



September 2017

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 statewide with your company contacts, colleagues, other organizations, etc. Thank you!

ARS

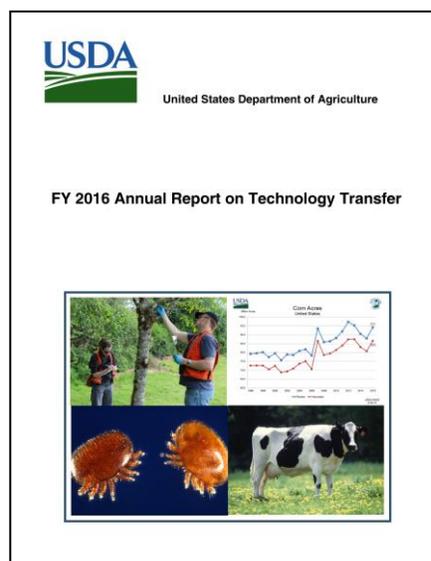
The Agricultural Research Service (ARS) is USDA's primary internal research agency. ARS conducts research to develop and transfer solutions to agricultural problems that are both national and international in scope. ARS has nearly 2,000 scientists nationwide and a few in overseas locations. ARS scientists 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>.

ARP Network

The ARP Network enlists the help of partners to spark economic development, entrepreneurship and community development. USDA ARS founded the ARP Network in an effort 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: <https://www.ars.usda.gov/business/Docs.htm?docid=24715>.

USDA Technology Transfer Report Highlights “Made in America” Research

U.S. Secretary of Agriculture Sonny Perdue has announced that USDA research generated 244 new inventions and 109 patent applications in the 2016 fiscal year. These innovations included gene-silencing technology that controls mosquito populations, a tool to identify bee mites and hand-held imaging tools to detect meat contamination. The Secretary released USDA’s annual Technology Transfer Report, which listed the technology produced through research either conducted or supported by USDA. The 559-page report outlines the public release and adoption of information, tools and solutions developed through USDA’s agricultural research efforts, collaborative partnerships, and formal Cooperative Research and Development Agreements. The innovations outlined in the report show how these efforts have translated into public-private partnerships that help American agriculture and other businesses compete in the world marketplace.



For more information, please read the Fiscal Year 2016 [Annual Report on Technology Transfer](#).

ARS Partnership Opportunities

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

Process Capabilities for Industrial Pilot Scale Applications

The Plant Polymer Research Unit at the National Center for Agricultural Utilization Research in Peoria, IL is seeking industrial or academic partners who anticipate the need for biobased polymer processing and characterization in the near future. The NCAUR Pilot Plant can compound, process, form, and characterize polymer resins and materials in a scalable fashion. Expertise in formula development of biobased resins and composites, design of extrusion parameters, and data analysis are available.

For more information, please read the National Center for Agricultural Utilization Research (NCAUR) [Pilot Plant brochure](#).

Please contact: Dr. Victoria Finkenstadt: victoria.finkenstadt@ars.usda.gov

Non-Nutritive Sugar-Based Control for Spotted Wing Drosophila

Spotted wing drosophila, *Drosophila suzukii*, damages a wide range of fruits including all berry and cherry crops. Current control methods depend on non-specific chemical insecticides which negatively impact the environment, human health and can lead to potential 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.

Benefits

- The artificial sweetener formulation is a biologically-based insecticide which is non-toxic and organic control alternative to chemical insecticides

Applications

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

The research results have been published on two peer-reviewed papers:

<http://dx.doi.org/10.1016/j.jinsphys.2017.04.001>; <http://dx.doi.org/10.1016/j.jinsphys.2017.07.015>

Please contact David Nicholson: david.nicholson@ars.usda.gov

Protein-Cyanoacrylate Nanoparticles that Improve Wetting Properties of Materials

Nanoparticles formed of a protein-poly (alkyl-cyanoacrylate) or protein-poly (alkenyl-cyanoacrylate) copolymer used as a surface treatment to alter the wetting properties of a variety of different materials. The nanoparticles are generated using a mild chemical reaction and proteins derived from agricultural sources. These new materials change the wetting properties of hydrophobic surfaces by adsorbing to the surface and rendering them hydrophilic.

Benefits

- When the nanoparticles are used as a coating material for transparent materials such as glass and transparent plastics, the surface wetting characteristics are modified without affecting the transparency
- When the aqueous suspension of the developed nanoparticle is sprayed on the surface of target material, the nanoparticle adsorbs in a matter of seconds

Applications

- As a surface treatment to alter wetting properties of a variety of materials such as glass panels and acrylic sheets
- Could be used for improving visibility of windshields, mirrors and goggles
- This surface-modifying property can also be used on stainless steel, porcelain and polymer films made of non-transparent plastics

U.S. Patent No. 9,062,151.

