Appendix G: Peer Review (Submitted)

Status: Complete

**Project ID/Title:** NE\_TEMP2140: Sustainable Management of Nematodes in Horticultural and Field Crop Plant Health Systems **Rate the technical merit of the project:**

1. Sound Scientific approach:

Approve/continue project

2. Achievable goals/objectives:

Excellent

3. Appropriate scope of activity to accomplish objectives:

Excellent

4. Potential for significant outputs(products) and outcomes and/or impacts:

Excellent

5. Overall technical merit:

Excellent

Comments

This is a very well conceived and presented multi-state project. The objectives are a combination of research and outreach efforts. Because of the diversity of nematodes and geographic locations covered by this project, individual and collaborative research is required. Additionally, emerging nematode pests in different regions of the country are of importance and require immediate response. While these responses will occur at the regional level, the expertise of this group can be leveraged to address these important problems. The research outlined in the proposal is straight-forward and encompasses many different approaches that can be customized into integrated nematode management programs that are relevant to specific regions of the country.

The training component in Objective 3 is excellent. The multi-day nematode diagnostic programs are essential for the dissemination of techniques and for the continued viability of the discipline.

With the interest in soil health across members of the multi-state project, there may be an opportunity for the group to leverage their individual datasets into more sophisticated analyses. For example a nation wide meta-analysis or some type of machine learning to allow for prediction of soil health parameters. Additionally, work by this group on emerging nematodes could be synthesized into recommendations for how regulatory agencies might deal with new nematode introductions in a proactive manner. Your Recommendation:

Approve/continue project

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Good

5. Overall technical merit:

Excellent

Comments

Scientific Approach:

The authors of NE\_TEMP 2140: “Sustainable management of nematodes in horticultural and field crop plant health systems” have proposed a project with sound scientific merit. Project participants have presented a holistic approach to the management of plant parasitic nematodes in multiple, diverse cropping systems that has valuable and integrated components. The authors rightly acknowledge that given the diversity of cropping systems and their associated nematode pests that a “one size fits all” approach is not warranted. The proposed project builds upon a foundation of information generated in previous multistate projects that positions the proposed project for success. The proposed integrative approach to nematode management that includes breeding for plant resistance, soil amendments, cover crops, biological control, plus new and existing nematicides has strong scientific merit and provides potential for applications of project results in these agricultural systems. The proposed studies on soil health that include the biology and ecology of nematode communities and the effects of nematode management systems are a welcome and sound scientific component of the proposed project. The added benefit that nematode community structure has been demonstrated as a useful bioindicator of soil health will provide an excellent scientific foundation to the project that can inform the development of new and integrative nematode management strategies that are tailored to cropping systems. The proposed inclusion of climate change effects and potential emergence of new nematode pests in northeastern cropping systems is very forward thinking and will allow project scientists to monitor and prepare for these potential new nematode threats. In total, NE\_TEMP 2140 assembles a team of expert scientists in a comprehensive project that is grounded in scientific excellence and potential for agricultural applications.

Achievable goals:

The four proposed project objectives are achievable given the breadth of research team expertise and the existing data and expertise that the team has generated in previous (and related) projects. The systems and tools for the first objective of developing and integrating nematode management systems are already in place for the team to make significant progress that can have timely applications in agriculture. The second objective of understanding the relationships of nematode ecology and biology to soil health is by its very nature a long-term endeavor. There will undoubtedly be further research on objective 2 to be realized beyond the scope of this project, but this objective builds upon previous results that make the outcomes in the proposed project realistic and achievable. Some tools and programs for assessment of emerging nematode pests as proposed in objective 3 have already been developed for immediate implementation in the proposed project. Objective 3 is a very forward-thinking and dynamic objective that will most likely need to remain flexible in its development and applications throughout the duration of this project. Dissemination of project results among the scientific community and agricultural stakeholders as proposed in Objective 4 takes advantage of the existing outreach and extension programs among the project team and is an achievable goal and critical outcome of this project. The proposed development of a dedicated project website for timely updating and posting of project results and information is an excellent project addition.

