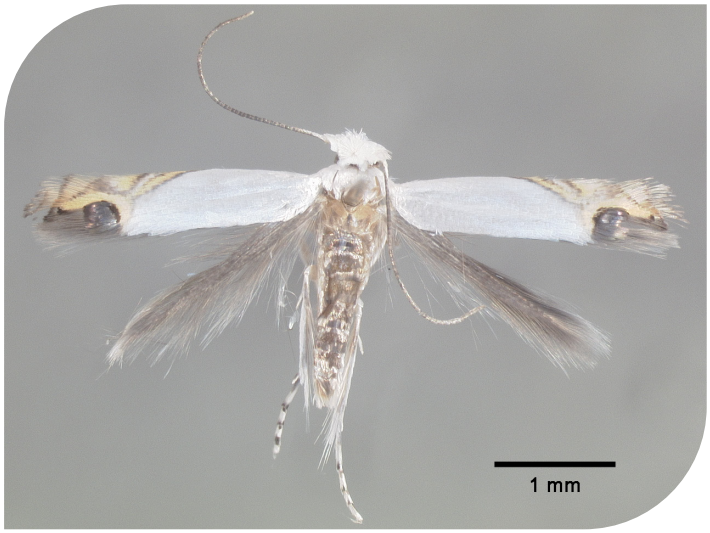
Compiled by Susan E. Halbert, Ph.D.

This section provides the division's plant protection specialists and other customers with accurate identifications of arthropods. The entomology section also builds and maintains the arthropod reference and research collection (the Florida State Collection of Arthropods with over 10 million specimens) and investigates the biology, biological control and taxonomy of arthropods.

	OCTOBER-DECEMBER	2021 - YEAR TO DATE
Samples submitted by other DPI sections	320	5,205
Samples submitted for botanical identification only	69	636
Total samples submitted	389	5,841
Specimens added to the herbarium	46	775

1 *Leucoptera coffeella* (Guérin-Méneville & Perrottet), coffee leafminer, a new Continental USA record. *Leucoptera coffeella* is deemed to be one of the worst pests of coffee in the New World. The larvae make large blotch mines in leaves of *Coffea* species, impeding photosynthesis, causing defoliation and depleting resources, resulting in lower berry production. This species has been established in the Caribbean Region since at least the 19th century, so it is surprising that it has not been detected previously in Florida. Infestations of *Coffea arabica* L. have been found thus far on four properties in Broward County. The moths were identified by the damage, DNA barcoding of mitochondrial COI (cytochrome oxidase subunit 1) and adult moths reared in containment. (Broward County; E1253-02-12022021-6783; Pattanjalidal Bissoondial, USDA; 1 December 2021.) (Dr. James E. Hayden and Matthew R. Moore.)

2 *Podothrips lucasseni* (Kruger), 1890, a new Continental USA record. Members of the genus *Podothrips* are predators of scales feeding on grasses (Poaceae/Gramineae). Most species of *Podothrips* are restricted to Asia and Australia, but *P. lucasseni* has colonized a wide geographic area ranging from Pakistan to Hawaii (Ritchie, 1974). In Asia, *P. lucasseni* often is found in association with scales feeding on rice or sugarcane (Mound and Minaei, 2007). Only one other member of *Podothrips*, *P. semiflavus*, has been reported previously from Florida (Diffie, *et al.,* 2008). *Podothrips lucasseni* is easy to distinguish from *P. semiflavus* by having the body evenly dark brown, the pelta divided into three sclerites and having a large seta mounted on a tubercle, basal to the protarsal tooth. (Lake County; E0005-01-09272021-4210; Abby Bartlett and Jimmy Hernández, DPI; 23 September 2021.) (Dr. Felipe N. Soto-Adames.)



1 - *Leucoptera coffeella*, coffee leafminer moth.
Photo by James E Hayden, FDACS-DPI

2 - *Podothrips lucasseni*, predatory thrips.
Photo by Felipe Soto-Adames, FDACS-DPI

3 ***Iccius cylindricus*** **Champion, a tenebrionid beetle, a new Florida State record.** One specimen of this species was recovered from a Lindgren funnel trap placed at Port Tampa Bay. The species is known from Guatemala as well as Arizona, Louisiana and Texas in the United States. The only life history notes indicate adults are found in hollow stems of morning glory (*Ipomoea*). This species does not appear to be a pest. (Hillsborough County; E1614-01-12212021-03404; Douglas Restom Gaskill, USDA; 12 December 2021.) (Kyle E. Schnepp.)

4 ***Bactrocera zonata*** **(Saunders), peach fruit fly, a regulatory incident.** A single male specimen was captured in a Jackson trap baited with methyl eugenol in North Miami. Increased trap densities in a 66-square-mile area around the detection site are being maintained, and traps will be monitored closely for an estimated two life cycles. If no additional flies are found, the delimitation program will end about 30 March 2022. (Miami-Dade County; 12142021-7907; Stephanie Paz, DPI; 13 December 2022.) (Gary J. Steck.)

REFERENCES

Diffie, S., Edwards, G.B. and Mound, L.A. (2008). Thysanoptera of southeastern U.S.A.: A checklist for Florida and Georgia. *Zootaxa* 1787: 45–62.

