Seed Testing
INTERNATIONAL

ISTA News Bulletin No. 146 Autumn 2013

FEATURE ARTICLES

ASSOCIATION NEWS

RULES DEVELOPMENT

ACCREDITATION

EDITORIAL

Seed Testing International
No. 146 Autumn 2013
ISSN 1999-5229

Produced on behalf of the
ISTA Executive Committee

International Seed Testing Association (ISTA)
ISTA Secretariat
Zürichstrasse 50
CH-8303 Bassersdorf, Switzerland

Phone: +41 44 838 60 00
Fax: +41 44 838 60 01
E-mail: ista.office@ista.ch
Internet: www.seedtest.org

Seed Testing International No. 147
Deadline for article submission: 15 February 2014
Publication date: April 2014
Circulation: 1500
No. of copies printed: 2000
Instructions to contributors: www.seedtest.org/STI

Other ISTA publications
For information on other ISTA publications, please contact the ISTA Secretariat or visit our web site at www.seedtest.org.

Photo credits:
Front cover (left), pp. 4–9: Jo Jones

Dear colleagues, seed testing analysts, and readers,

It is with great pleasure and some awe that I am writing this editorial; my first as the Secretary General. Being the chief editor of a journal, any journal, is a great privilege and an even greater responsibility; as the chief editor you are responsible (within limits) for the content of the publication, and more importantly, you are accountable for its quality. Thus, if it is a great journal you have to rise to its level and sustain its worth, if it is a poor one, you have to build it up. Either way it is a challenge.

In 1999 Dr. Michael Muschick, the former ISTA Secretary General, had transformed what was known as the ISTA News Bulletin into the journal Seed Testing International (STI), and fashioned it into the format we are presently familiar with, thus becoming its founder and first chief editor. Under his leadership the publication became more than an extended newsletter, but was shaped into a structured, informative, international publication. It is my obligation to continue the progress, and drive the journal through its next stages of evolution.

I have shared this aspiration with the co-editors: Dr. Rasha El-Khadem, Mrs. Patricia Muschick and Mr. Jonathan Taylor, and together we are trying to cultivate a vision of the direction in which we should steer the future of the journal. Some of the ideas put forward include introducing member laboratories, produce feature articles on crop species and describe some of the less well-known or endemic crops, produce thematic issues and ask for contributions from corresponding authors, and include advertisements and classified ads.

One of the more appealing ideas is to ask ISTA members to join the editorial board, thus expanding the prospective reflected in the journal and also increase the labour force! In this spirit I am calling both for people who may be interested to contribute, and for any fresh ideas for articles or sections; please do not hesitate to contact me.

Until we can implement any of the new ideas we will continue with the familiar STI format. In the present issue you will find amongst other things another historical article from Prof. Steiner and co-authors, a feature on seed photography, post-Congress reports and announcements, and some initial information about next year's Annual Meeting in Edinburgh, Scotland, and some important information about ISTA's main publication, the International Rules for Seed Testing.

In conclusion, I am looking forward to fulfilling this spot, and as can be seen in this short editorial I intend to share this privilege, and get as many members and experts involved, so be ready, I may be calling on you too.

Yours sincerely

Benjamin Kaufman

CONTENTS

10


14


22

10 Germany 1945: the start of the spread of tetrazolium testing

14 Report from the 30th ISTA Congress 2013, Antalya, Turkey

22 Dr. Alison Powell elected as the newest ISTA Honorary Life Member

President's Report

Joël Léchappé

The year 2013 is an important one for ISTA. From 11–18 June, the 30th ISTA Congress was hosted by our Turkish colleagues in Antalya. On behalf of all participants and ISTA, I would like to thank the Turkish Ministry of Food, Agriculture and Livestock, the Designated Authorities, and the National Organizing Committee, chaired by Kamil Yılmaz. Kamil was also a member of the ISTA Executive Committee from 2010 to 2013. The organization of the Congress was exceptional, in a beautiful place which contributed to a whole enriching experience, resulting in fruitful discussions.

368 people from 58 countries and distinct economies attended the Congress which started with the Seed Symposium, followed by the technical presentations from the Technical Committees and ended with the Ordinary General Meeting.

Two ISTA workshops were organized before the Congress. A workshop was held in Ankara, jointly organized by the Variety Registration and Certification Center, where Kamil Yılmaz is the Director, and the ISTA Purity and Germination Committees, represented by Jane Taylor and Sylvie Ducournau. The second workshop was a vigour workshop in İzmir, organized by Alison Powell and Stan Matthews of the Vigour Committee and Hülya İlbi from the Faculty of Agriculture of Ege University. Both workshops were very much appreciated by the 44 participants from 17 countries.

The ISTA Seed Symposium, under the theme: 'Evaluation of seed quality: a key step in exploiting the benefits of plant breeding and genetic conservation', was well attended, demonstrating the strong interest in the topics and lectures presented. These topics were closely related to the activities in seed testing laboratories and their future developments. The Symposium covered all the main scientific topics applied to seeds. It provided a unique opportunity for participants to update their knowledge in all fields of seed science at once, including sampling, botany, physiology, pathology, molecular biology, and innovative new tools such as phenotyping. The Symposium was chaired by Alison Powell, the Symposium Convenor. During the Congress, Alison Powell was made an ISTA Honorary Life Member, in acknowledgement of her work as ISTA Seed Symposium Convenor from 2004 to 2013, and her other outstanding contributions to ISTA in TCOMs and the ECOM.

Laura Bowden, a seed physiologist from the Official Seed Testing Station for Scotland at Science and Advice for Scottish Agriculture, will take over the responsibility of ISTA Seed Symposium Convenor for 2013 to 2016. We wish her all success.

I invite you to download the technical reports from the Technical Committees presented during the Congress. They represent three years of intensive work from the 225 seed experts who are members of the Committees including both amended and new ISTA Rules. We all agree that these are used extensively by the seed trade, and are often included in seed regulations and seed laws at the national and international level. Again this year the Rules adopted at the Ordinary General Meeting were designed to answer the demands of end users, including the laboratories and the seed sector. The intention is also to simplify the protocols and to shorten the duration of the tests, such as for germination tests. Another important consideration is to harmonize the ISTA Rules with methods used by other organizations, for example the AOSA method for blower calibration. New methods were introduced for the chapters on Seed Health, Tetrazolium, Verification of Species and Varieties, and Sampling. There is a new chapter dealing specifically with GMO testing, which will hopefully facilitate the recognition and use of ISTA GMO methods by national and international regulatory bodies.

ISTA is an association which benefits greatly from the diversity of members from all over the world. It is for this reason that I strongly believe that discussions and debates, where all opinions both for and against are shared, are a necessary step to insure progress. It is the substrate for innovation, taking into account the regulatory, economic and industrial environment. It was with this in mind that discussions were organized during the Congress on subjects such as use of in-house methods and new technologies, which led to very interesting debates. You are invited to download from the web site the related information, and to contribute to the ongoing debates with the Executive Committee or the relevant working groups.

In accordance to the Articles of the Association, an ISTA Congress is the time for the appointment of the Technical Committees, the election of the new Executive Committee and the development of a new strategy. I would like to thank sincerely the Executive Committee members for 2010 to 2013 for their very valuable work for the seed sector and ISTA, and their close collaboration with the ISTA Secretariat. I welcome all returning members and new members of the Technical Committees. Please note that in the past, only the Chairs of the Technical Committees were appointed at the Congress, whilst the members and working programmes were confirmed at

the February ECOM meeting following the Congress. This year, the Chairs, members and draft programmes were approved at the ECOM meeting in June, eight months earlier than in previous years. The aim is to increase the efficiency of the work of the Committees, and this was made possible by the contribution of Ronnie Don, Honorary Life Member, and the ISTA Secretariat staff.

I thank the retiring ECOM members for 2010 to 2013 for their work and strong team spirit: Mary Chipili, Francisco Krzyzanowski, Alison Powell and Kamil Yılmaz. I warmly welcome our new Vice-President Craig McGill, the returning and new members Margus Friedenthal (Congress organizer for 2016), Cecilia Jones, Steve Jones, Berta Killermann, Alexander Malko, Masatoshi Sato, Mable Simwanza, Grethe Tarp and Rita Zecchinelli, and our Honorary Life President Attilio Lovato. All regions of the world are represented. Each ECOM member represents their home region, and can be contacted directly. The ECOM members, the Secretary General Beni Kaufman and his team are already actively engaged in planning and implementing the strategy voted on by the membership. The main areas of current activity are briefly presented below.

