Research Guru
Online Journal of Multidisciplinary Subjects (ISSN : 2349-266X)
UGC Approved Journal No. 63726
Impact Factor:3.021 website: www.researchguru.net
Volume-11,Issue-3,December-2017

STUDY OF ZOOREMEDIATIVE PARAMETERS FOR CONGO RED DYE CONTAINED WATER.

M.M.Nandotriya, Dr.L.B.George, Dr.H.N.HIGHLAND, Dr.K.R.DESAI

Department of Zoology, BMTC & HG, School of Sciences, Gujarat University,

Ahmedabad-380009, Gujarat

E-mail: milind_success@yahoo.com

Abstract:

With the rapid industrialization water pollution has become a major problem. Characteristics of industrial effluent depend upon the type of industrial raw material and the output of product. The emission of effluents from textile industries has been a major concern of the modern world, due to the pollution that these effluents promote on the water resources. Among the synthetic dyes released in effluents from textile industries, azo dyes is one of the more detrimental classes because it is highly persistent in the aquatic environment, due to its chemical compositions, involving aromatic rings, azoic linkages and amino groups.

This study presents some considerations on the importance of the biological treatment of textile effluents, the discovery of microfauna capable of degrading condo red dye efficiently in order to reduce potential risks of these dyes to organisms and environment. The goal of bioremediation is to transform toxic materials into non-toxic ones so that they enter natural biogeochemical cycles more quickly.

Although, not widely known, invertebrates remain the most effective tool of bioremediation. It is probable that many animal taxa will possess attributes amenable to bioremediation. Here, it is described in detail, zooremediation, its mechanism, various invertebrates used, the role they play and how effective they can be.

Introduction

The ability of animals to act in a bioremediative capacity is not widely known. Animals are rarely considered for bioremediation initiatives owing to ethical or human health concerns. Nonetheless, specific examples in the literature reveal that some animal species are effective remediators of heavy metals, microbial contaminants, hydrocarbons, nutrients and persistent organic pollutants, particularly

in an aquatic environment.

Recent examples include deploying pearl oysters to remove metals and nutrients from aquatic ecosystems and the harvest of fish to remove polychlorinated biphenyls (PCBs) from the Baltic. It is probable that many animal taxa will possess attributes amenable to bioremediation (Gifford, S. *et al*., 2005).

The use of animals for bioremediation can be achieved in three ways: pollutants can be extracted from an area by harvesting wild :through the introduction, culture, and harvest of animals – a form of aquaculture; and supplementation or maintenance of wild animal populations, which might lead to stabilization or degradation of pollutants. (Gifford, S. *et al*., 2005)

Selected dye for study: Congo Red

IUPAC NAME: 3,3'-([1,1'-biphenyl]-4,4'diyl) bis(4aminonaphthalene-1-sulfonic acid)