Mound, L.A. and Minaei, K. (2007). Australian thrips of the *Haplothrips* lineage. *Journal of Natural History* 41: 2919–2978.

Ritchie, J.M. (1974). A revision of the grass-living genus *Podothrips* (Thysanoptera: Phlaeothripidae). *Journal of Entomology B* 43:261–282.

3 - *Iccius cylindricus*, darkling beetle. Adult male, dorsal view.
Photo by Kyle Schnepp, FDACS-DPI

4 - *Bactrocera zonata* (Saunders) collected in North Miami.
Photo by Gary J. Steck, FDACS-DPI

ENTOMOLOGY SPECIMEN REPORT

Following are tables with entries for records of new hosts or new geographical areas for samples identified in the current volume's time period as well as samples of special interest. An abbreviated table, with all the new records, but less detail about them, is presented in the body of this web page and another version with more complete data is downloadable as a PDF or an Excel spreadsheet.

The tables are organized alphabetically by plant host if the specimen has a plant host. Some arthropod specimens are not collected on plants and are not necessarily plant pests. In the table below, those entries that have no plant information included are organized by arthropod name.

PLANT SPECIES	PLANT COMMON NAME	ARTHROPOD GENUS AND SPECIES	ARTHROPOD COMMON NAME	COLLECTOR	RECORD
Abies fraseri	Fraser fir	*Fiorinia externa*	elongate hemlock scale	Alexander Tasi	REGULATORY SIGNIFICANT
Abies fraseri	Fraser fir	*Fiorinia externa*	elongate hemlock scale	Chase Groninger	REGULATORY SIGNIFICANT
Abies fraseri	Fraser fir	*Fiorinia externa*	elongate hemlock scale	Clarence Parkes	REGULATORY SIGNIFICANT
Abies fraseri	Fraser fir	*Fiorinia externa*	elongate hemlock scale	Jeanie Frechette	REGULATORY SIGNIFICANT
Abies fraseri	Fraser fir	*Fiorinia externa*	elongate hemlock scale	Jeanie Frechette	REGULATORY SIGNIFICANT
Abies fraseri	Fraser fir	*Fiorinia externa*	elongate hemlock scale	Jeanie Frechette	REGULATORY SIGNIFICANT
Abies fraseri	Fraser fir	*Fiorinia externa*	elongate hemlock scale	Jeanie Frechette	REGULATORY SIGNIFICANT
Abies fraseri	Fraser fir	*Fiorinia externa*	elongate hemlock scale	Keith Zugar	REGULATORY SIGNIFICANT
Abies fraseri	Fraser fir	*Fiorinia externa*	elongate hemlock scale	Kelsey Pitchford	REGULATORY SIGNIFICANT
Abies fraseri	Fraser fir	*Fiorinia externa*	elongate hemlock scale	Lisa Tyler	REGULATORY SIGNIFICANT
Abies fraseri	Fraser fir	*Fiorinia externa*	elongate hemlock scale	Logan Cutts, Dyrana Russell	REGULATORY SIGNIFICANT
Abies fraseri	Fraser fir	*Fiorinia externa*	elongate hemlock scale	Logan Cutts, Dyrana Russell	REGULATORY SIGNIFICANT
Abies fraseri	Fraser fir	*Fiorinia externa*	elongate hemlock scale	Victoria Benjamin	REGULATORY SIGNIFICANT
Abies fraseri	Fraser fir	*Fiorinia externa*	elongate hemlock scale	Victoria Benjamin	REGULATORY SIGNIFICANT
Aesculus pavia	red buckeye	*Saissetia miranda*	Mexican black scale	Lyle Buss	NEW FLORIDA HOST RECORD
Allium sativum	garlic	*Aceria tulipae*	dry bulb mite	Susan Halbert	REGULATORY SIGNIFICANT
Annona squamosa	sugar apple	*Andaspis punicae*	litchi scale	Arabia Barroso	NEW FLORIDA HOST RECORD
Annona squamosa	sugar apple	*Fiorinia phantasma*	phantasma scale	Sallie Simmons	NEW FLORIDA HOST RECORD
Bidens alba	beggarticks; romerillo	*Phenacoccus sisymbriifolium*	mealybug	Nora Marquez	NEW FLORIDA COUNTY RECORD
Blighia sapida	ackee	*Bactrocera zonata*	peach fruit fly	Stephanie Paz	QUARANTINABLE PEST
Brahea armata	Mexican blue palm	*Fiorinia phantasma*	phantasma scale	Liliana Jerez	NEW FLORIDA HOST RECORD
Brassica rapa	Napa cabbage	*Bactericera cockerelli*	potato psyllid	Jakira Davis, Eric Dougherty	REGULATORY SIGNIFICANT
Calamintha coccinea	scarlet calamint	*Sinea spinipes*	spiny assassin bug	Ethan Kelly	NEW FLORIDA COUNTY RECORD
Capsicum annum	poblano pepper	*Bactericera cockerelli*	potato psyllid	Jimmy Hernandez	REGULATORY SIGNIFICANT
Citrus sinensis	sweet orange	*Samea druchachalis*	crambid moth	Adriana Diaz	NEW FLORIDA COUNTY RECORD
Citrus sp.	citrus	*Nipaecoccus viridis*	lebbeck mealybug	Prem Kumar, Claire Franklin	NEW FLORIDA COUNTY RECORD
Cnidoscolus aconitifolius	chaya; tree spinach	*Tetraleurodes fici*	whitefly	Emily Safran	NEW FLORIDA COUNTY RECORD
Coffea arabica	coffee	*Leucoptera coffeella*	coffee leafminer	Pattanjalidal Bissoondial	NEW US CONTINENTAL RECORD
Crataegus michauxii	Michaux's hawthorn	*Schizoneurata tissoti*	wooly aphid	Ethan Kelly	NEW FLORIDA COUNTY RECORD
Cucumis melo	cantaloupe	*Scolopocerus uhleri*	coreid	Jakira Davis, Eric Dougherty	REGULATORY SIGNIFICANT
Dianthus sp.	pink	*Seira steinmetzi*	springtail	Farmer	NEW FLORIDA COUNTY RECORD
Ixora sp.	ixora; jungle flame	*Asiothrixus antidesmae*	ixora whitefly	Lyle Buss	NEW FLORIDA COUNTY RECORD
Lactuca sativa	romaine Lettuce	*Acyrthosiphon lactucae*	lettuce aphid	Ryan Brown	REGULATORY SIGNIFICANT
Lactuca sativa	Boston Lettuce	*Acyrthosiphon lactucae*	lettuce aphid	Ryan Brown	REGULATORY SIGNIFICANT

