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# Effect of some herbicides on earthworm (*Metaphire posthuma*) under field condition

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## ABSTRACT

A field investigation was carried out to study the number of earthpods formed by the earthworm (*Metaphire posthuma*) in herbicide treated plots at various time intervals. Four herbicides viz. Paraquat 24% SL, 2, 4 – D Na salt 80%, Glyphosate 41% SL and 2, 4 – D + Glyphosate (9% + 18%) were tested with two doses of each i.e. one at recommended dose and the other one was double to that of recommended one. It was found that proportionate change (in percentage) in earthpod formation was least in the plots treated with Glyphosate applied at recommended dose followed by 2, 4 – D Na salt and 2, 4 – D + Glyphosate when both of them were applied at recommended doses. The maximum change in earthpod formation was observed in case of Paraquat treated plots followed by 2, 4 – D + Glyphosate when applied at doses double to that of recommended doses. Again, the change in earthpod formation was increased with increase in time interval. However, all the test chemicals were safe to earthworm at recommended concentrations as no significant variations were found.

***Key works :*** Herbicide, Earthworm

Pesticides, being the most dangerous environmental pollutants have been given emphasis as a subject matter of investigation for many decades for their deleterious effect. Repeated application of pesticides in agricultural ecosystem has threatened the survivality of different nontarget soil fauna and earthworm is one group of soil dwelling animal, which improves soil fertility. Monitoring programme of herbicides is very much lacking especially in underdeveloped countries where large quantities of persistent herbicides are regularly used. However, such works are lacking in our condition though a few works have been reported from various parts of the world to see the pesticidal impact on *Lumbricus terrestris* (Edwards, 1991), *Eisenia* spp. (Gestel *et al.*, 1992; Zsombok *et al.*, 1997). Thus, the present investigation was conducted to see the effect of some herbicides on earthworm, which is considered to have great significance in orchards, forest and grassland where soil receives minimum tillage.

## MATERIALS AND METHODS

The investigation was conducted in the District Seed Farm (B Block), B. C. K. V. located at Kalyani, Nadia, West Bengal (22.5° N latitude, 89° E longitude and at an altitude of 9.75 m from msl). The earthworm (*Metaphire posthuma*) population, collected from the nearby agricultural land of this farm, was subsequently got identified from the Zoological Survey of India (ZSI), Kolkata and considered for the experiment (Mean size 7cm ± 0.5). Twenty-seven weed free small plots (1 sqm each) were selected for laying out the experiment. Then the test herbicides namely Paraquat 24% SL, 2, 4- D Na Salt 80%, Glyphosate 41% SL and a mixture formulation of 2, 4-D + Glyphosate (9% + 18%) were applied to experimental plots separately at both the sets of recommended doses as well as double of the recommended doses. One set of untreated control was also taken into consideration and the entire experiment was replicated thrice. As an indirect method of studying the herbicidal effect, observations on number of earthpods formed by earthworm were recorded from each plot in first, third and seventh day after application of test herbicides. Since, main effect of two factors i.e. treatment and exposure period and their interaction was considered during the course of investigation, the present experiment was laid out in an asymmetrical factorial design.

## RESULTS AND DISCUSSION

It is revealed from table 1 that the proportionate change in earthpod formation was least in the plots treated with Glyphosate applied @ 10 ml/lit (14.22) followed by 2, 4- D Na salt 80% @ 5g/lit (14.33) and the mixture formulation of 2, 4-D + Glyphosate @ 12ml/lit (14.47). Potter *et al.* (1994) also reported that these herbicides did not hamper much in earthpod formation at their recommended doses. The maximum change was observed in plots treated with Paraquat (28.57) and 2, 4- D + Glyphosate (27.19), when applied @ 20 ml/lit and @ 24 ml/lit of

water, respectively. However, in control plots, the number of earthpods was increased with the increasing exposure period. It is further revealed that when herbicides applied at the doses double to the recommended ones brought about the maximum effect on earthworm. Initial effect of herbicides on earthworm was 11.04 % after 1st day, which increased significantly to 20.27 % at the end of 3rd day and further increased to 27.70 % at the end of 7th day (Table 1). It is evident from table 2 that the single factor interaction effect was found to be non-significant indicating that the pattern of effect recorded under various herbicidal treatments at different days of observation was of similar nature. It can be concluded from the present experiment that the test herbicides are safe to *Metaphire posthuma* at recommended concentrations and among these, paraquat is slightly more toxic in comparison to others, which supports the findings of Zsombok *et al.* (1997).

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**Table1 Simple effect of some factors on proportionate change in earthpod formation by earthworm**

| Sl. No. | Factors | Dose | Proportionate change in earthpod formation (%) |
|---|---|---|---|
| 1. | **Herbicides** | | |
| | Paraquat 24% SL | 10ml/l of water | 20.01(25.86) |
| | Paraquat 24% SL | 20ml/l of water | 28.57(32.13) |
| | 2,4- D Na Salt 80% | 5g/l of water | 14.33(21.28) |
| | 2,4- D Na Salt 80% | 10g/l of water | 18.02(24.55) |
| | Glyphosate 41% SL | 10ml/l of water | 14.22(21.76) |
| | Glyphosate 41% SL | 20ml/l of water | 20.54(26.58) |
| | 2,4-D + Glyphosate | 12ml/l of water | 14.47(21.66) |
| | 2,4-D + Glyphosate | 24ml/l of water | 27.19(31.08) |
| 2. | **Exposure period (days)** | | |
| | 1 | | 11.04(18.83) |
| | 3 | | 20.27(26.43) |
| | 7 | | 27.70(31.58) |
| | | **Herbicides** | **Exposure period** |
| | **S. Em ±** | 0.98 | 0.599 |
| | **C. D. at 5%** | 2.79 | 1.7077 |

Figures in parenthesis are angular transformed values

**Table 2 Effect of interaction between herbicides X exposure period on proportionate change in earthpod formation by earthworm**

| Exposure periods (Days) | Herbicides | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Paraquat 24% SL (10ml/l) | Paraquat 24% SL (20ml/l) | 2,4-D Na salt 80% (5g/l) | 2,4-D Na salt 80% (10g/l) | Glyphosate 41% SL (10 ml/l) | Glyphosate 41%SL(20 ml/l) | 2,4-D + Glyphosate (12 ml/l) | 2,4-D + Glyphosate (24 ml/l) |
| 1 | 9.13 (17.33) | 20.17 (26.64) | 4.64 (12.73) | 8.60 (17.00) | 7.81 (16.19) | 11.61 (19.89) | 9.55 (17.29) | 16.81 (24.03) |
| 3 | 21.41 (27.39) | 29.83 (33.08) | 15.06 (22.72) | 19.68 (26.27) | 13.53 (21.57) | 20.94 (27.23) | 13.27 (20.99) | 28.42 (32.17) |
| 7 | 29.50 (32.85) | 35.70 (36.68) | 23.28 (28.83) | 25.77 (30.38) | 21.33 (27.51) | 29.06 (32.61) | 20.60 (26.69) | 36.34 (37.04) |
| **S. Em ±** | | | | | | | | 1.695 |
| **C. D. at 5%** | | | | | | | | 4.830 |

Figures in parenthesis are angular transformed values.

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