Properties

Molecular Weight:696.663219 g/mol

Molecular Formula: $C_{32}H_{22}N_6Na_2O_6S_2$

Hydrogen Bond Donor Count: 2

Hydrogen Bond Acceptor Count: 12

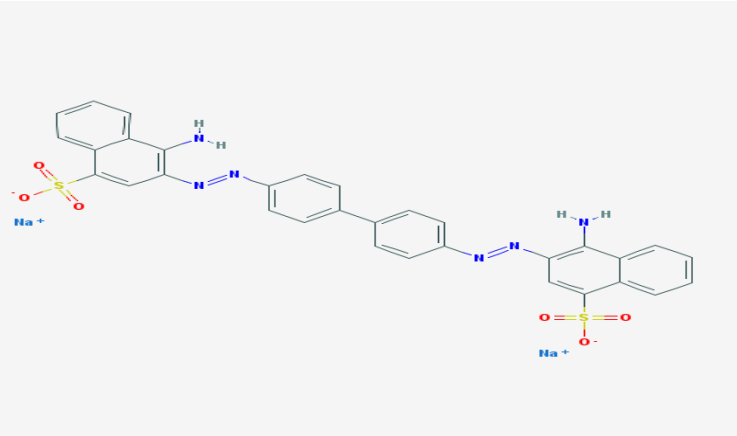
Rotatable Bond Count: 5

Exact Mass: 696.083763 g/mol

Monoisotopic Mass: 696.083763 g/mol

Heavy Atom Count: 48

Covalently-Bonded Unit Count: 3



Source: www.wikipedia.com

TOXICITY OF THE DYE

- Teratogenicity in rats has been demonstrated at high dosage. larger or more frequent doses than those recommended delay or prevent blood coagulation. (Rossoff, I.S. Handbook of Veterinary Drugs. New York: Springer Publishing Company, 1974., p. 131)
- A single 20 mg dose of this substance on the 8th day of gestation produced hydronephrosis, hydrocephalus or microphthalmia in about 15% of rat offspring. Using 10 mg on 3 days found only one rat fetus with hydrocephalus out of over 100 examined specimens. (Shepard, T.H. Catalog of Teratogenic Agents. 5th ed. Baltimore, MD: The Johns Hopkins University Press, 1986., p. 147)

Methodology

Selected Animals for Zooremediation:

There are certain invertebrate species that provides promising results in their cultural practices even when there is a wide range of environmental fluctuations.

These animals can be easily found in country waters and can be collected and handled with seldom difficulties and have less complex and short life cycles with high fecundity rate and can survive in unfavorable environmental condition. *Cypris sp*. was considered the most efficient for the zooremediation study.

Criteria for Selcting candidate zooremediation species:

- Accumulate pollutant
- Resistant to toxicity
- Non-invasive
- Rapid growth rate
- Relatively sedentary
- Ease of culture
- Population Dynamics Known
- Knowledge of carrying capacity
- Disease risks understood
- Uptake dynamics known

Classification:

Kingdom: Animalia

Class: Ostracoda

Order: Podocopida

Family: Cyprididae

Genus: ***Cypris***

Sampling:

The usual ostracod in Ahmedabad region is *Cypris sp.* This species has been taken from nearly any neutral or faintly acidic pond. They are small, about 1/2-2mm long, with a hard outer shell. In freshwater ponds they are usually found scuttling around among the debris at the shallow edges. They swim smoothly with appendages extended from between the two halves of their carapace(shell). When disturbed, they withdraw their limbs into their shell and clamp the halves tightly together.

Culture Method for *Cypris*:

Density of *Cypris* culture is 3 gm/l. One liter of this culture was centrifuged in batches of 50 ml each for 5 minute at 500 rpm. The supernatant was discarded immediately.

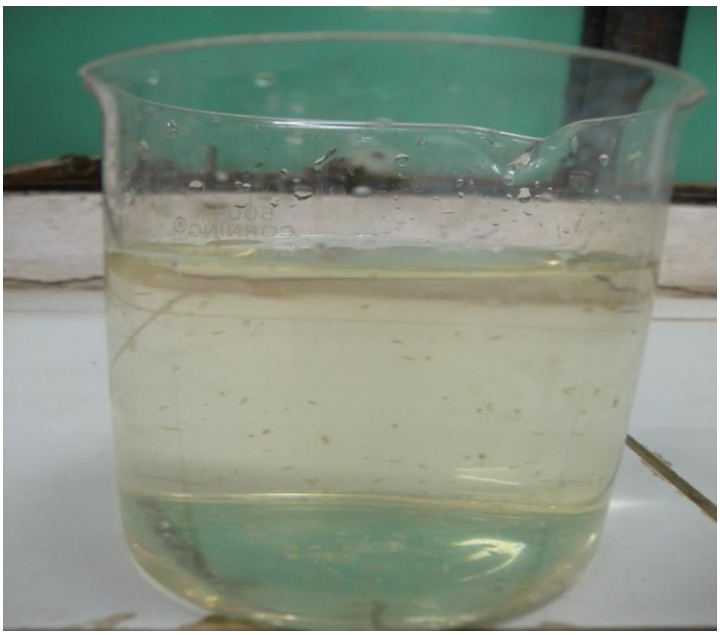
Two washes of distilled water was given to the pellet i.e., live *Cypris*. A wash of detergent/sterilizing agent was given followed by another two washes of double distilled water.

