


September 2020

Agricultural Research Partnerships (ARP) Network NOTES

Welcome to ARP Network Quarterly Notes! Our goal is to keep you informed about ARP Network and Agricultural Research Service's current information. We hope that the notes build networking opportunities for businesses to connect with ARP Network Members.

Please help us spread the word by sharing ARP Network Notes with your company contacts, colleagues, other organizations, etc. Thank you!

ARP Network

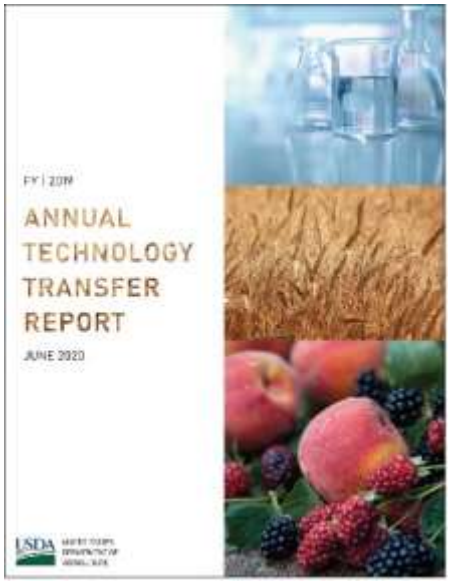
The ARP Network enlists the help of partners to spark economic development, entrepreneurship and community development. USDA ARS founded the ARP Network to expand the impact of ARS research and provide resources to help companies grow. By combining ARS research expertise with complementary capabilities and talents of partnering organizations, the ARP Network helps stimulate economic growth through technological advancements. The ARP Network matches business needs with ARS innovations and research capabilities and provides business assistant services to help companies and startups solve agricultural problems, develop products and create new jobs. Learn more by visiting us on LinkedIn: https://www.linkedin.com/in/agricultural-research-partnerships-arp-network-3863a8147

ARS Annual Report on Science, 2019

The ARS Annual Report on Science is a compendium of ARS research accomplishments that demonstrates ARS's impact on the food we eat, the water we drink, and the air we breathe. Every year, ARS discovers real-world solutions to agricultural challenges affecting our nation and a growing world. The agency positions itself strategically to address these challenges by gathering input from customers and stakeholders and conducting research that addresses programmatic research goals throughout a five-year cycles.

To learn more about ARS research programs, visit the ARS Office of National Programs homepage.

USDA Annual Report on Technology Transfer, FY19



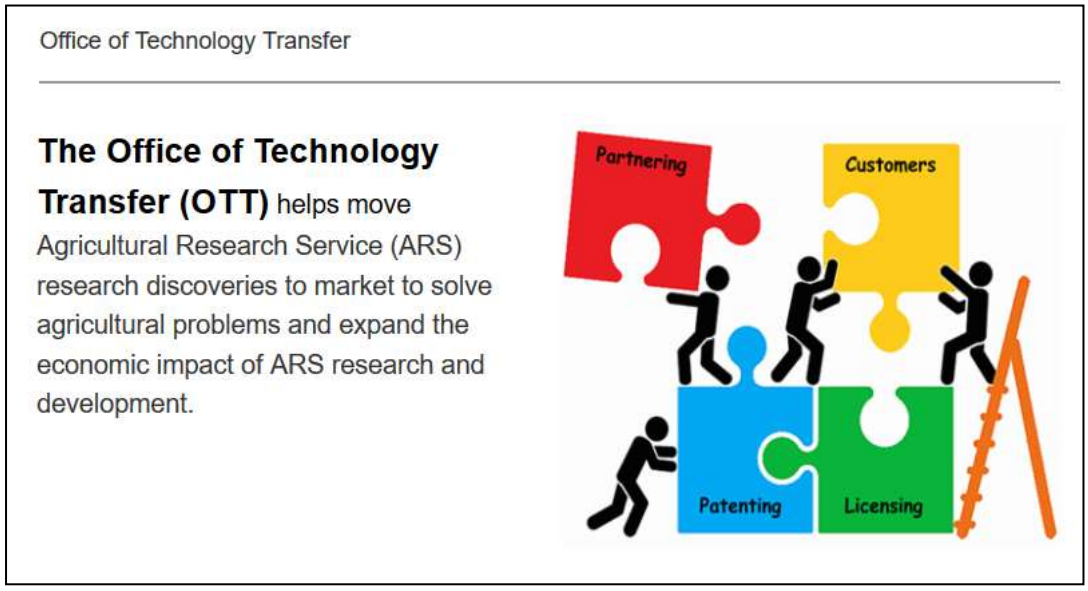
The report highlights innovations from scientists and researchers that are solving problems for farmers, ranchers, foresters, and producers; and creating opportunities for American businesses to thrive.