PLANT SPECIES	PLANT COMMON NAME	ARTHROPOD GENUS AND SPECIES	ARTHROPOD COMMON NAME	COLLECTOR	RECORD
Lactuca sativa	Tuscan lettuce	*Cavariella aegopodii*	carrot-willow aphid	Jakira Davis, Eric Dougherty	REGULATORY SIGNIFICANT
Lactuca sativa	red leaf lettuce	*Nasonovia ribisnigri*	currant-lettuce aphid	Jakira Davis, Eric Dougherty	REGULATORY SIGNIFICANT
Lactuca sativa	romaine Lettuce	*Nasonovia ribisnigri*	currant-lettuce aphid	Janie Echols	REGULATORY SIGNIFICANT
Lactuca sativa	romaine Lettuce	*Nasonovia ribisnigri*	currant-lettuce aphid	Logan Cutts, Dyrana Russell	REGULATORY SIGNIFICANT
Lactuca sativa	romaine Lettuce	*Nasonovia ribisnigri*	currant-lettuce aphid	Logan Cutts, Dyrana Russell	REGULATORY SIGNIFICANT
Lactuca sativa	romaine Lettuce	*Nasonovia ribisnigri*	currant-lettuce aphid	Ryan Brown	REGULATORY SIGNIFICANT
Lagerstroemia indica	crape myrtle	*Ceroplastes ceriferus*	Indian wax scale	Sam Hart	NEW FLORIDA HOST RECORD
Mangifera indica	mango	*Epicorsia oedipodalis*	fiddlewood leafroller moth	Jeanie Frechette	NEW FLORIDA COUNTY RECORD
Mangifera indica	mango	*Fiorinia phantasma*	phantasma scale	Lane Smith	NEW FLORIDA HOST RECORD
Manilkara zapota	sapodilla	*Sobarocephala cruciger*	clusiid fly	David Petendree	NEW FLORIDA COUNTY RECORD
Melinis repens	rose natalgrass	*Antonina graminis*	Rhodesgrass mealybug	Kyle Schnepp	NEW FLORIDA COUNTY RECORD
Palmae	palm	*Palmicultor palmarum*	Ehrhorn's palm mealybug	Muhammed Ahmed	NEW FLORIDA COUNTY RECORD
Parkinsonia aculeata	Mexican palo verde; Jerusalem thorn	*Rhinacloa callicrates*	Parkinsonia bug	Sam Hart	NEW FLORIDA COUNTY RECORD
Plectranthus sp.	coleus	*Phenacoccus sisymbriifolium*	mealybug	Clarence Parkes	NEW FLORIDA COUNTY RECORD; NEW FLORIDA HOST RECORD
Poinsettia pulcherrima	poinsettia	*Phenacoccus multicerarii*	mealybug	Chantelle Viloria	NEW FLORIDA HOST RECORD
Pseudotsuga menziesii	Douglas fir	*Chionaspis pinifoliae*	pine needle scale	Jakira Davis, Eric Dougherty	REGULATORY SIGNIFICANT
Pueraria montana var. lobata	kudzu	*Bemisia tabaci*	silverleaf whitefly	Patti Anderson	NEW FLORIDA HOST RECORD
Pyracantha koidzumii	Formosa firethorn	*Aphis eugeniae*	aphid	Susan Halbert	NEW FLORIDA HOST RECORD
Quercus sp.	oak	*Acrolophus waisinghami*	tribble moth	Kelsey Pitchford	NEW FLORIDA COUNTY RECORD
Rhododendron sp.	azalea	*Matsucoccus krystalae*	pine bast scale	Lily Deeter	NEW FLORIDA HOST RECORD
Rubus sp.	blackberry	*Amphophora sp.*	aphid	Jakira Davis, Eric Dougherty	REGULATORY SIGNIFICANT
Rubus sp.	blackberry	*Aphis ruborum*	permanent blackberry aphid	Jakira Davis, Eric Dougherty	REGULATORY SIGNIFICANT
Rubus sp.	raspberry	*Lygus sp.*	western lygus bug	Jakira Davis, Eric Dougherty	REGULATORY SIGNIFICANT
Schefflera arboricola	dwarf schefflera	*Aphis hederae*	English ivy aphid	Diane Mccoll	NEW FLORIDA HOST RECORD
Sporobolus indicus	smutgrass	*Antonina graminis*	Rhodesgrass mealybug	Kyle Schnepp	NEW FLORIDA HOST RECORD
Tridens flavus	purpletop tridens	*Antonina graminis*	Rhodesgrass mealybug	Kyle Schnepp	NEW FLORIDA HOST RECORD
Tripsacum dactyloides	Fakahatchee grass	*Podothrips lucasseni*	predatory thrips	Abby Bartlett, Jimmy Hernandez	NEW US CONTINENTAL RECORD
Vitis rotundifolia	grape	*Omolicna joi*	derbid planthopper	Rachel Conklin, Connor Kuppe	NEW FLORIDA COUNTY RECORD
Wodyetia bifurcata	foxtail palm	*Fiorinia phantasma*	phantasma scale	Jeanie Frechette	NEW FLORIDA COUNTY RECORD
Wodyetia bifurcata	foxtail palm	*Fiorinia phantasma*	phantasma scale	Scott Weihman, Erin Powell, Nelson Levy	NEW FLORIDA COUNTY RECORD
Zamia sp.	coontie	*Saissetia miranda*	Mexican black scale	Liliana Jerez	NEW FLORIDA HOST RECORD
		Aedes bahamensis	mosquito	Lawrence Hribar	NEW FLORIDA COUNTY RECORD

