



**SUMMARY | PEST MANAGEMENT ADVISORY COMMITTEE RESEARCH GRANT REVIEW MEETING
CALIFORNIA DEPARTMENT OF PESTICIDE REGULATION**

February 10, 2022

Produced by the Consensus and Collaboration Program, CSU Sacramento College of Continuing Education

Contents

1. Attendance.....	2
2. Opening Comments and Background.....	3
3. Research Grant Proposal Overview.....	4
4. Research Grant Proposal Discussion.....	7
Fennimore – Band Steamer.....	7
Grettenberger – Aphid and Thrip IPM in Lettuce.....	8
Michailides – Pistachio Decision Support Tool.....	9
Choe – Ant Growth Regulators.....	10
Grettenberger – Tadpole Shrimp in Rice.....	10
Neuman – UAV’s for Vine Mealybug Control.....	11
Westphal – Walnut Nematode Suppression.....	12
Loudon – Bedbug Surface Entrapment.....	13
Sutherland – Biting Mite IPM.....	14
Westphal – Nonfumigant Nematode Suppression.....	15
Choe – Drywood Termite Baiting.....	16
Hasegawa – Novel Approaches to Diamondback Moth and Thrips.....	17
Hewavitharana – Alternative Strawberry Crown Rot Management.....	18
Wilson – Cannabis IPM.....	19
Krugner – Lanternfly Vibration Disruption.....	19
Hoddle – Palm Weevil Lures.....	20
Lee – German Cockroach RNAi.....	21
Duarte – Cannabis Biofungicide.....	21
5. Decision on Recommendations.....	22
6. Process Review Discussion.....	23
7. Closing Remarks.....	25

1. Attendance

Pest Management Advisory Committee (PMAC) Members

1. Brian Gress, California Department of Food and Agriculture
2. Brenna Aegerter, University of California, Agriculture and Natural Resources
3. Tom Getts, University of California, Agriculture and Natural Resources
4. Jimena Diaz Leiva, Center for Environmental Health
5. Farzaneh Khorsandi, UCD Department of Biological and Agriculture Engineering
6. Eric Stein, Western Plant Health Association
7. Melissa O’Neal, Marrone Bio Innovations, Inc.
8. Jim Steed, Pest Control Operators of California
9. Jim Farrar, Director, Statewide UC IPM Program
10. Steve Scheer, California Agricultural Commissioners and Sealers Association
11. Greg Browne, USDA Agricultural Research Service
12. Jenny Broome, Driscoll Strawberry Associates, Inc.
13. Robert Ehn, California Garlic and Onion Research Committee
14. Hanna Kahl, Community Alliance with Family Farmers
15. Margaret Reeves, Pesticide Action Network North America
16. Jonathan Evans, Center for Biological Diversity
17. Anne Katten, California Rural Legal Assistance Foundation
18. Dave Tamayo, California Association of Sanitation Agencies
19. Nick Lupien, California Association of Pest Control Advisers
20. Jon Holmquist, Association of Applied IPM Ecologists
21. Terry Gage, California Agricultural Aircraft Association
22. Bill Allayaud, Environmental Working Group
23. Eric Lauritzen, California Strawberry Commission

California Department of Pesticide Regulation (DPR)

24. Julie Henderson, Director
25. Ken Everett, Assistant Director
26. Aimee Norman
27. John Gerlach
28. Leslie Talpasanu
29. Jordan Weibel
30. Rodney Jones
31. Catherine Bilheimer
32. Tory Vizenor
33. Lynette Komar
34. Brian Ingel
35. Kimberly Crispin
36. Hannah Jensen

Facilitation Support, CSU Sacramento

37. Ariel Ambruster
38. Alejandra Infante

2. Opening Comments and Background

Introductions and Chair's Opening Comments

Julie Henderson, Director, Department of Pesticide Regulation (DPR), welcomed everyone and thanked Pest Management Advisory Committee (PMAC) members for their time and commitment to reviewing the grant proposals.

Due to safety precautions related to COVID-19, the meeting was held remotely. Participants were invited to contact DPRpmgrants@cdpr.ca.gov if they experienced any technical challenges during the meeting. Ms. Henderson said that public comments and questions would be taken after each agenda item, via both the Zoom meeting platform and through email for those watching the meeting by webcast.

Ms. Henderson and Aimee Norman, , Branch Chief, DPR IPM Branch, shared the following department updates:

- The DPR Sustainable Pest Management Work Group is in the process of developing a roadmap, goals, and recommendations for achieving sustainable pest management both in urban and agricultural settings. The group plans to release a draft of the roadmap for public comment in Spring 2022 and adopt a final recommendation later in the year. Ms. Henderson recognized PMAC members who serve on the Work Group.
- DPR will hold its 2021 Integrated Pest Management (IPM) Achievement Awards on Feb 23, 2022, at 1:30 pm. The awards will honor 5 awardees that represent a diverse cross-section of organizations that have achieved successful implementation of IPM practices.
- The PMAC has two new members:
 - Bill Allayaud, Environmental Working Group, joined the PMAC filling the vacancy in the Environmental and Public Interest Organization category after Kendra Klein, Friends of the Earth, stepped down from her role on the PMAC. Tasha Stoiber will serve as Mr. Allayaud's alternate.
 - Hanna Kahl is the new representative for the Community Alliance for Family Farmers, filling the position formerly held by Emily Buerer.
- The 2022 Alliance Grants submission period is now open with a closing date of March 10, 2022. DPR will award projects with budgets ranging from \$50,000 to \$1.8 million.
- On January 1, 2022, new State citrus and bee protection area regulations went into effect, for notification procedures for apiary operators who want to receive advance notification of pesticides, and for pesticide applicators who intend to apply pesticides labeled toxic to bees.

