



Insight

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University of Idaho Invests in Nematology Research

Two significant developments in the world of nematology research are occurring at the University of Idaho. First up, a new, state-of-the-art laboratory that is expected to enhance nematode research in mint is up and running at the Idaho Parma Research and Extension Center.

Named the Idaho Center for Plant and Soil Health, the 10,000 square-foot facility, which opened earlier this fall, houses a “significantly sized nematology lab,” according to Melinda Jean Stafford, director of development for the University of Idaho College of Agricultural and Life Sciences.

Secondly, Stafford announced that the university has created an endowment for nematology research named after the widely recognized Idaho nematologist Saad Hafez. Called the Saad Hafez Endowed Chair in Nematology, the endowment will go to whomever fills



Rendering of the new Idaho Center for Plant and Soil Health

Saad's position upon his retirement, Stafford said.

“We are still working on acquiring all the funding needed to finish the endowment and get it fully funded,” Stafford said. “But the intention

with it is that when Saad retires, that endowment will go to whomever fills Saad's position.”

The expectation is the endowment will provide dollars annually toward the next nematologist's research. “That makes it

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a pretty attractive position for a faculty member,” Stafford said.

The new laboratory, meanwhile, brings state-of-the-art research opportunities to the university’s nematology program, a program housed in the Agricultural College’s Entomology, Plant Pathology and Nematology Department. In addition to the nematology lab, the new facility also has labs dedicated to pomology, hops, microbiology and molecular research.



Mike Kiester

Stations Operations Manager Mike Kiester said the facility is a significant upgrade from the Research and Extension Center’s former labs. “This significantly

updates the facilities,” Kiester said, noting most of the former labs on the center were built in the 1940s and 1950s.

Kiester said it also helps that the facility houses multiple labs, bringing together equipment that can serve multiple crops.

“It is now a lot easier, whether you’re working in mint or potatoes or onion or other crops in the state to have everything available in one spot,” Kiester said.



Rendering of the new Idaho Center for Plant and Soil Health



Construction of the new Idaho Center for Plant and Soil Health

The Idaho Center for Plant and Soil Health was funded by a consortium of interests, including Idaho commodity commissions, private donations, university funding and state funding

approved by the Idaho Legislature. The Idaho Mint Commission is among the funding sources.

The facility will have a dedication ceremony on February 20.



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UC Davis Breeding Work Shows Promise in MIRC Visit

This past June, Greg Biza, Chair of the Varietal Improvement Committee, MIRC Chair Jeff Johnson and Steve Salisbury visited the UC Davis Genome Center to meet with geneticists Isabelle Henry and Luca Comai, as well as the center's breeder, Juliya Abbasi.

The bottom line: They were impressed.

"It was fantastic to see progress made in a timely fashion in line with the goals set out in the original proposal," Biza said.

Salisbury, research and regulatory coordinator for the MIRC, added that the plants growing in the greenhouse were healthy and well managed. And the trio noticed significant visual differences in the plants and their oil fragrances, an indication of genetic diversity that Henry and Comai can potentially manipulate in hopes of delivering varietal differences desired in the industry.

The three also were able to view steps in the breeding process, as Henry and Abbasi showed how they moved plants from the greenhouse to what they call the flowering house and then made crosses.

The process also is expected to include participation from MIRC members, as Henry is asking members to sample oils from the progeny plants before further crossing them to achieve desirable traits. To date, the ask has been well received by MIRC members, who have indicated they are willing to assist in the chemo typing.

"I think that shows a good collaborative effort when you have member companies that are willing to step forward and contribute some lab space and time to chemotype," Salisbury said.

On another front, the Scientific Affairs Committee approved a change in direction for part of Henry's research. The initial direction involved asking



Greg Biza confers with UC Davis breeder Juliya Abbasi in the UC Davis Genome Center greenhouse during a visit by representatives from the MIRC in June.



From left, UC Davis geneticist Isabelle Henry, and MIRC's Jeff Johnson and Greg Biza in the UC Davis Genome Center greenhouse in June.

growers in different mint-growing regions to collect leaf samples of Black Mitcham, flash freeze them in liquid nitrogen and send the samples to Henry's laboratory.

In the new protocol, Henry and her team will collect samples from West Coast operations, a step that will simplify and improve the integrity of sample collections. After that, the team will ask growers to provide oil samples and

yield information from the different fields where the samples were taken so researchers will be able to form a complete picture of the different traits they are studying in the lab.

