Research & Reviews in Biotechnology & Biosciences
Homepage: http://www.biotechjournal.in
Volume: 6, Issue: 2, Year: 2019 PP: 48-50

Short paper

Foldscope: An Efficient Tool for Quality Analysis of Seeds and Grains for Farmers

Arun dev Sharma*, Priya Nischal

**PG Dept of Biotechnology, Lyallpur Khalsa College, Jalandhar, Punjab, India*

DOI: 10.5281/zenodo.3459500

Article History

Received: 03/07/2019
Revised: 29/07/2019
Accepted: 15/09/2019

**Corresponding Author:*
E-Mail:
arundevsharma47@gmail.com

Abstract

Foldscope is an ultra-affordable, paper microscope designed to be extremely portable, durable, and to give optical quality similar to conventional research microscopes. However its potential as in tool in the area of agricultural farmers is still not known. In this study, how foldscope can be used as an efficient tool for farmers in their fields was demonstrated. Seeds of wheat, maize, moong dal and black dal were purchased from local market. Imbibed seeds were half opened and stained in tetrazolium solution. Seed viability coupled with germination plays an fundamental role in plant growth, development and crop productivity. Therefore, foldscope images revealed viable red areas in the respective seeds, indicating live embryos. Based on data the use of foldscope was recommended.

Keywords: Farmers, Foldscope, Quality control, Seeds, Viability.

Introduction

Foldscope, is an paper based, portable microscope with magnification power of 140 X. It was invented by Prakash lab at Stanford University of America in 2014 [1]. Thereafter, Department of Biotechnology (DBT), Government of India and Prakash Lab at Stanford University, USA earlier signed an agreement to bring the Foldscope to India to encourage curiosity in science. Efficient tools to check purity of seeds or grains, variety identification, seed germination testing is prerequisite as for as the quality control in agriculture is concerned. Seeds which are generally soldin market often adulterated with low quality seeds having poor germination thereby reducing the productivity of crops. Quality of seeds can be checked through examination under microscopes, however, filed microscopy is not routinely used for quality control of seeds due to high cost and big size of microscopes. Various approaches have been used to examine seed quality, however the role of foldscope as an efficient tool in quality control of seeds is not known worldwide so far.With this background, the present study was carried out to assess the usefulness of portable foldscope for quality evaluation of crop seeds. Due to its less cost, environmental friendly, small size, and portable in nature, can be widely used even by agriculture farmers in the field conditions for quality control of seeds like wheat, cereals and maize which are widely grown and cultivated crops in India.

Material and methods

Foldscope was used in current study, was supplied by Department of Biotechnology (DBT), Government of India. Seeds of locally grown crop varieties like wheat (*Triticumaestivum*), maize (*Zeamays*), Moong dal (*Vignaradiata*) and Maa dal (*Vignamungo*)

was purchased from local market. Seeds were imbibed in water for overnight. Thereafter seeds (10 seeds= one replicate (n);

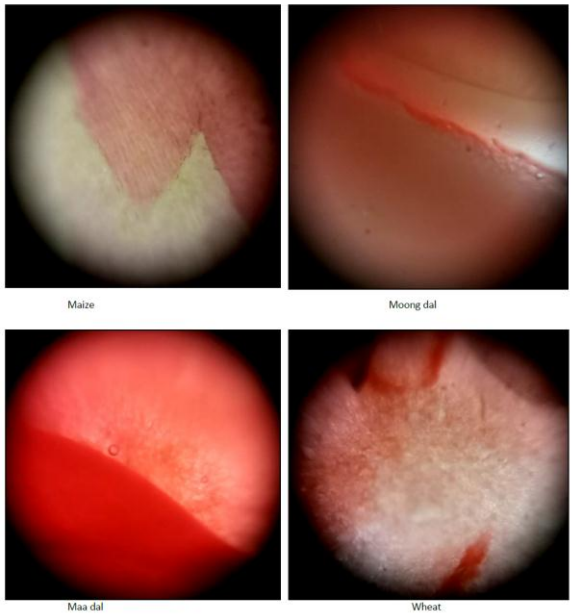


Fig. 1 Foldscope images of crop seeds. Data represent representative image from three replicates (n). n=3

n=3) were half opened with a pair of tweezers and incubated in 1% Tetrazolium solution (pH 7.0) for 15 min at room temperature. A lactophenol solution was used as a clearing agent if vision was not clear after staining. Thin section of tissues were taken on glass slides and covered with transparent cello tape/cover slip. The slide was inserted into the foldscope in such a way that sample side was close to lens of foldscope. A LED light supplied with foldscope instruments was used a light source. The clear images under foldscope for each sample were photographed using cell phone camera (Samsung, Galaxy Tab A) by adjusting zoom and focusing of camera and foldscope. Red stained areas indicate live tissue.