USDA's Technology Transfer Report revealed USDA's total number of income-bearing licenses in Fiscal Year 2019 was 510, total number of active Cooperative Research and Development Agreements (CRADAs) was 278, total number of CRADAs entered by USDA was 95, and total number of new patent applications filed was 97.

New agricultural innovations showcased include development of 'USDA Red,' the world's first red-leaf spinach that has 53 percent higher antioxidant capacity, and a new, responsive, web data collection system for the 2017 Census of Agriculture that enhances the web experience for agricultural producers responding to Ag Census surveys.

ARS Office of Technology New Website

Check out our new website: https://www.ars.usda.gov/ott



ARS Partnership and/or Licensing Opportunities

ARS is looking for industry partners interested in commercializing these technologies and/or evaluating them for potential commercial applications through a Cooperative Research and Development Agreement (CRADA). Many of these technologies are also available for licensing

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Novel Methods of Compositions to Evaluate and Determine Inactivation of Hazardous Biological Materials

Assays to determine that foodborne bacterial pathogens and other hazardous biological materials are adequately inactivated in food products. These assays/kits are time-temperature integrator assays that determine the inactivation of microbial food safety hazards in samples by quantifying the degradation of mitochondrial DNA using qPCR.

Benefits

- Quantitative and sensitive test
- Results obtained in 3 - 6 hours instead of days or weeks
- Continuous and rapid monitoring
- Assay food products directly

Applications

- Safety monitoring of thermally or microwaved processed fruits and vegetables
- Assay kits to evaluate and/or determine the amount of inactivation of biological material in food products and objects (e.g. reusable medical and dental devices)
- Evaluate inactivation protocols and deviations in processing to reduce the amount of viable biological material in or on items

ARS Docket nos. *42.13 + 61.20*. *Please contact Cathy Cohn*: cathleen.cohn@usda.gov

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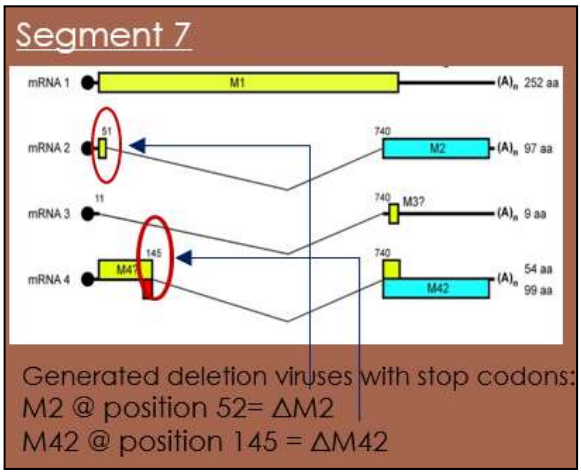
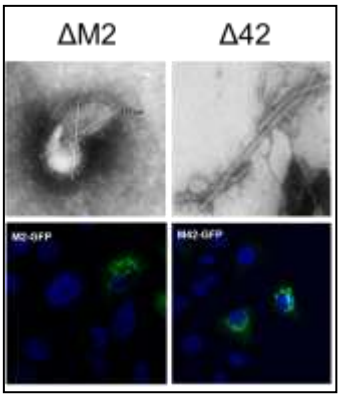
Live Attenuated Vaccine for Avian Influenza Virus

Novel, attenuated H5 influenza vaccines have been developed that do not express either the M2 gene or the M42 gene found on viral segment 7. A single dose of either vaccine provides poultry with complete protective immunity against highly pathogenic avian influenza challenge. Following application, the live virus vaccine does not transmit to susceptible animals.



Benefits



- Provides broad protection against all H5 HPAI lineages and recent 2.3.4.4 clades
- Induces mucosal, humoral and cellular immunity in birds
- Can be applied to protect from other avian influenza subtypes, and mammalian influenza including swine, equine, canine and feline

Applications

- Safe and efficacious vaccine to combat influenza viruses to prevent disease in animals and to reduce virus shedding that can be source of transmission, including humans

ARS Docket No. 134.18. *Please contact Cathy Cohn*: cathleen.cohn@usda.gov

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Recombinant vaccine against Marek's disease and Newcastle disease

A novel, recombinant dual vaccine against Marek's disease and Newcastle disease has been developed using reverse genetics technology. This vaccine is safe and stable and can be lyophilized or stored and transported at an amble temperature. Vaccine generation and vaccination methods are included in the invention.