PLANT SPECIES	PLANT COMMON NAME	ARTHROPOD GENUS AND SPECIES	ARTHROPOD COMMON NAME	COLLECTOR	RECORD
		Agallia deleta	leafhopper	Scott Weihman, Alexander Tasi	NEW FLORIDA COUNTY RECORD
		Bolacothrips striatopennatus	thrips	Krystal Ashman	NEW FLORIDA COUNTY RECORD
		Chionomus quadrispinosus	delphacid planthopper	Robert Leahy	NEW FLORIDA COUNTY RECORD
		Chionomus quadrispinosus	delphacid planthopper	Scott Weihman, Alexander Tasi	NEW FLORIDA COUNTY RECORD
		Delphacodes truncata	delphacid planthopper	James Bouie, Joseph Hanus	NEW FLORIDA COUNTY RECORD
		Delphacodes truncata	delphacid planthopper	Robert Leahy	NEW FLORIDA COUNTY RECORD
		Dysimia pseudomaculata	derbid planthopper	James Bouie, Joseph Hanus	NEW FLORIDA COUNTY RECORD
		Gonoporomiris mirificus	plant bug	Maximilian Carfagno	NEW FLORIDA COUNTY RECORD
		Iccius cylindricus	darkling beetle	Douglas Restom-Gaskill	NEW FLORIDA STATE RECORD
		Macrochlamys indica	horntail snail	Daniel Merced, Shanelle Mulrooney, Gary Webb	QUARANTINABLE PEST
		Micronecta sp.	corixid	James Bouie, Joseph Hanus	NEW FLORIDA COUNTY RECORD
		Mitrapsylla cubana	psyllid	Ben Rosson	NEW FLORIDA COUNTY RECORD
		Omolicna joi	derbid planthopper	Logan Cutts, Dyrana Russell	NEW FLORIDA COUNTY RECORD
		Phytocoris tillandsiae	mirid plant bug	Joan Paravassini	NEW FLORIDA COUNTY RECORD
		Sixeonotus albicornis	mirid plant bug	Robert Leahy	NEW FLORIDA COUNTY RECORD
		Sophonia orientalis	two-spotted leafhopper	Ben Rosson	NEW FLORIDA COUNTY RECORD
		Typhlocybella minima	leafhopper	Scott Weihman, Alexander Tasi	NEW FLORIDA COUNTY RECORD
		Xystrologa grenadella	bark-boring moth	James Hayden	NEW FLORIDA COUNTY RECORD
		Zyginama tripunctata	leafhopper	Alejandro Montoya	NEW FLORIDA COUNTY RECORD

NEMATOLOGY

Compiled by Renato N. Inserra, Ph.D.; Sergei. A. Subbotin, Ph.D.; Silvia Vau, Ph.D.;
Brian Alford, B.S. and Janete A. Brito, Ph.D.

This section analyzes soil and plant samples for nematodes, conducts pest detection surveys and provides diagnoses of plant problems, in addition to completing identification of plant parasitic nematodes involved in regulatory and certification programs. State of Florida statutes and rules mandate the predominant regulatory activities of the section. Analyses of plant and soil samples include those from in-state programs, plant shipments originating in Florida destined for other states and countries, as well as samples intercepted in Florida from outside the United States.

