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Manuscript Number:	Ms_UPJOZ_4504
Title of the Manuscript:	Entomopathogenic Fungi: Dual Role in Insect Control and Plant Disease Management
Type of the Article	Review Article

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PART 1: Comments

	Reviewer's comment	Author's Feedback <i>(Please correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)</i>
Please write a few sentences regarding the importance of this manuscript for the scientific community. A minimum of 3-4 sentences may be required for this part.	The manuscript "Entomopathogenic Fungi: Dual Role in Insect Control and Plant Disease Management" represents a great contribution to the scholarly community. Its focus on entomopathogenic fungus as a sustainable and ecologically acceptable alternative for use within integrated pest management and integrated disease control agrees with global initiatives that seek to reduce chemical usage in agriculture. Both ecological niches, attacking insect pests or suppressing plant diseases, evidence the adaptability and potential these two EPF hold for basic use in IPM systems. The emphasis of the manuscript on current innovative developments in genomics, biotechnology, and formulation technologies enhances its importance for key knowledge on the research, policy, and practice of chasing resilient and sustainable agriculture approaches.	
Is the title of the article suitable? (If not please suggest an alternative title)	The title of this article, "Entomopathogenic Fungi: Dual Role in Insect Control and Plant Disease Management," reflects the main emphasis of this manuscript on the dual role of EPF in managing insect pests and plant diseases. As a matter of fact, this summarizes the main issues of the research well and corresponds to the scientific focus on sustainable agriculture practices and integrated pest control (IPM). However, if you wish to add more detail or emphasize certain aspects, consider the following alternative titles: 1. "Entomopathogenic Fungi: A Dual-Purpose Instrument for Sustainable Pest and Disease Control" 2. "Application of Entomopathogenic Fungi within an Integrated Approach to Insect Pest and Disease Control: Mechanisms and Applications" 3. "Entomopathogenic Fungi in Integrated Pest Management: Linking Insect Pest and Plant Disease Management"	

Is the abstract of the article comprehensive? Do you suggest the addition (or deletion) of some points in this section? Please write your suggestions here.	The abstract of the publication "Entomopathogenic Fungi: Dual Role in Insect Control and Plant Disease Management" gives a concise overview of the dual functionality that entomopathogenic fungi have in managing insect pests and plant diseases. In fact, it captures the emphasis of the manuscript on the biological mechanisms, biotechnological innovations, and prospective uses of EPF in sustainable agricultural systems. It also points out recent developments in the field, including nano-carrier technologies, the integration of precision agriculture, and challenges such as regulatory issues and environmental constraints. <u>Improvement Recommendations</u> 1. More Emphasis on Innovation Although the abstract mentions genomics and formulation, a brief explanation of specific technological advances at work, such as CRISPR-mediated genetic engineering and incorporation into digital farming, would better place the abstract in terms of current research directions. 2. Prudence with Comparative Advantage Clear advantages of the EPF, if presented together with conventional chemical pesticides, would bring in benefits for their lesser environmental impacts and compatibility with organic systems as a better rationale of why they are important. 3. Broader Issues The abstract should focus concisely on broad issues of concern, such as climate change and loss of biodiversity, but highlight the need for action with the implementation of EPF-based solutions. 4. Key Use Concrete examples of how the EPF successfully performs in particular crops or to combat a certain pest status may add more practical application to attract practitioners. 5. Concision Some of the technical aspects, such as mechanisms of action, may be simplified or only cited in the main text to maintain focus and readability of the abstract by the general readership.	
Is the manuscript scientifically, correct? Please write here.	Yes, this manuscript presents a scientifically correct and full review on the role of EPF in sustainable agriculture. It effectively integrates contemporary knowledge and innovations and provides valuable insights into their application in	

