A COMPARATIVE STUDY OF LIFE CYCLES OF TWO INDIGENOUS SPECIES OF EARTHWORMS

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The present study was undertaken to observe the life cycle pattern of two indigenous species of earthworms Lampito mauritii and Metaphire posthuma reared in laboratory under static conditions of temperature and moisture. A comparison was made to evaluate the best suited species for mass production in situ. Life cycles were studied by counting the numbers of cocoons, juveniles and biomass production during total life period. The average number of cocoon production, number of hatching production and rate of hatching success were greater by Lampito mauritii than Metaphire posthuma. Observations indicate that Lampito mauritii was better suited species among two selected species for mass cultivation and vermicomposting than Metaphire posthuma.

Information on the reproductive biology of the Indian earthworms is spasmodic and very important for both growth and development of vermiculture based biotechnology and academic interest. Knowledge of the reproductive strategies of earthworms comes predominantly from studies on temperate species. The reproductive biology of D. rubida and L. rubellus, E. andri and D. veneta has been studied by evaluating their suitability for vermiculture. The most effective use of earthworms in organic waste management requires a detailed understanding of biology of all potentially useful species. Population dynamics and productivity in earthworms can not be fully understood unless the life cycle of each earthworm is known.

Studies on life cycle, cocoon production, morphology, hatching pattern and fecundity of seven tropical earthworm species have been done for effective vermiculture. The trends of reproduction, the characteristics of cocoon, incubation period, hatching success and fecundity were studied in E. eugeniae and in Indian earthworms, P. excavatus, P. elongata, P. corethraus, E. gammei, D. modiglianii and D. nepalensis. Furthermore relative population growth, moisture requirement and reproduction and temperature relation and their effect on survival growth, maturation and cocoon production were also well documented.

Though earthworm biology reared on various organic wastes has been studied by various authors, even then till date earthworm biology on their natural habitat have been poorly understood. The studies on growth, reproduction, cocoon production and life cycle of the wide spread Indian earthworms Lampito mauritii and Metaphire posthuma are very scanty. The basic facts about the life cycle and reproduction of these species of Haryana state are still lacking. The purpose of this study was to contribute to knowledge of the life cycle of Lampito mauritii and Metaphire posthuma by studying its growth, rate of cocoon production, hatching, and morphology under laboratory conditions.

MATERIALS AND METHODS

Adults of Lampito mauritii and Metaphire posthuma were collected from the soil near laboratory premises. The soil used in the experiment was brought from the site of original habitat. To study the life cycle of earthworms, fresh cow dung (CD) was selected for bedding materials. Growth parameters, the biomass (wet weight), morphology, number of cocoon production, hatching success of earthworms were determined every fortnightly during experiment. The cocoons were counted by hand sorting and the biomass of worms was weighed in an electronic balance.

RESULTS AND DISCUSSION

After the initiation of the composting process, the average body weight of earthworms was monitored at the interval of 15 days up to 60 days. No mortality was observed throughout experiment. In the present study, the increased body weight of the earthworms was observed up to 45 days. The readily available nutrients in feeding material enhance the feeding activity of the worms showing increase in biomass (Table 1, 2). The results of growth rate are less and
more in accordance with the findings of others authors for *Eisenia fetida*\(^1\), *E. andrei*\(^4\) and *D. veneta*\(^4\) at different substrates.