The idea behind the project, called Objective Four in Henry's research proposal, is to identify specific enzymes that might be associated with regional variations in oil composition and yield of Black Mitcham plants.

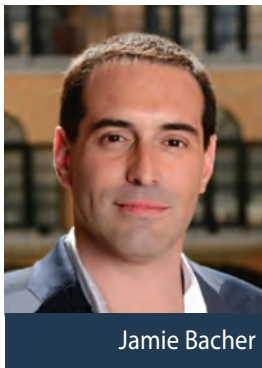
Biotech Company Looking at Biologicals to Target *Verticillium*

Boost Biomes, a biotechnology company from the Bay Area that will be presenting at MIRC's Annual Meeting in January, has an interesting product that it expects to roll out in 2024.

The product, the company's first, consists of two microorganisms that together have been shown to improve crop performance in grapes, tomatoes and other crops by suppressing diseases, including both root-borne and foliar diseases.

BC-18, the name by which the product is known inside the company, has also improved crop performance in mint by reducing *Verticillium* wilt incidence in a greenhouse trial in 2020. And the company anticipates doing more trials in mint in the future.

The company expects to gain EPA approval to release its product early next year, said Jamie Bacher, CEO and co-founder of Boost Biomes. The product will be brought to market in a granular form that dissolves easily and can be applied through an irrigation system or by a spray.



Jamie Bacher

Boost Biomes was started in 2017 by Bacher, Rob McBride and Adam Arkin, a professor at UC Berkeley. Its patent protected platform technology, which is unique to Boost, was developed initially at the Lawrence Berkeley National Laboratory, where Arkin serves as a professor.

Bacher said that the company is by no means the first to develop new microbials as crop inputs, noting the technology has been around for 30 years. "But we think we have some unique insight and some technology to address the insights that we have."

At its core, the company's insight is based on the fact that biological products are typically living microorganisms that are meant to do something in the soil or on the plant, Bacher said.

"That means that the product is something alive that's being used in an ecosystem where there are a lot of other living things," he said. "So, there tends to be interactions between all of those living things and we developed technology to understand those interactions between microorganisms and then design or develop products that leverage those interactions (in a positive way)."

Asked if BC-18 works by increasing a plant's natural defense to pathogens, Bacher said, "We know that the living microbes produce chemicals that are inhibitory towards these fungal pathogens. And there are a couple of other mechanisms that could be at play. It could be activating plant defenses. And the microorganisms in our product could be inhabiting niche environments that the pathogens would like to inhibit and interfering in that way. We don't have evidence yes or no on that, but we do know that our product is generating metabolites that are inhibiting the fungi."

The product is very stable, Bacher said, with a two-year-plus shelf life. "It is exceptionally stable for a biological," he said. "One of the problems biologicals tend to have is they tend to be unstable.

"We know that the living microbes produce chemicals that are inhibitory towards these fungal pathogens. And there are a couple of other mechanisms that could be at play. It could be activating plant defenses."

Jamie Bacher,
CEO and co-founder of Boost Biomes

But our product has a two-year plus shelf life at room temperature."

And the company has extensive research showing that the product performs, including more than sixty field trials over a several year period, a fact that differentiates the company and its products from other biotechnology releases, he said.

"As a biotech industry, we have tended to say this is the next big thing because it did really well in one very narrow set of application space, whether that is crops or pathogens or whatever," Bacher said of the biotechnology sector. "And biologicals haven't been able to capitalize on where biologicals are strong, in that the products are part of the natural ecosystem to more or less of an extent.

"So, there's been snake oil in the past," he said. "By comparison, anything that we do, anything we say is backed by rigorous field trials."

Like other biologicals, Bacher said growers can expect to pay a little more for the product than chemical crop protection products. But, he said, the

company expects it to be priced similar to other biologicals.

Bacher added that the company has other products in the pipeline that it expects to roll out in coming years, including a *Bacillus* product it expects to release in 2025.

“Many people have used *Bacillus* products,” Bacher said. “But we have found that this particular strain is unique and we have found that it has

some applications that other *Bacillus* products don’t.”

Boost Biomes plans to continue to work with mint, Bacher added, and to include mint in its crop protection portfolio. “We’re super excited about the potential to address a critical need in the mint industry,” he said.

As for its future, Boost Biomes has recently announced partnerships with Yara International, a global nutrition

company, and Nihon Nohyaku, a Japanese-based chemical input company with a global footprint that is also known as Nichino. “We are working with Nichino to develop novel bioinsecticides,” Bacher said.