	pest and disease management. Discussions related to the suggested areas for improvement, such as non-target effects, climate implications, and field-specific applications, would add more value to the depth and applicability of the discourse. <u>Strengths in Scientific Precision</u> 1. Detailed Analysis of the Entomopathogenic Fungi, EPF Indeed, this review manuscript represents a state-of-the-art and accurate review about the biology and ecological roles of EPF, emphasizing their dual utility in both pest management and disease mitigation. This is scientifically evidenced by enzymatic activities such as chitinases and proteases, and secondary metabolites such as destruxins and beauvericins. Key examples of this dual functionality of EPF in pest control and plant health promotion include species like <i>Beauveria bassiana</i> and <i>Metarhizium anisopliae</i>. 2. Advances in EPF Technology Discussion on very recently developed nano-formulations, microencapsulation, and other delivery systems assisted by drones reflects the recent trends of research on the subject. Such a technological advancement guarantees stability, precision, and efficiency regarding the use of EPF-based biocontrol agents at the field level. 3. Integration into IPM Systems The manuscript addresses the compatibility of EPF with other biological control agents and cultural practices quite well. Emphasis on integration underlines the holistic nature of IPM, integrating established concepts of integrated pest and disease management. 4. Environmental and Sustainability Focus The manuscript falls in place with the principles of sustainable agriculture and IPM, emphasizing reduced chemical inputs and fostering biodiversity through the use of EPF. This focus on environmental stewardship is timely and relevant to current agricultural challenges. <u>Possible Areas of Concern or Recommendations</u> 1. Nontarget Effects and Ecological Consequences While the study does hint at possible non-target effects, going deeper into the ecological risk-issues such as impacts on pollinators and soil microbiota-will enhance the robustness. Case studies on the mitigation strategies for such risks	
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	will add value to this work. 2. Climate Change Implications While the manuscript touches upon climate adaptability, this section could further discuss how EPF are being developed or adapted in response to the challenge thrown up by climate-resilient management of pest and diseases. Some specific examples of modifications or innovations for extreme climate conditions would strengthen this section. 3. Applications in Specific Agricultural Areas Inclusion of empirical data or case studies on the performance of EPF under varying agricultural settings, such as greenhouses or open fields, would further enhance the practical utility of the manuscript. Examples can be used to show how EPF has adapted and been successful in the diverse situations.	
Are the references sufficient and recent? If you have suggestions of additional references, please mention them in the review form.	Yes, the references within the manuscript are adequate in providing foundational knowledge and contemporary insights into entomopathogenic fungi (EPF). However, they could be further enriched by integrating newer studies that address emerging themes such as climate adaptation, digital agriculture, and applied case studies. This would ensure the work remains comprehensive and aligns with the latest research trajectories. <u>Opportunities for Enhancement</u> 1. Recency of Sources While the manuscript includes references from the 2020s, incorporating more studies published after 2021 would better represent the cutting-edge of EPF research and address rapidly evolving topics like climate resilience and precision farming. 2. Practical Case Studies Adding references to field-level applications of EPF, particularly those employing region-specific techniques or advanced technologies like drone delivery and digital farming, could increase the manuscript's practical utility.	

