Environment Conservation Journal 16(1&2) 149-152, 2015
ISSN 0972-3099 (Print) 2278-5124 (Online)
Abstracted and Indexed

Effect of pulp and paper mill effluent on tubificid worm

Manish Singh

Received: 22.03.2015 **Revised: 15.04.2015** **Accepted: 02.05.2015**

Abstract

Indicator organism, sometimes called bio indicator are plant or animal species known to be either particularly tolerant or particularly sensitive to pollution. The health of an organism can often be associated with a specific type or intensity of pollution and its presence can then be used to indicate polluted conditions relative to un-impact conditions *tubificid* worm are an example of organism that can indicates pollution *tubificid* worm live in the bottom sediment of streams and lakes and they are highly tolerant of pulp and paper mill. In a river polluted by waste water discharge from pulp and paper plant, it is common to see a large increase in the number of *tubificid* worm in stream sediments immediately downstream.

Keywords: bio-indicator, in-impact condition, potential indicator, feasible.

Introduction

Bio indicator organisms are also known as bio indicator species that are both of animal and plant species. Bio indicator species is sensitive and tolerant to pollution. Tubificid worm is such bio indicator that serves as an important bio indicator species for pollution in the rivers and stream. Tubificid worm is typically found in the water bodies and river stream polluted with pulp and paper mill discharge. Population of tubificid species could be used as an index of organic pollution. Tubificid concentration is also used as an parameter of pollution by APHA, as the number of tubifex in the polluted site is a indicator of pollution in the water bodies and sites of discharge of the effluent. The effect of organic pollution load decreases the number of the tubificid colony numbers that can be directly related with the LC_{50} of the tubifex colony. The tubificid is known to increase in abundance with organic pollution. Brinkhurst (1996) suggested that the population of the *Tubifex* species could be used as an index of organic pollution. The U.S. Environmental Protection Agency (EPA) is working diligently to find reliable predictor of aquatic ecosystem health using indicator species.

Author's Address
IET,Dr.R.M.L.Avadh University Faizabad
E-mail: sheetudhar@ymail.com

Material and Methods

To assess organic pollution load of paper mill effluent, by *tubificid* worm using as indicator organism three sampling sites were fixed at different location considering the source and degree of pollution. The sediment samples from the bottom at different stations were collected by using Peterson grab mud sampler (270cm) and were transferred to polythene bags. The samples were then rained through a sieve of various mesh sizes (310-400μm) and were transferred to 71% alcohol and were identified under dissecting microscope following the work of Edmondson (1993) Pennak (1989). The results were expressed as organism/meter^3.The degraded effluent will be using *tubificid* worm (APHA) because *tubificid* worm are important member of lenthic fauna in the aquatic environment, and dry harmful effect of paper mill effluent on these organism will likely be reflect in whole ecosystem for toxicity evaluation to worms of *tubificid* will be inoculated in to different concentration (10 to 100% v/v) of degraded kraft mill effluent and tube well water. The mortality in percentage an LC50 at different hrs and pH will be taken as criterion to assess the toxicity of degraded effluent. The *tubificid* is known to increase in abidance with organic pollution Brinkurst (1966) suggested that the population of the *Tubificid* species could be used as index of organic pollution. Present study also confirms the presence of

tubificid at deeper water, where accumulation of biologically active nutrient is very high. Thus, zoobenthas (i.e. *Tubificid*) reflect the stages of organic pollution in water (Hellawell 1986).

Results and Discussion

Tubifex tubifex, also sewage worm or lime snake is a species of *tubificid* demented worm that inhibits the sedimentation of lakes and river on several condition *T. tubifex* probably includes several species, but distinguishing between them is difficult because reproductive organs commonly used in species identification are reabsorb after matting and because external characteristic of the worm vary with change in salinity. These worms ingest sediments and gain molecule through body wall the worm can survive with little oxygen through the uses of their haemoglobin rich tail ends which they wave in order to absorb little oxygen they can also survive in areas so heavily polluted with organic matter that almost no other species can endure. By forming a protective cyst and lowering its metabolic rate, *T. tubifex* can survive drought and food shortage. Encystment may also function in dispersal of the worm. Toxicity studies on Tubificid worm (*Tubificid tubifex*) are shown in the Tables (1, 2 and 3). The result revealed that 100 and 75% concentration of paper mill effluents are highly toxic to tubificid worms and they cannot survive even for a 24 hrs after exposure to such concentrations. The 50% concentration of the effluent showed slight improvement in the survival of the Tubificid worms. It was toxic only when the worms exposed to more than 72 hrs. 25% concentration of paper mill effluents showed good results as it was only toxic when worms are exposed to 96 hrs. In other cases of exposure this concentration was found slightly, moderately and actually not toxic to tubificid worms when exposed to 48, 72 and 24 hrs against paper mill effluents (Table 1, 2 & 3). Out of three samplings sites, *Tubifex* were more at deeper regions. Tubificid worms are long terms indicators of environmental quality. Many workers have used Tubificid worms as indicators of pollution (Hellawell, 1986). *Tubifex* species have sensitive life stages that respond to stress and integrate effect on both short term and long term environmental stresses. During present study the polluted water zone was found to harbour of higher population density of Tubifid worms as compared to non-polluted zone. The tubificid is known to increase in abundance with organic pollution. Brinkhurst (1996) suggested that the population of the *Tubifex* species could be used as an index of organic pollution. Present study also confirms the presence of Tubificid at deeper waters, where accumulation of biologically active nutrient is very high. Thus, zoobenthos (i.e. Tubificid) reflects the state of the organic pollution in water (Hellawell,(1986).