Increase ISTA membership and active participation in ISTA work

A first action has been taken by the Secretary General, planning the creation of a new membership category 'industry membership' to replace the corporate membership, to be submitted to the membership for a vote. It is aimed to be better adapted to the seed industry, offering opportunities for sponsorship, being rewarded for example with possibilities of advertising in STI.

Maintain and develop the capacity of seed testing worldwide

This major topic of the strategy involves all ISTA's main resources, in particular the Technical Committees contributing to workshops and trainings, an ECOM Working Group on international relations, and the Secretariat involved with supporting workshops and providing resources for quality assurance workshops. The main aim is to contribute actively to maintaining and developing trained analysts, and to support the setting up of seed-testing facilities. Special attention will be given to targeting geographical areas with different needs with for training, accreditation or rules for new species.

As an example of immediate action, the Secretariat is offering assistance to help promote and facilitate the organization of workshops and training by the hosting laboratories. Do not hesitate to contact the ISTA Secretariat.

Promote harmonized Rules meeting the needs of stakeholders

This topic covers a large range of actions such as optimizing the validation of methods, use of new technologies, harmonization of the Rules with other organizations, or use of electronic certificates. Work is done by the Technical Committees and specific ISTA working groups. One working group, co-chaired by Joost van der Burg and ECOM member Masatoshi Sato, examines the flexibility of methods and the possibility to use in house methods for germination tests. It is a very important topic which started in 2009–2010, and needs further detailed consideration. It is proposed to promote this topic by organizing a workshop and seminar in 2014 with the aim to fully discuss the options with interested parties, both for and against. This workshop may have a restricted list of participants, but could be followed by a one-day seminar before an Annual Meeting (possibly 2015) that would involve the entire membership in discussing the issues and bringing the topic to a conclusion.

Another ECOM Working Group is focused on publications, and is chaired by Craig McGill, working in close collaboration with the Secretariat. The electronic publication of the ISTA Rules, scheduled for the 2014 edition, will promote access to the Rules by laboratories, stakeholders and non-members all over the world. It will technically make easier the incorporation of other new languages, Spanish being an example.

Review the audit process and the accreditation system

This topic is the implementation of the discussions and decisions taken by the membership at the Ordinary Meeting at Venlo in 2012. The ISTA Working Group and its terms of reference were presented at the 2013 Congress. This Working Group, chaired by Rita Zecchinelli, comprises ECOM members, the head of the ISTA Accreditation Department, representatives of ISTA Designated Authorities (DAs) and members from the seed industry (ISF). The first action is to ascertain the opinions and needs of the members, stakeholders and DAs by specific questionnaires. This information should help ISTA to design the accreditation system to better serve the needs of the seed sector, and to find its place amongst the existing accreditation schemes at the national and international levels.

Communication and dissemination of knowledge

The actions will mainly be led by the Secretariat, with priorities given to the web site and electronic tools.

Strengthen the scientific and technical work of ISTA

The Technical Committees are a key to strengthening the scientific and technical work of ISTA. Therefore, the ECOM has decided to allocate annually a set amount to support each TCOM financially. Currently this is 3000 Swiss francs per TCOM, and is for specific projects, validated by the ECOM.

Management of ISTA affairs

This topic includes the management of the Association supported by an ECOM Working Group on Management and Finances chaired by Steve Jones. This Working Group aims to provide support to the Secretary General in the decision-making process and the development of policies for the management of the Association and the Secretariat.

To conclude, I warmly thank all members for their support and active contribution to ISTA's development. Along with the Executive Committee, the Secretary General and his team, we are all actively listening to the membership and the seed sector. As your President, I hope that together we will achieve most of the topics in the ISTA strategy and bring new ideas for the future. Your thoughts and comments are very welcome.

The Executive Committee is looking forward to meeting you in June 2014 in Edinburgh at the Ordinary General Meeting. ■

Taking seed images on a budget

Jo Jones
Biologist and freelance photographer

Saskatoon, Saskatchewan, Canada
joj.images@gmail.com

Why is it important to have good quality seed images?

Many analysts have their own 'real life' seed reference material. However, in today's world of digital images and easy sharing of information, a digital reference library of seeds that is readily accessible and can be shared is an important additional resource (Fig. 1). Also, some species may not be readily available for collection, and it is also easier to e-mail a good quality image for identification purposes than send the actual sample. In the past the cost of specialist equipment may also have been prohibitive for many smaller laboratories.

Good-quality seed images can now be taken relatively cheaply and easily with the camera equipment and software freely available. As a photographer on contract I have had the best of both worlds, using a high quality microscope and lens system for my contract work and my own, less expensive camera set-up at home.

This article aims to show how to achieve good-quality images using a standard digital single-lens reflex camera, a lens or two and some associated equipment such as flash units and stepping rings for under USD 3500. In addition, details of image manipulation software to tidy the background and add a scale and the copyright are provided.

All the images in this article are the copyright of Jo Jones and have been taken with my own home-based Nikon camera system as detailed in Table 1. My system cannot compete with the expensive microscope-based image systems to provide images of very small seeds or very high magnification for extreme detail, but I hope to provide you with information and ideas about what is possible with a more affordable set-up. If you would like any more information about this article or how I take images, feel free to contact me at joj.images@gmail.com.

Basic equipment

To obtain good images, all that is needed is a digital camera with the option to change lenses and a good quality lens, ideally a macro lens. Macro lenses are specialised lenses that allow up to life-size reproduction of the object (ratio of 1:1, or ×1 magnification) with excellent image clarity, but because they generally have more glass elements in the lens construction they are usually more expensive.

If you can afford a more expensive camera such as the Nikon D90, you will have more flexibility and control over your images, and depending upon how you intend to use your images the number of megapixels (mpx) can be a factor. The higher the pixel count the more your final image can be enlarged, but if you are only using the images for the web and publications you do

Figure 1. Dragon bean seed (*Phaseolus vulgaris*) photographed at a magnification of ×2. The background, copyright and scale were added using Adobe Photoshop.

Table 1. Approximate costs for a Nikon based camera and flash system, for other manufacturers see the websites listed in Table 2.

Equipment	Guide price (USD)
Nikon D90 camera (12 megapixels)	560
105 mm f2.8 macro lens	810
*R1C1 flash kit (two versions available)	520 or 800
Tripod and head	100–300
**StackShot controller, including quick-release platform and remote release	750
Quick-release clamp and plate for camera body	150
***Zerene Stacker (full licence)	300
Additional second-hand lens and ×2 converter	100
Reversing rings	50
Image editing software	100–1000
TOTAL	3450–4630

Prices do not include any taxes or shipping and are for guide purposes only.
*Cheaper flash units are available; ensure that the unit is compatible with your camera system.
**The StackShot can be customised according to your requirements, therefore the price is variable.
***This is for a full licence for Zerene Stacker. A licence for a not-for-profit organisation is USD 90 and for students USD 40.

Figure 2. Nine frames (individual photographs) of Nyjer seeds (*Guizotia abyssinica*), each with a different focal point. The final image used 154 frames.

Figure 3. Final image of Nyjer seeds, stacked from 154 overlapping frames with focal points set 5 µm apart.

not really need an expensive 18 or 24 mpx camera. A 10 or 12 mpx is ideal and easily allows enlargements to 24 × 36 inches, sufficient for poster publications, without significant loss of image quality.

Camera movement equals poor resolution, resulting in less sharp images. Some form of stable platform, such as a tripod or copy stand, is therefore critically important, and extra lighting will also be needed, preferably flash, although the fibre optic lighting that many labs use for their microscopes may be sufficient. An added extra is a remote release for the shutter if you are not using a PC for control. This will eliminate any movement of the camera when the shutter is pressed by hand.

