

Performance Analysis of TriFungi-Based Rapid Composting System

Prof. Madan Pawar¹, Ms. Priti Kharade², Ms. Sakshi Khot³, Ms. Sneha Somwanshi⁴

¹Assistant Professor, Marathwada Mitra Mandal's Institute of Technology, Lohegaon, Pune, Maharashtra, India
^{2,3,4}Marathwada Mitra Mandal's Institute of Technology, Lohegaon, Pune, Maharashtra, India

ABSTRACT

The rapid increase in population has resulted in excessive generation of municipal solid waste, creating serious environmental concerns. This study focuses on rapid composting using Trichoderma-based microbial inoculants in an in-vessel system. The process significantly reduces decomposition time to 30–40 days and improves compost quality. The final compost is nutrient-rich and suitable for agricultural applications.

KEYWORDS: Solid Waste, Rapid Composting, Trichoderma, In-vessel Composting, Sustainable Agriculture.

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1. INTRODUCTION

Solid waste management is a major environmental issue. Composting is an eco-friendly method to convert organic waste into useful fertilizer. Rapid composting techniques using microbial cultures enhance the decomposition rate.



2. Methodology

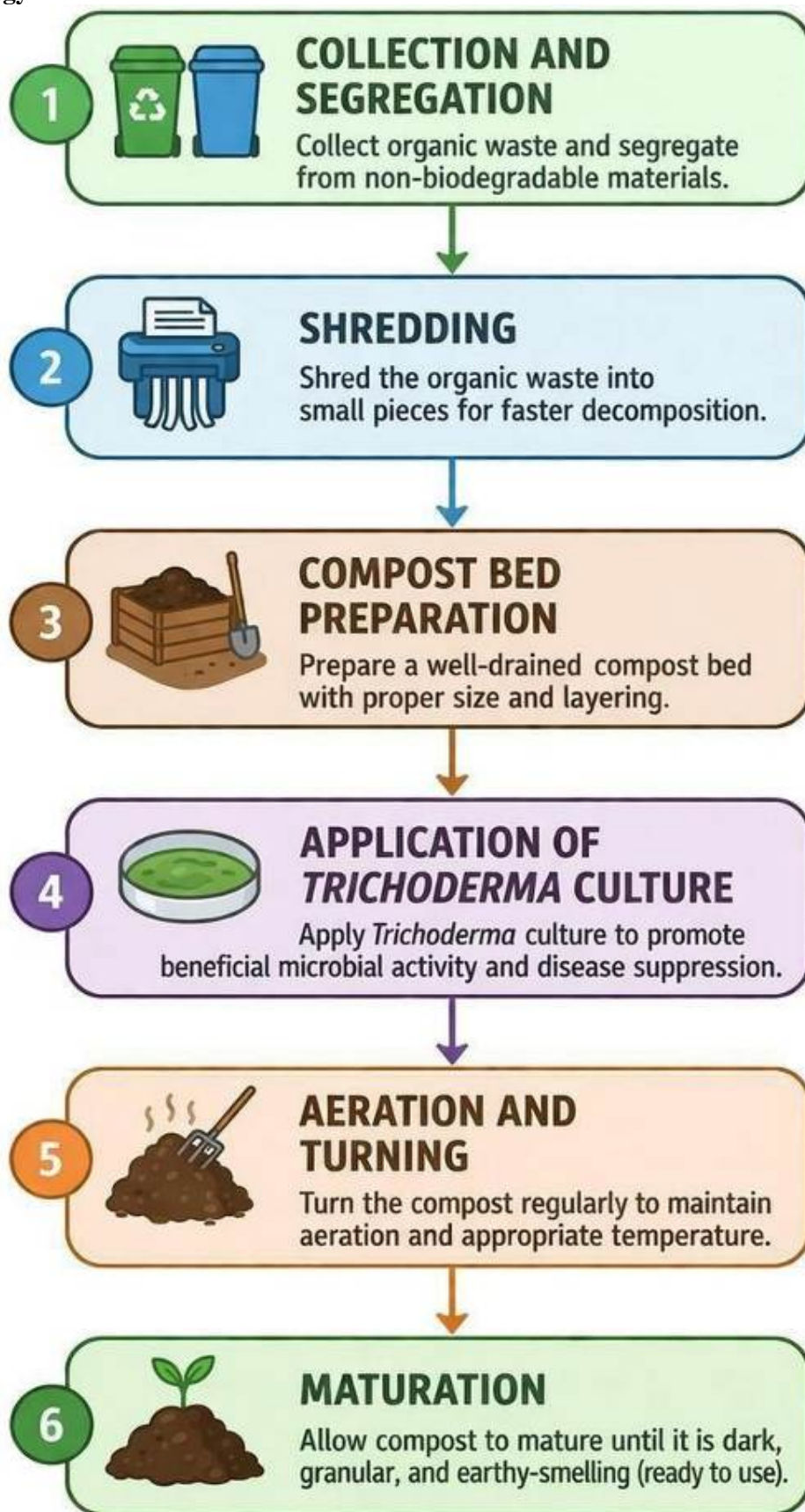


Fig. (1)