The company also recently announced it is working with CGIAR, a global NGO that funds research and performs other work for global food security.

Chair of Risk Mitigation Committee Aims for Active Agenda

John Williams, the new chair of the Risk Mitigation Committee, said he wants the committee to take the next step and bring an action agenda to the membership.

“One of my goals is to try to get the industry to come together and take action that would benefit all of our members, from farmers to end users,” Williams said.

In the past, he said, the Risk Mitigation Committee has done a great job of collecting information on risks the industry faces.

“Collecting all of that information is incredibly valuable,” he said. “But if we don’t do anything, then we are just observing the occurrence of issues that are affecting us. My goal for the Committee is that we take what we know about the current risks and what has been reported to the industry and we use that to create some meaningful, pragmatic change for the industry as a whole.”

Williams views the continued regulatory burden placed on the mint industry as the industry’s biggest single threat.

“I think it really affects all levels of the industry, from the farm to the dealer to the end user.”

And, he said, the mint industry, like other agricultural industries, has largely been reactionary.

“We don’t want to do anything that would cause problems for our industry, so we try to meet all requests or obligations and it has almost been a race to the bottom where the regulatory

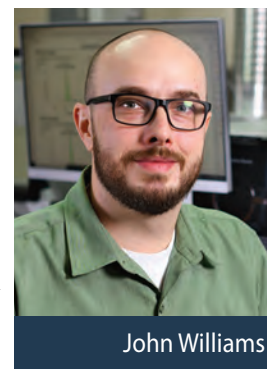
“One thing that is great about the committee is we have representation from all levels of the industry, from the farm to the end user.”

John Williams,
Risk Mitigation Committee Chair

burden at every level has increased to the point where it almost seems that it isn’t sustainable,” Williams said.

“It affects the industry tremendously,” he said. “It is a huge time and resource burden to be able to meet all the requests.”

“We’ve collected enough information at this point that I think we can suggest action that benefits the membership and the industry as a whole,” Williams said.



John Williams

Williams, essential oil Chemist and regulatory specialist for RCB International, who holds a master’s degree in chemistry from Western Washington University (2016), took over as chair of the Risk Mitigation Committee earlier this year.

“One thing that is great about the committee is we have representation from all levels of the industry, from the farm to the end user,” he said.

“This is part of the reason I am confident that we can assess risks to the industry as a whole,” he said. “But the topic needs engagement from the broader membership, because while we can assess a lot of the risks, we can’t assess all of them alone.”

Distillation Research Project Up and Running in Washington

Backed by MIRC funding, Washington State University Professor Troy Peters has launched a research project looking at some of the variables involved in mint distillation.

The project could evolve into a long-term study that drills down into nuances of distillation. First off, Peters said, he is looking at analyzing which of the variables are worth a more in-depth look. And he plans to develop and release an Extension publication for distillers on best management practices.

“We will publish and make available the publication on issues like cut-off times, pressure and flow rates. How to set up the boiler. When to cut back on steam or increase steam. What types of lines to use. These kinds of things,” Peters said.

Peters, a licensed professional agricultural engineer based in Prosser, Washington, said he proposed the idea

to the MIRC because he was interested in pursuing an in-depth look at mint distillation.

“We know that with the same hay, some growers get a lot more oil out of it than others do,” Peters said. “And outside of some field-management practices, the only differences would be kind of how they conducted that distillation process, that mint hay preparation and cutting, dry times, tub designs and mint oil distillation processes.”

Also, Peters said, the costs to distill mint are increasing, placing more emphasis on the need for a project of this scope.