Secure your seed onto some tape (or similar) before you take any frames; this will stop it moving. Any slight movement of the seed when focusing is exaggerated at higher magnification. I use some Scotch tape on a small piece of glass which is slightly raised above a white background. A raised seed allows the flash to pass through the glass eliminating any unwanted shadows. I've found that the seed is easily removed undamaged. The background is then edited out using Adobe PhotoShop.

How to achieve an image with the whole seed in focus

If you are taking a picture of anything and want the background in focus then the depth of field is very important. Depth of field is the term used to describe just how much of the foreground, subject and background is in focus. For example, in a portrait where you wish to isolate the subject from the background, a shallow depth of field is preferred, compared to a landscape where you wish to record much of the detail. This is achieved by closing the aperture of the lens. In a typical lens, the aperture is adjusted by the aperture ring, marked in f-numbers or f-stops, which is the ratio between the focal length of the lens and the aperture. Thus, a typical 50 mm lens may have apertures or f-numbers ranging from f1.4 (open) to f16 or f22 (closed). A small f-number means a large aperture, allowing more light onto the camera sensor through the lens, but also only a shallow depth of field. A large number means a small aperture, allowing less light onto the camera sensor, but a greater depth of field, so that more of the image will be in focus.

In digital cameras, the sensor replaces the photographic film of older cameras. It is where the light making up the image is 'captured' before being 'transferred' as a digital signal to the memory card in the camera.

However, in the case of magnified images of small objects such as seeds, it may perhaps be impossible to achieve a satisfactory depth of field, i.e. with the entire seed in sharp focus, simply by using a small aperture (except for very thin, flat seeds).

The solution is to take a sequence of individual photographs, or frames, but with each frame focused on a slightly different level of the seed. Thus, in each frame a slightly different area of the seed surface will be in sharp focus. With a suitable depth of field, there will be an overlap in the areas of sharp focus from frame to frame. In this way, over the whole sequence of frames the entire surface of the seed can be captured in sharp detail (Fig. 2).

Using software, the frames of the sequence are then merged, one on top of another, to create a final composite image with everything in focus (Fig. 3). This process is called 'stacking'. It is analogous to a panoramic photograph, in which the

final picture is composed of several frames which overlap, and are 'stitched' together along the horizontal axis. For a seed image, the frames are then 'stacked' together, one on top of another, in the vertical axis. The overlap in the areas of sharp focus from one frame to the next ensures that the images can be put together seamlessly.

The one essential luxury for my home system is the StackShot controller (Fig. 4). This automatic system uses a motor to drive a macro focusing rail to which is attached the camera and lens. When I use this controller to take a sequence of frames, as one option I can set the first and last points of focus of the sequence, and then the distance that the rail will move for each frame between these two points. I thus know that the frames are focused, for example, 10 micrometres apart, taking the guesswork out of using manual focus. I then know that all the frames will overlap, allowing me to stack the image without any unfocused areas.

Figure 4. My arrangement for the StackShot and Controller. I also use a Novoflex macrofocusing rail to facilitate movement along an axis at 90° to the StackShot. For easy attachment of the StackShot to the Novoflex rail and the camera to the StackShot I use quick release platforms and plates from Novoflex and Wimberley. The Novoflex rail is attached to a tripod using a ballhead, again with a quick release plate.

Software

There are now many choices of software. These are widely available, and prices vary. I routinely use Adobe Photoshop CS6 as my image editing software of choice, but again there is a good selection available at competitive prices. However, the software must be capable of stitching multiple images together, either as a panorama (useful for seedling images, the subject of a possible future article), or more importantly one on top of another as a stacked image for seeds.

To put my frames together I use Zerene Stacker software. It will also interface with the StackShot controller so I can control the entire process by computer. Using Nikon's Control Pro software (purchased separately; Canon have an equivalent software package supplied with some of their cameras) I can connect my camera to the computer and use the monitor to judge focusing instead of using the viewfinder. If the camera has Live View, the image can also be seen directly on the computer monitor. Zerene Stacker can manage a very large number of frames to produce an overall composite image, and it also has some image editing functions (although I prefer to use Adobe). I export the composite image as a TIFF file to Adobe Photoshop for final editing, such as changing the background and adding a scale and copyright. There are now a number of software packages that compete with Adobe for functionality at various prices. Adobe also sells several versions of software, so that the full version of Photoshop may not be needed. There are also other stacking software packages and maybe some 'freeware' available, but beware of infringing any licences.

Lighting

One downside to using a smaller aperture is that more light will be needed to obtain a correctly exposed frame, and also to actually see the seed to focus on (I use a desk lamp which I switch off when I take the frame). The use of supplementary lighting such as flash is necessary. Many laboratories use fibre optic lights for their microscopes, and these can also be used. However, you may get a 'colour cast' on your image. This can be corrected using software, but it is easier to correct before taking any photographs by ensuring that the white balance control of the camera is set to auto. This will normally compensate for a variety of different lighting situations.

Lighting can in fact be difficult to manage, and you will probably need to diffuse the light to avoid harsh shadows that can either hide diagnostic features or imply

that the seed has features that are an artifact of how the image was taken. There is a wide selection of flash units available. A ring flash (centred around the lens barrel) is one solution, but I have found that lighting from both sides with two or more flash units and level with the subject gives the best lighting effect, although it does depend upon the seed (Fig. 5). Nikon have a wireless macro flash system that allows you to either use the system as a ring flash or position the flash units where required (R1C1 kit). Their system also has a panel that fits over the front of each flash unit to diffuse the light. If you do not have this, a much cheaper alternative, and one that works well, is to use either a single tissue or a strip of opaque Scotch tape over the front of the flash. It does not damage the unit and is easily removed. Wireless flash is nice, no cables to fall over, but the camera must be capable of controlling the flash when it is not physically attached to the camera. Canon produces a similar macro flash unit arrangement, but their system is not wireless and the controller fits onto the hot shoe of the camera.

Figure 5. Nasturtium seed (*Tropaeolum majus*) from packet seed ready to grow in the garden showing various surface features highlighted by the angle of the flash light. The final image was composed from 57 frames; each frame was 100 µm apart with significant overlap to ensure that the final image was all in focus. Two flash units were used, positioned at either side; the light was diffused to avoid harsh shadows.

Magnification up to ×10 without using a microscope

To illustrate any diagnostic features or surface texture, magnification can be increased relatively simply and cheaply by mounting a lens back-to-front either directly onto the camera body or onto another lens, by using reversing rings. These screw into the filter thread in the front of the lens, and are widely available in various sizes for a few dollars (or pounds or euros) in camera stores or online. The reversed lens does not need to be of the same make as the camera, as it is not being attached directly to the camera body. Reversing works because it increases the camera sensor to lens distance compared to the subject to lens distance (a standard lens is designed to give ideal results when the camera sensor to lens distance is less than the subject to lens distance). However, the lens must have an aperture ring; for example, Nikon's series of G lenses will not work. An old manual-focus lens is ideal, and these can be found second-hand from camera stores, as these days few people want to use manual-focus lenses.

If reversing rings with the correct filter thread are not available, temporary but workable attachments may offer a solution. For example, taking images of seeds for this article I temporarily joined two lenses with different filter threads. My 105 mm lens has a 52 mm filter thread, my 20 mm lens one of 62 mm; using several rings and duct tape I joined these together without any loss of image quality (Fig. 6).

Another method, but more expensive, is to use a ×2 teleconverter. This doubles magnification but also affects aperture, although image quality is not greatly affected. Teleconverters are also available as ×1.4 and ×1.7 from the major manufacturers and independent makers such as Kenko.

Reversing my 'old' 20 mm lens directly onto the camera body using a Nikon BR2A adapter increased magnification to ×3.4. Adding a ×2 teleconverter to the front of this arrangement increased it to ×6.8 (Fig. 7).

The 105 mm macro lens alone produces a life size image (Fig. 8). Reversing the 20 mm lens to the front of this lens increased magnification to a ratio of 5:1 (Fig. 9). Adding a ×2 teleconverter will increase this further to 10:1 (Figs. 10, 11).

A consequence of the higher magnification is that the light entering the camera is very low, but a flash system can compensate for this. The reversed lens must be wide open, i.e. the aperture must be at as low a number as possible.