Zoom Orientation

The facilitator, Ariel Ambruster from the Consensus and Collaboration Program at California State University, Sacramento, oriented PMAC members and the public to the Zoom remote meeting platform and reviewed the meeting agenda. She noted that public comments and questions, taken after each agenda item, would be limited to three minutes each.

3. Research Grant Proposal Overview

Jordan Weibel, Research Grants Program Lead, DPR IPM Branch, shared updates to the IPM Grants Program.

- Alliance Grants
 - DPR expanded the Alliance Grants proposal application period. The closing date is March 10, 2022.
 - The funding pool for the Alliance Grants increased, with \$1.8 million available.
 - DPR will screen the proposals and PMAC members will review those that pass the screening.
 - The PMAC meeting to review the Alliance Grant proposals is scheduled for May 12, 2022.
- Research Grants
 - Numerous changes were made for the 2022 Research Grants:
 - The funding pool expanded compared to previous funding cycles, with \$3.75 million available.
 - DPR removed the concept application phase, in turn lengthening the solicitation period.
 - The project length is shorter – 2.5 years for 2022 grants compared with 3 years in previous cycles.

Mr. Weibel outlined the 2022 Research Grants solicitation. DPR received 19 proposal applications. After DPR screened the applications, 18 qualified for PMAC review, totaling over \$9.5 million requested. With \$3.75 million available, the proposals represent 255% of the available funding. Three submissions received for this grant cycle were resubmissions of projects previously reviewed by the PMAC:

- Grettenberger – Rice (previously led by Espino)
- Wilson
- Hewavitharana

2022 - 2023 Research Grant Summary of Proposals

Proposal Short and Full Title	Principal Investigator	Budget
Fennimore – Band Steamer Precision steam application for soil pest control in horticultural crops	Steve Fennimore	\$641,149
Grettenberger – Aphid and Thrip IPM in Lettuce Novel precision technologies to reduce insecticide use targeting aphids and thrips in lettuce	Ian Grettenberger	\$328,058
Michailides – Pistachio Decision Support Tool Decision Support Systems to reduce fungicide applications in pistachio orchards	Themis Michailides	\$241,292

Proposal Short and Full Title	Principal Investigator	Budget
Choe – Ant Growth Regulators Effects of Insect Growth Regulators (IGRs) on Argentine ants and the development of effective IGR baiting systems for sugar-feeding pest ants	Dong-Hwan Choe	\$269,178
Grettenberger – Tadpole Shrimp in Rice Developing an IPM approach for management of tadpole shrimp in rice	Ian Grettenberger	\$277,835
Neuman – UAV's for Vine Mealybug Control Use of UAVs to Release Beneficials to Control Vine Mealybugs in California Vineyards	Andreas Neuman	\$167,637
Westphal – Walnut Nematode Suppression Mitigating negative nematode infestation effects on productivity of almond without the use of soil fumigation	Andreas Westphal	\$406,244
Loudon – Bedbug Surface Entrapment Using Entrapping Surfaces to Augment Non-chemical IPM Approaches to Bed Bug Control	Catherine Loudon	\$486,264
Sutherland – Biting Mite IPM Biting Mites in California's Homes and Other Structures –assessing the problem and building capacity for institutional outreach and intervention	Andrew Sutherland	\$165,721
Westphal – Nonfumigant Nematode Suppression Use of Walnut byproducts for Suppression of Plant-parasitic Nematodes	Andreas Westphal	\$389,631
Choe – Drywood Termite Baiting Drywood Termite Baiting	Dong-Hwan Choe	\$274,655
Hasegawa – Novel Approaches to Diamondback Moth and Thrips Receptor interference: A novel IPM technology for managing key insect pests of vegetables in California	Daniel Hasegawa	\$335,878
Hewavitharana – Alternative Strawberry Crown Rot Management Reducing future pesticide use and paving the path for non-fumigant tactics by breaking the disease cycle of <i>Macrophomina phaseolina</i> in strawberry	Shashika Hewavitharana	\$149,539
Wilson – Cannabis IPM Reducing the Environmental Impacts of Cannabis Pest Management in California	Houston Wilson	\$312,580
Krugner – Lanternfly Vibration Disruption Substrate-borne vibrations as a novel pest management tool against the spotted lanternfly, <i>Lycorma delicatula</i>	Rodrigo Krugner	\$304,538
Hoddle – Palm Weevil Lures Fatal Attraction: Area-wide Control of South American Palm Weevil Using Attract and Kill Technology	Mark Hoddle	\$1,060,130
Lee – German Cockroach RNAi Development and evaluation of RNAi-based biopesticide against insecticide-resistant German cockroaches, a primary indoor pest of public health	Chow-Yang Lee	\$258,805
Duarte – Cannabis Biofungicide Evaluation of Biofungicide for Hemp and Cannabis	Miguel Duarte	\$360,000

Twenty-three PMAC members reviewed the proposals ahead of the meeting and submitted ranks for each proposal. Mr. Weibel shared the submitted ranks, as presented in the following chart. As the chart illustrates, all proposals received a wide range of rankings across the reviewers. Over half of the proposals were ranked highest by at least one reviewer, over half were ranked lowest by at least one reviewer, and all but one proposal (Duarte - Cannabis fungicide) received at least one ranking of four or better.