Table 1: Toxicity studies on Tubificid worm (*Tubifex tubifex*) against paper mill effluents.

Study time	Effluent concentration	Experiment type	Toxicity end point	Effect	Measurement	Acute Toxicity Rating
24 hrs.	100% & 75%	Static	LC_{50}	Mortality	Mortality	Highly toxic
48 hrs.	100% & 75%	Static	LC_{50}	Mortality	Mortality	Highly toxic
72 hrs.	100% & 75%	Renewal	LC_{50}	Mortality	Mortality	Highly toxic
96 hrs.	100% & 75%	Renewal	LC_{50}	Mortality	Mortality	Highly toxic

Table 2: Toxicity studies on Tubificid worm (*Tubifex tubifex*) against paper mill effluents.

Study time	Effluent concentration	Experiment type	Toxicity end point	Effect	Measurement	Acute Toxicity Rating
24 hrs.	50%	Static	LC_{50}	Accumulation	Reduce	Slightly toxic
48 hrs.	50%	Static	LC_{50}	Intoxication	Chell changes	Slightly toxic
72 hrs.	50%	Renewal	LC_{50}	Cells (s)	Enzyme activity	Moderately toxic
96 hrs.	50%	Renewal	LC_{50}	Injury	Mortality	Toxic

Table 3: Toxicity studies on Tubificid worm (*Tubifex tubifex*) against paper mill effluents.

Study time	Effluent concentration	Experiment type	Toxicity end point	Effect	Measurement	Acute Toxicity Rating
24 hrs.	25%	Static	LC_{50}	Accumulation	Residue	Not actually toxic
48 hrs.	25%	Static	LC_{50}	Accumulation	Residue	Slightly toxic
72 hrs.	25%	Renewal	LC_{50}	Injury	Chell changes	Moderately
96 hrs.	25%	Renewal	LC_{50}	Injury	Enzyme activity	Toxic

The findings on the effect of paper mill effluents on a zooplankton Tubificid are given in the present investigation. Indicator organisms, sometimes called bio-indicators, are plant or animal species known to be either particularly tolerant or particularly sensitive to pollution. The health of an organism can often be associated with a specific type or intensity of pollution and its presence can then be used to indicate polluted conditions relative to unimpacted conditions. Tubificid worms are an example of organisms that can indicate pollution. The usefulness of organism is limited while their presence or absence provides a reliable general picture of polluted condition; they are often little help in, identifying the exact source of pollution. Pollution tolerant insect larvae are overwhelmingly dominant. However, it is impossible to attribute the large larval populations to just one of the sources of pollution there, which include ship traffic, sewage and industrial discharge and storm runoff. The U.S. Environmental Protection Agency (EPA) is working diligently to find reliable predictor of aquatic ecosystem health using indicator species. Recently, the EPA has developed standards for the usefulness of species as ecological indicator organisms. A potential indicator species for use in evaluating watershed health must successfully pass four phases of evaluation. First, a potential indicator organism should provide information that the relevant to societal concerns about the environment, not simply academically interesting information. Second, use of a potential indicator organism should be feasible. Logistics, sampling costs, and timeframe for information gathering are legitimate considerations in deciding whether an organism is a potential indicator species or not. Thirdly, enough must be known about a potential species before it may be effectively used as an indicator organism. Sufficient knowledge regarding the natural variations to environmental flux should exist before incorporating a species as a true watershed indicator species. Lastly, the EPA has set a fourth criterion for evaluation of indicator species. A useful indicator should provide information that is easily interpreted by policy makers and the public, in addition to scientists.

References

APHA 1998.*Standard methods for the examination of water and waste water* 24th Ed. Washington DC.

Bajpai, M. and R. Kumar.2008. Nature of Alkins pulp and paper mill effluent of Kanpur district (U.P.).***SCITECH***, 3 (2): 60-62.

Brinkhurst, R.O. 1966. The tubificide (Oligochacta) of polluted water, *Int. Verei.Theo. and Limno.Verno.,Verha*, 16: 854-859.

Campbell, R.C. 1974. *Statistics of biologists*, Cambridge Univ. Press, London.

Edmondson, W.T. ed 1993. *Ward and Whipple's Fresh water*

Hellawell, J.M. 1986. Biological indicators of fresh water pollution and environment management, Elsevier, London

Pennak, R.W. 1989. *Fish invertebrates of the U.S. Protozoa to mollusca* John Wily & Sons INC.