Benefits

- Provides dual protection against Marek's disease and Newcastle disease
- Eliminates the "cold chain" requirement for Marek's disease vaccine production, storage, and transportation
- Can be delivered by mass immunization routes (e.g. aerosol, drinking water) to large chicken populations at an extremely low cost

Applications

- Safe, stable and efficacious vaccine to prevent Marek's disease and Newcastle disease in chickens, and to reduce vaccination and poultry production costs

ARS Docket no. 34.19. *Please contact Cathy Cohn*: cathleen.cohn@usda.gov

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New Lighting System Helps Deer Avoid Vehicles at Night

These images show the difference in the "looming" appearance of approaching vehicles equipped with headlights (top) versus headlights plus the new rear-facing LED light (bottom).

Through a series of experiments with free-roaming white-tailed deer, researchers at the U.S. Department of Agriculture's (USDA) Wildlife Services (WS) program found the use of a light that illuminates a larger portion of the vehicle's front surface than standard headlights alone–resulted in fewer dangerous deer-vehicle interactions. The likelihood of dangerous interactions decreased from 35% to only 10% of vehicle approaches towards deer when using a rear-facing light plus headlights versus just headlights alone. The reduction in dangerous interactions appeared to be driven by fewer instances of immobility or "freezing" behavior by deer when the rear-facing light was used. The study "Frontal vehicle illumination via rear-facing lighting reduces potential for collisions with white-tailed deer" is highlighted in the latest issue of the journal *Ecosphere*.

The patent-pending technology can be incorporated as an after-market device, like a brush guard or bumper, or can be embedded in the vehicle as part of the manufacturing process.

To learn more, please visit:
YouTube – https://youtu.be/g99uN1kk94s or Facebook – https://www.facebook.com/1430WNAV/videos/2185289248281168

Article – https://www.aphis.usda.gov/aphis/newsroom/stakeholder-info/sa_by_date/sa-2020/sa-07/nwrc-deer-lights

USDA is currently seeking a licensing partner to build and market the technology. For more information, please contact NWRC's Technology Transfer Program Manager John Eisemann: john.d.eisemann@usda.gov.

A Nematicide Having Low Toxicity Made from Corn Starch and a Vegetable Oil Derivative

When water-insoluble corn starch is combined with a water-insoluble fatty amine salt (from vegetable oil) at elevated temperature using a common industrial technique, an amylose inclusion complex is formed which acts as a nematicide.

Benefits

- Orders of magnitude safer than current nematicides
- Ease of application
- ~100% Biobased and biodegradable
- Ingredient costs less than $1/lb

Damage caused by plant-parasitic nematodes to raspberry (left) and wheat (right). Smaller plants

Applications

- Ease of use and safety makes this ideal for controlling nematodes in the home garden
- Cost makes this an ideal addition to a multi-faceted approach to controlling nematodes in agricultural settings

Docket No: 128.18. Please contact Renée Wagner: renee.wagner@ars.usda.gov

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Antibodies to Lethal Mushroom Toxins

Amatoxins are produced by some wild mushrooms, such as Death Cap mushrooms which could be mistakenly identified as one of the choice edible *Amanitas*. Amatoxin-producing *Amanita* are responsible for most of the serious mushroom poisonings.

Most current methods to detect amatoxins are time consuming and require expensive instrumentation. Novel monoclonal antibodies were developed against lethal amatoxins (amanitins). These antibodies can be used in a portable, easy-to-use, diagnostic test strip to quickly determine amatoxin poisoning in humans and dogs, as well as for presence of the toxin in a mushroom. Fast and sensitive detection of mushroom poisonings is critical for timely medical treatment.

