


September 2019

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

Discover the New, Updated LabTech in Your Life - Explore Commercialized Technologies!

LabTech in Your Life is a virtual experience that showcases the everyday places and spaces where you find and interact with USDA and other federal technologies. The FLC is excited to release several upgrades to this virtual platform that now features nearly 50 federally developed commercialized technologies, 7 tour stops, and an all-new look and feel throughout each virtual space. Visit www.labtechinyourlife.com

Note: The LabTech environment is best viewed via Chrome or Safari web browsers

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

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

Two-line Breeding System in Sorghum

A novel, two-line breeding system based on a stable nuclear male sterile mutant *ms8* and its gene. The breeding system is efficient because it doesn't require breeding for A/B pair or R lines. The principle and method are described in the PC Publication No. WO2019/136174

Benefits

- Sorghum hybrids can be created by pollinating the bridge plants with any elite line or natural collection
- Simplified breeding process and more hybrid vigor
- Avoid devastating diseases that attack sorghum hybrids made with A1 cytoplasm

Applications

- Efficiently create hybrids for any type of sorghum, especially for biomass or special use sorghums, for which the traditional three breeding system is not well-established.

ARS Docket No. 68.17. *Please contact Jeff Walenta:* jeffrey.walenta@usda.gov

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Bioactive Peptides to Control and Deter Pest Slugs

Synthetic bioactive peptides have been developed from slug and insect neuropeptides that repel and deter slugs from feeding on agricultural plants. These peptides can be synthesized using standard laboratory equipment. Effective results can be obtained by applying the peptides directly to the pest or its environment.

Benefits

- Deter slugs, including the gray garden slug (*Deroceras reticuatum*)
- Peptides are specific and don't kill non-target and beneficial organisms
- Novel peptides are commercially viable
- Highly unlikely that pests will acquire chemical resistance to the synthetic peptides

Applications

- Simple and specific peptide that can be applied directly to the slug, plant, or soil. can be either through aircraft or personnel with backpack applicators

ARS Docket No. 22.19. *Please contact David Nicholson:* david.nicholson@usda.gov

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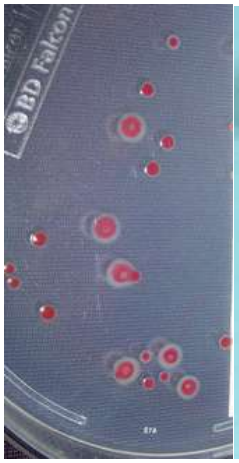
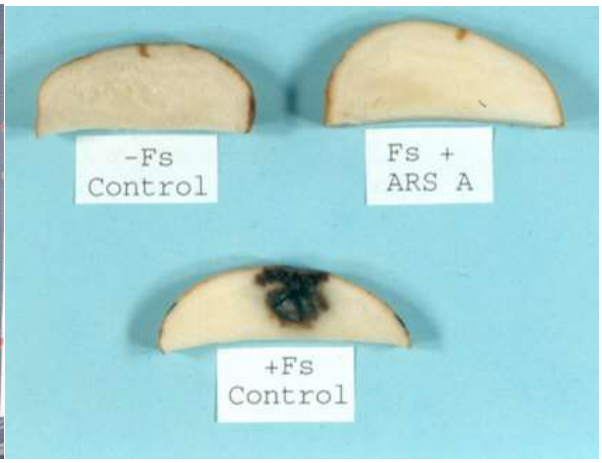
Desiccation Resistant *Pseudomonas*





Novel Pseudomonas strains were generated using adaptive laboratory mutagenesis to repetitively challenge the parent population during exposure to stressed conditions of growth, drying, long term dry storage and rehydration. Resistant variants were isolated and ranked based on high viable cell yield, recovery after dry storage, suppression of potato disease, and rapid growth on low cost medium, including hydrolyzates of renewable lignocellulosic biomass. The desiccation resistant bacterial strains and method of mutagenesis are included in the invention.

Benefits

- Is a dry storable agent that provides broad protection against a variety of potato maladies, including fungal diseases (Fusarium dry rot, late blight, pink rot, and others)and sprouting
- Will reduce the use of azole chemistries in agriculture that have lost efficacy due to widespread resistance of target pathogens
- May lessen efficacy loss of medically important azoles used to control fungal infections in humans

Applications

- Is a biological agent to be applied to potatoes (and potentially other crops) to control fungal infections and reduce sprouting

ARS Docket No. 137.17. *Please contact Renee Wagner:* renee.wagner@usda.gov

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Double Stranded RNA for Asian Citrus Psyllid Control

Novel double stranded RNA constructs that target trehalase enzyme, gene expression in psyllids. Trehalose is the major blood sugar in insects with a crucial role as an instant source of energy and in dealing with abiotic stresses. The hydrolysis of trehalose is under the enzymatic control of trehalase. The use of constructs suitable as topical applied or incorporation for plant expression.