2022/2023 Research Grants Program Initial PMAC Proposal Rankings (average of 23 rankers)

Principal Investigator	Short Title	Rank Order	Average Rank	Standard Deviation	High	Low
Fennimore	Band Steamer	1	5.35	5.23	1	17
Grettenberger	Aphid and Thrip IPM in Lettuce	2	6.43	4.86	1	18
Michailides	Pistachio Decision Support Tool	3	6.61	4.17	1	17
Choe	Ant Growth Regulators	4	7.04	4.53	2	18
Grettenberger	Tadpole Shrimp in Rice	5	7.14	4.38	1	15
Neuman	UAV's for Vine Mealybug Control	6	8.30	4.64	1	17
Westphal	Walnut Nematode Suppression	7	8.83	4.62	1	17
Loudon	Bedbug Surface Entrapment	8	8.86	4.68	1	17
Sutherland	Biting Mite IPM	9	8.86	4.68	2	18
Westphal	Nonfumigant Nematode Suppression	10	9.43	5.09	1	18
Choe	Drywood Termite Baiting	11	9.86	5.56	1	18
Hasegawa	Novel Approaches to Diamondback Moth and Thrips	12	10.18	4.65	1	16
Hewavitharana	Alternative Strawberry Crown Rot Management	13	10.26	5.02	3	18
Wilson	Cannabis IPM	14	10.52	4.51	4	18
Krugner	Lanternfly Vibration Disruption	15	10.68	4.72	2	18
Hoddle	Palm Weevil Lures	16	10.91	4.60	3	18
Lee	German Cockroach RNAi	17	11.68	3.84	4	18
Duarte	Cannabis Biofungicide	18	16.00	2.15	10	18

Quorum Count

Aimee Norman ascertained that a quorum of PMAC members was participating in the meeting, in accordance with the Bagley-Keene Act. Ms. Norman reminded PMAC members of their legal obligation to disclose any conflicts of interest and initiate recusal as appropriate. She noted that DPR received a conflict-of-interest disclosure ahead of the meeting from PMAC member Whitney Brim-DeForest, representing the University of California Cooperative Extension (UCCE), who recused herself due to her role as a co-principal investigator (PI) for the Grettenberger – Rice proposal.

Ms. Norman noted that 4 members were being represented by their alternates:

- Brian Gress for Karen Ross, California Department of Food and Agriculture
- Eric Stein for Renee Pinel, Western Plant Health Association
- Melissa O’Neil for Keith Pitts, Marrone Bio Innovations

- Thomas Getts for Whitney Brim-DeForest, UCCE

Ms. Norman noted that Ex Officio members do not count toward quorum and affirmed that quorum had been attained. See above for the attendance list.

Ms. Norman also provided an advisement on the Hasegawa proposal application package: the package included a letter of support printed on DPR letterhead which did not go through proper channels of approval with DPR and should not have been included in the proposal package. Ms. Norman emphasized that the letter should be completely disregarded in the PMAC's review, deliberations, and recommendations.

4. Research Grant Proposal Discussion

Ms. Ambruster explained the proposal review process and reviewed ground rules for the conversation. She noted that the various perspectives shared by PMAC members are helpful to inform Director Henderson's funding decisions as well as to provide feedback to the teams submitting proposals.

Discussion of Proposals

PMAC members discussed the merits, concerns, and areas needing clarification for each project proposal, in the order of their initial ranking. Below is a summary of PMAC members' comments for each proposal. Comments reflect individual PMAC member observations, not consensus opinions. Thus, merits and concerns may occasionally appear to be contradictory.

Fennimore – Band Steamer

Merits

- Previous work on steaming in strawberry production has shown positive shifts in the microbial community, with desirable bacteria surviving and recolonizing the soil. Previous work also shows that the approach is more effective when applied to smaller amounts of soil, making it more appropriate for vegetable crops.
- The proposal and team are strong.
- Steam provides a replacement for fumigants to address soil problems.
- The project targets an application cost of less than \$500 per acre, which would make the approach cost effective for the industry.
- The project applies steaming in a more precise manner over a smaller area, which could make it more effective as well as decrease cost.
- The approach has the potential to have a big effect on reducing the use of some high priority pesticides.
- The project is well designed and could positively impact the health of nearby residents, especially children and pregnant women.
- The project addresses fumigants, which are a high risk and high regulation concern pesticide and a focus of the Request for Applications.
- The approach has potential to work on many crops to control pathogens and provide weed control.

Concerns

- The proposal should provide more detail on how this could be tailored for different growers and how that information will be shared.
- The proposal should provide more details on the application method needed to address targeted pests and diseases, such as the temperature and length of application.
 - A PMAC member said that previous research has shown that most pathogens are killed in 20-30 minutes at around 70 degrees Celsius.

Clarifications

- What is the definition of a low-carbon intensity fuel?
- What impact does this process have on groundwater?
- Does the proposal address weed control between bands, since the application is done in bands?
 - A PMAC member said that the proposal addresses treating weeds mechanically.
- Would the effectiveness of this method be influenced by soil characteristics like soil texture?
- At what scale would this approach be applicable?

Grettenberger – Aphid and Thrip IPM in Lettuce

Merits

- Western flower thrips transmit a virus in the Salinas area and can destroy lettuce fields. There are only two products to treat it currently, one of which is organic and should not be overused. This provides an alternative approach to addressing this problem.
- A creative idea looking at adapting existing technology to a new use.
- The approach would reduce the amount of insecticide applied in the field.
- Pyrethroids, the target pesticides, are of high regulatory concern and end up in surface water.
- Methomyl poses a high risk to human health.
- The letters of support, ranging from growers to shippers, are strong. This kind of networking is important to IPM work.
- Using drones to release beneficial insects is a novel approach that could make use of beneficial insects much more time efficient.
- The project is well designed.
- The cost is reasonable.
- The project includes significant exploration of biological control options.
- The project clearly addresses how arthropods operate in the agroecosystem.
- Western thrips are one of the biggest pest problems in the state to date.

Concerns

- The proposal is focused primarily on engineering the technology and precision application, but the project team does not include technical background in these areas.

- The insectary industry prioritizes larger acreage and sometimes there are feasibility issues with meeting demand within the right timing.
- Though the project could reduce pesticide use, it still relies on use of pesticides that are of concern.

Clarifications

- In what way is the project’s “nozzle configuration” novel?
- How widespread is the problem? Is it regional?
 - A PMAC member responded that the problem exists along the coast where lettuce and other vegetables are grown.