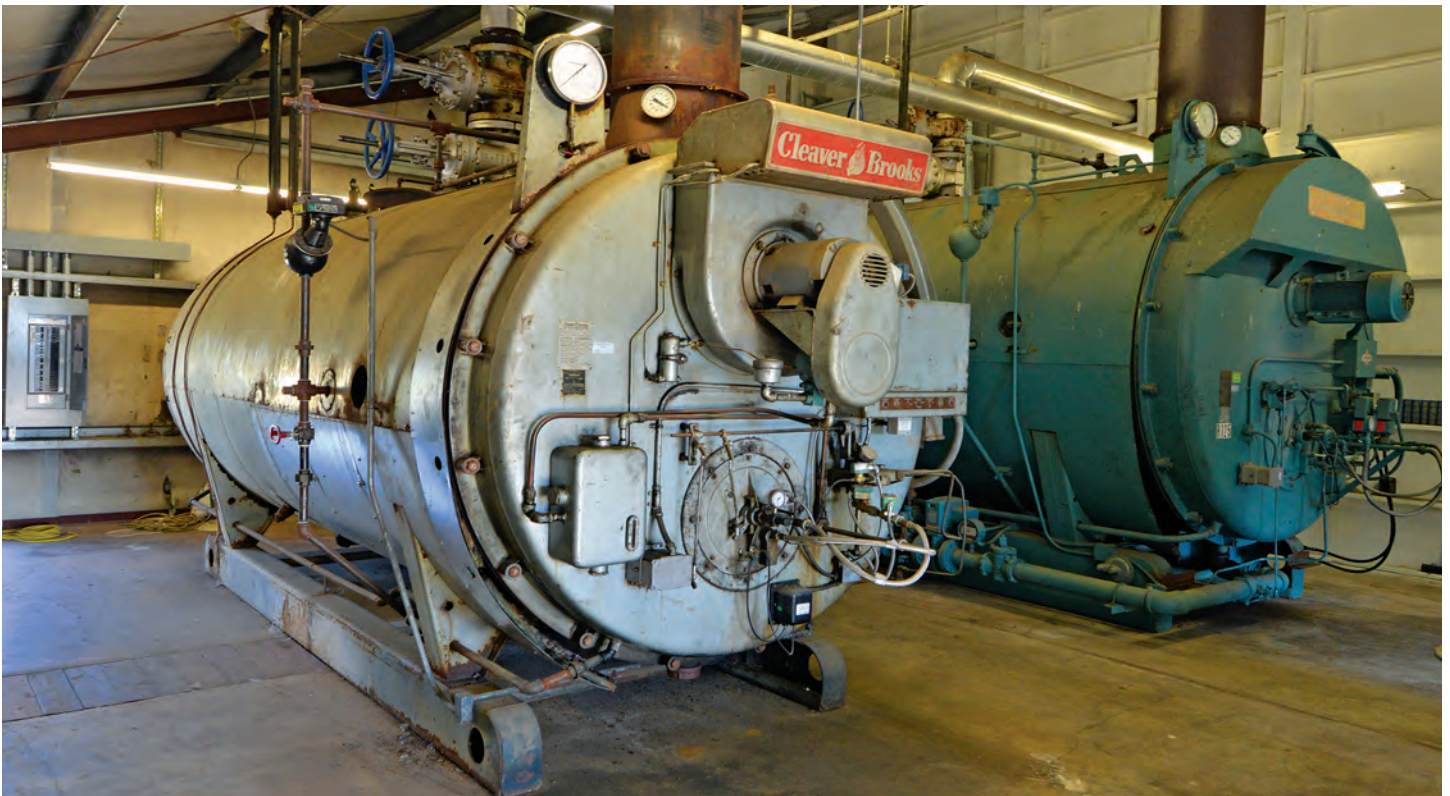
“The energy prices are going up and they’re just going to keep going up. And, of course, mint distillation uses steam, which means you have to boil water, so you need to have some sort of heat source. So, you’re using propane or diesel to burn in order to create that heat to

boil water and those costs, as well as labor and other costs, are going up,” Peters said.

“So, what we wanted to do was see if we can’t triangulate this in an educational manner,” he said, “because some growers are very good at this and some growers may be using more rudimentary tactics. And some of the rudimentary tactics and methods can be efficient if done right, but there are just a lot of variables like the tub design, the steam-flow rate, the water-flow rate, how much steam you’re trying to push out versus your boiler’s capacity to put that out. There’s the steam-line size, the condenser unit. What



Troy Peters



is the temperature of the water going in, the temperature of the water coming out? These are all things that they can control and a lot of it at this point is just trial and error and trying to get in the ballpark.”

Peters said he anticipates that the first stage of the project, which he started this summer, will provide a base of research data on oil production rates and costs, distillation costs and how oil

components change over the process of the distillation. That data, he said, will help inform researchers on which areas to pursue in later research.

Peters said he expects to have the Extension publication published sometime in late winter, early spring of 2024.

To date, Peters said he hasn't used the mint distiller at the Irrigated Agriculture

Research and Extension Center in Prosser for this particular project “because it is so different” than modern commercial mint distillers. Instead, he has been working with commercial distillers in the Yakima Valley.

