

Report on the ISTA ATC Workshop on Seed Image Analysis

26–30 November 2018, University of São Paulo, Piracicaba, Brazil

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Workshop participants

THE RAPID DEVELOPMENTS IN OPTICAL AND COMPUTER TECHNOLOGIES

have found their way into seed-related applications, such as in the seed testing and seed production chain. This has created a large demand among seed scientists and analysts for insight and hands-on experience in imaging technologies. This need has been met by a workshop on Seed Image Analysis, organised by the Advanced Technologies Committee (ATC) of the International Seed Testing Association (ISTA) and hosted by the Luiz de Queiroz College of Agriculture, Department of Crop Science at the University of São Paulo, Piracicaba, Brazil.

The total number of participants (including lecturers) at the workshop was 26, with a 30:70 distribution between private industry and public institutions, respectively. The presence of participants from different disciplines and with a range of working experience, greatly stimulated the discussions. The participants came from France, Denmark, Peru, Argentina, Canada, the United Kingdom, the Netherlands and Brazil.

The aim of the workshop was to illustrate the possibilities for optical technologies in seed evaluation. Participants were introduced to RGB imaging, multi-spectral imaging, single seed near-infrared spectroscopy (NIRS),

thermal imaging, chlorophyll fluorescence, electrophotography, magnetic resonance imaging (MRI), 2D and 3D X-ray, as well as micro X-ray fluorescence.

There was a specific aim to acquire hands-on experience in the use of imaging technologies. The training sessions included this hands-on experience with image analysis, where participants could work with aspects of different seed imaging analysis systems in seed testing. An objective was to give participants an insight into the potential and limitations of how these new methods may have a role in seed evaluation and seed testing.



The team in the Seed Technology Department at the Luiz de Queiroz College of Agriculture, University of São Paulo, is specialised in research and innovations in seed testing, with a strong focus on imaging technologies. This location was excellent for the aims of the workshop, as the hosts have a long-standing knowledge base on seed and imaging technologies, a broad range of different equipment, as well as a great number of students active in the seed research field. In addition, the department has strong links with neighbouring departments and institutions working on innovation in advanced [imaging] technologies from a technological point of view. These contacts provided an opportunity for excellent excursions, allowing participants to become informed about the latest developments at a technological level.

The workshop was opened by Bert van Duijn, the Chairman of the ATC, with an introduction to the use of optical technologies in seed analysis. The different imaging technologies presented during the workshop were discussed in relation to their technical possibilities and limitations, as well as the different degrees of applicability, application fields and technological maturity [in seed applications]. Lectures were given by members of the ATC as well as guest lecturers from universities and industry, covering all the relevant topics. Practical demonstrations were offered for multi-spectral imaging for other seed determination, RGB imaging in vigour testing, chlorophyll fluorescence imaging in seed maturity, and on X-ray image analysis and infrared thermal imaging.

Besides knowledge transfer and hands-on activities, excursions were organised to neighbouring institutions, working on state-of-the-art imaging technologies. Visits



Official dinner

“Great balance between lectures, practical work and excursions; very interesting and informative content, great group of participants with many fruitful discussions, and hopefully future collaborations; A+ workshop!”

were paid to the Brazilian Synchrotron Light Laboratory (Campinas city, São Paulo State), the Centre of Image and Spectroscopy in vivo by Magnetic Resonance (CIERMag) and Embrapa Instrumentation (São Carlos city, São Paulo State), where demonstrations and lectures were given.

The networking and discussions among participants were an important part of the workshop. In the discussions on the requirements for new technologies for seed testing, it was concluded that speed, accuracy, repeatability and costs are very important. In addition, it was mentioned that these new technologies would preferably be non-destructive, should be applicable to all kinds

of seeds, and should be able to hold a database of information for different species.

In the current status of imaging technologies for seed testing, the missing element is the robustness that characterises validated methods. For this, global models and extended databases must be produced and tested.

The workshop was marked by dynamism, multi-disciplinarity and technological innovation, achieving much more than expected. We are very grateful to the sponsors and to all the speakers and other collaborators of this important event. Comments from some participants show that the workshop was very successful.