Fine details such as those seen in Figure 11 can aid in seed identification where the surface features can be easily seen. This image could be compared to seeds of other grasses which could be prohibited or noxious species.

Figure 6. A 20 mm lens reversed onto a 105 mm macro lens resulting in a magnification of approximately ×5 (left), and a Nikon BR-2A adapter attached to the camera body to reverse a 20 mm lens using reversing rings for a magnification of ×3.4 (right). The silver is a thin strip of duct tape used to join the rings together to keep a tight, light-free seal.

Figure 7. Poppy seed (*Papaver* sp.) taken with a reversed 20 mm lens and a ×2 teleconverter (Magnification of ×6.8).

Figure 8. Home-saved dragon beans (*Phaseolus vulgaris*) photographed using a 105 mm macro lens at a magnification of ×1.

Another relatively cost-effective way to increase magnification is to use a close-up lens screwed into the filter thread of your lens. These are available at most camera stores and range from +1 to +4.

Some other tips

I use a calibrated monitor to ensure that the seed colours are true to life.

I also take my individual frames as JPEG images, using the largest JPEG format available on my camera, with the least compression. This is principally because RAW files are so large that handling a large number can cause the computer to 'hang'. If you convert the stacked image to a TIFF image for further work, no loss of image quality is evident. I have found that the colour difference that can sometimes be seen between RAW and JPEG images is not usually an issue when photographing seeds.

Figure 9. The surface features of this onion seed (*Allium cepa*) can be clearly seen at ×5. The image was composed from 100 individual frames; the distance between focal points was 15 µm.

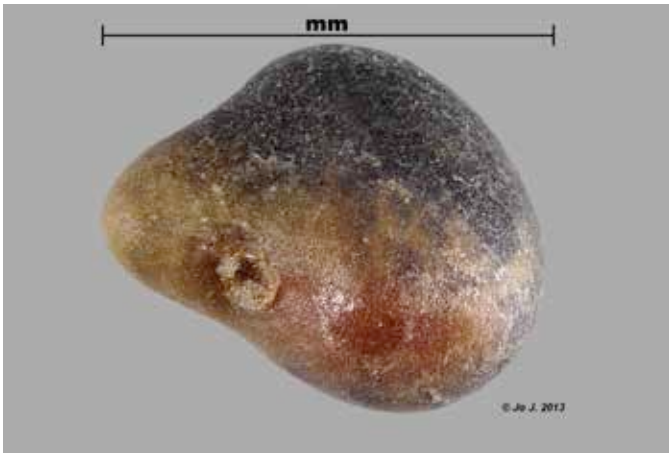


Figure 10. Clover (*Trifolium* sp.) from bird seed taken at a magnification of ×10. A total of 107 frames were taken and stacked together; frames were 5 µm apart.

Web sites and useful contacts

Product	Company	Web site	Prices quoted in:
Adobe Photoshop (software)	Adobe	Adobe.com	
Aperture (software)	Apple	Apple.com	
Nikon Control Pro (software)	Nikon	Nikon.com	
Zerene Stacker (software)	Zerene Systems	zerenesystems.com	USD
Nikon camera systems	Nikon	Nikon.com	
Canon camera systems	Canon	Canon.com	
StackShot controller	Cognisys	cognisys-inc	USD
Macrofocusing rail	Novoflex	novoflex.com	
Quick release platform and plates	Wimberley	tripodhead.com	USD
Ballhead for tripod	Acratech	acratech.net	USD
Reversing rings, filters etc.	Speedgraphics	speedgraphic.co.uk	GBP
Reversing rings, filters etc.	The Camera Store	thecamerastore.com	CAD
Reversing rings, filters etc.	B&H	bhphotovideo.com	USD

Most companies will ship worldwide.

Figure 11. A grass seed from a lawn seed mix, showing the features of the seed at the rachilla. ×10.

Acknowledgements

I thank the editors of STI for giving me the opportunity to publish this article and their helpful comments. I also thank Dr. Ruojing Wang at the Canadian Food Inspection Agency (CFIA), Saskatoon, Canada for past contract work using a microscope-based system to take images of seeds and seedlings. I also thank my husband Steve Jones for his comments on the text and involving me in his work with seeds over the years.

Web sites and contact details for Jo Jones, PhD, MSB

Gallery: www.pbase.com/joj
Web site: http://joj.images.tripod.com
E-mail: joj.images@gmail.com

Germany 1945: the start of the spread of tetrazolium testing

A. M. Steiner[1], M. Kruse[2] and N. Leist[3]

[1]ISTA Alumnus, [2]ISTA Personal Member, [3]ISTA Past President and Honorary Life Member

[1, 2]University of Hohenheim
Hohenheim, Germany
[3]Karlsruhe Institute of Technology
Karlsruhe, Germany
am.steiner@uni-hohenheim.de
michael.kruse@uni-hohenheim.de
norbert.leist@partner.kit.edu

Often, important and terrible events of world history give rise to small and beneficial developments in tiny special fields. This was the case with World War II, ending with the occupation of Germany by the Allied Forces in 1945, and the start of the worldwide expansion of tetrazolium viability testing of seeds.

On the evening of 20 April 1945, coming from the south, the 3rd Algerian and 4th Tunisian Rifle Regiments, supported by tanks of the 5th French Division, seized the suburb of Hohenheim on their way to Stuttgart, the state capital of Württemberg. Unfortunately, in occasional encounters seven soldiers were killed or died later from wounds. However, none of the buildings of the Agricultural College of Hohenheim or the huge Hohenheim Castle were damaged. It was a wonderful spring day, and the first author, at the age of eight, was an eyewitness to the invasion and following events in Hohenheim.

The state capital Stuttgart was destined to become the headquarters of the American Zone of Occupation. However, the US 100th Infantry Division, attacking Stuttgart from the north, was held up in Bad Cannstatt. This is an urban district of Stuttgart on the right bank of the river Neckar, and all bridges were destroyed. Even after a bridge was repaired, the French forces did not leave until 8 July 1945, when the US forces took over.

During the 11 weeks of occupation by the French forces, nothing much happened in Hohenheim. However, immediately after the takeover of the administration of Stuttgart by the US Allied Expeditionary Force, the situation changed completely. Straight away, a Food Investigating Group of the United States Department of Agriculture began to interrogate researchers of the Agricultural College Hohenheim. Only three days after the takeover, a first report on tetrazolium testing was filed.

Investigation of research activities at Hohenheim

Towards the end of the war, all remaining able-bodied staff and students were drafted for "home defence". Eight elderly Professors were left, among them Georg Lakon at the age of 63 (Steiner and Kruse 2003, Steiner 2004b). In 1942, Lakon had published two papers on the determination by tetrazolium testing of the viability of cereal seeds and maize seeds, respectively, in German in a German journal (Lakon, 1942a, b). Shortly after, a report was published in French (Lakon 1943). Tetrazolium testing had been practised in German seed testing since 1941, and in 1944 it was officially approved as strategic. Due to the war, tetrazolium testing remained unknown to the seed scientific community outside Germany.

While investigating Hohenheim, and with it the Institute of Seed Science with the State Seed Testing Station, i.e. Lakon's laboratory, three representatives of the Food Investigating Group of the Supreme Headquarters learned about tetrazolium testing. Straight away, they filed a report dated 11 July 1945 (Fig. 1). Two months later, on 21 September 1945, E. Adams Dutcher wrote in the FIAT Final Report (1945): "Here I found something of real interest which, if confirmed by other workers, will save considerable time and money for cereal crop producers all over the world." In peacetime, Dutcher, an agricultural chemist, was Head of the Department of Agricultural and Biological Chemistry, Frear Laboratories, at Pennsylvania State College.

The interest in tetrazolium testing and the constructive cooperation of Lakon and his team with the Food Investigating Group led to the financial support of Lakon's research work and the support of his personal situation. A copy of a letter of Paul F. Taggart, Captain, SpR, Chief Food & Agri Section, Headquarters US Military Government Württemberg/Baden of 3 September 1945 reads: "To the President of the Agricultural College Hohenheim/near Stuttgart. In as much as the Military Government is interested in the research work being conducted by Dr. G. LAKON you will provide him with office and laboratory space and the necessary supplies for carrying out his work. In addition you will employ Miss Gerda Kalbrock as his assistant. Funds in the amount of RM 5000.- [RM = Reichsmark] pro year will be allocated and made available for this project." In those days, a letter such as this was a command.