He plans to work with distillers all over the county and into Canada for future phases of the project.

New WSU Weed Scientist Working in Mint

Washington State University weed scientist Rui Liu spent the summer of 2013 working under former USDA Agricultural Research Service weed scientist Rick Boydston in Prosser, Washington.

The thought never occurred to her that one day she would come back and make Prosser home. But today Liu is conducting weed research at the Prosser Irrigated Agriculture Research and Extension Center, and she has begun working in mint.

“I never thought I would come back to spend my career here,” Liu said.

Liu comes to the Prosser Center from Kansas State University, where she worked as an assistant scientist after obtaining a Ph.D. in agronomy from Texas A&M University. Previously, she received her bachelor's degree and master's degree from Nanjing

Agricultural University in Nanjing, China. She was working on her master's degree in 2013 when she worked in Prosser.

She started as an assistant professor in Weed Science for Washington State University in November 2022.

Liu said that when she started at WSU, her experience in mint was very limited. She has since compiled substantially more time on the crop.

“When I got here, in the second week of my job, we had a meeting and (WSU professors) Doug Walsh and Troy Peters told me about the history of mint research at the station,” Liu said. “There is this mint plot on the station that has been here for a decade or so, and (research technician) Ray Baker was continuing some weed science work, and they asked me if I was interested in taking on responsibilities in mint.”

Liu agreed and carried on with research that Baker was involved in before he retired in June 2023.

“Two weeks into my job, we submitted a proposal to look at different timing and rates of fertilizers in mint,” she said. The project was based on previous

research looking at different fertilizer rates in combination with irrigation rates, she said.

Another part of the study, which is being done in collaboration with Oregon State University, involves looking at different herbicide programs for weed control in mint. And Liu is generating data to support registrations of new herbicides in mint. “We are looking at that because we have such limited options for weed control in mint,” she said, “so growers need more options.”

Liu added that she learned a lot from Baker between the time she came on and when he retired last June.

As for her future plans, Liu said she plans to continue working in mint and has no immediate plans to leave the Prosser Center.

“It is a good fit and I do like Prosser and this region a lot,” she said.



Rui Liu



Salibro Focus on Idaho Research

The Idaho Mint Commission has put forward funding for a project that could benefit mint growers throughout North America.

The commission this fall earmarked \$14,000 to continue a research project into the nematocide Salibro, with the idea of eventually getting enough residue and efficacy data to register it for use in mint.

A sulfonamide nematocide, the Corteva product also is thought to suppress *Verticillium* wilt.

The project is being led by Dr. Saad Hafez, considered one of the top nematologists in the world.



Dr. Saad Hafez

Hafez is working with Eric Jemmett, a Parma, Idaho, grower who also manages Jemmett Research and Consulting.



Eric Jemmett

Idaho Mint Commission Administrator Roger Batt said Jemmett came to the Commission with a proposal to work with Hafez on the project. “He said, ‘Hey, I’ll do the field trials, and maybe Dr. Hafez can do the lab work. Would you guys agree to that?’ And the Commission didn’t hesitate to fund that opportunity,” Batt said.

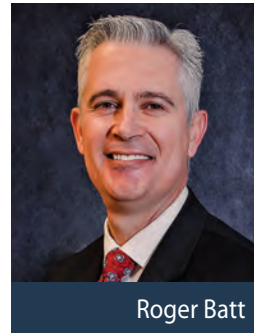
“Since we have Dr. Saad Hafez here and we don’t know when he’s going to retire, the Idaho Mint Commission felt

it was important to continue to fund the research,” Batt said. “We realize how important it is nationally.”

Batt said Hafez and Jemmett are comparing other products to Salibro, but the main emphasis of the research is Salibro.

“Salibro is obviously the focus, because we want to make sure we get it labeled for mint,” Batt said.

“The Idaho Mint Commission realizes that we are all in this together and we want to make sure that we move things forward for the industry,” Batt said.



Roger Batt





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C A L I F O R N I A

Chair's Report

Jeff Johnson, Chair of the Board

As I near the end of my first year as Chair of the MIRC, I am pleased to see increasing global and domestic demand for U.S. oils, both in the oral care and confectionary categories.

Also encouraging is that we perceive continued growth in these markets for mint.

My first year included several highlights, including an excellent trip with Greg Biza and Steve Salisbury to see how our varietal improvement research is going at the UC Davis Genome Center. I am happy to report that the team down there is making good progress and are well within the timelines of expected completion. It looks like that research is in good hands.