Michailides – Pistachio Decision Support Tool

Merits

- Using leaf moisture to model whether spraying is needed would reduce pesticide use by moving away from prophylactic application of pesticides.
- Moving away from a calendar-based approach to pesticide application is a classic IPM strategy.
- Pesticides should be applied based on well-established thresholds, and this project would improve understanding of those thresholds.
- The approach would leverage existing infrastructure in orchards.
- The project approach combines more effective control with decreased application of pesticides, which could lead to year-to-year improvement.
- This disease forecasting technology has been used successfully in several other crops, particularly in rainier areas of the country.
- Past applications of this approach have relied on a leaf wetness monitor on weather stations. This project would address that limitation by using a proxy of relative humidity to estimate leaf wetness, increasing the number of weather stations that would be able to support this approach and the potential reach of the approach.
- It will be a low cost of use for growers, which can bring significant savings.
- Includes assessment with growers and pest control applicators about the tool.

Concerns

- Although the project provides an alternative to calendar-based spraying, it is fundamentally about supporting pesticide application rather than exploring alternative pest management techniques.
- The proposal does not address cultural practices and why they are inadequate.
- A modeling approach like that taken by this project is promising, this has not had a high rate of adoption. Models may need to be fine-tuned, incorporating real-time information, to improve adoption.
- The project should incorporate assessments throughout the process, rather than only at the end.

Clarifications

- None.

Choe – Ant Growth Regulators

Merits

- Sugar feeding ants are a significant problem in both agricultural and urban settings.
- The project has the potential to get control of an important pest using a low-risk insecticide and baiting system.
- Insect growth regulators (IGR) are more important than the products they are often used alongside. It is good to see IGRs being tested with an alternative baiting system.
- The pest control industry is likely to be supportive of this approach.
- Given the impacts IGRs have on honeybees, it would be important to be able to use IGRs in bait form rather than using an air delivery sprayer.

Concerns

- The approach could be too high cost for growers.
- The proposal does not address whether there are cultural issues that could prevent use of hydrogels in urban environments, such as being attractive to pets or kids to eat.
- The proposal tests the efficacy of the IGR in fumigant form, however the project is focused on bait, not fumigant, application.
 - A PMAC member said that the test of the IGR in fumigant form is not the only way the project would test efficacy, but rather contributes to understanding how the IGR works.

Clarifications

- Do ants go through molting stages that make IGRs effective? Are IGRs effective on this species?
 - IGRs have been shown to work against some of the fat-loving ants. The main challenge has been how to deliver IGRs to other ants.
- Do the hydrogel beads have the potential to add to microplastics concerns?
 - A PMAC member responded that no, these are not plastic based.

Grettenberger – Tadpole Shrimp in Rice

Merits

- The project would contribute a lot of important basic information on managing tadpole shrimp, including how to monitor effectively and how to support potential benefits they might provide.
- The project addresses a major issue in rice and the potential downstream effects of current approaches.
- The proposal lays out how addressing runoff – pyrethroids are known to be impacting the Sacramento River and the Sacramento-San Joaquin River Delta – would benefit

- waterways and protect both agricultural workers and recreation.
- The project looks at the interaction between the shrimp and the flooding of the fields to identify alternative methods that do not rely on pesticides. For example, it will identify potential cultural approaches to reduce the need for insecticide.
- The project includes significant scouting and monitoring, true IPM processes that will help identify biological controls such as shrimp helping control weeds, reducing the need for herbicides, and mosquito fish helping control the shrimp, reducing the need for insecticide.
- The description of organic methods was helpful.

Concerns

- Though the acreage affected is not small, other projects look at larger commodities that represent larger acreage and larger overall pesticide usage.
- There isn't transferability of this approach to other crops.
- Because pyrethroids used in rice are usually applied for other pests, not tadpole shrimp, the project's impact on pesticide use may be limited.
- The proposal does not address unregistered use of pyrethroids – pyrethroids aren't registered for tadpole shrimp, but for weevils.
 - One PMAC member said that pyrethroid is listed on the UCIPM website for tadpole shrimp.
 - Another PMAC member said this may be an error to be corrected.
 - Contact needs to be made to the Rice Board to find out what is being applied for tadpole shrimp.

Clarifications

- How does the project's approach align with how the rice industry is working to address shrimp?
- Could the industry provide funding to support this project?

Neuman – UAV's for Vine Mealybug Control

Merits

- Vine mealybug is a large problem with few tools available to address it.
- Using biological controls in conjunction with unmanned aerial vehicles (UAVs) could help treat a larger amount of acreage, improving technology and reducing pesticide use.
- The approach addresses the problems of shortage and cost of labor.
- The proposal showed evidence that biological control can be effective but has been impractical and too expensive with previous methods of application.
- The proposal includes an economic analysis.
- Drones have been effectively used to apply beneficial insects in other crops.
- Although the cost may be prohibitive for small farmers to pursue on their own, it may be possible for smaller farmers to conduct joint applications.
- The project has a strong team of researchers.

- The project is affordable.

Concerns

- The approach may not be economically feasible for use on small areas of under 15 acres.
- The proposal notes that the rate of release is an unknown. The proposed rate of application in the project is 1,500 beneficial insects per acre, significantly below the 10,000 insects per acre that referenced research found reduced vine mealybug populations by 50%.
- The proposal does not address collecting yield data to show the benefit of this control option.
- A large part of the budget is for services provided by project's PI.
- Objective 3 highlights the need to improve drone technologies to scale this pest control method, however the work under that objective is focused on assessing mortality of beneficial insects using the current method, not reducing mortality through an improved method.
- Because ants support mealybugs, for example by killing the mealybug biological controls, the top priority should be ant control.

Clarifications

- Given the effectiveness of mating disruption, how necessary is an additional tool?
- To what extent will the information gathered be shared broadly and publicly?