Result and discussion

Seed viability coupled with germination plays an fundamental role in plant growth, development and crop productivity [2]. Foldscope images of various seeds like wheat, moog dal, Maa dal and maize were taken and analyzed (Fig. 1 and supplementary Fig. 1). With staining with tetrazolium solution, well defined red areas in each seed section were detected, indicating that seeds contained live embryos. Living tissue contains dehydrogenase enzymes, which reduce the tetrazolium chloride to formazan, a reddish, water-insoluble compound. This reaction only happens in or near living cells that are releasing hydrogen as they respire, so staining indicates the seed is living. Based on this data it was concluded that foldscope can be a cheap, portable and powerful efficient tool to evaluate seeds quality at the spot in farmers fields under local agronomic conditions. Further studies can be conducted to make it easy to identify foreign verities, mites or fungal diseases in seed samples.

Acknowledgement

ADS want to thank DBT, Govt. of India for giving Foldscope project grant.

Conflict of interest

Authors declares no conflict of interest

Compliance with Ethical Standards

The authors declare that they have no conflict of interest. This article does not contain any studies involving animals or human participants performed by any of the authors

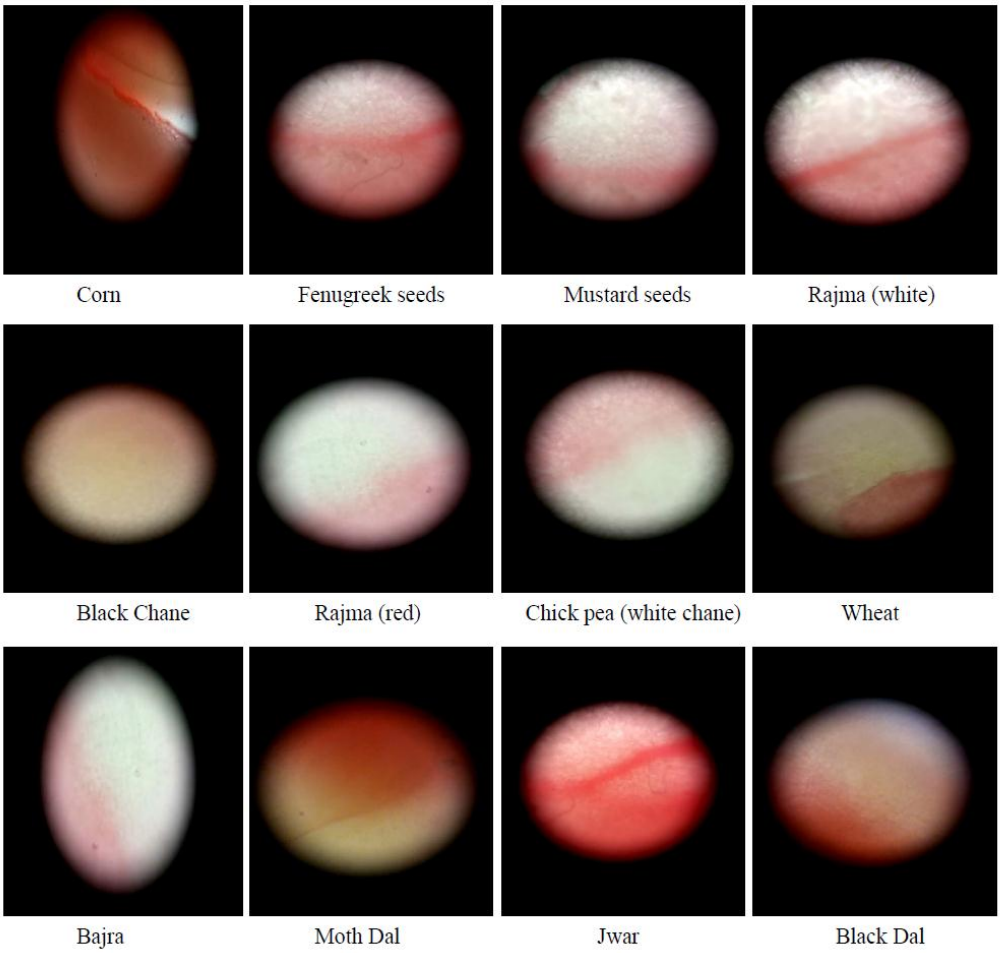
Author contributions

PN: did experiment work

ADS: manuscript Preparation and editing

REFERENCES

1. Cybulski, J.S., Clements, J., &Prakash, M. (2014).Foldscope :origami-based paper microscope. *Public Library Of Science ONE*, 9(6) :e98781.
2. He, M., Zhu, C., Dong, K., Zhang, T., Cheng, Z., Li, J., &Yan, Y. (2015). Comparative proteome analysis of embryo and endosperm reveals central differential expression proteins involved in wheat seed germination. *BMC Plant Biology*, 2015, 15,97.



Supplementary Fig 1: Seed Viability Test using Foldscope