



June 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>

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.

Cooperative Research and Development Agreement (CRADA) Opportunity for a Vaccine Against Classical Swine Fever

Plum Island Animal Disease Center (PIADC), a component of the Agricultural Research Service (ARS), United States Department of Agricultural (USDA) seeks a cooperative research and development (CRADA) Collaborator to jointly carry out the development of the Classical Swine Fever (CSF) FlagT4G vaccine with DIVA capability for the rapid response to CSF outbreaks in CSF-free countries, or control programs in CSF-endemic countries.



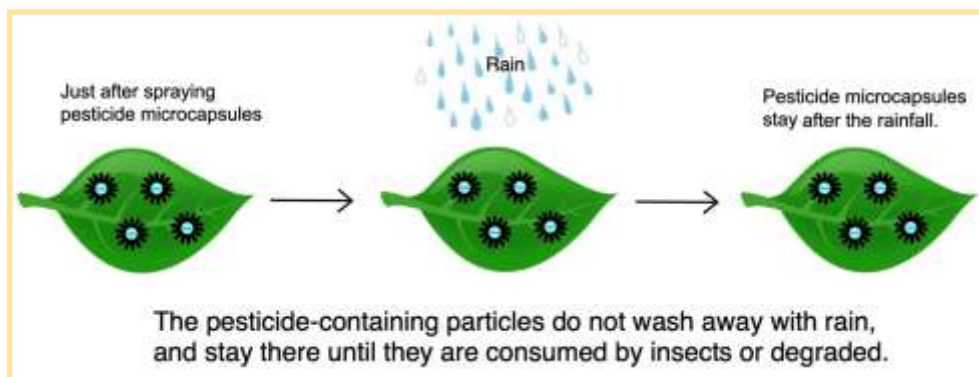
More information:

<https://www.ars.usda.gov/ARSUserFiles/ott/Classical%20Swine%20Fever%20CRADA%20Opp%206.4.19.pdf>

ARS Docket no. 162.06. Please contact Jim Poulos: jim.poulos@ars.usda.gov

Pesticides That Do Not Wash Away with Rain

Existing pesticides wash away with rain or morning dew after spraying. A novel procedure that can be used for the encapsulation of pesticides into microparticles was



developed. These microcapsules adhere to the surface of plant leaves and are not washed away with rain. They stay on the leaves until they are consumed by insects or degraded. Therefore, multiple applications of pesticides are not necessary. Farmers thereby save application cost and labor, and environmental contamination is minimized. Compositions and methods of generating microcapsules are included in the invention.

Benefits

- No need for multiple application of pesticides
- Lower application cost

- Saves time and labor
- Minimizes environmental contamination and lowers applicator exposure

Applications

- Replaces conventional formulations for pesticides
- Can be applied to any plants that are infected by pests
- Especially useful when multiple applications must be avoided

Docket No: 140.17. Please contact Renee Wagner: renee.wagner@ars.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

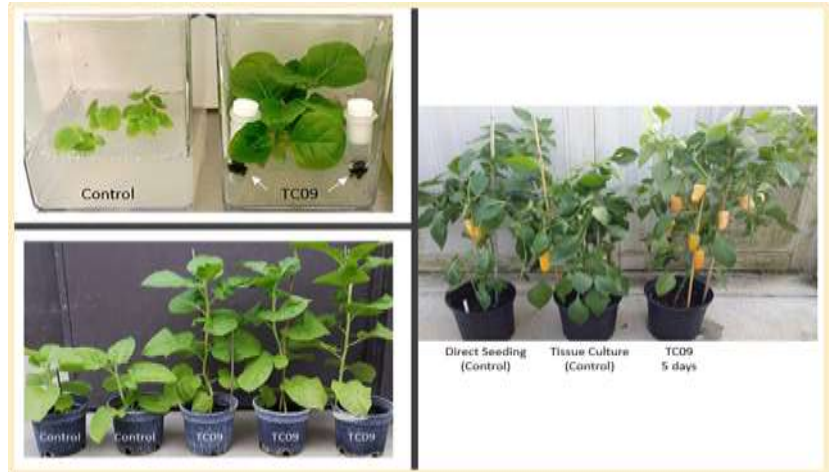
Applications

- 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@ars.usda.gov

Fungal Volatiles to Promote Plant Growth and Increase Crop Productivity

This technology involves the use of non-phytopathogenic isolates of the fungal species *Cladosporium sphaerospermum* to rapidly promote plant growth, early flowering and increased crop productivity. All of these can be achieved by a short duration exposure of seedlings to the volatiles emitted by the fungus.