Westphal – Walnut Nematode Suppression

Merits

- Multiple PMAC members agreed that using a waste product, walnut hulls, for pest suppression on a pest that requires pre-plant fumigation is a win-win.
- The economic benefits and feasibility are phenomenal.
- Fumigant use is standard in tree crops and is highly risky, and there is a great need for fumigant alternatives. This is a worthy problem to tackle.
- Applying waste products to reduce fumigant use is a great approach.
- The target nematodes are on the outside of the roots so are a fantastic target for leachates.
- The PI does great work and has had success with full almond recycling – I trust they will be clear-eyed in the research.

Concerns

- A PMAC member said their biggest concern was the lack of labor to be able to apply this approach, particularly given the location of walnut orchards in the northern part of the state. One letter of support is from Yolo County, in an area where labor for harvesting has already been a challenge.
 - Another PMAC member questioned if labor would be an issue as hand labor

- would not be required.
 - The member said it would require two people, one on a loader, another on a spreader. The work might be done during the off season when there might be no available labor for the orchards.
- The author discusses using the waste as a soil amendment but does not address analyzing the impact of that on soil health.
- There was not much experimental detail or controls to capture the effect.
- A PMAC member did not see any outreach described.
- There needs to be more field-based work on implementation and testing details, such as where and how they are being tested. There are concerns about the efficacy of this approach in field settings.
- Walnuts are phytotoxic to a lot of other plants and the proposal didn't address that potential toxicity to other plants and soil health.
- Soil health is extremely important, as the drought is causing serious issues already; we need to be careful when adding something new, and consider the health of the trees providing the waste.
- It seems a bit far from practical use yet.
- A cost analysis needs to be carried out.

Clarifications

None.

Loudon – Bedbug Surface Entrapment

Merits

- A unique, novel, strategic approach, with the potential to have huge statewide and nationwide impacts on this pervasive, tough pest problem, offering sustainable solutions.
- It is a strong, solid proposal, with lab and field trials and follow-up surveys.
- It is a simple approach, which therefore has a huge chance of success if it reaches implementation.
- There are very strong letters of support from many entities.
- The PI is uniquely prepared to take this on.
- The economic analysis is well thought-out.
- One PMAC member appreciated the project's extension component.
- It could have a wide impact on public health, including children.
- This is a particularly difficult pest for low-income people, because all treatment options are often cost-prohibitive. The return on investment for the amount being asked for is super high, because it can impact a lot of people who can't afford current treatments.

Concerns

- One PMAC member said the proposal didn't address why current non-chemical methods are ineffective.

- A PMAC member with a structural pest background shared that this approach could give someone with limited income the ability to buy a mattress cover with this material on the rim to protect against bedbugs in bed until the bugs could be eradicated. Once bugs are on the bed, a current mattress encasement doesn't prevent them from getting on people. This member sees the approach as a unique and new tactic that could be helpful in places like multifamily housing where the pest control sector is battling bedbugs on an almost daily basis.
- The proposal provides very little information about the material the PI is proposing to manufacture.
- The budget raised some red flags.
- A PMAC member was skeptical about the efficacy of the approach, concerned that a trap wouldn't achieve the level of control needed.
- It seemed as if this proposal was more of a product development project, more suitable for private investment. This might not be the best use for these research funds.
- How far along is the material? The last objective is to develop new material that would be easier to manufacture, so the experiments would be done on a different version of the material. The impact of this is not addressed.
 - Another PMAC member said they initially had the same concern, but could see that the PI is going to take a detailed look at the structure and physical characteristics of the material. The logical next step is how to do this more effectively, making it more affordable and scalable.
- There was a concern about how much of the budget is devoted to development and manufacture, rather than testing.

Clarifications

- There was not enough clarity about whether the approach is about monitoring or control.
- How impactful would the approach be on reducing pesticides?

Sutherland – Biting Mite IPM

Merits

- There is only anecdotal information about this problem; this project helps to elucidate how much of a problem it is. If people don't know what the issue is, they will keep trying things. It is important to get a better handle on the issue to diagnose it properly and guide actual solutions to the problem.
- This addresses an emerging pest problem, particularly for people who have less access to medical care.
- This is a necessary first step to IPM – it is not yet implementation, but a critical step. You can make the case that many infestations go undetected, are misidentified, or mismanaged. Basic biology is key.
- Sometimes short-term mite infestations tip people into delusory parasitosis, which is a serious psychological problem.

- The project is relatively low cost and worth the money.
- Mites are one of the most infrequent problems encountered in structural pest control, but are frequently mismanaged. There is a risk of unnecessary fumigation.
- There would be a low economic barrier to use.
- The project leverages the resources of vector control agencies, putting tools in the hands of the people who will be addressing the problem. The survey method leverages people who are already in the field to collect samples – that keeps the budget down while adding reach.
- Dr. Sutherland has a history of running well-managed and well-budgeted projects.

Concerns

- This is more of a rodent problem than a mite problem [with mites arising from rodent infestations]. How big of a problem is it?
 - A PMAC member stated it may also be a chicken problem.

Clarifications

- None.

Westphal – Nonfumigant Nematode Suppression

Merits

- Research on the multiple benefits different cover crops may offer is important.
- Fumigant use is a high risk, high regulatory concern pesticide use. This is a high priority for this grant program to address.
- Non-fumigant alternatives to nematode control are a critical issue, and there are not a lot of options for nematode control post-planting. This is a good cultural option after trees are planted.
- The research could have widespread, major impact.
- It involves widely used crop systems.
- The proposal is well organized and quantified. It is stronger than the PI's other proposal, hitting on what was hoped the other proposal would address.
- The research looks at the interaction of keeping the cover crop alive and the water needs of the crop. It is not just about controlling the pest, but the practical aspects of the application of this approach.
- The use of cover crops in almonds would be a benefit. Most of them are clean cultured – they spray Roundup over the entire floor to keep anything from growing. If you work in a cover crop in the spring, it decomposes rapidly and would be beneficial.
- It further expands on the multifaceted benefits of cover crops, for multiple soil components. It builds on a practice that is already in use but needs more research.
- The use of cereal rye makes sense because it can improve soil structure and health and water infiltration, but does not have the risk of nematodes.

