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REVIEWER'S REPORT

Manuscript No.: IJAR- 56214

Title: HEAVY METALS AND CADMIUM TOXICITY IN SOIL AND PLANTS

Recommendation:
Accept as it is .....
Accept after minor revision.....
Accept after major revision
Do not accept (*Reasons below*)

Rating	Excel.	Good	Fair	Poor
Originality		✓		
Techn. Quality		✓		
Clarity			✓	
Significance			✓	

Reviewer Name: **ANAPANA GOPAL**

Reviewer's Comment for Publication.

General Comments
The manuscript titled *"Heavy Metals and Cadmium Toxicity in Soil and Plants"* presents a review of heavy metal contamination with a primary focus on cadmium (Cd) toxicity in soil–plant systems and its implications for human health. The topic is important and globally relevant, particularly in the context of food safety, agricultural sustainability, and environmental pollution.
The manuscript compiles a wide range of literature addressing Cd sources, soil contamination pathways, plant physiological effects, phytoremediation strategies, and health impacts. However, despite covering substantial literature, the review lacks structural coherence, critical synthesis, and analytical depth. It reads largely as a compilation of studies rather than a structured, thematic, and critical review article.
Significant revisions are required to improve clarity, organization, scientific rigor, and presentation quality before the manuscript can be considered for publication.

Content and Originality
Strengths:
- The topic is timely and highly relevant.
- The review includes recent references (2020–2024).
- It integrates soil contamination, plant physiology, phytoremediation, and human health.
- The inclusion of a large summary table on plant responses to heavy metals is useful.

Limitations:
1. **Limited Original Synthesis**
   - The manuscript summarizes studies sequentially rather than synthesizing them thematically.
   - There is little critical comparison between findings.
   - No conceptual framework or mechanistic model is developed.

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2. **Lack of Focus**
    - The title suggests a broader heavy metal review, but the content predominantly focuses on cadmium.
    - Other heavy metals (Pb, Cu, Cr, Hg, etc.) are mentioned but not systematically reviewed.
3. **No Clear Review Objective**
    - The manuscript does not clearly define:
        - What gap this review fills.
        - How it differs from existing Cd toxicity reviews.
        - Whether it is mechanistic, applied, or policy-oriented.
4. **Insufficient Depth in Mechanisms**
    - Cd uptake, transporters (ZIP, NRAMP, HMA), vacuolar sequestration, and molecular pathways are only briefly mentioned.
    - Omics approaches (transcriptomics, proteomics) are not critically discussed.
    - Soil–Cd speciation chemistry is largely absent.

Overall, the manuscript is informative but lacks analytical originality and conceptual advancement.

Technical Quality

Several technical and scientific issues must be addressed:

1. Scientific Accuracy Issues

- Line 31: "specific weight greater than 5 g cm^2" is incorrect. It should be density >5 g/cm^3.
- Cd half-life in soil (10–33 years) should be supported by stronger citation and context (bioavailability vs persistence).
- WHO "reasonable monthly dose" should be clearly referenced (Provisional Tolerable Monthly Intake – PTMI).

2. Table 1 Issues

- Table formatting is inconsistent.
- Some entries lack plant species.
- Some effects are vague (e.g., "–" or "unspecified symptoms").
- The heading claims elaboration of experimental design, but details (concentrations, duration, conditions) are not provided.

3. Repetition

- Several statements about ROS production and chlorosis are repeated.
- Cd persistence and uptake mechanisms are described multiple times.

4. Lack of Quantitative Discussion

- No discussion of:
    - Soil Cd threshold values.
    - FAO/WHO permissible limits in crops.
    - Cd bioavailability factors (pH, CEC, organic matter).
    - Bioconcentration factor (BCF) or translocation factor (TF).

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5. Figures

- Figure numbering is inconsistent (two "Fig. 1").
- Figures are mentioned but not described analytically.
- No explanation of figure relevance in text.

Overall, the technical content needs strengthening through clearer definitions, improved accuracy, removal of redundancies, and better scientific precision.

Language and Presentation

The manuscript requires substantial language editing.

Common Issues:

- Grammatical errors (e.g., "a high concentrations of metal contamination").
- Inconsistent spacing and formatting.
- Missing spaces between words and references.
- Awkward sentence structures.
- Overly long sentences.
- Redundant phrasing.

Examples:

- "Pollution has become a minor issue to solve…" → should be more formal.
- "The presence of Cd in agricultural soil not only impacts plant physiology…" → correct but overly repetitive.

The tone sometimes shifts from academic review to descriptive commentary. Professional editing is strongly recommended.

Structure and Organization

The structure needs minor improvement.

Current Issues:

- Introduction is broad and unfocused.
- No clear subheadings for:
  - Sources of Cd contamination
  - Soil chemistry of Cd
  - Uptake and transport in plants
  - Physiological effects
  - Human health risks
  - Remediation strategies
- Table discussion section reads like bullet-point commentary.
- Conclusion mixes recommendations, summary, and policy suggestions without clear organization.

Suggested Structure:

1. Introduction
2. Sources and Environmental Fate of Cadmium
3. Soil Chemistry and Bioavailability of Cd
4. Mechanisms of Cd Uptake and Transport in Plants
5. Physiological and Biochemical Effects
6. Human Health Implications
7. Remediation and Mitigation Strategies
8. Research Gaps and Future Directions
9. Conclusion

Currently, the manuscript lacks logical thematic flow.

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References and Citations
Strengths:
- Good mix of classic and recent references.
- Several high-impact journals cited.

Issues:
- Formatting inconsistencies.
- Some references improperly formatted (spacing errors).
- Some journals incorrectly capitalized.
- Duplicate 2020 Kumar citations need differentiation.
- Incomplete reference for Jarvis (if included).
- Some references unrelated to Cd (e.g., manganese metabolism).

Reference formatting must be standardized according to journal guidelines.

Overall Recommendation
The manuscript addresses a highly important topic and compiles extensive literature. However, it currently reads more like a literature summary than a structured, critical review article.
To be publishable in a reputable journal, the manuscript requires:
- Minor structural reorganization
- Stronger mechanistic discussion
- Elimination of repetition
- Correction of scientific inaccuracies
- Improvement of tables and figures
- Significant language editing
- Clear articulation of review novelty and scope

Final Decision:
Minor to moderate Revision Required
The manuscript has potential but requires substantial restructuring, scientific refinement, and language correction before it can be reconsidered for publication.