These sterilised *Cypris* were transferred to Congo red dye solution in flask.

The concentration of dye was 1mg/l.

2 ml food was supplemented to the flask containing *Cypris* in dye solution after every three days.

Fig.1 Showing culture of *cypris sp.*



Analytical method:

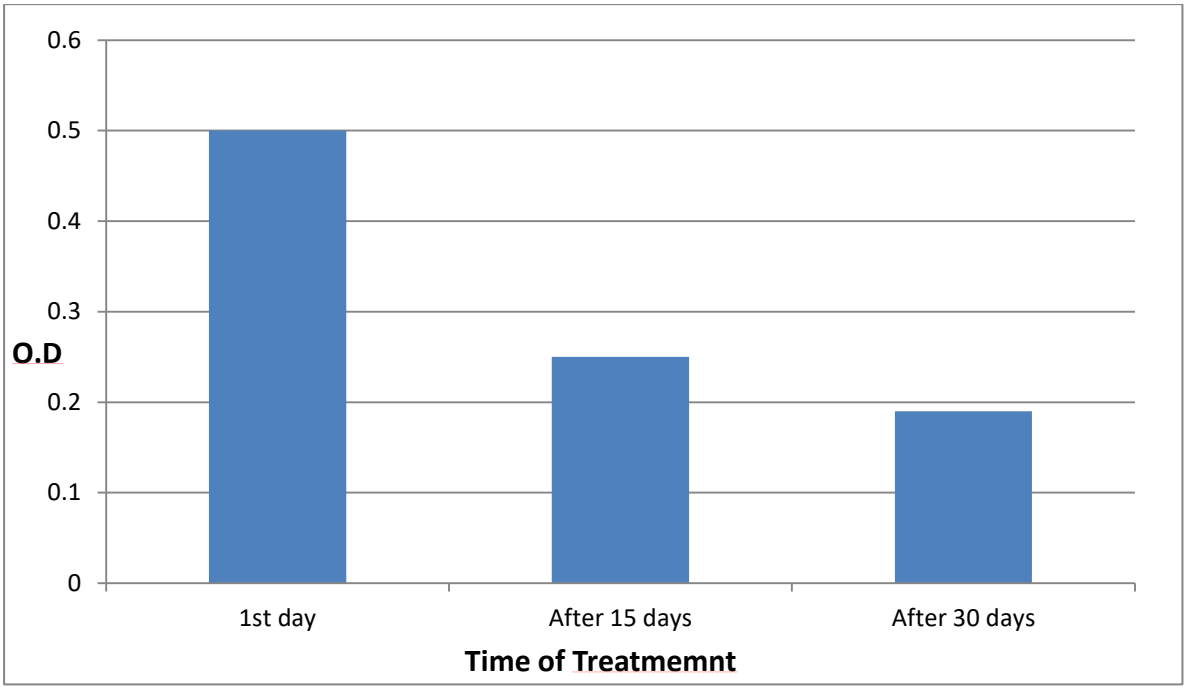
- Various parameters like pH, colour, Total dissolved solids (TDS), Biological oxygen demand (BOD), Chemical oxygen demand (COD) were measured according to the procedure outlined in standard methods. (APHA,2007).
- Absorbance of the Congo red dye containing solution was measured at its respective λ max values using a UV-visible recording spectrophotometer.
- pH was measured using a digital pH meter.

Results:

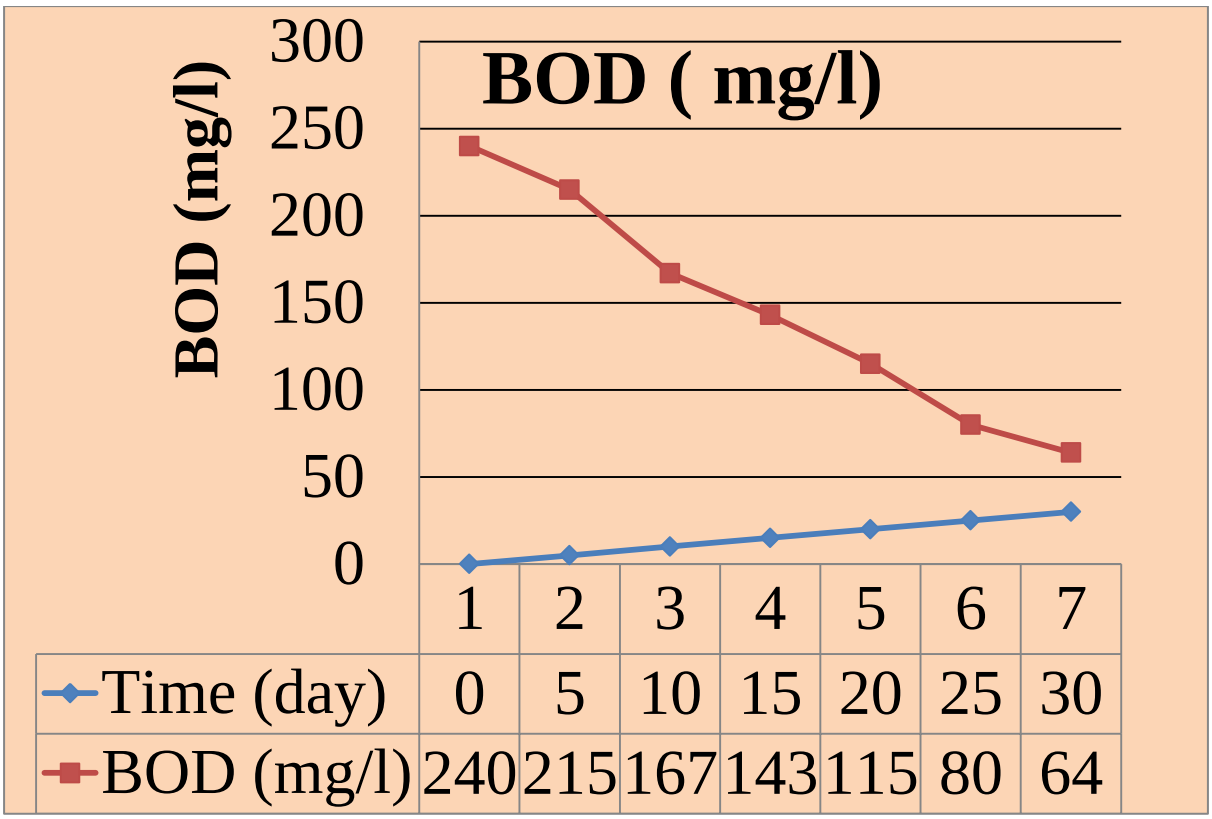
Table 1: Showing Characteristics Raw water and after treatment

	Raw Waste Water	After treatment
pH	**7.1 to 7.9**	**5.5 to 7.5**
SS (mg/l)	**25 to 90**	**12 to 56**
BOD (mg/l)	**15 to 21**	**40 to 65**
COD (mg/l)	**232 to 731**	**175 to 250**
Colour	**Reddish**	**Light pink**