Appropriate scope:

The authors indicate that the number of nematolgists in northeastern states is limited, so the project team has rightly enlarged its scope to include nematologists across the U.S. that provide particular expertise to the overall project. While the full project is ambitious, the team assembled provides the breadth and depth of expertise that is appropriate to address and achieve the scope of project objectives. The specific milestones as listed in the proposed project are very achievable in the timelines presented and will provide a significant volume of research results (and potential agricultural applications) on an annual basis. While the full scope of the project is quite ambitious, and some objectives are long-term in nature, significant results on all objectives can be achieved within the project duration.

Potential significance:

One of the strengths of the proposed project is its potential to generate both significant short-term and long-term outputs. The integration of existing and emerging nematode management options in specific cropping systems can generate relatively timely nematode management strategies that can provide significant benefits to agricultural stakeholders. The proposed studies on

nematode communities and soil health will provide significant advances in scientific knowledge that can be integrated with existing management strategies as they are generated. Research on the effects of climate change and potential emerging nematode pests will undoubtedly play a significant role in limiting and managing emerging nematode pests in the future. Your Recommendation:

Approve/continue project

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Excellent

4. Potential for significant outputs(products) and outcomes and/or impacts:

Excellent

5. Overall technical merit:

Good

Comments

The proposal makes a clear case for the need and importance of the research. The range of plants and cropping systems to be covered in this proposal are extremely diverse, but the objectives are broad enough to be inclusive. It builds on a solid body of previous work, and the scientists involved have a demonstrated history of work in the proposed areas. Overall, this is a well-written proposal that is likely to advance nematode management in meaningful ways.

The first objective (to develop and integrate management tactics) is crucial to the success of the project. Evaluation of products, crop genotypes, and other management options provides immediately useful information for growers. Wherever possible, I strongly urge the scientists to evaluate the economics of the management tactics they study because many options may have measurable suppressive effects but be economically detrimental. Additionally, I question the likely success of using mixtures of susceptible and resistant cover crops for nematode suppression unless one species causes active suppression or acts as a trap crop, otherwise the nematode should reproduce freely on the susceptible plants in the same manner as they reproduce on weeds when a resistant cultivar is grown. Recommendations that acknowledge that some products will not equally affect all nematode genera is good.

Under objective #2, it is stated that “soil quality aspects also will be assessed,” but it would be very helpful to define what “soil quality” means.

Identification of emerging nematode issues is a very valuable contribution. In the search for M. enterolobii, I suggest including as many sweet potato fields as you can find, including inspecting their cull piles. The planned outreach activities, especially the workshops and short courses, are excellent additions to the project. The planned outreach efforts appear to be extensive and are likely to be very effective.

One of the projected outcomes mentions combining remote and ground-based sampling, but nothing relating to that was mentioned previously in the proposal. The list of milestones is extensive and appropriate for the proposal.

Your Recommendation:

Approve/continue project

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Excellent

Comments

The strengths of this proposal are 1) a coherent and coordinated research and outreach plan, 2) a unique focus on perennial and specialty crops 3) inclusion of nematode pests that need more attention, and, 4) a highly respected and talented team with diverse research expertise. The first objective, the heart of the project, targets recognized nematode problems that either haven’t been managed adequately, are in need of new approaches due to product withdrawal, or could benefit from new products and tactics that need vetting. A nice balance of” well-studied” and novel tactics will be evaluated. The research will be conducted in a variety of settings ranging from indoors to commercial fields and the majority of the outputs and outcomes have an excellent chance of success. In addition, these studies will chronicle nematode problems and document yield loss, providing much needed data to support nematology staffing in land grant universities and the USDA. The second objective takes a deeper dive into the management experiments to address the broader impact of nematode management on nontarget nematodes and, by proxy, the soil food web. The research output from this objective will help justify the use of biological approaches, reveal unintended consequences that need to be studied, and provide an interface for the project to the national discourse on soil health. The long term perspective and organic focus of many of the studies is commendable. The third objective targets five important nematode problems that are newly emerging with projects representing a good mix of activities that both stand alone, such as nematode detection and life cycle studies, and feed into the management focus of objective one. The fourth objective of formalizing the communication of research is important because it will articulate the common threads among the diverse systems represented in the project. The messaging activities appear robust and will benefit the targeted clientele as well as provide opportunity for synergistic research collaborations among project members.