Concerns

- The proposal was difficult to read and confusing, with an unclear design. The PI could have developed the proposal much further: What are benefits of cover crops? What is going on below ground? The proposal discussed different irrigation systems but did not specify which would be used.
- One PMAC member would have liked to see more than one collaborating farm.
- A PMAC member had irrigation concerns. Irrigation is necessary to keep cover crops alive. Often almonds use microsprinklers, and this approach would require a switch in irrigation systems.
 - Another PMAC member saw microsprinklers as wetting the root zone so that a switch in irrigation systems might not be needed.
 - Another PMAC member responded that most almond orchards are being planted with two-line drip, cover crops would depend on fall and winter rain.
- Two PMAC members raised the issue of drought-related water challenges, with many growers having already lost water. How much water would cover crops take? Is that additional to what is needed to grow almonds?
- One PMAC member preferred the PI's other proposal because it attempts to make use of an existing organic amendment, and is recycling material into the soil rather than adding water needs. This proposal was also more expensive than the other.

Clarifications

- A PMAC member was curious about how the PI chose which cover crop to apply, having heard of using mustard for nematode suppression.
 - Another PMAC member shared that many mustards are hosts for nematodes, whereas cereal ryes are not.

Choe – Drywood Termite Baiting

Merits

- This would address a high-risk fumigant with major climate impacts, as it is over four thousand times more potent than carbon dioxide as a greenhouse gas. This chemical is largely used in Los Angeles, indicating there are other approaches. It was put into DPR reevaluation in 2008, and has been stuck there since – the PMAC member encouraged DPR to look critically at how to deal with this important issue.
- Efficacious baiting for drywood termites is urgently needed. Sulfuryl fluoride, which made up more than 70% of structural pesticide use in 2018, is also toxic to people, including children and the elderly.
- More needs to be done to address drywood termite infestations, and this type of baiting technique has been useful for subterranean termite and cockroaches.
- It is a good approach, and interesting technology.
- It has the potential to greatly reducing fumigation. It would be a much better tool for the structural pest control industry as there are clear limitations to current baiting strategies.

Concerns

- There are serious questions about the effectiveness of the treatment. There are similar products that don't give that high a level of confidence that the pest is fully eradicated – people want that certainty.
- How does one bait at the scale of the whole house? Whole-house fumigation is often applied during a real estate transaction, with time constraints that might not be effective for this method.

Clarifications

- PMAC members discussed heat treatment as an approach to control termites, questioning why it is not explored or used more.
 - One PMAC member noted the same PI was funded to look at heat, an essential tool in the toolbox, and essential oils for drywood termites and produced an impressive progress report.
 - Another PMAC member said it is an important option except it does not work where there is a heat sink [an adjacent area that draws heat away from the target area].
- One member said they would like to know how much past funding has been spent.

Hasegawa – Novel Approaches to Diamondback Moth and Thrips

Merits

- The proposal included a strong economic evaluation.
- This biopesticides research has the potential for a large impact, as it involves the high-value \$200 billion lettuce crop – 80% of US lettuce comes from the Salinas Valley.
- The problem with western flower thrips is huge – these are important target pests.
- This is a novel approach to control that deserves looking at, interesting and exciting. It is important to look at new mechanisms for getting at insect pests.
- It was good to see the use of vegetable crop rotations to address both fertility and pest management, and to see recognition that the focus should be on control of the virus, which is the direct cause of the disease, not the vector.
- This would be applicable to organic growers.
- This project would advance technology that is basic enough that it could be applied to other crops.

Concerns

- One PMAC member would have liked more detail on the rotations and cultural approaches.
 - Two other PMAC members expressed confusion about this comment, saying they thought this research was focused on early-phase discovery of receptor interference, not rotations.
 - The original member clarified they desired more information on how that would interact with existing crop rotation and cultural practices.

- This is very early in the discovery phase, so it may not be the best place to use these DPR funds for advancing IPM. There is a desire for more confidence on the merit of the approach and how it would work.

Clarifications

- None.

Hewavitharana – Alternative Strawberry Crown Rot Management

Merits

- This group has been working for some time on a truly integrated approach which looks at key cover crops that have been shown to be suppressive of *Macrophomina* as well as crop termination to replace broader fumigation. Crop termination would use a chemical through the drip line to kill the plant, which may not release as much chemical into the soil, though there are questions still about how that will impact *Macrophomina*. They are looking at various ways to control soil-borne pathogens.
- The fumigants used are high risk and of high regulatory concern. It is important to reduce fumigation in this crop.
- The project will demonstrate whether this approach will work – if it does, it would be a major win.
- The proposal includes clear statistics – more than 25% of the dying plants tested positive for crown rot.
- This has a high bang for the buck – reducing fumigant application is one of the most important things in California agriculture
- If this project helps expand the use of cover crops to improve soil health and fertility and the microbiome, that would be a huge success. There are some growers who use cover crops, but at large, growers are unaware of the benefits of cover crops to suppress disease. The research would expand awareness of these potential benefits.

Concerns

- The price of land in the Salinas Valley is so expensive that it will not be left uncropped – that is a barrier to adoption.
- This proposal essentially adds an additional fumigation to kill the plants – that is not appropriate for this grant.
- It would increase the fumigant load.
 - A PMAC member replied that the intent is as a remediation tool for a dramatic situation, where there is a known *Macrophomina* problem, in the off year, not fumigating twice in a year.
- Doing fumigation at the end of the cropping cycle wouldn't address off-gassing through the plant holes in the plastic, which could be an important risk if the technology works.
- There was a lack of discussion of collecting cost information and economic analysis.

Clarifications

- A PMAC member asked whether the project would use wheat as the cover crop, or potentially other grains as well.
 - A PMAC member familiar with the project said it would use a specific cultivar of wheat that has known soil and microbial benefits.