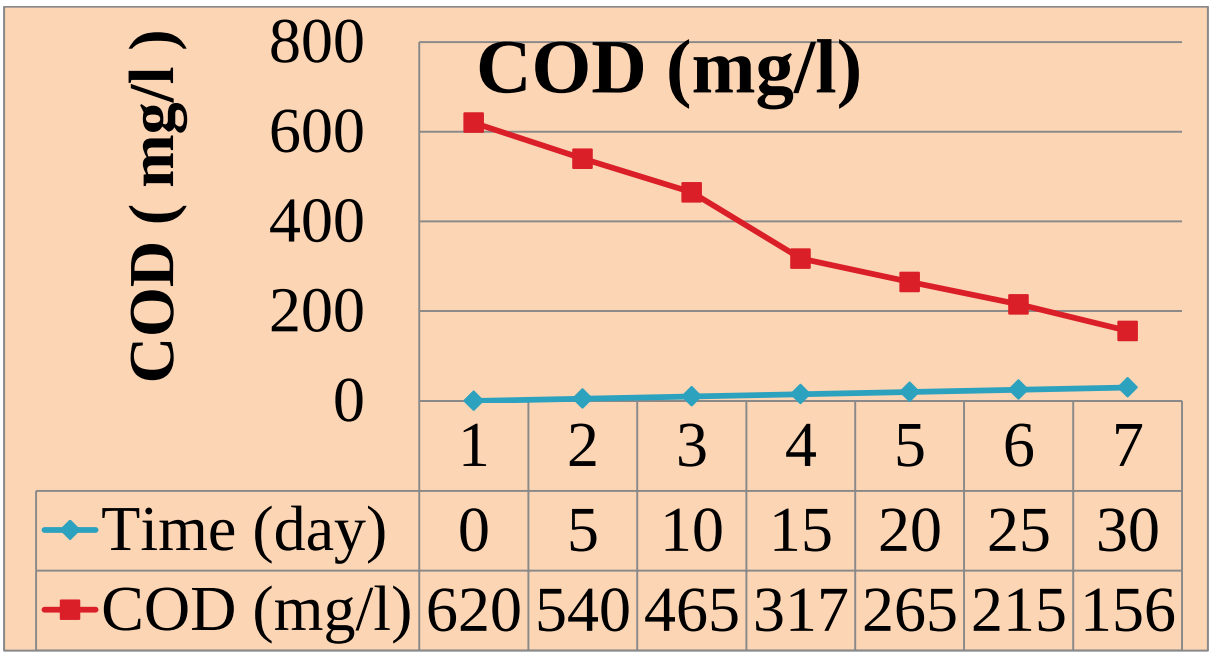
Graph 1: Showing results of Optical density during the time period of study



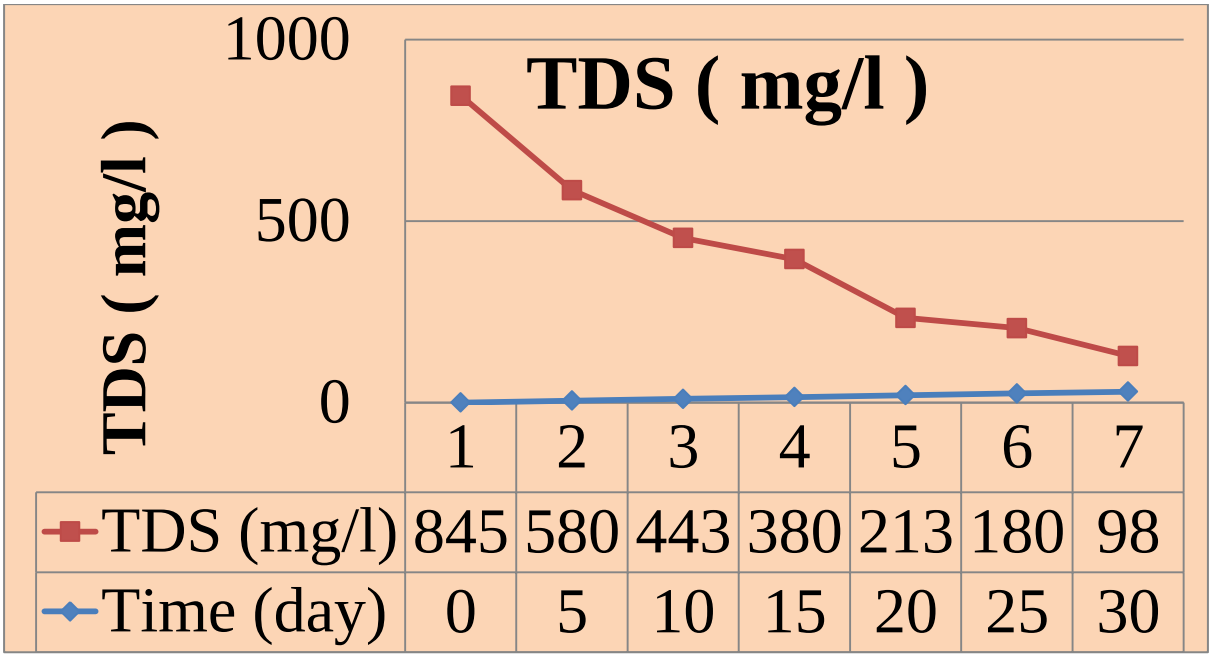
Graph 2: Showing results of BOD (biological oxygen demand)



