

**STUDY THE EFFICIENCY OF VERMICOMPOSTING IN
TERMS OF DIFFERENT WASTE TYPE FOR DIFFERENT
WORM SPECIES A META-ANALYSIS**



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ABSTRACT

Small-scale composting is an effective practice within the circular economy, with vermicomposting standing out as a method that produces high levels of Nitrogen (N), Potassium (K), and Phosphorus (P) by accelerating the breakdown of organic waste through the natural processes of earthworms. Vermicomposting not only enhances soil fertility but also offers a sustainable solution for managing household and garden waste. There are four key earthworm species used in this process: *Eisenia fetida*, *Eudrilus eugeniae*, *Perionyx excavatus*, and *Aporrectodea caliginosa*. While previous research has focused on specific worm types and waste feeds, a comprehensive comparative study of these variables has yet to be thoroughly investigated. This study aims to identify the optimal combinations of worm species and waste feed types for maximizing the production of N, P, and K in vermicomposting. A detailed literature review was conducted, selecting data from 135 published research papers. A meta-analysis was performed to assess the degradation rate, moisture content (50–80%), and pH levels (6.0–7.0), C: N ratios as they relate to vermicomposting performance. Descriptive statistics and skewness values were analyzed to understand the impact of worm and waste types on composting outcomes. The analysis revealed that worm type and waste type significantly influence the degradation rate and the production of N, P, and K. A positive correlation was found between worm type (0.62) and waste type (0.45) with the degradation rate, while the degradation rate negatively correlated with the levels of N, P, and K. In overall view food and animal waste is more efficient in producing N and P where, animal waste is only significant in producing K. *Eisenia fetida* demonstrated strong performance in producing N (>1.6%) and K (>1.4%) across all waste types, though it was less effective for P production. However, mixing waste feeds improved overall performance. The highest N production (2.70%) was achieved with food waste and *Eudrilus eugeniae*, the highest P production (2.05%) with food waste and *Perionyx excavatus*, and the highest K production (1.7%) with animal waste and *Aporrectodea caliginosa*. The study concludes that animal waste is generally more suitable for vermicomposting, with specific worm-waste combinations yielding the highest nutrient levels in the compost produced.

Key words: Earth worms, Meta-Analysis, Vermicomposting efficiency, Waste management

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