ARS Docket no. 131.11. Please contact Renee Wagner: renee.wagner@ars.usda.gov

Bio-based Methacrylic Acid and Other Alkenoic-Derived Monomers via Catalytic Decarboxylation

Methacrylic acid is an important commodity monomer used for the production of many commercially significant polymers, most notably acrylic glass. The traditional route to methacrylic acid is petrochemically-based and involves the reaction of acetone with concentrated sulfuric acid and hydrogen cyanide. A novel method has been developed for selective catalytic decarboxylation to produce the organic acid, which consists of reaction of simple sugars from natural sources with appropriate catalysts in an aqueous solvent. This method can be used for synthesis of acrylic acid and other related monomers and provides an approach that can provide a renewable alternative to the current methods, thus further reducing the environmental impact of and demand for petroleum products.

Benefits

- A viable, bio-based alternative to producing methacrylic acid instead of using petrochemicals
- Requires lower operating temperatures and pressures and higher product selectivity than other bio-based methods, thus affording economical production of methacrylic acid

Applications

- A bio-based method for producing methacrylic acid

ARS Docket No. 70.14. Please contact Renee Wagner: renee.wagner@ars.usda.gov

Starch Amine Complexes for Increased Water Resistance of Paper

Methods for increasing the hydrophobic, water-repelling properties of the surface of a cellulosic article such as paper, cotton or cotton blends. Complexes that are prepared from natural products are applied to cellulosic material form a water resistant coating that retards water penetration. The complexes are environmentally friendly, water soluble and prepared from low cost corn/rice starch. The process could be used in conjunction with current paper sizing equipment.

Benefits

- Environmentally friendly method using biodegradable renewably sourced materials
- Complexes are prepared from low cost corn/rice starch
- The magnitude of the water resistances may be adjusted
- The products are water soluble complexes and do not need to be emulsified or cured
- Process could be used in conjunction with current paper sizing equipment

Applications

- Production of hydrophobic, water-repellant paper or cotton

ARS docket No. 96.15. Please contact Renee Wagner: renee.wagner@ars.usda.gov

Soil Respirometer

The technology is a partially automated soil respirometer for use in conjunction with the “Haney Test” – an ARS award winning soil-testing procedure. This device tests for soil CO₂ respiration, a measure of the microbial activity in soil, and is further able to estimate possible fertilizer Nitrogen reductions in soil, thus protecting farmers and the environment from over fertilization, a valuable cornerstone of soil health testing data. ARS Researchers have built this device for roughly \$6000. Current methods for this type of testing range from \$8 per sample to over \$20 per sample. If a soil-testing lab ran 10,000 samples a year testing soil respiration using this device, the range in savings to soil test laboratories is estimated to be from \$80,000 to \$200,000 dollars per year.

Benefits

- This device gives laboratories the ability to test soil respiration from a wide array of samples accurately and quickly, with an excellent detection range and an inexpensive per sample cost

Applications

- Commercial soil testing labs to test for soil CO₂ respiration

ARS Docket No. 67.17. Please contact Jeff Walenta: jeffrey.walenta@ars.usda.gov

Multi-Sample Soil Respirometer

This machine is a near-real time monitoring device of soil respiration for up to 42 soil samples. The soil samples can be given a variety of food sources (carbon) to measure their response as CO₂. It uses software, a series of solenoids, check-valves, tubing, lab jacks and mason jars to arrive at the necessary data for analysis.

Benefits

- This instrument is valuable as a research tool or multi sample commercial testing device in that it has high versatility to study soil microbial activity from specific soils with custom designed inputs to help us better understand the dynamics of soil microbial activity under a variety of conditions

Applications

- For Agricultural researchers to quickly assess the impact of various chemicals on the soil microbial community as a whole
- For developing cover crop planning recipes for farms
- For commercial soil testing labs to determine cover crop selection for farmers and ranchers based on the results from their soil

ARS Docket No. 46.17. Please contact Jeff Walenta: jeffrey.walenta@ars.usda.gov

ARS Partnership and/or Licensing Opportunities

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

Applications

- Removal of dyes and other contaminants from industrial process water

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

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 contaminants 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 contaminants without the costly soil sampling, preparation, and laboratory analysis normally required

ARS Docket No. 112.15. Please contact Joe Lipovsky: joe.lipovsky@ars.usda.gov

System for Non-invasive Measurement of Nitrogen

A device for making non-invasive measurements of nitrogen (N) elemental content in situ of N containing material. The device is a portable field unit using a neutron generator positioned near the material. The device makes measurements in a large volume and can determine the N content regardless of chemical components present. Results are generated immediately following scanning. The device can be utilized for measuring N in manures or compost or can be used for the detection of large N containing objects such as explosives.