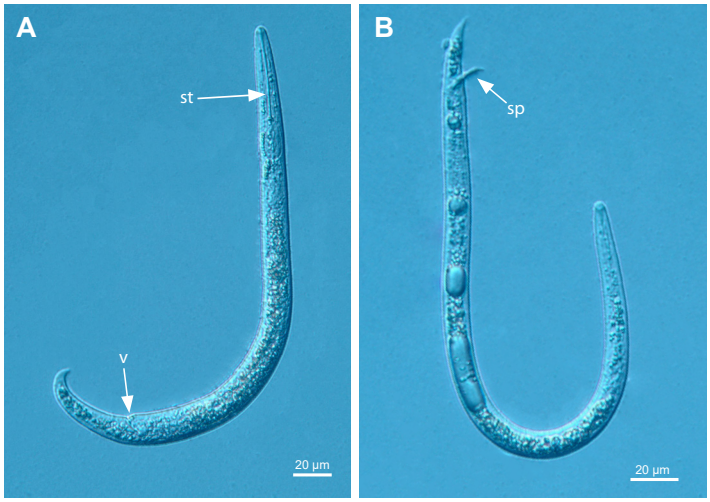
QUARTERLY ACTIVITY REPORT

	OCTOBER-DECEMBER	2021 - YEAR TO DATE
Morphological Identifications	3,182	**13,774**
Molecular Identifications *	98	**847**
Total Identifications	3,280	**14,621**

* The majority of these analyses involved root-knot nematode species.

Nematode of Special Interest

1 The pin nematode, ***Paratylenchus straeleni* (De Coninck, 1931) Oostenbrink, 1960,** was detected in the rhizosphere of live oak (*Quercus virginiana* Mill.) trees, **a new County record,** in Ocala, Florida. (Marion County**;** 12092021-3226-3-1; Brian Alford; 9 December 2021.)



1 - Photomicrographs of *Paratylenchus straeleni* from Florida. Female (A) and male (B) entire body. (Sp = spicule; St = stylet; V = vulva).
Photo by Silvia Vau and Scott Burton, FDACS-DPI

The pin nematode, *Paratylenchus straeleni,* was found by De Conink (1931) on moss in Liege, Belgium, and described with the name *Procriconema straeleni*. Subsequently, this species was transferred to the genus *Paratylenchus* Micoletzky, 1922 by Oostenbrink, 1960. This pin nematode has a wide geographical distribution and has been reported in many countries other than those in Europe, including Canada, Iran, South Africa, Turkey and the United States. A morphologically similar species was found by Tarjan (1960) in Lake Alfred, Florida, and described under the name of *P. sarissus*, considered a junior synonym of *P. straeleni* by Geraert (1965). Subsequently, phylogenetic studies have been conducted to elucidate the taxonomic status of pin nematode populations identified as *P. straeleni* from different localities. A study conducted by Sing, *et al*. (2021) indicated DNA sequences of topotype Belgian populations of *P. straeleni* matched those of populations from California and other distant geographical areas. Recently, regulatory nematode samples collected from live oaks in a tree farm were found infested with a pin nematode morphologically similar to *P. straeleni,* associated with the tylenchulid nematode, *Trophotylenchulus floridensis* Raski, 1957. Molecular and phylogenetic analyses, still in progress, have shown the Florida population clusters in the same phylogenetic clade as other *P. straeleni* populations from Belgium and California. In addition to the report of this species as *P. sarissus* by Tarjan (1960), Lehman (2002) lists a *P. straeleni* population from Taylor County, Florida, in association with *Sabal palmetto.* However, this report cannot be confirmed because no morphological data on the population are available. The *P. straeleni* populations from both California and Florida were associated with plant species of the genus *Quercus*. The economic importance of *P. straeleni* in agriculture has not been assessed.

REFERENCES

De Coninck, L.A.P. (1931). Sur trois espèces nouvelles de nématodes libres trouvés en Belgique. *Bulletin du musée royal d'histoire naturelle de Belgique* 7: 1-5.

Geraert, E. (1965). The genus *Paratylenchus. Nematologica* 11: 301-334.

Lehman, P.S. (2002). *Phytoparasitic nematodes reported from Florida*. Florida Department of Agriculture and Consumer Services, Division of Plant Industry, Bureau of Entomology, Nematology and Plant Pathology, Nematology Section. Gainesville, Florida.

Oostenbrink, M. (1960). The family Criconematidae. In Sasser, J.N. and Jenkins, W.R. (Eds.), *Nematology fundamental and recent advances with emphasis on plant parasites and soil forms* (pp.196-205). University of North Carolina Press, Chapel Hill, North Carolina.

Sing, P.R., Karssen, G., Couvreur, M., Subbotin, S.A. and Bert, W. (2021). Integrative taxonomy and molecular phylogeny of the plant-parasitic nematode genus *Paratylenchus* (Nematoda: Paratylenchinae): linking species with molecular barcodes. *Plants* 10: 408. https://doi.org/10.3390/plants10020408.

Tarjan, A.C. (1960). A review of the genus *Paratylenchus* Micoletzky, 1922 (Paratylenchinae: Nematoda) with a description of two new species. *Annals New York Academy of Science* 84: 329-390.