Already two months later, on 5 November 1945, the State Administration for Cultural Affairs, Education and Arts in Württemberg, the Ministry, directed in a decree to the Rector of the Agricultural College Hohenheim that the unbudgeted amount of 5000 Reichsmarks must be made available to Lakon by order of the Military Government. A corresponding increase of the total budget of the High School was not provided. Hence, suspecting difficulties, simultaneously in the decree a report on its implementation was requested by 1 March 1946. At that time, 5000 Reichsmarks was a tidy sum. Thus, in the midst of all the disorder of those days, Lakon was able to continue his research activities as if nothing had happened, almost a miracle.

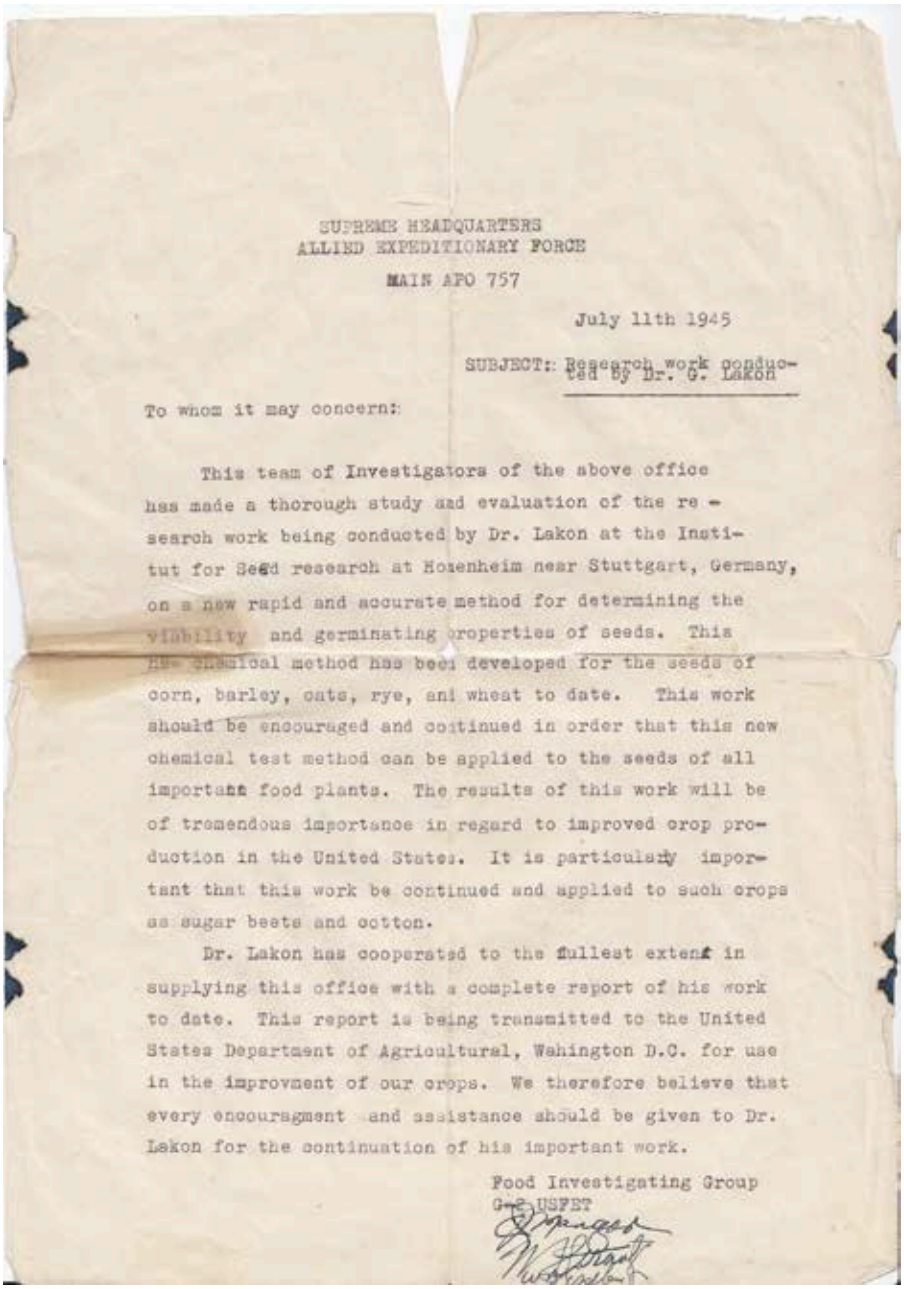
In addition, the personal welfare of Dr. and Mrs. Lakon, who were living in an official residence on the campus, was generously protected. During the war and the post-war period, rooms in apartments were requisitioned to provide housing for the numerous bombed-out residents, refugees

and displaced persons. Moreover, there was a threatening shortage of all daily needs, in particular of energy and food supply. Only those with first-hand experience of the war and the post-war period can imagine the severe troubles, the misery and anxiety, the distress and destitution. In this situation, a letter was sent to the Housing Commission of Stuttgart to secure Lakon's housing (Fig. 2). This letter was confirmed by an additional letter to Lakon of 26 Sept 1945: "To: Whom it may concern" signed by Fentress Gardner, Captain Cav., with an official stamp (Fig. 3). This letter was for Lakon to show at the front door to prevent any kind of annoyance or trouble.

A year later, a letter was made out to Lakon for a supplement of his gas allotment for heating and cooking (letterhead as in Fig. 3): "To: Whom it may concern. In order to conduct required research work, Prof. Dr. Lakon should have made available to him in his home at 33, Militärstr., Hohenheim near Stuttgart, gas in the amount of 120 cbm (monthly) in addition to the amount permitted for his household"; signed by Paul F. Taggart, Major AUS, Chief Fd & Agr branch, with official stamp. Such letters were worth a mint.

An invitation to Lakon and his staff by the US scientific investigators to a garden party was just sensational. Only a few weeks after the occupation, in the East Court of the Hohenheim Castle, on a clear summer's day in front of the Institute, tables and benches were arranged. Plenty of food, bread, meat, chicken, cheese, fruit, and beverages were served. The residents of the castle courtyard and passers-by could hardly believe their eyes. This event was like the coming of another world at another time.

Lakon, a strong personality, self-assured and convinced of tetrazolium testing, carried on his research, well planned as ever. Since tetrazolium testing of cereals and corn had been established, the studies turned to legume and crucifer seeds, as agreed upon with the Food, Agriculture & Forestry Branch of the Bipartite Affairs Division of the Office of Military Government for Germany (U.S.)(OMGUS). An office memorandum of 4 September 1946 of the US Government, Department of Commerce, to Dr. Arno Viehoever, Technical Coordinator, refers to a forthcoming



SUPREME HEADQUARTERS
ALLIED EXPEDITIONARY FORCE
MAIN APO 757

July 11th 1945

SUBJECT: Research work conducted by Dr. G. Lakon

To whom it may concern:

This team of Investigators of the above office has made a thorough study and evaluation of the research work being conducted by Dr. Lakon at the Institut for Seed research at Hozenheim near Stuttgart, Germany, on a new rapid and accurate method for determining the viability and germinating properties of seeds. This chemical method has been developed for the seeds of corn, barley, oats, rye, and wheat to date. This work should be encouraged and continued in order that this new chemical test method can be applied to the seeds of all important food plants. The results of this work will be of tremendous importance in regard to improved crop production in the United States. It is particularly important that this work be continued and applied to such crops as sugar beets and cotton.