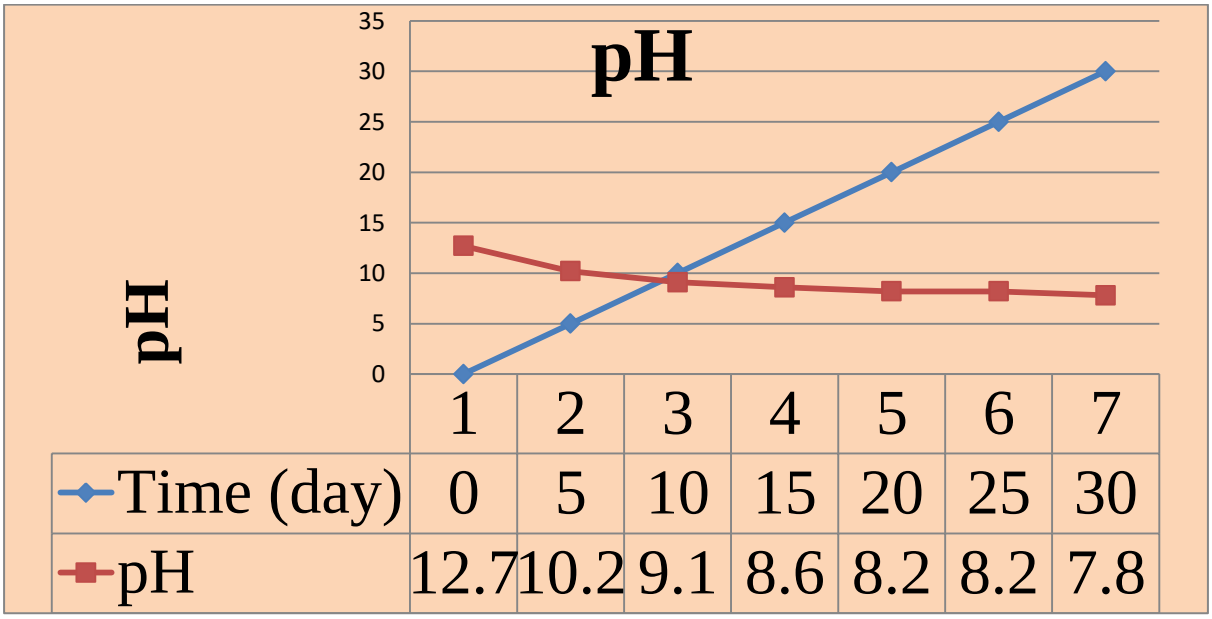
Graph 3: Showing results of COD (chemical oxygen demand)



Graph 4: Showing results of TDS (Total dissolved solids)



Graph 5: Showing results of pH



Conclusion

The synthetic waste water composed of only Congo red dye has been effectively decolorized through zooremediation. The decolorisation capabilties of the ostracod is quite evident and requires 2-3 weeks to complete. The color changes can also be seen with naked eyes.

It can be easily concluded from the present study that animal culture of *cypris* can treat the congo red contaminated water moderately (i.e. it can degrade the dye successfully and making it less harmful to the environment.)

Finally, the optimal zooremediation model is context-specific for both the estuary of interest and the candidate zooremediator species requiring carefully planned preliminary research programmes to maximise remediative benefits against any potential negative impacts.

References

Gifford, S. et al. (2005) Pearl aquaculture: profitable environmental remediation? Sci. Total Environ. 319, 27–37

Rossoff, I.S. Handbook of Veterinary Drugs. New York: Springer Publishing Company, 1974., p. 131

Shepard, T.H. Catalog of Teratogenic Agents. 5th ed. Baltimore, MD: The Johns Hopkins University Press, 1986., p. 147

APHA, (2007), Standard methods for examination of water and waste water. 20th edition. American Public Health Association, Washington DC.

Site Referred: www.wikipedia.com