PLANT PATHOLOGY

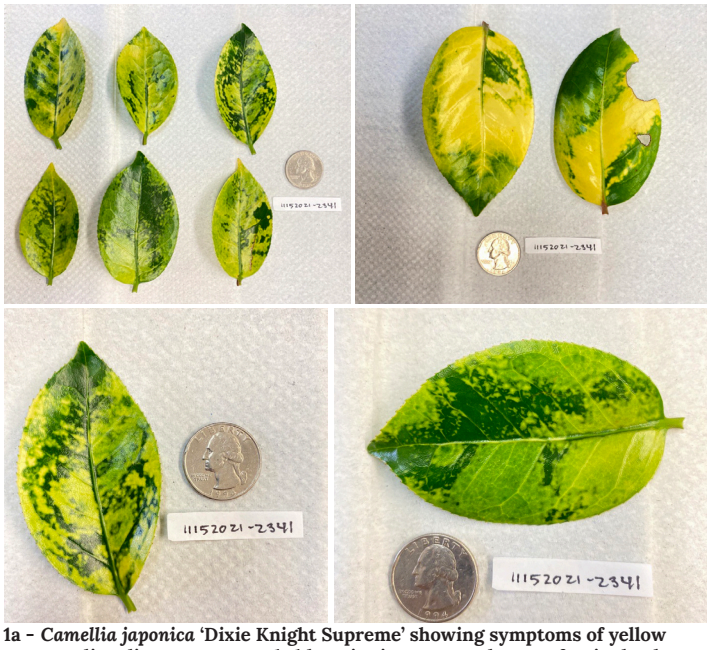
Compiled by by Hector Urbina, Ph.D.; Jodi Hansen, M.S.; Taylor Smith, B.S.;
Kishore Dey, Ph.D.; Melanie Fryman, B.S. and Maria Velez-Climent, M.S.

The Plant Pathology section provides plant disease diagnostic services for the department. The agency-wide goal of protecting the flora of Florida very often begins with accurate diagnoses of plant problems. Management recommendations are offered where appropriate and available. Our plant pathologists are dedicated to keeping informed about endemic plant diseases along with those diseases and disorders active outside Florida to be prepared for potential introductions of new pathogens to our area.

1 Apple fruit crinkle viroid, a **new Host** record; **Camellia ringspot associated viruses 1, 2 and 3,** and **Camellia associated Badnavirus, new State** records; and **Camellia japonica associated Emaravirus 1 and 2,** and **Camellia yellow ringspot virus, new Continental USA** records, were all found on a *Camellia japonica* 'Dixie Knight Supreme' plant collected from a garden center in Alachua County. Camellia ringspot associated virus 2 and 3 and Camellia yellow ringspot virus were also found on a *Camellia hiemalis* 'Shi Shi Gashura' plant collected from the same garden center. The *C. japonica* and *C. hiemalis* samples displayed yellow mottling, yellow line patterns and chlorotic ringspots on the leaves. Color breaking was also observed on flowers. All isolates were confirmed by sequencing and genetic analysis.

Apple fruit crinkle viroid (Genus *Apscaviroid*) has a narrow host range; previously reported to infect only apple, hops and persimmon (EPPO, 2021). Plant viroids are mainly transmitted by vegetative propagation but can also be transmitted mechanically or biologically by seed, pollen and aphids (Fauquet *et al.,* 2005). Tentative names for the Pruneviruses Camellia ringspot-associated virus 1 and 2 (Genus *Prunevirus*) have not yet been recognized by the International Committee on Taxonomy of Viruses (ICTV), but these viruses and Camellia ringspot associated virus 3 (Genus *Capillovirus*) were previously isolated in Maryland where they are considered widespread. They are all graft and seed transmitted (Liu *et al.,* 2020). Camellia-associated Badnavirus (Genus *Badnavirus*), a tentative virus name also not yet recognized by the ICTV, was independently identified by two different researchers from Maryland and China. It was tentatively named Camellia Lemon Glow virus in the United States and Camellia-associated Badnavirus in China (Li *et al.,* 2020). Badnaviruses can be vectored by mealybugs and aphids (Bhat *et al.*, 2016). Camellia yellow ringspot virus (Genus *Idaeovirus*) was first reported in China in 2020 (Zhang *et al.,* 2020) and can be transmitted through vegetative propagation and pollen (Bulger *et al.,* 1990). *Camellia japonica* associated Emaravirus 1 and 2 (Genus *Emaravirus*), recently discovered in *Camellia* sp. in Italy (Peracchio *et al*., 2020), can be transmitted by mechanical inoculation, grafting and arthropod vectors, such as mites (Mielke-Ehret *et al.,* 2012).

The discovery of biodiverse viromes occurring naturally in horticultural hosts through next generation sequencing is becoming the new norm in plant virology. Many viral diseases



1a – *Camellia japonica* 'Dixie Knight Supreme' showing symptoms of yellow mottling, line patterns and chlorotic ringspots on leaves of a single plant caused by a mixed viral infection including Apple fruit crinkle viroid, Camellia ringspot-associated virus 1, 2, and 3, Camellia-associated Badnavirus, Camellia yellow ringspot virus and *Camellia japonica* associated virus emaravirus 1 and 2.
Photos by Maria Velez-Climent, FDACS-DPI

are found to be associated with multiple viruses, and the role of each member in the disease complex is difficult to discern, especially since virus and host genetic background, as well as environment, all play a role in symptom development. The manifestation of symptoms may be just one component of such complicated interactions. Camellias present a classic example of such mixed infection. Variegation in camellias has long been thought to be caused by Camellia yellow mottle virus, but when variegated plants were analyzed with deep sequencing technology, multiple viruses were discovered to be associated with the condition. Because camellias are extensively grafted and propagated to produce new cultivars, diverse virus populations tend to persist and evolve in the host. Since these symptoms have been reported wherever camellias are grown, it is likely the viruses we detected are widespread in the southeastern United States, where camellias are often planted for ornamental purposes (Bond, 1994). (Alachua County; P0528-1115-2021-2341; Maria Velez-Climent; 13 November 2021) (Alachua County; P0744-12092021-7931; Maria Velez-Climent; 8 December 2021).