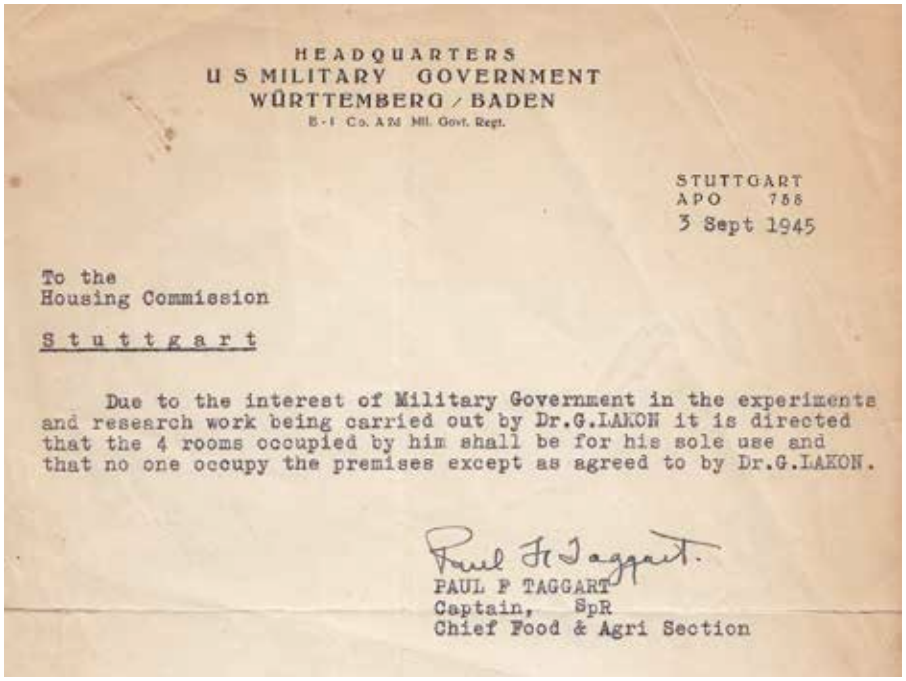
Dr. Lakon has cooperated to the fullest extent in supplying this office with a complete report of his work to date. This report is being transmitted to the United States Department of Agricultural, Washington D.C. for use in the improvment of our crops. We therefore believe that every encouragment and assistance should be given to Dr. Lakon for the continuation of his important work.

Food Investigating Group
G-2 USFET

Figure 1. Letter from the Food Investigating Group. The undersigned are Ch. J. Mangan, W. F. Straub and W. B. Esselene. W. F. Straub was a chemist.

"fairly elaborate report" and asks whether this report would come through the Pharmaceutical & Medical Unit of the Department of Commerce, or the Agricultural Department. In this memorandum, staining by tetrazolium salts for making bacterial counts by Nobel Laureate Prof. Dr. Kuhn, Heidelberg, Kaiser Wilhelm Institute, was also addressed, and a request made for a report. Lakon and Kuhn had been in contact since 1940. A copy of this memorandum was sent to Hohenheim. On the right margin of this copy is the handwritten remark: "corn work is finished, cereals (oat, wheat, rye, and barley) are also – no new report written", below upside down is written: "beans, peas not published but complete – cabbage, cauliflower in progress – all good results".

The cooperation continued. Memorandum AG 080 of 8 October 1948 of the 7780th OMGUS Group, Wuerttemberg-Baden



HEADQUARTERS
U S MILITARY GOVERNMENT
WÜRTTEMBERG / BADEN
E-I Co. A2M Mil. Govt. Regt.

STUTTGART
APO 758
3 Sept 1945

To the
Housing Commission

Stuttgart

Due to the interest of Military Government in the experiments and research work being carried out by Dr.G.LAKON it is directed that the 4 rooms occupied by him shall be for his sole use and that no one occupy the premises except as agreed to by Dr.G.LAKON.

Paul F Taggart.
PAUL F TAGGART
Captain, SpR
Chief Food & Agri Section

Figure 2. Signed copy of a writ of protection to the Housing Commission Stuttgart to the benefit of Dr. Georg Lakon's dwelling place. Only the upper part of the letter is shown.

Figure 3. Official Stamp of the Military Government, Food and Agriculture Office, Württemberg/Baden. This stamp is on the originals sent to the addressees. Copies for others were only signed.

Section, Fd, Agr & For, shows that three years after the investigation in Hohenheim, Paul F. Taggart was still in charge of the contacts. The memorandum informs under 1. that recently Dr. Dutcher, since 1945 well acquainted with the work at Hohenheim, would have sent a letter, and, under 2., that the letter directed to Lakon would point to a paper in Science indicating that tetrazolium chloride is also useful in identifying cancer tissue. This memorandum demonstrates that contacts resulting from the days of the end of the war developed into pioneering scientific cooperation. Actually, even Dutcher himself with colleagues published papers on tetrazolium testing and the synthesis of tetrazolium salt (Mattson, Jensen and Dutcher, 1947, 1948).

Spread of tetrazolium testing in the United States, ISTA and AOSA

After tetrazolium testing became known in the United States, a remarkable interest immediately arose. The history of its reception and incipient broad research is described by Moore (1976; cf. Steiner, Kruse and Leist, 2012). The steps to the final incorporation of tetrazolium testing into the ISTA Rules 1966 and the AOSA Rules 1970, as well as the publication of tetrazolium testing handbooks by AOSA (1970), Russia (1982) and ISTA (1985), are described by Steiner and Kruse (2003). Important steps were a publication by Lakon in English in Plant Physiology (Lakon, 1949), and Lakon's lecture and discussion on tetrazolium testing at the 9th ISTA Congress 1950 in Washington, D.C. (Lakon, 1950; for photo see Steiner 2000). Lakon participated at this Congress as the representative of the Federal Government of Germany, delegated by a letter of appointment of the German Federal Ministry of Food, Agriculture and Forestry, Bizone, of 6 May 1950. The Rockefeller Foundation bore the travel costs.

After tetrazolium testing had become more widely known, many scientists visited Hohenheim. First they came to meet Lakon, later his successor W. Lindenbein (Steiner, 2004c), and certainly the coworker of both, Dr. Helene Bulat, who put heart and soul into tetrazolium testing (Steiner 1997, 2004a). Many German training courses followed, and in 1960 the first two-week ISTA International Tetrazolium Training Course took place in Hohenheim for agricultural and horticultural seeds. In 1961 the second course, for forest and ornamental tree seeds, was held (Lindenbein 1960, 1961, 1962). Many well-known ISTA colleagues participated, and some still enjoy nostalgic memories of a fortnight of work and friendship (Fig. 4). Numerous courses followed at many places all over the world, to this day.

Dedication

This paper is dedicated to our highly esteemed colleague Prof. Dr. Attilio Lovato, ISTA Honorary President. It honours his interest in tetrazolium testing and, in particular, his friendship and good counsel to the authors on many occasions.

Addendum: The documents shown or mentioned in the text and further documents are in the archives of the Division of Seed Science and Technology, University of Hohenheim.

Figure 4. Participants of the 1st ISTA International Tetrazolium Training Course 1960 in Hohenheim. Back row: 1. Ing. C. Verhey, Wageningen, Netherlands; 2. Mrs. E. Lindenbein, 3. Prof. Dr. W. Lindenbein, 4. Dr. H. Bulat, and 5. Mrs. H. Werth, née Eckstein, all Hohenheim, Germany; 6. Mr. Miklavec, Lubljana, Yugoslavia; Front row: 7. Mr. J. Bartz, Poznan, Poland; 8. Miss Eickemann, country unknown; 9. Ing. D. Jovanovic, Belgrade, Yugoslavia; 10. recumbent, Prof. Dr. A. Lovato, Bologna, Italy; 11. Ing. P. Overaa, Vollebekk, Norway; 12. Ing. M. Ujevic, Zagreb, Yugoslavia; 13. Ing. R. Grbitsch, Novi Sad, Yugoslavia; 14. Dr. G. Solaroli, Rome, Italy; 15. Mr. L. W. Clayton, Cambridge, United Kingdom. Persons without a number are Hohenheim staff. The photograph was taken by Mr. Kailash Shrivastava, New Delhi, India, a doctoral student of Prof. Lindenbein.

References

Dutcher, R. A. (1945). *Report on interrogation of research workers at the agricultural high school at Hohenheim.* Report of Joint Intelligence Objectives Agency PB-1247. FIAT Final Report No. 77, 1–3 (cited in Moore, 1976).

Lakon, G. (1942a). Topographischer Nachweis der Keimfähigkeit der Getreidefrüchte durch Tetrazoliumsalze. *Berichte der Deutschen Botanischen Gesellschaft* **60**, 299–305.

