

An Earthworm : Bio-indicator of Ultra Violet (UV) Radiation in Environment

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ABSTRACT

In the present study, impacts of UV radiation on earthworm behavior was evaluated and established a relationship between intensity of UV radiation and earthworm's health based behavioral alterations. An endemic earthworm species *Lampito mauritii* was exposed to solar UV radiation in the climate of Indian Thar desert. Locomotion, touch response, feeding and reproductive behavior were studied. UV irradiated worms showed significant changes in the parameters as compared to the control group of earthworms. The impacts of ultra violet radiations on the earthworm behavior in Desert climate is worked meagerly, therefore the study was performed on the earthworm species *L. mauritii* in the Indian Thar desert and the earthworm species was identified as bio-indicator for radiation level measurement.

Keywords: Ultra Violet (UV) Radiation, Earthworm, Bio-indicator, Desert Climate

I. INTRODUCTION

The Sun is an ultimate source of energy for all living beings on the earth. Green plants trapped the solar energy through photosynthesis and accumulate in various forms and used by animals. Visible part of solar spectrum responded with eyes that's why we can see. However, sunlight is essential for existence of life, although some detrimental effects of the solar light on biological systems of living being are also to different radiations such as ultra violet radiations, X-radiation, gamma radiation and infrared radiations of the solar emission. Generally, electromagnetic spectrum is subdivided into three bands on the basis of wavelength as UV-A (400-320 nm), UV-B (320-290 nm) and UV-C (290-200 nm). Wavelength of shorter than 290 nm is generally more photobiologically active than longer wavelength radiation.

In the present era of development, extreme use of air conditioning systems fluids that generates CFCs which transmitted to stratosphere and destroying the ozone layer continuously. Although, short exposure of UV radiation beneficial for human health mainly concerning to vitamin D synthesis which prevents from osteoporosis, diabetes type 1, some type of cancer and autoimmune diseases (Holick, 2004 and Ponsonby *et al.*, 2005). UV-A radiation creates free radicals that can also damage the

DNA in skin cells increasing the risks for malignancy (Wang *et al.*, 2010 and ScienceDaily, 2017). In addition, UV-A that penetrates into the dermis can cause cross linking of the collagen-elastin network resulting in skin damaging and wrinkling (Sjerobabski and Poduje, 2008) and effect on the immune system as increasing immune tolerance (Vink *et al.*, 1996). Aquatic organisms were affected by UV radiation (Hader *et al.*, 2015).

Although some workers (Misra *et al.*, 2005) used earthworm to determine the level of UV radiation but nobody has worked on *L. mauritii* in desert climate in Indian Thar desert. therefore, an earthworm species *L. mauritii* was selected for the experiment and it may be used in assessment of solar radiations in tropical environment.

II. METHODS AND MATERIAL

Mature earthworms were exposed to solar radiation at different durations that is 0.25, 0.5, 1, 2, 3 and 4 hours for 15 days. Experiment was conducted in the month of July- August, 2016.

Earthworm species *Lampito mauritii* was collected from Nehru Garden of Jodhpur city and prepared a stock culture, it was inoculated in vermibed prepared with an equal ratio of cow dung and soil. Triplicate sets of

vermibeds (500g each) were prepared separately for each decided period of solar exposure using soil and cow dung in equal ratio in plastic containers (30 cm diameter x 25 cm height) and moistened to stabilize within 48 hours. In the experimental set, 25 worms of *Lampito mauritii* were inoculated in each container. One set of control (without exposing UV radiation) was run simultaneously. Each experimental set was exposed to solar radiation during peak day time (12:00 noon – 4:00 Pm) every day and continued for 15 days. After 15 days, some selected behavioral parameters were evaluated such as locomotion, touch response, feeding and reproduction.

III. RESULTS AND DISCUSSION

In the experimental set of 0.25h exposure to sun light not any kind of alterations observed in locomotion, touch response, feeding and reproduction behavior as compared to control group of *L. mauritii*. Whereas, 0.5h exposure group behavior of touch response and locomotion were not affected while feeding and reproduction were moderately decreased. The observations of 1h exposed group of earthworms showed moderate decrease in activities of locomotion, touch response and reproduction whereas feeding was decreased to low level and significantly differed from control group of worms. Similarly, earthworms of 2h exposure group were declined their activities low to very low level in all the above parameters. In the 3h solar radiated worms exhibited very low to lethal effects and 4h period of exposure exhibited lethal effects and maximum worms found dead (Table 1). The above activities were occurred probably due to degeneration of epidermal cells, body musculature, sense and nervous system.

The present work is an agreement with the observation of Misra *et al.* (2005) they studied that histological anomalies such as thickening, vacuolation and hypertrophy of epidermal cells were observed when the animals were exposed for 1 to 2 h, while a higher exposure period (3h) caused degeneration of circular and longitudinal muscles.

They observed that continuous exposure more than 3h was found lethal to worms. They also document that the level of UVR in sunlight may produce significant phototoxic effects in the earthworms probably via the generation of ROS (photodynamic action).

Since, the effects of UV radiation on earthworm were assessed and found significant changes in solar exposed set as compared to control set of earthworms. Hence, *L. mauritii* may be used for evaluating the level of UV radiation in desert climate and evoke safety measures for human welfare. However, further study may be warranted to reveal the facts.

IV. REFERENCES

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