3. Flow chart of parameters

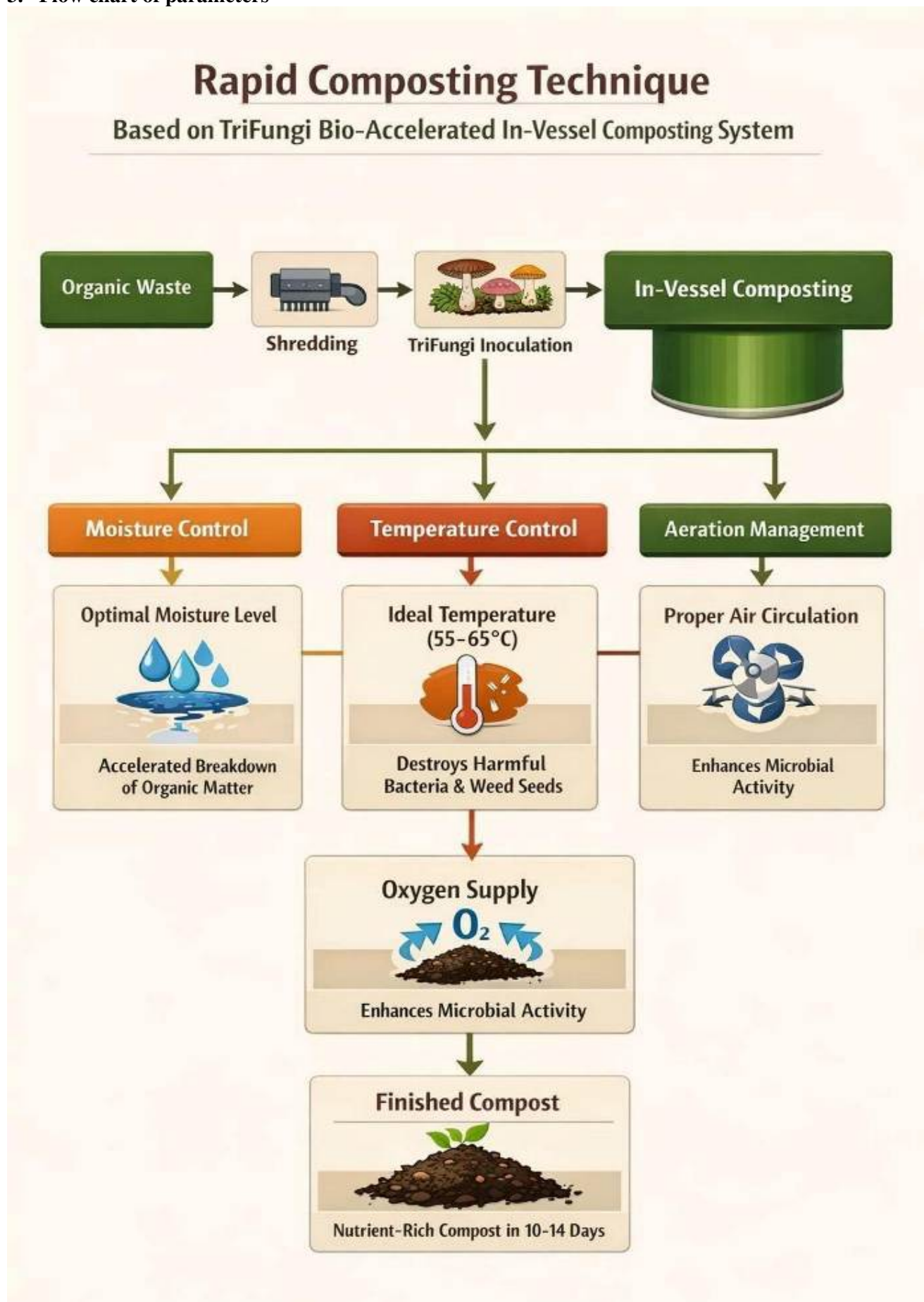


Fig. (3)

4. Comparison of parameters







| Rapid Composting Technique based on TriFungi Bio-Accelerated In-Vessel Composting System | |
|---|---|
| Why These Factors are Important? | If Not Maintained, What Happens? |
|  Moisture <ul style="list-style-type: none"> • Maintains microbial activity • Aids in decomposition • Ensures nutrient transport |  Moisture <ul style="list-style-type: none"> • Drying out of compost • Slowed decomposition • Microbial inactivity |
|  Temperature <ul style="list-style-type: none"> • Speeds up microbial growth • Optimizes breakdown process • Prevents pathogens |  Temperature <ul style="list-style-type: none"> • Slow decomposition • Heat loss • Pathogen survival |
|  Aeration <ul style="list-style-type: none"> • Provides oxygen for microbes • Prevents foul odors • Regulates heat |  Aeration <ul style="list-style-type: none"> • Anaerobic conditions • Foul smells • Heat buildup |