Lakon, G. (1942b). Topographischer Nachweis der Keimfähigkeit von Mais durch Tetrazoliumsalze. *Berichte der Deutschen Botanischen Gesellschaft* **60**, 434–444.

Lakon, G. (1943). Un nouveau procédé rapide pour contrôler la faculté germinative des graines. *Presse Agric. étrangere 3: 5, d'après Kölnische Zeitung* 13, 1 (cited in AOSA Testing Handbook 1970).

Lakon, G. (1949). The topographical tetrazolium method for determining the germinating capacity of seeds. *Plant Physiology* **24**, 389–394.

Lakon, G. (1950). Weitere Forschungen über das topographische Tetrazoliumverfahren und die Ermittlung der Triebkraft [Further studies on topographical tetrazolium testing and the determination of vigour]. *Proceedings of the International Seed Testing Association* **16**, 254–266.

Lindenbein, W. (1960). Report Tetrazolium-Training course in Stuttgart-Hohenheim August 15th-27th, 1960. *ISTA News Bulletin* **4**, 13–14.

Lindenbein, W. (1961). Report of the Tetrazolium training course, Stuttgart-Hohenheim, August 1st to 12th 1961. *ISTA News Bulletin* **4**, 13–14.

Lindenbein, W. (1962). Report of the activities of the Tetrazolium Test Committee (1959-1962). *Proceedings of the International Seed Testing Association* **27**, 224–234.

Mattson, A. M., Jensen, C. O. and Dutcher, R. A. (1947). Triphenyltetrazolium chloride as a dye for vital tissues. *Science* **106**, 294–295.

Mattson, A. M., Jensen, C. O. and Dutcher, R. A. (1948). The preparation of 2,3,5-triphenyltetrazolium chloride. *Journal of the American Chemical Society* **70**, 1284.

Moore, R. P. (1976) Tetrazolium seed testing developments in North America. *Journal of Seed Technology* **1**, 17–30.

Steiner, A. M. (1997). Dr. Helene Bulat in memoriam. *ISTA News Bulletin* **114**, 30.

Steiner, A. M. (2000). Landmarks of seed testing – ISTA for future. *ISTA News Bulletin* **121**, 9–12.

Steiner, A. M. (2004a). *Bulat, Helene, geb. Kurtz, Saatgutwissenschaftlerin*. Biographisches Lexikon zur Geschichte der Pflanzenzüchtung, 3. Folge, 28–29, Göttingen.

Steiner, A. M. (2004b). *Lakon, Georg, Botaniker.* Biographisches Lexikon zur Geschichte der Pflanzenzüchtung, 3. Folge, 105–107, Göttingen.

Steiner, A. M. (2004c). *Lindenbein, Johann Werner, Botaniker.* Biographisches Lexikon zur Geschichte der Pflanzenzüchtung, 3. Folge, 115–116, Göttingen.

Steiner A. M. and Kruse M. (2003). On the origin and rise of topographical tetrazolium testing – a brief historical retrospect. *ISTA Working Sheets on Tetrazolium Testing, Vol. II,* 1–5.

Steiner A. M., Kruse, M. and Leist, N. (2012). Centenary of Robert Parker "Bob" Moore (30 January 1912 – 11 October 2000. *Seed Testing International* **143**, 31–32.

The 30th ISTA Congress 2013

ISTA Secretariat
8303 Bassersdorf
Switzerland
ista.office@ista.ch

The International Seed Testing Association (ISTA) was delighted to hold its 30th ISTA Congress from June 12 to 18 in Antalya, Turkey, upon the kind invitation of the Ministry of Food, Agriculture and Livestock of the Republic of Turkey. The conference venue chosen for this occasion was the Kervansaray Hotel Lara in Antalya.

Two ISTA workshops preceded the Congress: a vigour testing workshop held 4–6 June in İzmir, and a workshop on purity and germination held 6–9 June in Ankara (see detailed reports on page 57 and page 59).

The ISTA Congress, which includes a three-day Seed Symposium, was attended by a total number of 384 participants from universities, companies, seed industry and governments, representing in total 58 countries.

The first official day started with the Welcome Reception, held on Tuesday evening, 11 June in the inner courtyard of the Kervansaray Hotel Lara. The beautiful weather enabled everyone to spend an amusing evening in sunshine outside the congress complex, and to enjoy the food and drinks offered by the courteous waiters.

The official opening ceremony of the Congress was the first agenda item on 12 June. The participants were warmly welcomed by a stunning dance performance, followed by speeches from the ISTA President, the Undersecretary of the Ministry of Food, Agriculture and Livestock, Vedat Mirmahmutoğulları, and the Chair of the National Organizing Committee and Member of the ISTA Executive Committee, Kamil Yılmaz, rounded off by an

Kamil Yılmaz, Chair of the National Organizing Committee and Executive Committee Member.

ISTA President Joël Léchappé with the Undersecretary of the Ministry of Food, Agriculture and Livestock, Vedat Mirmahmutoğulları.

Mevlüt Gümüş, General Director of Plant Production of the Ministry of Food, Agriculture and Livestock.

insight to the seed industry of Turkey presented by Mevlüt Gümüş, General Director of Plant Production, Ministry of Food, Agriculture and Livestock.

After the coffee break, the ISTA Seed Symposium "Evaluation of seed quality: a key step in exploiting the benefits of plant breeding and genetic conservation" was officially opened by the Seed Symposium Convenor Alison Powell. This was the first of the three-day ISTA Seed Symposium (see page 19).

Due to the pleasant temperature in Antalya, the official Congress dinner on 14 June was enjoyed in the open air in the garden of the Keravansaray resort.

The marvellous location and the well-chosen live music allowed everyone to spend an enjoyable and unforgettable evening with food and wine.

A surprise for many people was the announcement that ECOM member and Vigour Committee Chair Alison Powell had been elected Honorary Life Member of ISTA.

On Saturday and Sunday (15 and 16 June), the ISTA Technical Committees presented their work.

On Monday the last Technical Committee presentation was held, followed by a presentation by the ISTA accreditation department, as well as a discussion on the Accreditation Review. The rest of the day was filled with two discussion forums on the topics "Do the current principles and requirements for the ISTA Rules meet with the future needs for developments in seed technology?" (page 23) and "Discussion on the use and international standardization of DNA technologies in the area of seeds" (page 24).

On the last day of the meeting, the Ordinary General Meeting (see detailed minutes of the OGM at www.seedtest.org/OGM13) was opened by a welcome from the ISTA President. He expressed his appreciation for the invitation from the national Designated Authority, and the audience thanked Kamil Yılmaz for his hard work prior to and during the Congress with a standing ovation.






The meeting then followed the agenda as defined by the Articles of the Association:

1. Call to order
2. President's address
3. Roll call of Designated Members entitled to vote

Out of 65 countries/distinct economies with voting rights, 41 Voting Delegates were present. The Meeting was declared to be quorate, since 40% of member countries was required for a quorum.

4. Comments about the minutes of the previous General Meeting

No comments had been received.

5. Report of the Executive Committee (including review of accreditation and use of the financial tool)

(see document OGM12-03 Activity Report of the ISTA Committees 2012 (www.seedtest.org/AR))

6. Report of the Secretary General (see document OGM12-03 Activity Report of the ISTA Committees 2012 (www.seedtest.org/AR))
7. ISTA Strategy 2013–2016
8. Election of Officers and members-at-large of the Executive Committee
9. Fixation of annual subscriptions

The annual subscription fees were not increased.

10. Consideration and adoption of the proposed changes to the ISTA Articles (see page 26)




11. Consideration and adoption of the proposed Rules changes (see page 27)
12. Consideration and adoption of reports (see document OGM12-03 Activity Report of the ISTA Committees 2012 (www.seedtest.org/AR))
13. Announcement of the place and date of the next Ordinary General Meetings

The next Ordinary General Meeting will be held on 19 June at the ISTA Annual Meeting 2014 (16–19 June), which was announced to be held in the beautiful city of Edinburgh, Scotland (see page 35 or www.seedtest.org/AM14). The Annual Meeting 2015 will go to Uruguay, and Estonia was chosen to host the 31th ISTA Congress in 2016.