REFERENCES

Bhat, A.I., Hohn, T. and Selvarajan, R. (2016). Badnaviruses: the current global scenario. *Viruses* 2016, 8(6), 177; https://doi.org/10.3390/v8060177.

Bond, E.R. (1994). Camellia variegation. *American Nurseryman*, Sept. 15, p. 50-51.

EPPO Global Database. (2021). Apple fruit crinkle viroid (AFCVD0). Retrieved January 20, 2021, from https://gd.eppo.int/taxon/AFCVD0/datasheet.

Fauquet, C.M., Mayo, M.A., Maniloff, J., Desselberger, U. and Ball, L.A. (2005). *Virus taxonomy: eighth report of the international committee on taxonomy of viruses.* Elsevier Academic Press, San Diego, California.

Li, R., Zheng, L., Cao, M., Wu, L., Normandy, P. and Liu, H. (2020). First identification and molecular characterization of a new badnavirus infecting camellia. *Archives of Virology* 165: 2115–2118 (2020). https://doi.org/10.1007/s00705-020-04698-0.

Liu, H., Wu, L., Zheng, L., Cao, M. and Li, R. (2019). Characterization of three new viruses of the family Betaflexiviridae associated with camellia ringspot disease. *Virus Research* 272: 197668.

Mielke-Ehret, N. and Muhlbach, H.P. (2012). A novel genus of multipartite, negative strand RNA plant viruses. *Viruses* 4: 1515-1536. https://doi.org/10.3390/v4091515.

Peracchio, C., Forgia, M., Chiapello, M., Vallino, M., Turina, M. and Ciuffo, M. (2020). A complex virome including two distinct emaraviruses associated with virus-like symptoms in *Camellia japonica*. *Virus Research* 286: 197964. doi: 10.1016/j.virusres.2020.197964.

Zhang, S., Yang, L., Ma, L., Tian, X., Li, R., Zhou, C. and Cao, M. (2020). Virome of *Camellia japonica*: discovery of and molecular characterization of new viruses of different taxa in camellias. *Frontiers in Microbiology* 11: 945. doi: 10.3389/fmicb.2020.00945.

1b - *Camellia hiemalis* 'Shi Shi Gashura' showing symptoms of yellow mottling on leaves and flower color breaking on a single plant, caused by a mixed viral infection including Camellia ringspot-associated virus 2 and 3 and Camellia yellow ringspot virus.
Photos by Maria Velez-Climent, FDACS-DPI

QUARTERLY ACTIVITY REPORT

	OCTOBER-DECEMBER	2021 - YEAR TO DATE
Citrus black spot	221	**328**
Citrus canker	282	**720**
Citrus greening / HLB	114	**846**
HLB certification for out of state shipping	4,553	**9,336**
Import inspections	8	**Not available**
Interdictions	30	**178**
Palm phytoplasma	37	**52**
Pathology, general	130	**2,162**
Soil	14	**188**
Totals	5,389	**13,810**

PLANT PATHOLOGY IDENTIFICATION TABLE

The following table provides information about samples identified between October-December 2021. The table is organized alphabetically by plant species, with new records listed on the right.