Also, judging from reports at our Scientific Affairs Committee meeting this past September, other research funded through the MIRC appears to be robust and in good hands, as well.

As for harvest, it seems to have gone well this year. There weren't any significant problem areas or winter kill. In some areas we did have some late-season rain that did cause some problems, but generally the harvest went well for most growers.

As for this coming year, we are concerned about what the El Niño weather pattern will mean for the water situation in the Pacific Northwest, as it is supposed to be a warmer, drier year. But the water systems we have in place are robust and

we feel like the growers should be able to manage it well.

Finally, I'd like to say that I am looking forward to the Annual Meeting in January. We have some great speakers lined up and it should be a good educational event. It is nice to be meeting in person again and I look forward to seeing everybody down in San Diego.



Jeff Johnson



Research & Regulatory Update

Steve Salisbury

The MIRC's Scientific Affairs Committee (SAC) met in September for their annual mid-year meeting to be updated on the progress of this year's research projects. The SAC enjoyed in-person updates from Dr. Isabelle Henry with UC Davis and Dr. Troy Peters with Washington State University. We are looking forward to the January annual meeting to hear from all of our researchers and several invited industry speakers. I'm confident that you will find value in this year's program and look forward to seeing you there.

The continuation of the genetics and varietal improvement work by Dr. Henry and her team is going very well and they are making good quality progress. MIRC Chairman Jeff Johnson, Varietal Improvements Committee Chairman Greg Biza and I went to Davis, California to visit Dr. Henry and see the project first-hand this past summer. The project is in good shape and being well managed. They are hitting all their timeline marks for three of their four objectives. The fourth objective has been revised to ensure proper and productive protocols. We were pleased with the very clear line of communication and productive discussions with the MIRC and the research team. The revised fourth objective will be carried out in 2024.

Dr. Peters has initiated a distillation project. The MIRC's distillation committee is working closely with him on this project to ensure that the findings will be of value to the industry. This year's project collected baseline information on distillation practices in our industry to help develop some general recommendations for improved efficiencies and tied to economic return. The hope was that the 2023 project will

lead to some further best management practices that may help producers make quick and accurate economic decisions during distillation. There have been productive discussions and meetings with growers, Dr. Peters and the MIRC to develop further research objectives on distillation that growers would find of value. We are anticipating another proposal for 2024 for consideration.

Overall, this year's integrated pest management projects are going well and progress has been made. Dr. Jeremiah Dung at Oregon State University is continuing the development of a field deployable bioassay to evaluate the presence of *Verticillium* in both mint plants and field soils. This effort looks promising that a practical tool will be developed for use in fields for making knowledgeable decisions. The Dung lab is also evaluating the use of phosphites in the battle with *Verticillium*. We look forward to hearing more about his findings in January.

Other IPM projects that will be presented on the annual meeting general program include two entomology studies by Dr. Doug Walsh at Washington State University and the multi-state weeds project that will be presented by Rob Wilson at the University of California Tulelake Research and Extension Center. Dr. Walsh evaluated the utilization of pheromone mating disruption strategy to manage mint root borer as well as a second project evaluating candidate acaracides for use on mint and management of acaracide resistance development. The multi-state weeds team continues to evaluate tiafenacil use for both dormant and between cuttings of double-cut mint application timings. The dormant timing looks quite

promising, but the use between cuttings may be a stretch. Wilson will present the data from all locations which includes both the Midwest and Far West.



Steve Salisbury

It is wonderful news that the Idaho Mint Commission has funded a nematode study with the collaboration between Jemmett Research Farm and Dr. Saad Hafez in Parma. Thank you very much to Idaho for funding this effort. The industry needs data to evaluate the use of fluazaindolozone, a potential new nematicide for mint. The MIRC funded the initial research in 2022 but did not receive a proposal to continue the project in 2023. A proposal was presented to the Idaho Mint Commission in the spring for their consideration. Generating further data on this front is critical to the process of pursuing the possible registration and label for a new nematicide in mint. We look forward to seeing the results from the 2023 trials. Thank you again to the Idaho Mint Commission, Saad and Jemmett's for making this possible.

A complete update on all research activities as well as reports from the regulatory world will be presented at the MIRC annual meeting. Of course, I will be presenting at the state mint conferences as well and I would be happy to answer any questions or discuss topics with you there. I look forward to seeing you all at the meetings.



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