Benefits

- Provides focused pest suppression, Psyllids, Asian citrus psyllid by reducing populations
- Could result in a reduction in the use of insecticides in citrus production
- Can be applied as topical product or incorporated into citrus trees in expression systems

Applications

- Safe and efficacious psyllid population suppression to aid reduction of transmission and spread of *Liberibacter asiaticus*, pathogenic bacteria in citrus

ARS Docket No. 137.14. *Please contact Joe Lipovsky:* joe.lipovsky@usda.gov

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Antisense Oligo Targets Bacterial Pathogens in Plants and Insects

This invention relates to bactericidal molecules to suppress bacterial pathogens inside of plants (Citrus trees or Potato) and insects (Hemiptera: Psyllids and Leafhoppers). Specifically, Liberibacter pathogens, but also gram-negative or gram-positive bacteria. Suppression of Liberibacter bacteria in potatoes reduced symptoms, and suppression of bacteria in citrus trees is associated with increased retention of fruits.

Benefits

- Provides protection against Bacteria, including *Candidatus Liberibacter (Citrus pathogen) and Candidatus Liberibacter solanacearum* (potato pathogen)

Applications

- Prevent and reduce spread of citrus huanglongbing, HLB and Zebra Chip in potato
- Suppression of other bacterial plant pathogens
- Suppression of insects by targeting endosymbionts

ARS Docket No. 40.17. *Please contact Joe Lipovsky:* joe.lipovsky@usda.gov

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RNAi Strategies for Control of Whitefly

A double stranded RNA that targets genes important for the viability of the whitefly. By suppressing expression of key genes, the whitefly dies quickly, reducing whitefly populations on plants treated with these RNA constructs or on modified plants producing the RNAs. Reduced incidence of whitefly numbers and whitefly feeding on plants has the potential to greatly reduce transmission of whitefly-transmitted plant viruses that infect a wide array of crops.

Benefits

- Provides broad plant protection against whitefly, *Bemisia tabaci*, *B. argentifolii*, and biotypes, by reducing populations
- Could result in a reduction in the use of insecticides in crop production
- Can be applied as topical product or incorporated into plant expressed systems

Applications

- Efficacious whitefly suppression to combat pest and the viral pathogens they transmit
- Increase yields by reducing losses to whitefly

ARS Docket No. 105.17. *Please contact David Nicholson:* david.nicholson@usda.gov

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Methods and Strains for Producing Bioproducts in *Aureobasidium Pullulans*

Methods for producing arabitol-containing liamocin and other bioproducts from novel modified strains of *Aureobasidium pullulans*. The A. pullulans strains contain genetic alterations to control the type of liamocin produced and decrease unwanted bio-products and bio-contaminants. Other

useful bio-products produced include exophilins, massoia lactone, pullulan and liamocins with other head groups. The bioproducts can be produced melanin-free.

Benefits

- The modified *A. pullulans* produce near 100% arabitol-containing liamocins on an inexpensive carbon sources such as glucose
- The liamocins and other bio-products produced are melanin-free

Applications

- Antibacterial activities of liamocins against certain gram-positive organisms may have potential applications as a veterinary treatment
- Potential chemical feedstock for the synthesis of a variety of products such as biosurfactants and polymers
- Antifouling agent, phytopathogen control agent

ARS Docket no. 74.19 + 69.15. *Please contact Renee Wagner:* renee.wagner@usda.gov

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***Chromobacterium phragmitis* for Insect Control**

Chromobacterium phragmitis is a newly discovered species of bacteria that has insecticidal activity against immature stages of both fly and moth pests. These bacteria are not insect pathogens, but produce compounds in culture that are toxic to the insects. This means that it is not necessary to maintain the viability of the bacteria in a product, and that the toxic compounds can be concentrated in post-fermentation processing.

