

# Vermicomposting: An alternative and complimentary eco-friendly tool for sustainable waste management and soil fertility enhancement

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## INTRODUCTION

The earthworms are natural resources of fertility and life, so they are popularly known as “friends of farmers” and “natural plough met”. But now it is a time for us to think and work on the utility of earthworms in the area other than farmer’s friend. (Edwards, 1998). The soil organic matter and nitrogen levels are important for crop production. In the present investigation three species of earthworm namely *Eudrilus eugeniae*, *Perionyx excavates*, and *Eisenia fetida* was subjected for decomposing fish waste whose maturity was analyzed by the following objectives.

## OBJECTIVES

- ❖ Determination of physico-chemical parameters of vermicomposted fish waste
- ❖ Nursery application of vermicompost for green gram
- ❖ Analysis of untreated and post harvested soil
- ❖ Nutritional estimation of fish waste investigated earthworms compared with control.

Table 1: Determination of physico-chemical parameters of vermicomposted fish waste using *Eudrilus eugeniae*, *Perionyx excavates* and *Eisenia fetida*

| PHYSICO-CHEMICAL PARAMETERS | VERMICOMPOST SPECIES     |                           |                       |
|-----------------------------|--------------------------|---------------------------|-----------------------|
|                             | <i>Eudrilus eugeniae</i> | <i>Perionyx excavates</i> | <i>Eisenia fetida</i> |
| Bulk density (g/cc)         | 0.50                     | 0.39                      | 0.36                  |
| Particle density (g/cc)     | 1.01                     | 0.94                      | 0.94                  |
| Water holding capacity (%)  | 56.0                     | 55.21                     | 55.78                 |
| Organic carbon (g %)        | 9.20                     | 8.93                      | 8.89                  |
| Humic acid (g %)            | 5.00                     | 4.97                      | 4.99                  |
| Available Nitrogen (g%)     | 1.11                     | 1.03                      | 1.00                  |
| Available Phosphorus (g%)   | 1.00                     | 0.98                      | 0.99                  |
| Available Potassium (g%)    | 1.00                     | 0.91                      | 0.96                  |

Table 2 Nursery trials on green gram height and biomass applied with vermicompost and chemical fertilizer

| TREATMENTS                | PLANT HEIGHT |       |       | FRESH WEIGHT |      |      | DRYWEIGHT |      |      |
|---------------------------|--------------|-------|-------|--------------|------|------|-----------|------|------|
|                           | 25           | 45    | 65    | 25           | 45   | 65   | 25        | 45   | 65   |
| C- control                | 27.60        | 32.20 | 37.73 | 0.54         | 0.87 | 1.42 | 0.12      | 0.70 | 0.20 |
| Chemical fertilizer       | 29.60        | 35.40 | 42.86 | 0.86         | 1.20 | 2.28 | 0.63      | 1.15 | 0.40 |
| <i>Eudrilus eugeniae</i>  | 29.40        | 30.20 | 39.20 | 0.67         | 1.08 | 1.89 | 0.60      | 1.00 | 0.44 |
| <i>Perionyx excavates</i> | 27.10        | 31.80 | 39.10 | 0.56         | 1.02 | 1.85 | 0.47      | 0.98 | 0.38 |
| <i>Eisenia fetida</i>     | 25.00        | 34.60 | 39.60 | 0.71         | 1.23 | 1.65 | 0.51      | 1.11 | 0.31 |
|                           | D**          | T**   | DT**  | D**          | T**  | DT** | D**       | T**  | DT** |
| SED                       | 3.80         | 7.28  | 12.61 | 0.12         | 0.24 | 0.42 | 0.67      | 0.12 | 0.22 |
| CD (P < 0.05)             | 7.59         | 14.54 | 25.18 | 0.25         | 0.48 | 0.84 | 0.13      | 0.25 | 0.44 |



Fig. 1

## METHODOLOGY

Earthworms were collected from Nonconventional Energy Resource And Development (NERD) Society, Vadavalli, Coimbatore, South India, and maintained wooden box (60 x 40 x 30cm). Bottom was completely covered with a wet sac A layer of straw was laid down above this; a layer of pretreated fish waste and cow dung was laid and inoculated with earthworms. Finally a layer of goat dung was laid down. The bed was occasionally mixed and water was sprayed frequently for 30 days. The compost was collected on 30th day of inoculation and sun dried for analysis like physico-chemical parameters.

