

FOLDSCOPE: A NOVEL PAPER MICROSCOPE AND ITS APPLICATION

¹Srinivasa SundaraRajan R, ²Poonam Singh, ³Maruthamuthu S, ⁴Arumugasamy K
CSIR-Central Electrochemical Research Institute, Karaikudi, Tamil Nadu

Abstract

Foldscope is an origami based novel paper microscope. It is unique and provides magnification up to 140x. Here we use foldscope for visualization of microorganisms. The water samples were being examined using foldscope and images are captured using mobile phone.

Index Terms: Foldscope, microorganisms, origami, microscope, smartphone

Introduction

Microorganism and biofilms are ubiquitous in nature. Many microorganism are found in aquatic systems. Biofilms virtually grow on any surface in contact with water (Jachlewski et al., 2015). Microscopes are universal tool in science providing a vital association between the macro and the micro world. Foldscope is an origami based paper microscope which can assembled from a flat sheet of paper. Foldscope gives up to 140x magnification. It is durable, cost effective and easy to carry. It can survive a drop from a high building or stepped on by a person. Its scalable design is useful for all purposes (Cybulski et al., 2014). Here, we have used foldscope for microscopic observation in aquatic environment. In this short communication we present a mosaic of various microscopic observations captured using foldscope.

Materials and Methods

Foldscope

Foldscoopes were provided by Department of Biotechnology, Govt. of India under DBT- Foldscope grant.

Microorganism analysis using Foldscope

The collected water sample was examined using foldscope. A drop of water sample was placed on the paper slide and covered with a sticker tape and observed under foldscope. Similarly, a loopful of biofilm was taken on a glass slide and observed using foldscope.

Bacterial Enumeration

The collected water sample was grown on R2A agar. Microbial colonies were picked and a smear was prepared on a clean glass slide which was stained with Gram stain and observed under Foldscope.

Results and Discussion

Foldscope Examination

The specimen/samples were examined using foldscope. The images of microorganisms isolated from different aquatic environment showed presence of both Gram positive and negative organisms and algae. The biofilm were observed as a thick mass.



Fig 1:Image of Foldscope

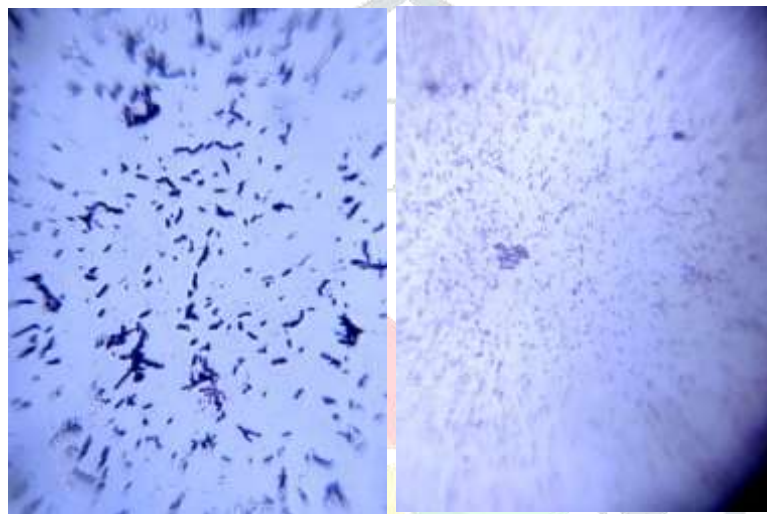


Fig 2: Stained samples of bacteria observed under foldscope

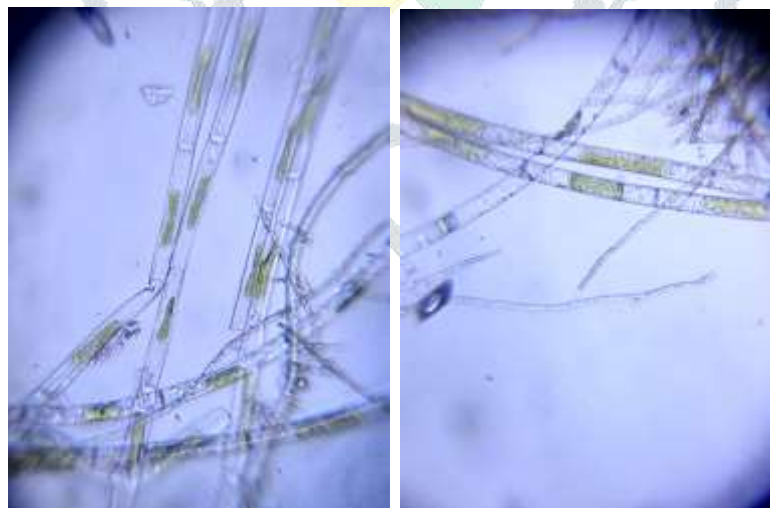


Fig 3: Algal samples observed under foldscope

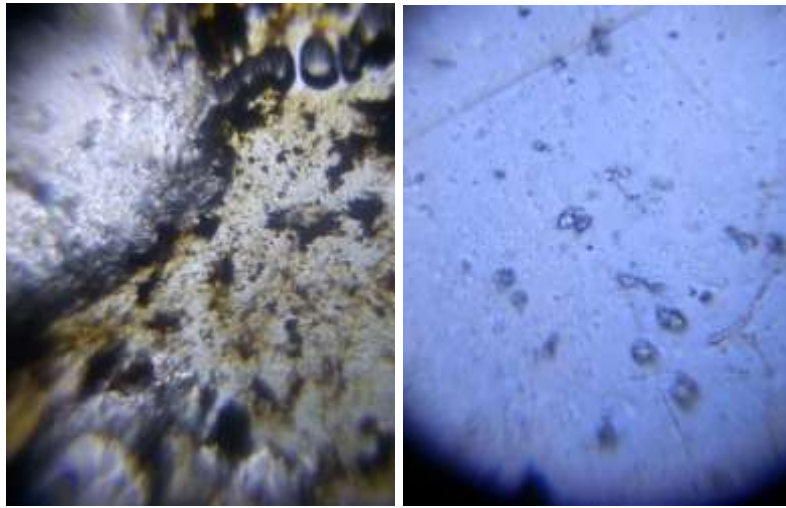


Fig 4: Biofilms observed under foldscope

Conclusion

Examination of microorganisms was done using a novel paper microscope. Different types of microorganism were observed in the collected water samples. The stained slide showed presence of both Gram positive and negative organism present. Beautiful images of algae was observed and captured using smartphone. Foldscope is useful in identification of microorganism as a quick tool.

Acknowledgements

The authors acknowledge Department of Biotechnology (DBT), Government of India, New Delhi for providing financial support and Foldscopes for carrying out this research work.

References

- Cybulski, J.S., Clements, J. and Prakash, M (2014) Foldscope: origami-based paper microscope. *PloS one*, 9(6), p.e 98781.
- Jachlewski, S., Jachlewski, W.D., Linne, U., Bräsen, C., Wingender, J. and Siebers, B., 2015. Isolation of extracellular polymeric substances from biofilms of the thermoacidophilic archaeon *Sulfolobus acidocaldarius*. *Frontiers in bioengineering and biotechnology*, 3, p.123.