Benefits

- Minimizes the use of chlorine (or other sanitizers) and reduces the volume of water used
- Speeds up the development of both shoots and roots within days of exposure
- Dramatically increases biomass
- Provides higher growth rates throughout the entire plant life cycle
- Achieves up to 20-day earlier flowering
- 100% increase in fruit yield
- Provide higher
- Improve root growth under both in vitro and ex vitro conditions
- Effective on many crop species in diverse plant families

Applications

- May be incorporated in seedling preparation for field crops with transplant system, greenhouse crops and vertical agriculture operations
- The technology can be used to enhance root growth in tissue culture systems to overcome poor rooting-associated problems as well as to accelerate plant transformation systems

ARS Docket no. 57.17. Please contact Jim Poulos: jim.poulos@ars.usda.gov

Recombinant *Eimeria Maxima* Protein Delivered as Nanoparticles for Poultry

A vaccine against avian coccidiosis has been developed that utilizes recombinant DNA technology and nanoparticles to stimulate an immune response in newly-hatched chickens against the causative agent *Eimeria maxima*. The recombinant protein, called EmaxIMP1 is purified and then conjugated to extremely small nanoparticles (20 nm in diameter) and orally give to newly-hatched chickens. This vaccine confers solid immunity against a challenge infection with the parasite *Eimeria maxima*. ARS scientists are now exploring the injection of embryonated chicken eggs as a practical means of delivering the nanoparticle-conjugated EmaxIMP1 protein to chicks prior to hatching just as vaccines against several viral pathogens are given.



Benefits

- Delivering recombinant EmaxIMP1 as a conjugate to nanoparticles improves the level of production against *E. maxima* infection

Applications

- Incorporating a recombinant *E. maxima* antigen, namely EmaxIMP1 into nanoparticles and using these to orally immunize newly-hatched broiler chick

ARS Docket no. 94.17. Please contact Jim Poulos: jim.poulos@ars.usda.gov

A Tool for Managing the Quality of Plant Products

This system provides a novel approach to quality management in plant-based products. Plants do not always do what we want. Sometimes stress is needed to get the human-desired outcome. This system consists of a combination of physiological information, plant temperature and water status, and an irrigation controller. The system allows a user to continuously monitor and manage the progress of the plant toward a desired quality outcome.



Benefits

- Allows for the precise imposition and management of plant thermal and water stress
- Allows for management of quality-related plant outcomes in a highly reliable manner
- Useful in greenhouse and field settings
- Automated

Applications

- Quality-related factors such as aromatics and taste parameters can be associated with plant status and modified over a season
- Provides water at minimum amounts to achieve desired outcome (product)

ARS Docket no. 99.09. Please contact Jeff Walenta: jeffrey.walenta@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 nos. 42.19 + 161.15. Please contact Jim Poulos: jim.poulos@ars.usda.gov

Chromobacterium Species with Insecticidal Activity

A novel species of chromobacterium that selectively kills lepidopteran insect larvae (such as, gypsy moth, diamondback moth, tobacco hornworm larvae, and cabbage looper larvae). Compositions containing *Chromobacterium spagni* sp. strains and the use of these compositions to kill insect

larvae are covered by the U.S. and PCT patent applications. These compositions kill the indicated larvae at least as well as or better than some *C. subtugae* 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 nos. 58.19 + 33.15. Please contact Jim Poulos: jim.poulos@ars.usda.gov

Micro-Fluidic Mixer and Method of Determining Pathogen Inactivation Via Antimicrobial Solutions

An automated micro-fluidic device and method to determine whether sufficient free chlorine is present in a wash solution to inactivate a target pathogen.

Benefits

- The device can determine whether sufficient free chlorine is present in wash solution to inactivate a target pathogen
- It can determine the time and dose-dependent response of pathogen inactivation via free chlorine in times as short as a few seconds or less

Applications

- Use in the produce washing industry to determine the minimum free chlorine concentration needed to prevent pathogen survival/cross-contamination when washing fruits and vegetables
- Applications in food, agriculture, pharmaceuticals, and other biological fields. Examples: chemical reaction kinetics study during drug development and microbial challenge studies during the development of new sanitizers and anti-microbial agents for food and human usages

ARS Docket no. 112.14. Please contact Jim Poulos: jim.poulos@ars.usda.gov

Method for Killing Insects Using Methyl Benzoate

Natural compounds that provide alternatives to conventional synthetic pesticides to control the populations of brown marmorated stink bugs and other insect pests. The compounds could reduce threats to natural ecosystems and human health caused by application of conventional synthetic pesticides.