The clitellum of the worms becomes swollen before the formation of the cocoons. The cocoons of both *Metaphire posthuma* and *Lampito mauritii* have an oval shape. The cocoons of *Lampito mauritii* was slightly smaller than the *Metaphire posthuma*. There are two sticky fibrous spines at both ends of the cocoon to which organic particles can adhere. The cocoons of *Metaphire posthuma* were light yellowish and the cocoons of *Lampito mauritii* were semi transparent and are very soft jelly like immediately after their formation. The colour of cocoons change to reddish brown due to blood vessels of pre emergent hatchlings developing immediately before hatching. The cocoons become transparent so that embryos and young worms can be seen through the wall. The number of cocoons production by both the earthworms is depicted in Tables 1 and 2. The number of cocoons produced by *Lampito mauritii* was more than *Metaphire posthuma*. Cocoon production varies with species and environmental conditions\(^1\). Mean number of cocoons produced by *Lampito mauritii* in different seasons was 0.0, 5.5±0.75 and 4.97±0.78 for winter, summer and monsoon respectively\(^8\). Cocoon production and time for maturation of cocoons vary with species, population density, age structure and external factors especially soil temperature, moisture and energy content of the available food\(^1\). Greater percentage of solid textile mill sludge (STMS) in the feed mixture significantly affected the biomass gain and cocoon production\(^16,17\). The total number of cocoon production was maximum (62) in 100% CD and minimum (43) in 50% STMS feeding mixture\(^15\). The hatching of both species of earthworms emerged through a hole made at the pointed end of the cocoon. The hatchings production was observed only on 30th day. The mean number of hatchings is depicted in Tables 1 and 2. The rate of hatchling production was observed 0.26 and 1.05 per cocoon for *Metaphire posthuma* and *Lampito mauritii*, respectively, and the rate of hatching success was 25.82% for *Metaphire posthuma* and 104.55% for *Lampito mauritii*. The mean number of hatching per cocoon obtained from cow dung was found to be higher for *Lampito mauritii* than *Metaphire posthuma*. The optimal growth, maturation, cocoon production and reproductive potential of earthworms have been reported to depend on the quantity and quality of the available feed and various physiochemical parameters\(^13,18\). A hatching success of 60-100% per cocoon was recorded in *Metaphire posthuma* at different substrates\(^19\). The present study indicates that *Metaphire posthuma* has a lower growth rate and produce few cocoon and hatchlings in comparison to *Lampito mauritii*. *Lampito mauritii* due to its higher rate of hatching success could be preferred species for vermicomposting than *Metaphire posthuma*.

**Table 1: Life profile of *Metaphire posthuma***

<table>
<thead>
<tr>
<th>Observation</th>
<th>Initial</th>
<th>15 days</th>
<th>30 days</th>
<th>45 days</th>
<th>60 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of earthworm</td>
<td>10 ± 0.38</td>
<td>10 ± 0.19</td>
<td>10 ± 0.37</td>
<td>10 ± 0.37</td>
<td>10 ± 0.38</td>
</tr>
<tr>
<td>Biomass in gm</td>
<td>14.86 ± 0.24</td>
<td>20.27 ± 0.15</td>
<td>21.16 ± 0.27</td>
<td>29.14 ± 0.34</td>
<td>28.76 ± 0.34</td>
</tr>
<tr>
<td>Cocoons</td>
<td>NIL</td>
<td>10 ± 0.30</td>
<td>17 ± 0.50</td>
<td>28 ± 0.50</td>
<td>40 ± 0.50</td>
</tr>
<tr>
<td>Hatchling production</td>
<td>NIL</td>
<td>NIL</td>
<td>5 ± 0.57</td>
<td>7 ± 0.58</td>
<td>11 ± 0.58</td>
</tr>
</tbody>
</table>

**Table 2: Life profile of *Lampito mauritii***

<table>
<thead>
<tr>
<th>Observation</th>
<th>Initial</th>
<th>15 days</th>
<th>30 days</th>
<th>45 days</th>
<th>60 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of earthworm</td>
<td>10 ± 0.38</td>
<td>10 ± 0.36</td>
<td>10 ± 0.37</td>
<td>10 ± 0.38</td>
<td>10 ± 0.38</td>
</tr>
<tr>
<td>Biomass in gm</td>
<td>8.89 ± 0.13</td>
<td>14.14 ± 0.27</td>
<td>17.46 ± 0.24</td>
<td>19.41 ± 0.19</td>
<td>18.75 ± 0.12</td>
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<tr>
<td>Cocoons production</td>
<td>NIL</td>
<td>17 ± 0.56</td>
<td>46 ± 0.58</td>
<td>63 ± 0.58</td>
<td>73 ± 0.58</td>
</tr>
<tr>
<td>Hatchling production</td>
<td>NIL</td>
<td>NIL</td>
<td>50 ± 0.58</td>
<td>74 ± 0.73</td>
<td>68 ± 0.58</td>
</tr>
</tbody>
</table>
Fig. 1: Rate of cocoon production by *Metaphire posthuma* and *Lampito mauritii*

Fig. 2: Rate of juvenile production by *Metaphire posthuma* and *Lampito mauritii*

**REFERENCES**