PLANT SPECIES	PLANT COMMON NAME	CAUSAL AGENT	DISEASE NAME	LOCATION TYPE	SPECIMEN NUMBER	COUNTY	COLLECTOR	DATE	NEW RECORDS
Camellia hiemalis	Camellia	*Prunevirus Camellia ringspot associated virus 2*	Camellia ringspot associated virus 2	nursery	12092021-7931	Alachua	Maria Velez-Climent	12/8/2021	State
Camellia hiemalis	Camellia	*Capillovirus Camellia ringspot associated virus 3*	Camellia ringspot associated virus 3	nursery	12092021-7931	Alachua	Maria Velez-Climent	12/8/2021	State
Camellia hiemalis	Camellia	*Idaeovirus Camellia yellow ringspot virus*	Camellia yellow ringspot virus	nursery	12092021-7931	Alachua	Maria Velez-Climent	12/8/2021	Continental USA Record
Camellia japonica	Camellia	*Apscaviroid Apple fruit crinkle viroid*	Apple fruit crinkle viroid	nursery	11152021-2341	Alachua	Maria Velez-Climent	11/13/2021	Host
Camellia japonica	Camellia	*Prunevirus Camellia ringspot associated virus 1*	Camellia ringspot associated virus 1	nursery	11152021-2341	Alachua	Maria Velez-Climent	11/13/2021	State
Camellia japonica	Camellia	*Emaravirus Camellia japonica associated emaravirus 1*	Camellia japonica associated emaravirus 1	nursery	11152021-2341	Alachua	Maria Velez-Climent	11/13/2021	Continental USA Record
Camellia japonica	Camellia	*Emaravirus Camellia japonica associated emaravirus 2*	Camellia japonica associated emaravirus 2	nursery	11152021-2341	Alachua	Maria Velez-Climent	11/13/2021	Continental USA Record
Camellia japonica	Camellia	*Badnavirus Camellia-associated badnavirus*	Camellia-associated badnavirus	nursery	11152021-2341	Alachua	Maria Velez-Climent	11/13/2021	State
Citrullus lanatus	watermelon	*Coguvirus Watermelon crinkle leaf-associated virus 1*	Watermelon crinkle-leaf associated virus 1	agricultural site	102222021-2543	Columbia	Nicholas Dufault	9/10/2021	State
Coffea arabica	coffee	*Hemileia vasatrix*	rust	residence	11052021-9024	Collier	Scott Krueger	11/4/2021	Continental USA Record
Ipomoea batatas	sweet potato	*Potyvirus Sweet potato feathery mottle virus*	Sweet potato feathery mottle virus	agricultural site	10222021-3312	Suwannee	Nicholas Dufault	9/16/2021	State
Ipomoea batatas	sweet potato	*Badnavirus Sweet potato pakakuy virus*	Sweet potato pakakuy virus	agricultural site	10222021-3312	Suwannee	Nicholas Dufault	9/16/2021	Continental USA Record
Ipomoea batatas	sweet potato	*Potyvirus Sweet potato virus G*	Sweet potato virus G	agricultural site	10222021-3312	Suwannee	Nicholas Dufault	9/16/2021	State
Ipomoea batatas	sweet potato	*Potyvirus Sweet potato virus 2*	Sweet potato virus 2	agricultural site	10222021-3312	Suwannee	Nicholas Dufault	9/16/2021	State
Ipomoea batatas	sweet potato	*Mastrevirus Sweet potato symptomless virus 1*	Sweet potato symptomless virus 1	agricultural site	10222021-9166	Suwannee	Nicholas Dufault	9/16/2021	Continental USA Record
Ipomoea batatas	sweet potato	*Potyvirus Sweet potato virus C*	Sweet potato virus C	agricultural site	10222021-9166	Suwannee	Nicholas Dufault	9/17/2021	State
Persea sp.	redbay	*Avsunviroid Avocado sunblotch viroid*	Avocado sunblotch viroid	agricultural site	09282021-4163	Nassau	Robert Leahy, Krystal Ashman	9/28/2021	Host
Solanum lycopersicum	tomato	*Amalgavirus Southern tomato virus*	Southern tomato virus	nursery	12152021-2596	Lee	Walter Golden	12/14/2021	State
Tabebuia heterophylla	tabebuia	*Prospodium tabebuiae*	rust	residence	10082021-4322	Miami-Dade	Cynthia Morales	10/1/2021	Continental USA Record
Zinnia elegans	zinnia	*Potyvirus Bidens*	Bidens	community	108964	Alachua	Robert Leahy,	8/16/2021	Host

NOTES FROM A GUEST

By Patti J. Anderson

Astronauts and Agriculture: a match made in the heavens?

Fall gardens usually produce a welcome bounty in Florida backyards, but what about in space? In the fall of 2021, astronauts on the International Space Station (ISS) enjoyed the rewards of gardening after harvesting peppers for tasty tacos. How is DPI involved?

DPI occasionally reviews permit applications to move seeds from other states to the NASA site in Florida for experiments in space. Agronomists are interested in the effects of microgravity on plants, and NASA is eager to find more sources of food for humans during extended stays away from earth. Although the permits seldom involve any plant species of concern to the state, the process reminds us astronauts and agriculture can have shared interests. Several permit applications have come to DPI for projects to test changes in seeds (such as lettuce and grapes) from exposure to space travel. This year, the fall garden was planted for food as well as research.

Seeds of the dwarf pepper cultivar *Capsicum annuum* 'NuMex Española Improved' were transported to the ISS and cultivated in a Plant Habitat-04 (a high-tech box) with the goal of producing at least one edible pepper. After 137 days (longer than the earthly average of 90 days for this early maturing cultivar), the first harvest took place in October 2021 and led to the tasty tacos. (The designation 'NuMex' indicates the pepper cultivar was developed at New Mexico State University.)

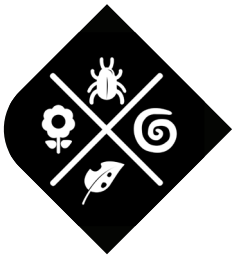
Since there were no space bees available, astronaut farmers used variable-speed fans to spread pollen and carried out some hand-pollination as well. A second harvest took place in November, providing enough peppers for more taste tests in space and for testing nutritional value and safety back in earth-bound laboratories. The tests will help determine any effects of growing the crop in microgravity.

What's next? NASA plans research experiments with growing dwarf tomatoes and several leafy greens. The ground-based team is also planning more harvests with microgreens, legumes and herbs to add variety to the astronaut diet. Cotton and algae are also subjects of future research now in the planning stages.

Will DPI plant inspectors soon be needed in space? Only if NASA decides to cash in on space crops and sell plants grown on the ISS.

Amazing! NASA Astronauts Make Tacos With Chillies Grown In Space - NDTV Food

***Capsicum annuum* 'NuMex Española Improved' in microgravity.**
Photo from NASA



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