Benefits

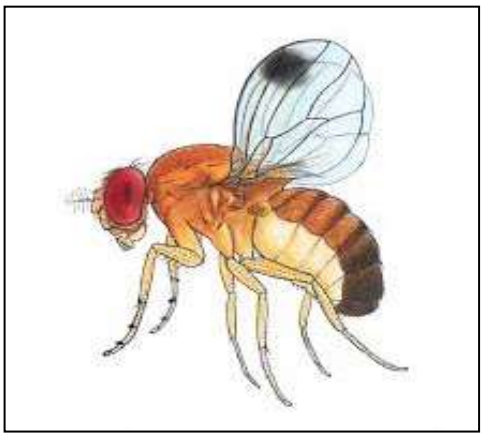
- Early diagnosis of amatoxin poisoning can help prevent deaths (in humans and dogs)
- Antibodies help produce highly-purified amanitin for cancer therapy and as a reference standard for research

Applications

- Rapid detection of deadly amatoxins from clinical samples (urine) and mushrooms
- Concentration and purification of amatoxins
- Potential therapeutic in the treatment of amatoxin poisonings
- A tool for easily, rapidly and safely determining amatoxin-containing mushroom species

ARS docket no. 21.19. *Please contact David Nicholson:* david.nicholson@usda.gov

Sweetly Control Fly Pests



Insect dipteran pests damage a wide range of agricultural crops and livestock, and transmit a variety of vector-borne diseases to humans. Current control methods heavily depend on non-specific chemical insecticides which negatively impact the environment and human health and can lead to chemical resistance. There is a need to replace current control methods with environmentally friendly alternatives. ARS has developed an insecticidal formulation based on non-nutritive sugars to control spotted-wing drosophila adults, and it has potential to control other fly pests and mosquitoes.

Benefits

- The artificial sweetener formulation is a biologically-based insecticide
- Could be an organic control alternative to chemical insecticides
- Provides a safe and simple method

Applications

- The sugar formulation can be sprayed directly on berry crops including blueberry plants
- This formulation can be used as a delivery agent or feeding attractant combined with conventional or biological insecticides to enhance insecticidal efficacy
- The method can be expanded to other Dipteran pests

ARS Docket no. 47.19. *Please contact David Nicholson*: david.nicholson@usda.gov

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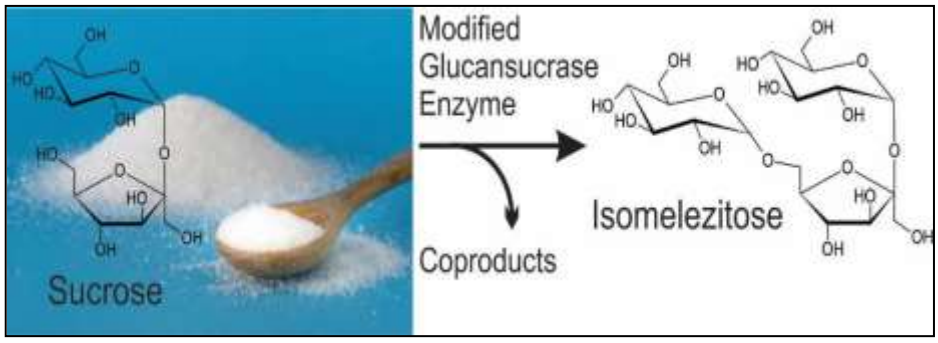
Enzymatic Synthesis of a Novel Bioprotectant



ARS has engineered an enzyme to produce high yields of a rare sugar, called isomelezitose. Similar types of sugars, such as trehalose, are known to have bioprotective properties that minimize damage to proteins from heat, freezing, or drying; and are therefore extremely important to the pharmaceutical, agricultural, and food industries. Isomelezitose was originally found in trace amounts in honey, but efforts to produce this

compound were hampered by inefficient synthesis methods. This technology allows the valuable isomelezitose sugar to be produced in commercial quantities.

Benefits

- High product yield from a simple enzymatic conversion of inexpensive sugars
- Demonstrated ability to maintain bacterial viability when added to cultures during drying

Applications

- Low-calorie sweetener that does not promote tooth decay
- Improved long-term stability of foods, drugs, vaccines, cells and bacterial cultures
- Potential prebiotic food ingredient for improved intestinal health

ARS Docket no. 19.16. *Please contact Renee Wagner:* renee.wagner@ars.usda.gov

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Use of Modified Cyclodextrins to Promote Honey Bee Health

Modified cyclodextrins are functionally capable of conferring several protections to honey bees. This includes the ability to: sequester pesticides from bees, bolster immune responses against viruses, increase overwintering success, and lowering the level of Nosema parasites found in early spring bees. ARS developed a novel formulation compatible with common beekeeping practices that can efficiently deliver cyclodextrins directly to honey bees.