Wilson – Cannabis IPM

Merits

- Additional testing will be important for cannabis and hemp industries, with false positives being an issue in the industry.
- The project gets at basic information: what are the pests and what pesticides are being used? One PMAC member noted that it's the "Wild West" out there – the industry needs to protect its crop as well as its workers and customers, but currently they don't even know what the main problems are, so they can't intelligently deal with the problem. This would be a critical first step.
- The project has the potential to impact a lot of people.
- Pesticide usage has to be very high.
- Growers' primary source of pesticide information is Google, and their primary source of products is off the internet. The PMAC member has seen photos of horrible grow sites using terrible products. This is probably the California sector that has the most misuse and abuse, and the PMAC member is strongly in favor of any project that can address the misuse. There is a desperate need for education and outreach to these growers.
- It is a great idea to directly involve growers in data collection and train them appropriately.
- It is a really creative approach, with multiple stakeholders, working with growers and PCAs and tackling many angles.

Concerns

- It is time for this industry to invest in themselves rather than going after State grants – it is making so much money.
- There is more being grown illegally than commercially and illegal grows can't be regulated anyway. For this reason, it would be better to put the money toward something else.

Clarifications

- None.

Krugner – Lanternfly Vibration Disruption

Merits

- The approach has the potential of providing a strong tool before lanternflies are here and are a threat.
- It's a non-pesticidal technology, and if it works, it would be of great benefit.
- It's an interesting and unique idea.

- Lanternfly could become a very important pest for us, if it makes its way to California. We always need to guard against invasive pests.
- The methods of control are good.
- If this project is not funded this year, please try again – there is a lot of promise in this proposal.

Concerns

- It is very early in the discovery phase.
- There is a lack of documentation of plant fitness impacts to get to an economic analysis.
- Could the approach affect other beneficial insects negatively?
- It seems high risk in terms of the chance of success.
- It might be better to study in the field in an area where lanternflies are already established.
- This group has done some work with substrate vibrations in glassy-winged sharpshooter, but the industry stopped pursuing that line. It is hard to understand how they will economically be able to apply this vibrating to prevent or interrupt the mating signal – there are practical feasibility questions.

Clarifications

- There was mention of predators – what if they get disrupted by the vibrations?
- Why did the proponents choose a pest that is not currently a problem in California?

Hoddle – Palm Weevil Lures

Merits

- When the state sprays urban areas, that is a highly visible use of pesticides and highly unpopular in a troublesome way, so any alternative to that is good.
- The materials and methodology are very well written.
- This is a pest of great concern within the palm industry, and the vector is of concern.
- The weevil has the potential to have a huge residential impact by killing palm trees, on the nursery industry, and on residents.
- It is difficult to spray ornamental and date palms because the trees are so high.
- This proposal could help both ornamental palms (important in Southern California) and get a handle on a reservoir of pests that will eventually reach the date palm industry.

Concerns

- A lot of money is being requested when the attract and kill technology already exists, and the pheromone is already identified.
- This seems more like an implementation project rather than research.
- Considering the level of effort versus the cost, what the project is really doing, it is too expensive for what it is.
- One PMAC member felt that a proposal asking for a large dollar amount should have a

broad benefit throughout the state. Another thought the project was too expensive and specialized.

- The proposal's language was unclear. Some of the protocols were confusing, and the discussion of expected results was hard to follow (weevil control versus weevil mortality).

Clarifications

- None.

Lee – German Cockroach RNAi

Merits

- This is one of the toughest pests we deal with every day in structural pest control – having a new tool would be phenomenal. Having this investigation initiated to see if it is a viable tool is important.

Concerns

- One PMAC member thought the research should go further than just addressing pesticide resistance.
- There is concern about the risk that this technology could transfer to other species, off-targeting gene silencing.
- This is very early in the discovery phase, and this is not the most appropriate application of the limited funds.

Clarifications

- None.

Duarte – Cannabis Biofungicide

Merits

- None.

Concerns

- There has been a significant reduction in acreage of industrial hemp grown.
- The approach uses calendar spraying, which is not IPM.
- The proposal is vaguely written.
- A PMAC member's understanding was that the proposers are just trying to add methyl dihydrojasmonate to see if there is synergistic effect with existing pesticide applications, basically a one-treatment experiment.
- One PMAC member had concerns about the rigor of the experimental design.
- The economic benefits were very poorly described.

Clarifications

- None.

Following discussion, public comment was invited. Two proposal Principal Investigators offered comments:

- Dr. Dong-Hwan Choe thanked the PMAC members for their feedback on all the proposals.
- Dr. Ian Grettenberger provided a clarification on a question raised earlier in PMAC discussion regarding pyrethroid use in rice, saying there are several early season pests that are simultaneously managed with the pesticide, not only tadpole shrimp but also rice water weevil and seed midge. Shrimp are the biggest issue.

PMAC members were asked to re-rank the proposals and submit their re-rankings via email.

5. Decision on Recommendations

Quorum was confirmed and the re-rankings were reviewed. With 22 PMAC members submitting re-rankings, the overall ranking order saw some changes: while the top five and bottom two ranked proposals remained the same, the re-ranking changed the rank of several proposals in the middle of the pack. The PMAC's re-rankings elevated:

1. Westphal's proposal to research the use of walnut tree waste to suppress nematodes from 7th to 6th;
2. Choe's proposal to look at injecting bait into wood to get at drywood termites from 11th to 9th;
3. Wilson's proposal to gather basic pest, pesticide and IPM information on the cannabis sector from 14th to 12th; and
4. Hoddle's proposal to use attract-and-kill technology to get at palm weevils from 16th to 15th.