Benefits

- Cultures of *C. phragmitis* are more toxic to moth species than *C. subtsugae*
- An alternative to *Bacillus thuringiensis* with a broader activity spectrum

Applications

- Cultured *C. phragmitis* can be used as an organic insecticide with activity against lepidopteran and dipteran insect pests such as cabbage looper, diamondback moth, and seedcorn maggot

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

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Novel Polytriglycerides

Polyketone, polyamine and polyimine vegetable oil derivatives from renewable sources enable chelation or removal of heavy metal ions from aqueous solutions. The oil is heavier than water and can be regenerated and recycled after recovery of the heavy metal content.

Benefits

- High molecular mass compared to current neutralization agents
- Made from renewal resources in the form of vegetable oils

Applications

- Potentially used for neutralization, metalworking, metal ion absorption/extraction/sequestration
- Sequestration of toxic metal species from aqueous media and environmental purposes
- Biodegradable lubricating agents

ARS Docket No. 156.17 + 190.13. *Please contact Renee Wagner:* renee.wagner@usda.gov

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Cryogenic Trap

A thermoelectric cryogenic trap system and method used to separate and identify inorganic and organic arsenicals in a vapor stream.

Benefits

- The cryogenic trap is cost effective, sensitive and selective
- No reagents or coolants (i.e. no liquid nitrogen) used. It is a physical approach

Applications

- Monitoring to protect consumers from dietary arsenic exposure
- To uphold regulations and protect consumers, methods capable of inorganic arsenic detection at ng g-1 level are needed. Because rice is such an important crop, it was selected as the model matrix in this work
- Monitoring of environmental pollution
- Pharmacokinetic, clinical and toxicology studies

ARS Docket No. 118.15. *Please contact Jim Poulos*: jim.poulos@usda.gov

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Plant-mediated Silencing of a Fatty Acid and Retinol-binding Protein in *Pratylenchus Penetrans*

Fatty acid- and retinol-binding (FAR) proteins are a family of proteins unique to Pratylenchus Penetrans, a species of nematodes. This invention consists of a region of the FAR-1 gene from the root lesion nematode that has been made into a dsDNA construct (ds-FAR-1) that is designed to silence the FAR-1 gene of root lesion

A root infected with many nematodes

nematodes. The reproduction of root lesion nematodes feeding on soybean roots engineered to contain this construct was significantly reduced.

Benefits

- ds-FAR-1 can be used to engineer plants, or apply directly to plants, for resistance to root lesion nematodes
- Plants with resistance to root lesion nematodes decreases the use of fumigants and pesticides from nematode control
- Because the FAR-1 protein is found on in nematodes, application of this technology should not affect non-target organisms such as humans, plants, insects (e.g. bees), etc.

Applications

- The ds-FAR-1 construct may be a useful technology for genetic improvement of plants that are susceptible to root lesion nematodes such as potatoes, soybeans, corn, fruits (apples, raspberries, and cherries), and lilies

ARS Docket No. 199.16. *Please contact Jim Poulos*: jim.poulos@usda.gov

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Bio-based Resins/Adhesives for Wood Composites

There has been significant interest in using non-petroleum-based adhesives and resins to fabricate wood composites, particularly for interior uses. Unfortunately, currently available bio-based adhesives derived from soybean meals are more expensive than their petroleum counterparts. ARS has developed methodologies to employ inexpensive by-products from corn, ethanol processing and other feedstocks for production of a more cost-effective bio-based adhesive/resin for this purpose.

Benefits

- Inexpensive to produce
- Excellent adhesive and mechanical properties

Applications

- Building, furniture and manufacturing industries

ARS Docket No. 166.16. *Renee Wagner:* renee.wagner@usda.gov

Aerial Electrostatic System for Weather Modification

A novel process for enhancing rainfall has been invented using only tap water. The water is electrically charged before it is released into warm continental or maritime convective clouds with an agricultural aircraft. This technique has been shown to double the amount of additional rainfall generated compared to conventional cloud seeding methods.

Benefits

- Doubles the additional rainfall generated by cloud seeding compared to conventional methods
- Uses only tap water instead of silver iodide or calcium chloride
- Operating costs are greatly reduced

Applications

- Effective, cost efficient and environmentally friendly method of enhancing rainfall from warm continental or maritime convective clouds

ARS Docket No. 36.18. *Please contact Jeff Walenta:* jeffrey.walenta@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.

Natural Enemies Close in on Fire Ants

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.

ARS scientists are examining the potential of colored rice bran to help with diabetes management. Finding ways to enhance the health benefits of rice and other agricultural commodities is one of their goals. Learn more about ARS rice research

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USDA Blog

Check out USDA Blog site for updates on Agricultural issues. Click here to read. 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.

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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