Benefits

- Sequesters pesticides from bees
- Bolsters immune response against pathogens
- Significantly improves overwintering success, specifically in the presence of miticides
- Reduces levels of Nosema parasites within the gut of honey bees

Applications

- Simple and safe formulation that meets all FDA requirements, and uses are consistent with contemporary commercial, sideline, and backyard beekeeping practices. Additionally, provides benefits to bees from multiple issues associated with their pesticide detoxification and immunity.

ARS Docket no. 122.18. Please contact Jim Poulos: jim.poulos@usda.gov

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Methods of Attracting *Drosophila Suzukii*

A Method of attracting *Drosophila suzukii,* involving treating an object or area with a chemical attractant composition based on volatiles that attract *Drosophila suzukii*.

Benefits

- The compound is a synthetic natural attractant based on fruits
- The method provides a means of early detection and population monitoring of *Drosophila suzukii*

Applications

- Infestation detection and monitoring
- Could potentially enable future development of mass trapping and mating disruption technologies for managing this pest

ARS Docket No. 148.18. Please contact Jim Poulos: jim.poulos@ars.usda.gov

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System for Cleaning Fresh and Fresh-Cut Produce

A system and method for cleaning and sanitizing fresh-cut produce. The approach is to use an upwardly-directed spray, with one or more water jets of sanitizer solution, to remove organic exudate foreign materials and microorganisms from fresh-cut produce immediately after the produce exits the cutter blades. The system is designed so that as the produce falls, it is impacted, reoriented, cleaned, and/or sanitized by the produce-washing liquid.

Benefits

- Minimizes the use of chlorine (or other sanitizers) and reduces the volume of water used

Applications

- A system and method to quickly and efficiently remove organic exudate, field debris and soil particulates from freshly-cut produce

ARS Docket nos. 42.19 + 161.15. Please contact Jim Poulos: jim.poulos@ars.usda.gov

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Processes and Treatment Systems for Treating High Phosphorus Containing Fluids

A process for treating manure slurries to concentrate manure particulate matter into solid form that is easily transportable. The process involves liquid-solid separation and chemical treatment where greater than 90% of the total phosphorous is concentrated into solid form while most of the nitrogen remains in the liquid.

Benefits

- Economical
- The system can be compact and mobile

Applications

- Efficiently remove livestock manure phosphorus from areas of excess to areas of shortfall

ARS Dockets: 45.14 + 165.17. Please contact Jim Poulos: jim.poulos@ars.usda.gov

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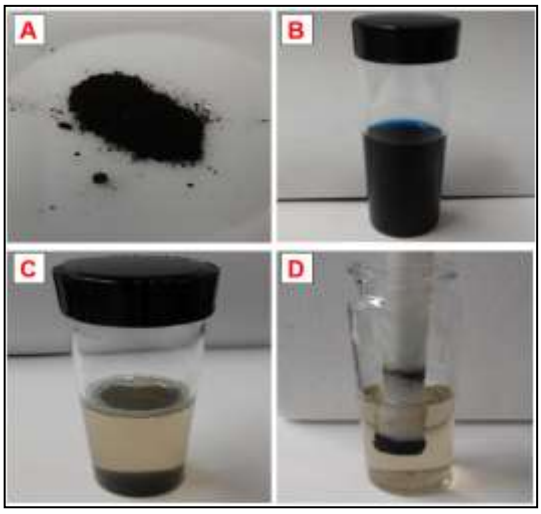
Hemoglobin/Iron Oxide Composite for the Removal of Organic Dye



A novel hemoglobin/iron oxide composite for the removal of organic dyes and other contaminants from wastewater. The composite has high removal efficiency for all the different classes of dyes studied. It possesses the extra advantage of being easily recovered after use using a magnet. The used composite can be regenerated and re-used many times.

Benefits

- Easy synthesis
- Re-usable
- Minimization of agricultural waste
- Low Cost

Applications

- Removal of dyes and other contaminants from industrial process water

ARS Docket No. 177.16 + 57.20. Please contact Jim Poulos: jim.poulos@usda.gov

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An Economical X-ray Based Irradiator with High Dose Uniformity and Precision

A cabinet style irradiator employing standard commercially available x-ray components in a novel configuration that allows for precise dosimetry in real-time along with unprecedented uniformity of radiation dose among samples.