Fig. (4)

5. Temperature vs Days in Composting

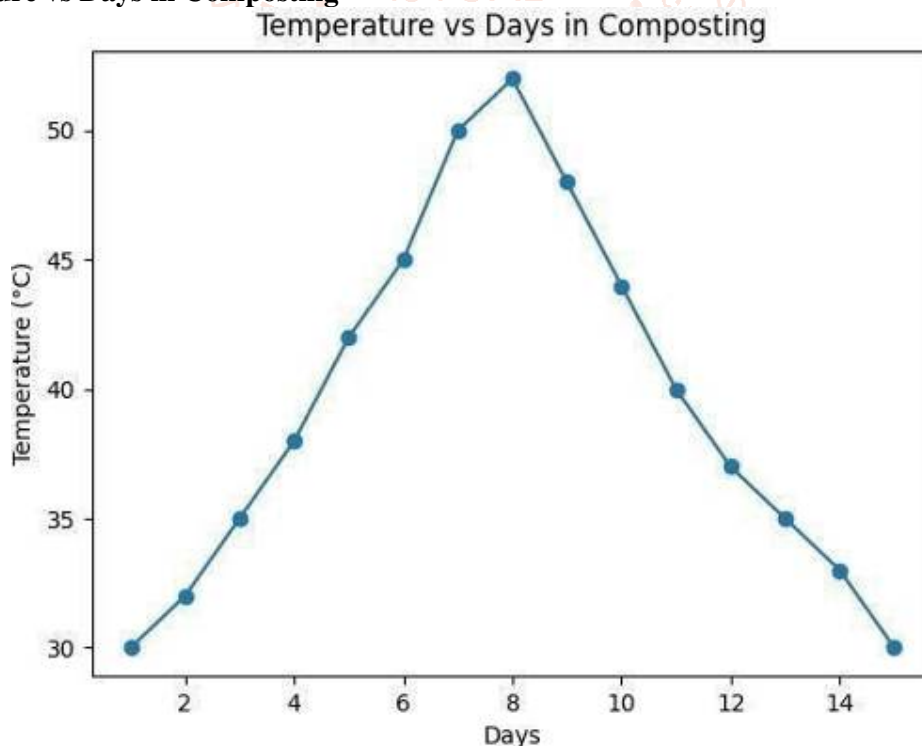


Fig. (5)

Temperature increases in initial days due to microbial activity and reaches thermophilic phase, then gradually decreases indicating compost stabilization.

6. Moisture Variation During Composting

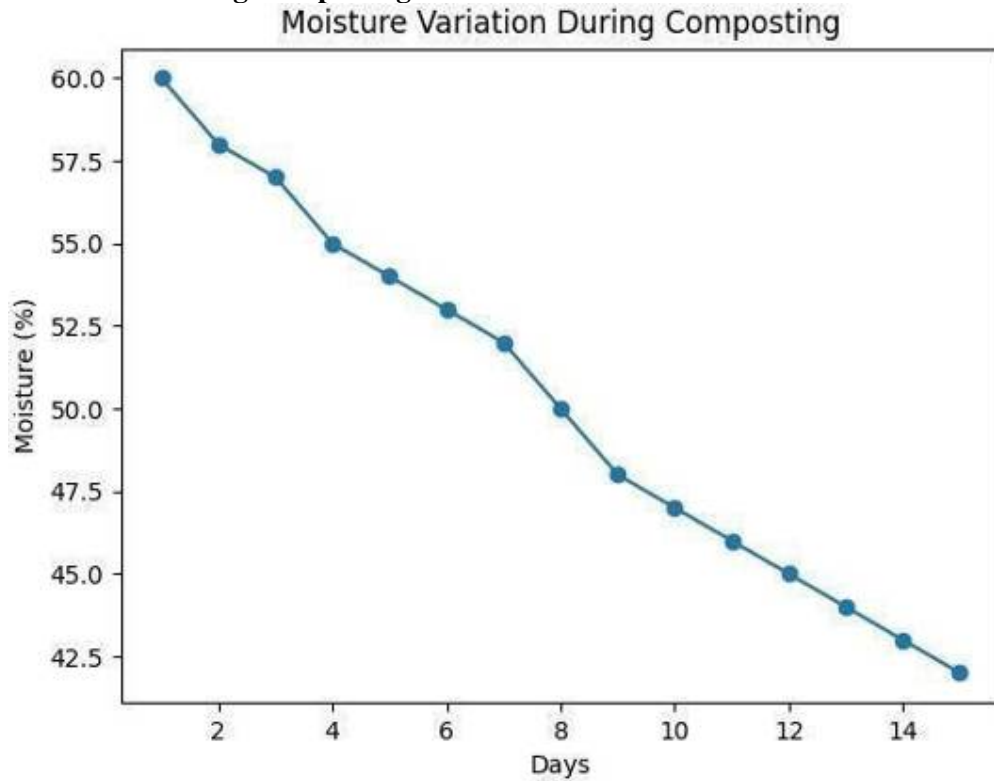


Fig. (6)