Benefits

- Environmental-friendly green pesticide as an alternative to synthetic pesticides

Applications

- Botanical pesticide for controlling spotted wing drosophila, *Drosophila suzukii* and other pest species including brown marmorated stinkbug *Halyomorpha halys*, diamondback moth *Plutella xylostella* and tobacco hornworm *Manduca sexta*



ARS Docket no. 179.16. Please contact Jim Poulos: jim.poulos@ars.usda.gov

Use of Phyllosphere Associated Lactic Acid Bacteria as Biocontrol Agents to Reduce Bacterial Growth on Fresh Produce

The use of phyllosphere-associated lactic acid bacteria that demonstrate inhibitory effects on the growth and maintenance of human pathogens, such as *Salmonella enterica*, on the surface of food products, particularly fresh fruits and vegetables.

Benefits

- Bacteria are applied in liquid or freeze-dried powder forms onto food surfaces or agricultural environments that are already contaminated with pathogenic bacteria
- Treatment of produce can take place either pre- or post-harvest
- Easily implemented, low cost solution

Applications

- Could be used to eliminate prevalent food-borne pathogens
- Bacteria could also be used to decontaminate food processing environments and machinery as part of a normal sanitization process

ARS Docket no. 76.14. Please contact David Nicholson: david.nicholson@ars.usda.gov

Methods of Producing Calcined Coke from Bio-Oil and Calcined Coke Produced

A process for synthesizing biologically-derived coke from a byproduct of bio-oil distillation. The process entails fast pyrolysis, atmospheric distillation and vacuum distillation to remove liquid and volatile products.



Benefits

- Bio-renewable
- Sulfur is eliminated to trace levels below 500 ppm (vs. > 2 – 3%)
- Vanadium and nickel are absent completely in most cases (vs. > 300 ppm)
- Total ash/metal content is comparable and/or less than petroleum coke
- A desulfurization step is not needed

Applications

- The carbon rich product can be used as a solid fuel (coal) substitute
- Can be calcined into coke suitable for use in aluminum smelting anodes, steel carburization and titanium dioxide production

ARS Docket no. 118.18 + 126.14. Please contact Jim Poulos: jim.poulos@ars.usda.gov

Novel Polytriglycerides

Polyketone, polyimine and polyamine 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. 190.13 + 156.17. Please contact Renee Wagner: renee.wagner@ars.usda.gov

Sorghum Yield Enhancement Gene (msd1)

Global demand and consumption of grain crops for food, feed and fuel is increasing at a rapid pace. This demand has expanded for many years and is expected to continue to increase as human population increases. This invention relates to multi-seed sorghum mutants (MSD1) which develop seeds at not only the sessile spikelets of the panicles, but also at the pedicellate spikelets, thereby significantly increasing the seed production and yield. The results of the MSD1 mutant show potential as a resource for increasing grain yield as a parent to use for crosses.

ARS Docket No. 222.13. Please contact Jeff Walenta: jeffrey.walenta@ars.usda.gov

Mutant Sorghum Bicolor Having Enhanced Seed Yield (msd2)

This invention relates to a novel mutation in a sorghum gene which further increases the seed yield in sorghum. Specifically, genetically altered sorghum plants expressing the multi-seeded 2 (MSD2) phenotype and genotype contain one of two genomic alterations which result in the activity of an encoded protein. These alterations result in an increased number of seeds and seed weight, thus increasing the yield. These alterations can be generated in ortholog genes in maize (TS1), rice, barley, and other monocot plants, generating the MSD2 phenotype.

ARS Docket No. 52.14. Please contact Jeff Walenta: Jeffrey.walenta@ars.usda.gov.

A Sorghum Yield Enhancement Gene Multi-Seeded 3 (msd3)

This invention relates to third novel mutation in a *sorghum* gene, Msd3, which increase the seed yield. The nucleic acid sequences of this mutated gene and its encoded protein(s) are included. This invention also relates to genetically altered plants having this mutated gene and/or containing the mutated protein and which have increased flower production and seed yield and lower jasmonic acid production.

ARS Docket No. 119.16. Please contact Jeff Walenta: jeffrey.walenta@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. 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.

ARS Latest News

The Agricultural Research Service rolls out *Tellus*, its new online communications platform, replacing its legacy *AgResearch* online magazine. Click [here](#) for latest articles.



ARS Latest News

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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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