Benefits

- Substitute for gamma irradiation using radioisotope-based sources and subsequent reduction in cost, regulations, and safety concerns for operators
- High dose precision and uniformity
- High reliability and proven ruggedness

Applications

- Insect sterilization for Sterile Insect Control technique
- Irradiation of small samples such as seeds, nuts, grain, sprouts or rice

ARS Docket nos. 38.20. *Please contact David Nicholson*: david.nicholson@usda.gov

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System for Non-invasive Measurement of Soil Chlorine

A device for making non-invasive measurements of chlorine elemental content in situ from the surface of the soil. The device is a portable field unit using a neutron generator positioned on the surface of the soil to generate fast neutrons that penetrate the soil. The device makes measurements in a large volume of soil and can determine the Cl content regardless of chemical component present. Results are generated immediately following scanning. The device can be utilized for the remediation of contaminated soil for contaminates such as polychlorinated biphenyl (PCB) and perchlorate.

Benefits

- Non-invasive measurements of Cl content in soil
- Large volume soil sampling and immediate results
- The large sample volume reduces uncertainty from site sampling and immediate results facilitates planning for soil remediation
- Detection of any Cl containing contaminate without specific laboratory analysis

Applications

- This device can be used to detect Cl containing contaminates without the costly soil sampling, preparation, and laboratory analysis normally required

ARS Docket No. 125.19 + 112.15. Please contact Cathy Cohn: cathleen.cohn@usda.gov

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Available Technologies for Licensing

Each year, approximately 60 new patents are issued by the U.S. Patent Office for USDA inventions. The Office of Technology Transfer (OTT) transfers these inventions through licenses to the private sector for commercialization. Click here for a link to *recently filed* U.S. patent applications that are available for licensing.

Snapshot of ARS Technology Transfer

A brief information sheet that highlights some ARS Technology Transfer metrics and commercial products resulting from ARS Research. Click here to read.

Resources for Businesses

Some resources for small businesses at USDA and other Federal agencies. Click here to read.

Tellus

Tellus is a digital experience that features stories about the cutting-edge work at ARS. **Tellus**, Latin for Earth, reflects the global reach of our efforts to feed a growing population while remaining good stewards of the land. Click here for the latest articles.

Using Perennial Grasses for Bioenergy and Other Sources

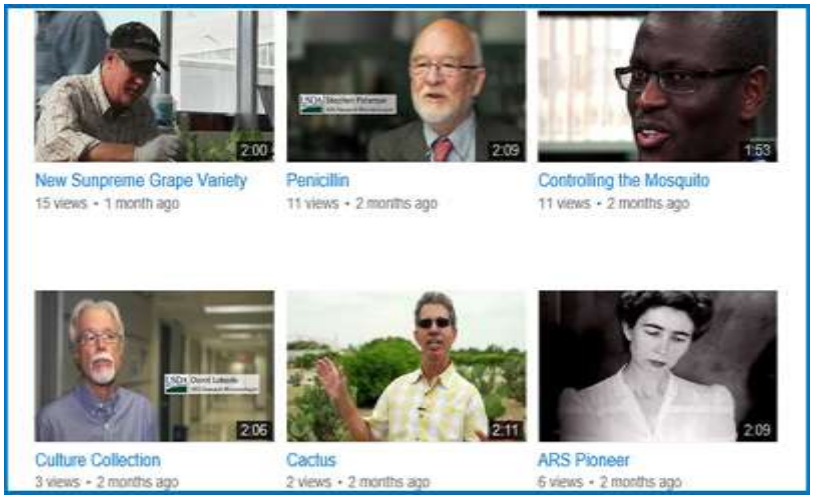
ARS Latest News

USDA's ARS is a leading source for U.S. agricultural research. The ARS vision is to lead America towards a better future through agricultural research and information. Click here for the latest news.

A beneficial fungal "tenant" of wheat plants could help protect them from another fungus that causes scab disease and other harm.

USDA-ARS YouTube Channel

Did you know that ARS is on YouTube? Explore our new YouTube channel to see how our research touches your life: [USDA-ARS YouTube Channel]



ARS

The Agricultural Research Service (ARS) is USDA's primary internal research agency. ARS conducts research to develop and transfer solutions to agricultural problems that are both national and international in scope. ARS has nearly 2,000 scientists nationwide and a few in overseas locations. ARS scientists carry out 690 research projects on a variety of subjects. ARS has a Congressional mandate to disseminate the research findings of these projects to the American public and other interested parties. Learn more by visiting: http://www.ars.usda.gov

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