Table 3: Determination of yield characters of green gram

| TREATMENTS                | NUMBER OF PODS/PLANT | POD LENGTH (cm) | NUMBER OF SEED/POD |
|---------------------------|----------------------|-----------------|--------------------|
| C- control                | 2.0                  | 3.50            | 4.0                |
| Chemical fertilizer       | 7.5                  | 3.85            | 9.0                |
| <i>Eudrilus eugeniae</i>  | 9.5                  | 5.20            | 10.5               |
| <i>Perionyx excavates</i> | 6.0                  | 4.80            | 8.5                |
| <i>Eisenia fetida</i>     | 6.0                  | 4.80            | 9.0                |

Table 4: Analysis of untreated and post harvested soil

| TREATMENTS                 | pH   | N     | P   | K   |
|----------------------------|------|-------|-----|-----|
| Preharvested soil          | 7.48 | 120.0 | 6.0 | 215 |
| <b>POST HARVESTED SOIL</b> |      |       |     |     |
| C- control                 | 6.52 | 139   | 8.0 | 478 |
| <i>Eudrilus eugeniae</i>   | 6.64 | 187   | 8.0 | 500 |
| <i>Perionyx excavates</i>  | 6.72 | 167   | 6.0 | 476 |
| <i>Eisenia fetida</i>      | 6.95 | 164   | 6.0 | 500 |
| Chemical fertilizer        | 6.80 | 171   | 8.0 | 500 |

## RESULTS

In that the height and biomass of green gram plant was more or less similar in all three compost applied when compared to chemical fertilizer. Yield characters like pod, seed numbers and pod length was also postulates the efficiency of vermicompost. Finally, it is evident that the proximate composition and nutrient composition like carbohydrates, glucose, total lipids, free fatty acids, triglycerides, protein and total free amino acids were higher in fish waste fed earthworms.

## CONCLUSIONS

Vermicompost is Cost effective and ecofriendly waste management which is an excellent sources of biofertilizers and their utilization for agriculture soil improves the physiochemical and biological properties. Vermicomposting amplifies the diversity and population of beneficial microbial communities. The study also concludes that earthworm fed fish has good nutritional impact which can be substituted with animal and human diet.

Table 5: Nutritional value of earthworm before and after composting fish waste

| Parameters            | <i>Eudrilus eugeniae</i> |       | <i>Perionyx excavates</i> |       | <i>Eisenia fetida</i> |       |
|-----------------------|--------------------------|-------|---------------------------|-------|-----------------------|-------|
|                       | Before                   | After | Before                    | After | Before                | After |
| Composting period     |                          |       |                           |       |                       |       |
| Carbohydrate          | 3.21                     | 04.34 | 3.00                      | 04.01 | 3.56                  | 04.66 |
| Glucose               | 02.00                    | 02.33 | 2.00                      | 02.11 | 02.23                 | 02.42 |
| Total lipids          | 0.31                     | 0.48  | 0.36                      | 0.45  | 0.32                  | 0.42  |
| Free fattyacids       | 0.25                     | 0.31  | 0.27                      | 0.30  | 0.26                  | 0.31  |
| Triglycerides         | 0.19                     | 0.23  | 0.15                      | 0.22  | 0.17                  | 0.23  |
| Protein               | 4.85                     | 05.21 | 4.33                      | 05.81 | 4.48                  | 05.00 |
| Total free aminoacids | 1.96                     | 2.31  | 1.00                      | 2.00  | 0.96                  | 2.01  |

## REFERENCES

Edwards,C.A., (1998) Earthworm ecology, St.Luice press, New York, 355-371.