The proposal has some weaknesses, but nothing that I consider fatal to the broader success of the project. An administrative detail is easy to fix – there is a big disconnect between the states with an identified role in each objective and the declared participation of members in the organization section. For example, five states have a role identified in obj. one but are not listed in the organization section (MA, NY, OH, IL, MS(????)) and one member shown in the organization as participating has no identified role (USDA-TN).

A second minor issue is the wording of objective 2; it is confusing and not informative since the relationship of "management practices" to any of the words in the objective is not communicated. The last paragraph of objective two needs clarification as the relationship between the text “…the extent to which they (farming practices) contribute to nematode-suppressive soils”, the milestone of “testing... for potential to induce suppressive soils”, and the rest of the proposal is not obvious. Text is also needed under objective 2 to explain the outcome of “A combined remote and ground truth nematode sampling protocol will become accepted by the discipline of nematology”. The description of work related to SCN throughout the proposal is also confusing. Adaptation to resistant germplasm is presented as an emerging issue, yet a SCN-resistant cover crop is not only proposed as a viable management strategy, it is predicted to lead to the seemingly-inconsistent outcome of avoiding adaptation to soybean resistance genes. The outcomes section mentions generic trap crops for SCN, so if this is referring to the cover crop project more explanation is needed. Because of the issues detailed above, the current version of research plan does not instill confidence that outputs and outcomes related to suppressive soils, soil sampling, and SCN will be achieved. My advice is to drop these claims as the project is strong without them.

Marisol’s response: For USDA TN, Lesley Schumacher had recently been hired in ther position and she had not yet received permission to be involved in some of the projects but she was approved to participate in NE-1640 in general. We expect large involvement from her in the following year.

I do not find the “management practices” phrase in the comment above in order to address it but I suppose what was mean was farming practices which was addressed.

I have edited the SCN section and added more information regarding the trap crop project

Your Recommendation:

Approve/continue project

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Good

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Excellent

5. Overall technical merit:

Excellent

Comments

The Northeast Regional Nematology Project has provided significant advancements for recognizing and managing plant-parasitic nematode damage to agronomic and horticultural production in the region for decades. The proposed project will continue these contributions. The continued emphasis of part of the project on the role of the total soil nematode community in regulating and predicting soil health is a much-needed area of investigation. The group is key to maintaining this effort nationally. Research efforts directed toward certain foliar nematodes parasitizing garlic, strawberry, beech, and other hosts are unique among the four regional research projects focusing on nematodes. Research on susceptibility of hemp cultivars to PPNs is important considering the absence of any recent relevant knowledge regarding this emerging crop. Project participants are a mix of early career nematologists and veteran scientists, providing excellent opportunities to strengthen the discipline. In regard to the scope of activity, a total of 1.95 SY seems a bit meager, but may be misleading if regional project efforts overlap closely-related state efforts. Your Recommendation:

Approve/continue project

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Excellent

4. Potential for significant outputs(products) and outcomes and/or impacts:

Excellent

5. Overall technical merit:

Good

Comments

The project is tackling a very important area - nematode management through soil health. the project, reflective of Northeast agriculture, touches upon many different nematode species infecting minor crops that are often neglected. We need more research in these crops and should do all that we can to encourage the research. Plant-parasitic nematode management using sustainable approaches and soil health management are not easy approaches and the participants should be lauded for taking this approach.

The team of scientist is extremely well qualified and positioned to make substantial progress and contributions to sustainable nematode management and tactics to improve soil health.

The proposal does lack fine editorial proofing but is very good overall. This should be an exciting project for the participants and the outputs will be welcomed by fellow scientist and agricultural producers.

Your Recommendation:

Approve/continue project