Benefits

- Non-invasive measurements of N content in material
- Immediate results without sample preparation or laboratory analysis
- Immediate results allows for no lag time resulting in timely determination of compost processing and N content for fertilizer application
- Detection of any N containing material without specific laboratory analysis, such as for explosives

Applications

- Can be used to measure N content in materials without the costly laboratory analysis
- Can be used to detect explosives and to determine the likely explosive material type

ARS Docket No. 112.15. Please contact Joe Lipovsky: joe.lipovsky@ars.usda.gov

Antibacterial Peptides to Control Plant Diseases

Novel, antibacterial peptides have been designed that include both recognition and cleavage sequences, with high affinity for plant gram-negative bacterial pathogens, and more specifically, *Xanthomonas citri* spp. *citri* and *Candidatus Liberibacter asiaticus*. Genetically altered plants producing these peptides show remarkable resistance against citrus canker and HLB.

Benefits

- Provides broad protection against *Xanthomonas citri* spp. *citri* and *Candidatus Liberibacter asiaticus*

Applications

- Prevent and reduce spread of citrus canker and HLB diseases

U.S. Patent No. 9,725,734

ARS Docket No. 23.15 + 124.17. Please contact Joe Lipovsky: joe.lipovsky@ars.usda.gov

Small Hive Beetle Aggregation Pheromone

ARS has discovered and subsequently isolated and synthesized the small hive beetle aggregation pheromone. This pheromone serves as an effective attractant for adult beetles of both sexes. The pheromone may be placed within a trapping device for capturing adult small hive beetles.

Benefits

- Efficient pheromone-based trapping systems are the key to population reduction
- This system is cost effective and provides the necessary control measures for management or eradication of the small hive beetle

Applications

- The trapping system can be employed within an apiary for monitoring and control of the small hive beetle
- This technology will help give control of this invasive species that is effecting honey bee survival throughout the United States

ARS Docket No. 11.16. Please contact Joe Lipovsky: joe.lipovsky@ars.usda.gov

Methods of Attracting *Drosophila suzukii*

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

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. 58.16. Please contact Jim Poulos: jim.poulos@ars.usda.gov

Method for Controlling Fungal Plant Pathogens Using a Combination of UV Radiation Followed by Antagonist Application and Dark Period

Strawberries are available throughout the year either from production in the field or from high and low tunnel culture. Diversity of production conditions results in new challenges in controlling diseases before and after harvest. ARS found that UV-C irradiation followed by a dark period kills two major pathogens of strawberry, *Botrytis cinerea* and *Colletotrichum acutatum*. The UV-C irradiation and dark period is followed by repopulation with beneficial biocontrol microorganisms. A mobile treatment apparatus was designed to provide the appropriately timed UV-C doses, dark period, and sprayable doses of biocontrol microorganisms.

Benefits

- The UV-C dose and repeated exposure does not affect pollen germination or cause chlorophyll degradation in strawberry leaves
- Fruit can be harvested on a daily basis unlike when using fungicides
- Minimizes the use of herbicides and fungicides

Applications

- To kill strawberry pathogens in high tunnel and open field production
- Provides opportunities to optimize the effectiveness of biocontrol agents

ARS Docket No. 119.17. Please contact Jim Poulos: jim.poulos@ars.usda.gov

Biopesticide Auto-Dissemination Method and Apparatus

The Asian citrus psyllid (ACP) harbors the bacterium that causes Huanglongbing or citrus greening disease, the most devastating citrus disease in the United States and the world today. Eradication of ACP is considered an important mechanism for control of citrus greening. ARS researchers have observed that the Asian citrus psyllid is susceptible to certain pathogenic fungi, which may be useful in suppressing ACP populations in situations where chemical control is prohibitive. ARS researchers working with Texas A&M University and University of Florida have developed formulations of pathogenic fungi that suppress ACP populations. Also developed is a biopesticide auto-dissemination apparatus structured to attract the insects, distribute the fungi and efficiently eradicate Asian citrus psyllids or other insects that exhibit "thigmotaxis" behavior.

Benefits

- Currently there are no means of controlling or suppressing ACP in dooryard citrus absent highly invasive and difficult measures such as tree removal
- The auto disseminator is simply hung from a tree branch

Applications

- ACP is susceptible to pathogenic fungi, which may be useful in suppressing ACP populations in situations where chemical control is prohibitive, such as residential areas (referred to as 'dooryard' citrus by growers)
- When ACP contact the auto-disseminator, a biopesticide deposited in the substrate pleats infects and ultimately kills the ACP
- Could be used by homeowners in neighborhoods near commercial citrus orchards

ARS Docket No. 5.10. Please contact Jeff Walenta: jeffrey.walenta@ars.usda.gov

Chromobacterium Species with Insecticidal Activity

A novel species of Chromobacterium that can selectively kill insect larvae in general, and more specifically Lepidopteran species (such as, gypsy moth, diamondback moth, tobacco hornworm larvae, and cabbage looper larvae). Compositions containing Chromobacterium strains and the use of these compositions to kill insect larvae are covered by the pending U.S. and PCT patent applications. These compositions kill the indicated larvae at least as well as or better than some *C. subtsugae* biocontrol agents.