Moisture content gradually decreases due to evaporation and microbial consumption, but remains within optimal range (50–60%).

7. Decomposition Rate During Composting

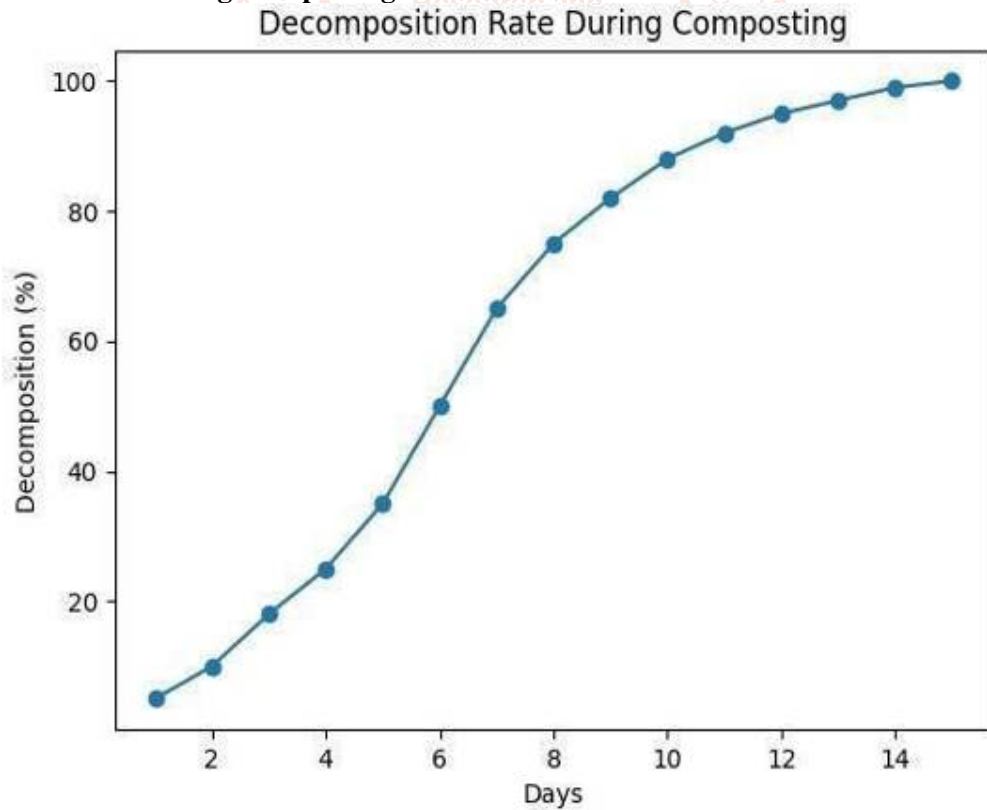


Fig. (7)

Decomposition rate increases rapidly in early days and reaches near completion by the end, showing effectiveness of Trichoderma + APSA-80.

8. Result

The compost obtained from the TriFungi Bio-Accelerated In-Vessel Composting System was observed to be in a wet and partially decomposed state. It appeared dark in color, indicating active microbial decomposition; however, the material was sticky and clumpy due to high moisture content. Some undecomposed particles were still present. It is expected that after spreading and drying, the compost quality will improve, but it is not yet fully matured.

9. Discussion

The analysis of the compost shows that the decomposition process has been successfully initiated, as indicated by the dark color of the material. However, excess moisture and inadequate aeration resulted in a sticky texture and formation of clumps, suggesting partial anaerobic conditions. Drying the compost by spreading will help reduce moisture, improve aeration, and enhance texture and odor. However, drying alone is not sufficient to complete the composting process. Further curing is required to achieve complete stabilization and maturity of the compost.

10. Conclusion

It can be concluded that the compost produced is partially decomposed and requires further processing. Drying the compost will improve its physical properties, but complete maturity can only be

achieved after proper curing. Therefore, both drying and curing are essential steps to obtain good quality, stable compost. Therefore, rapid composting combined with microbial biotechnology can play a crucial role in sustainable solid waste management and eco-friendly agriculture.

11. References

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