2022/2023 Research Grants Program Final PMAC Proposal Rankings (average of 22 rankers)

Principal Investigator	Short Title	Rank Order	Average Rank	Standard Deviation	High	Low
Fennimore	Band Steamer	1	3.64	3.57	1	13
Grettenberger	Aphid and Thrip IPM in Lettuce	2	4.82	4.01	1	18
Michailides	Pistachio Decision Support Tool	3	5.27	3.72	1	13
Choe	Ant Growth Regulators	4	6.32	3.69	2	18
Grettenberger	Tadpole Shrimp in Rice	5	7.18	4.16	2	15
Westphal	Walnut Nematode Suppression	6	7.50	3.89	1	16
Neuman	UAV's for Vine Mealybug Control	7	7.82	4.47	1	17
Loudon	Bedbug Surface Entrapment	8	8.14	4.54	1	17
Choe	Drywood Termite Baiting	9	8.23	2.90	1	14
Sutherland	Biting Mite IPM	10	8.95	4.49	3	18
Westphal	Nonfumigant Nematode Suppression	11	9.45	3.78	3	14
Wilson	Cannabis IPM	12	10.68	3.09	4	17
Hewavitharana	Alternative Strawberry Crown Rot Management	13	11.23	4.50	2	18
Hasegawa	Novel Approaches to Diamondback Moth and Thrips	14	11.91	4.30	3	16
Hoddle	Palm Weevil Lures	15	13.86	2.76	8	17
Krugner	Lanternfly Vibration Disruption	16	13.91	2.74	5	17
Lee	German Cockroach RNAi	17	14.91	2.47	8	18
Duarte	Cannabis Biofungicide	18	16.82	2.93	6	18

A PMAC member proposed that the full suite of feedback be shared with Director Henderson for consideration, including the initial rankings and re-rankings as well as the range of perspectives shared by the PMAC on merits, concerns, and areas needing clarification. Another PMAC member expressed support for this proposal.

There were no public comments.

In a roll-call vote on the proposal, eighteen of the twenty-three PMAC members who had participated in the meeting were in favor and the proposal was approved. Five members did not respond to roll call and therefore did not vote.

6. Process Review Discussion

PMAC members provided thoughts on the meeting and proposal review process at several points during the meeting, with a particular focus on the number of proposals and the level of work needed to review them. Topics raised and DPR responses included:

- In response to a question on whether there was a great deal more funding available for proposals for this round, Jordan Weibel assented, saying the budget was increased to \$3.75 million this time.
- A PMAC member asked if DPR could consider revising the application materials to encourage applicants to provide more cogent and relevant, and less repetitive,

proposal content. Currently PMAC members may have several documents to review for one proposal, and find repetitive content, or open a document to find it blank. It was not possible to tell from application to application which file to open in which file would contain what information.

- Two other PMAC members echoed these thoughts. One asked that more space be provided for description of the projects and their methods.
- A PMAC member said that 18 proposals is significantly more than the PMAC has reviewed in the past, and desired to clarify PMAC obligations moving forward, as this was time-consuming work. Was this number of proposals anticipated in the future? Is DPR still screening applications?
 - Leslie Talpasanu, Program Manager and Supervisor of the Agricultural Pest Management Section, said DPR still does do the screening and passed on only those proposals that met criteria. She said the Department is looking at ways to improve the review process moving forward when there are so many proposals.
- Another PMAC member said supporting materials provided with proposals can contain irrelevant information and reviewing all the materials can be a huge undertaking.
 - Ms. Talpasanu said the Department passes along to the PMAC all the materials it receives, for those PMAC members who would like to review everything. She encouraged PMAC members to focus solely on the proposal itself and the answers to the application questions, considering the rest of the information supplemental.
 - The PMAC member indicated feeling an obligation to look at everything that is sent.
- Another PMAC member thanked the Department for the change in asking PMAC members to only rank the proposals, rather than scoring each one from 1 to 100, saying the changed approach is much easier.
 - Another PMAC member agreed, adding that ranking is more realistic.
- This PMAC member suggested DPR ask applicants to follow consistent naming conventions, which would be very helpful for reviewers. For example, it is very helpful when all letters are collected in one PDF. Applicants could be given clear direction on where to place detailed information on the experiments, as this varied from proposal to proposal, and in some cases, that information was not clear.
- A PMAC member asked if the increase in funding that allowed for more proposals to be considered was a one-time occurrence.
 - Ms. Talpasanu replied that it is a two-year increase.

With meeting time short, Ms. Talpasanu urged PMAC members to feel free to email DPR with additional thoughts and suggestions.

In addition, the topic of how the PMAC is to consider proposals in the context of available funding arose. PMAC members asked for information about how many proposals might be

funded, or how much funding may remain. DPR representatives explained that the Director will make the final decision about which and how many proposals would be funded, and that might not necessarily reflect the rankings as provided by PMAC recommendations. PMAC members also grappled with a proposal that asked for more than \$1 million in funding, discussing whether those should meet a higher bar or if DPR ought to place a limit on the amount that an individual proposal could seek. DPR has asked PMAC members to focus only on the merit of each proposal on its own, rather than considering proposals in the context of funding or the total funds available.

Ms. Norman of DPR provided clarification to the PMAC around discussion of cost issues, asking PMAC members not to be concerned about a proposal's overall dollar value, but welcoming consideration of the value of the proposal in terms of cost and line-item issues.

Newer PMAC members asked various clarifying questions during the day, including about the process; Ms. Norman clarified that even though time is tight, DPR is required to receive a formal roll-call vote recommendation from the PMAC, after PMAC completes the re-ranking process and reviews the results.

DPR representatives responded to a question about how the USDA can apply for a State DPR grant, saying that the grants are open to a diverse array of recipients, with only a few categories precluded, such as DPR employees. While most recipients have come from the University of California and California State University, applicants from outside those systems are welcome to apply.

7. Closing Remarks

On behalf of DPR and Director Henderson, Ms. Norman thanked PMAC members for their interest, commitment and willingness to volunteer, and the time they committed to reviewing the proposals.

The next PMAC meeting will take place on May 12, 2022.