Benefits

- Biocontrol agent
- Some species of Lepidoptera have become resistant to currently used pesticides. Thus a need exists for new biocontrol agents

Applications

- This invention covers an insecticidal bacterium that can be used to kill lepidopteran insect larvae without harming non-target insect larvae

ARS Docket No. 109.15. Please contact Jim Poulos: jim.poulos@ars.usda.gov

Chlorine Dioxide Gas Releasing Package Insert for Enhancing Microbial Safety of Food and Non-Food

A novel, biobased package insert that can generate and release chlorine dioxide gas at levels sufficient to inactivate microorganisms on food and non-food products. This insert offers several desirable attributes for commercialization: 1) ease of manufacturing; 2) flexibility of design to manipulate the concentration and the rate of release; 3) economically feasible; 4) simple activation process and application into a package.

Benefits

- Acts as a secondary disinfection treatment against a variety of pathogenic and spoilage microorganisms for post processing of food and non-food products
- The design of the insert can be adjusted to manipulate chlorine dioxide concentration and release rate to meet specific product needs
- Safe, environmentally friendly, easily incorporated into the packaging line and economically feasible

Applications

- This packaging insert is a versatile solution to enhance the microbial safety and the shelf-life of a variety of packaged food and non-food (e.g. medical equipment) products

ARS Docket No. 154.15. Please contact Jim Poulos: jim.poulos@ars.usda.gov

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 No. 161.15. Please contact Jim Poulos: jim.poulos@ars.usda.gov

Use of Nitrogen-Containing Compounds as Plasticizers for Peptide-Based Biopolymers

A method of reducing the melting point of a peptide-based biopolymer, such as keratin or silk, using a nitrogen-containing compound as a plasticizer.

Benefits

- The peptide-based processed biopolymers are malleable, digestible and biodegradable
- Using nitrogen-containing compounds as plasticizers lack the problems of using urea or petroleum-based plasticizers

Applications

- Produce animal feed to increase the adsorption of amino acids (for mammals, fish, birds, amphibians and reptiles)
- Produce fertilizer

- Produce substitutes for petroleum-based plastics

ARS Docket No. 104.14 + 120.17. Please contact Jim Poulos: jim.poulos@ars.usda.gov

Barley Mutant Lines Having Grain with Ultra-High Beta Glucan Content

A barley plant having grain with ultra-high beta-glucan content and total fiber.

Benefits

- A lower starch, but not empty endosperm line like other high beta-glucan lines
- Could provide high beta-glucan flour that is used in various food products
- Plants have normal looking morphology

Applications

- Use as an critical parental line to significantly boost beta-glucan content in food barley cultivars
- Use as parental line to significantly boost total dietary fiber in food barley development
- Directly use it as dietary fiber extraction source

U.S. Patent No. 9,681,620

ARS Docket No. 53.12

Please contact David Nicholson: david.nicholson@ars.usda.gov

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. Here is a link to *recently filed* U.S. patent applications that are available for licensing. This list is updated monthly so check back often! <http://www.ars.usda.gov/Business/Business.htm>.

ARS Technology Transfer at a Glance:

<https://www.ars.usda.gov/ARSUserFiles/ott/TT%20at%20a%20Glance.pdf>

Resources for Businesses:

<https://www.ars.usda.gov/ARSUserFiles/ott/ARS%20Resources%20for%20Businesses.pdf>

ARS Digital Online Research Magazine

AgResearch is a monthly publication highlighting short features on the scientific research discoveries occurring at all of ARS' research laboratories across the Nation and abroad. View *AgResearch* at <http://agresearchmag.ars.usda.gov>. One can subscribe to electronic delivery of the magazine on the website.



USDA Blog

Check out USDA Blog site for updates on Agricultural issues: <http://blogs.usda.gov>. One can sign up for email updates on the website by checking boxes of categories of interest including the blog, news categories and social media.

We are seeking contributions for future ARP Network Notes from members who wish to share information that would be of interest to the group. Suggestions include events, Ag challenges and community initiatives. For ideas of content for future notes, please contact Cathy Cohn at cathleen.cohn@ars.usda.gov.

Get more information: www.ars.usda.gov



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September 2017