	3. Sustainability and Climate Adaptation Including references that link EPF to broader sustainability goals such as their role in climate-smart agriculture or contributions to ecosystem health would align the work with global agricultural priorities and policy shifts. <u>Recommended Supplementary References</u> 1. Innovations in Precision Agriculture - Shaari, S. A., Radzi, N. A. M., et al. (2024). Current Trends in Precision Agriculture: Applications and Challenges in Precision Farming. <i>International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies</i>. This source discusses the integration of EPF with digital technologies, such as precision agriculture tools, emphasizing advanced deployment strategies. 2. Climate Change and EPF - Zanzana, K., Dannon, E. A., et al. (2024). Management of fall armyworm in a changing climate: Climate-responsive integrated pest management techniques. <i>Egyptian Journal of Biological Pest Control</i>. This paper highlights EPF applications tailored to climate variability, addressing resilience in pest control. 3. Pioneering Genomic Research - Samal, I., Bhoi, T. K., et al. (2023). Mitigating insect-induced biotic stress via endophytic entomopathogenic fungi in horticultural crops. <i>Frontiers in Plant Science</i>.	
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	This study provides insights into the genetic optimization of EPF for enhanced efficacy in pest management. 4. Formulation and Field Applications - Behl, K., Jaiswal, P., & Pabbi, S. (2024). Recent advancements in microbial and nano-formulations for agricultural sustainability. <i>Biocatalysis and Agricultural Biotechnology</i>. This reference highlights innovations in EPF formulations and their field efficacy. 5. Integrated Ecosystem Approaches: - Bamisile, B. S., Akutse, K. S., et al. (2021). Examine the utilization of entomopathogenic fungi as substitutes for chemical pesticides. <i>Frontiers in Plant Science</i>. This work underscores the ecological benefits of EPF in reducing chemical pesticide dependency while supporting biodiversity. <u>Conclusion</u> While the current references provide a robust foundation, the inclusion of the suggested supplementary references would enhance the manuscript's relevance, depth, and alignment with contemporary research. These additions would offer a broader perspective on emerging challenges and innovative solutions in EPF applications.	
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Is the language/English quality of the article suitable for scholarly communications?	Yes, the manuscript's linguistic quality aligns with academic standards but could benefit from targeted revisions to improve clarity, readability, and overall impact. <u>Areas for Enhancement</u> 1. Excessive Utilization of Complicated Sentences Certain sentences are overly complex, which may hinder comprehension. Breaking these into shorter, more direct sentences would enhance readability. Original: By colonizing plant tissues as endophytes, these fungi stimulate the plant's hormonal defense mechanisms, specifically those governed by jasmonic acid (JA) and salicylic acid (SA), resulting in the synthesis of defensive enzymes such as peroxidases and polyphenol oxidases, thereby enhancing the plant's immune system. Suggested Revision: These fungi inhabit plant tissues as endophytes, triggering hormonal defense mechanisms such as jasmonic acid (JA) and salicylic acid (SA). This initiates the synthesis of defensive enzymes, including peroxidases and polyphenol oxidases, thereby enhancing the plant's immune system. 2. Reiteration of Essential Terminology Certain terms like "dual role" and "eco-friendly" appear frequently, which can make the text feel redundant. Introducing synonyms or paraphrasing would improve flow and maintain reader engagement. Example Synonyms: "Dual role" → "versatile functionality" or "multifaceted application" "Eco-friendly" → "environmentally sustainable" or "green solution" 3. Ambiguities in Specific Sections Some sections could benefit from additional clarification or specificity to ensure accessibility for a broader audience. Original: The segment titled "Compatibility of EPF with Other Biological Control Agents" discusses interactions but lacks clarity on whether these interactions are always synergistic or context-dependent. Suggested Revision: The section on "Compatibility of EPF with Other Biological Control Agents" should clarify whether interactions between EPF and	
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	other agents are universally synergistic or vary depending on environmental and biological conditions. 4. Minor Grammatical Errors Occasional issues with articles (e.g., "the," "a") and prepositions slightly disrupt the flow of the text. Correcting these would refine the language for academic precision. Example: Original: Integration of EPF in ecosystem could be highly beneficial. Corrected: The integration of EPF into ecosystems could be highly beneficial <u>Conclusion</u> The manuscript meets the expectations for academic discourse but would significantly benefit from comprehensive language editing. Implementing these enhancements will improve clarity, eliminate redundancy, and elevate the overall quality of the text to meet top-tier academic standards.	
<u>Optional/General</u> comments	The manuscript is pertinent and offers a thorough examination of entomopathogenic fungi (EPF) in sustainable agriculture, consistent with Integrated Pest Management (IPM) concepts. Its strengths encompass explicit aims, comprehensive biological mechanisms, and an examination of technology improvements. <u>To augment its efficacy</u> 1. Incorporate additional real-world case studies to enhance practical applicability. 2. Elaborate on non-target consequences and options for mitigation. 3. Simplify intricate sentences and correct small grammar errors. 4. Highlight the systematic incorporation of EPF into IPM frameworks.	

PART 2:

	Reviewer's comment	Author's comment <i>(if agreed with the reviewer, correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)</i>
Are there ethical issues in this manuscript?	<u>(If yes, Kindly please write down the ethical issues here in detail)</u> This manuscript does not provide any substantial ethical concerns. The authors might enhance their ethical position by elaborating on the mitigation of non-target consequences, examining the ecological ramifications of biotechnological innovations, and guaranteeing fair access to the suggested solutions. These enhancements would significantly strengthen the manuscript's compliance with ethical standards in scientific research.	
Are there competing interest issues in this manuscript?	No obvious competing interest issues exist; however, the authors must incorporate a definitive declaration in the article disclosing any potential conflicts of interest or affirming their absence. This technique conforms to established academic and ethical standards for maintaining the integrity of scholarly communications.	
If plagiarism is suspected, <u>please provide related proofs or web links.</u>	-	

PART 3: Declaration of Competing Interest of the Reviewer:

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“I declare that I have no competing interest as a reviewer”

PART 4: Objective Evaluation:

Guideline	MARKS of this manuscript
Give OVERALL MARKS you want to give to this manuscript (Highest: 10 Lowest: 0) <u>Guideline:</u> Accept As It Is: (>9-10) Minor Revision: (>8-9) Major Revision: (>7-8) Serious Major revision: (>5-7) Rejected (with repairable deficiencies and may be reconsidered): (>3-5) Strongly rejected (with irreparable deficiencies.): (>0-3)	8.2 (Minor Revision)

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	Author's Feedback

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WhatsApp Number of Reviewer (Optional)	-
Write 5-8 Keywords regarding expertise of Reviewer	Insect Pest Control by Fungi, Insect Pest Control, Organic Farming, Organic Agriculture, Agricultural Science