14. Any other business raised by a Member, of which notice in writing has been received by the Secretary General at least two months prior to the date of the General Meeting

No such business had been received.

15. Any other business raised by consent of the Executive Committee

No item was raised under this point.

16. Discharge of the Executive Committee
17. Installation of new Officers and Executive Committee members

The following ECOM Members were elected for the term of office 2013-2016:

Vice-President: Craig McGill (New Zealand)

Members-at-large: Cecilia Jones (Uruguay), Steve Jones (Canada), Berta

Killermann (Germany), Alexander Malko (Russian Federation), Masatoshi Sato (Japan), Mable Simwanza (Zambia), Grethe Tarp (Denmark), Rita Zecchinelli (Italy), Margus Friedenthal (Estonia) as Chair of the National Organizing Committee for the next Congress.

18. President's closing address
19. Adjournment

At the closing address of the Meeting by the ISTA President, the National Organizing Committee was honoured and given a certificate of appreciation, expressing gratitude for all their dedicated work for the Association. The President also thanked everyone for the very intensive and productive meeting and invited everyone to the next Ordinary General Meeting, to be held in Edinburgh.

The full programme, presentations, documents and further information about the 30th ISTA Congress 2013 are available on the ISTA web site at www.seedtest.org/Congress2013. ■

Report from the ISTA Seed Symposium 2013

Alison Powell

ISTA Honorary Life Member and Chair, ISTA Seed Vigour Committee

School of Biological Sciences
University of Aberdeen
Aberdeen, AB24 3UU, UK
a.a.powell@abdn.ac.uk

Antalya, Turkey was an ideal choice for our 30th ISTA Seed Symposium, with the title 'Evaluation of seed quality: a key step in exploiting the benefits of plant breeding and genetic conservation'. We had a very warm welcome from all our Turkish hosts, and we found ourselves in a delightful atmosphere with a most impressive congress centre and excellent technical facilities. The easy access between the hotel and congress centre was not only convenient, but also encouraged ready interaction between participants. Added to this we had amiable and efficient support from the technical assistants, the National Organising Committee and the ISTA Secretariat, all of whom helped the symposium run smoothly and make it a (relatively!) stress-free event for me. And finally, those of us coming from the long winter of northern Europe enjoyed the sun and warmth!

The format of the symposium was similar to previous symposia, with five oral sessions, each led by a Chair, who was also the Lead Speaker, and two poster sessions. The oral sessions included the presentations by the Chairs of each session and 30 submitted papers from all over the world. The range of species covered was most diverse, including the cereal and vegetable crops critical for feeding the increasing world population, but also extending to less familiar species, such as the tropical grass *Paspalum vaginatum*, *Mimosa foliolosa* (a shrub), the Mediterranean tree *Quercus ilex* (holm oak), and the shrubby Russian thistle *Salsola vermiculata*.

The first oral session, 'Role of quality evaluation in seed production', was introduced by Dr. Francisco Krzyzanowski (Brazil), who illustrated how seed quality evaluation is applied within the whole process of seed production, from the early stages of plant breeding to commercial seed production, using soybean as his example.

The papers in this session included two on practical seed production. These examined the factors that affect true seed production in perennial ryegrass, and the influence of both treatments to improve flowering and fruit set and different pollinators in shallots (*Allium cepa* var. *ascalonicum* L.). These were followed by two papers on aspects of seed processing: caryopsis extraction in *Andropogon gerardii*, and determination of the optimum blowing point for *Paspalum vaginatum*.

Finally, we had two papers on aspects of seed pathology. The first described important pathogens of Nordmann fir (*Abies nordmanniana*) and illustrated their probable transmission as seed-borne pathogens, while the second studied the survival of the spores of the cereal diseases common bunt and dwarf bunt in soil and farmyard manure in different crop rotation systems.

The second session, 'Seed storage for commercial use and genetic conservation', was led by Dr. Robin Probert (UK), who discussed the prestorage factors that critically affect the quality of seeds for storage and use, with particular reference to native wildflower seeds that may be used for habitat creation and landscape regeneration.

Two papers in this session focused on seed drying before storage. The first of these reported the use of seed drying beads for gene-bank storage of rice and the determination of the optimum bead-to-seed ratio, while the second compared different drying methods, including ultra-drying, for storage of *Allium tuberosum* Rottler ex Spreng (Chinese chives).

Comparisons of the influence of storage conditions were reported for orchids, the Russian thistle *Salsola vermiculata* and *Mimosa foliolosa*. The final paper reported an investigation of molecular mapping and physiology of seed longevity in relation to seed coat colour of common bean, relevant for the effective long-term storage of genotypes for potential future use in plant breeding.

Our third session, 'Physiological, biochemical and molecular markers of seed quality', was held in collaboration with the ISSS, and was led by Dr. Françoise Corbineau (France). She examined the evidence for using a wide range of markers of seed quality, from the physiological, through biochemical to a molecular approach.

The papers in this session covered all of these approaches and a wide range of topics. Two papers were related to seed storage, namely the application of molecular marker technologies to the study of longevity and dormancy, and a study of the physiological changes during storage of the recalcitrant holm oak in polyethylene bags.

The third paper described in great detail the physiological, biochemical and molecular changes during priming of cucumber, illustrating the greater enhancement of activities in low-vigour seeds following priming. This was followed by a fascinating illustration of the great diversity in seed mucilage chemistry, morphology and extrusion during imbibition in the *Lamiaceae*.

The final two papers focused on the early stages of germination and changes during the germination process as a result of seed ageing in storage. Seed ageing and its repair were presented as the basis of a hypothesis that explains seed quality and its evaluation, and in the final paper of the session, comparisons were made of the progress in the cell cycle in maize seed differing in vigour.

The fourth session looked towards 'Advanced methods in seed quality evaluation', led by Dr. Beni Kaufman (US). His presentation introduced new and emerging DNA analysis technologies and discussed how they might be used in measuring the traditional seed quality parameters.

Five papers in this session had computer vision as the background to the work reported. The first paper described the phenotyping of seed, with the aim of producing a seed phenotype database, followed by a paper in which medicinal species were identified accurately, providing a possible support for purity testing. Lucid software was combined with imaging technology for seed identification, and a new method for determination of genetic purity in wheat, combining biochemical and image analysis, was described. The fifth paper using computer vision illustrated how early

assessments taken during imbibition can identify hard seed and whether a seed will produce a normal or abnormal seedling or is dead.

The final paper in this session described a multiplex system to detect plant pathogens, valuable to reducing the considerable impact of seed-borne pathogens on crop production.

Session 5, 'Evaluation and improvement of physiological quality' was introduced by a presentation by Dr. Alison Powell (UK), in which she discussed the hypotheses for membrane changes during imbibition, the major contribution of dead tissue to high solute leakage from seeds and the potential to predict germination as well as vigour from measurements of leakage.

The first three papers in the session illustrated ways to improve seed performance, by using a period of steeping in water, then drying to prevent seedling blindness in kohlrabi; soaking aged maize seeds in cathodic water; and the potential for using chlorophyll sorting to improve pepper seed lots harvested at differ maturities.

The remaining three papers focused on aspects of tests in the ISTA Rules. The first compared seed testing methods for uniformity in testing lentil seed lots. This was followed by a clear illustration of the effect of semi-permeable layers in the seed coat on uptake of tetrazolium solution, and our final paper examined the possibility of using an estimate of oxygen consumption to replace germination in the Controlled Deterioration test.

The oral papers gave the audience much to think about. The papers clearly prompted a lot of thought, as there were many stimulating questions from the audience following the papers. However, I am sure the questions did not stop in the congress hall and continued into the coffee breaks.

The poster papers also make up a major part of the symposium, and the two poster sessions, chaired by Dr. Hülya İlbi (Turkey), were most successful, with participants keenly reading and discussing the 142 posters with their authors. The enthusiasm for the poster papers was seen not only in the two formal sessions but also during the coffee breaks, as the placing of the poster boards adjacent to the coffee sessions encouraged people to browse through them further.

By far the most posters were on arable crops such as soybean, rice, maize and cotton, but these were closely followed by horticultural crops such as cabbage, bean and onion. It was also encouraging to see posters on other species such as medicinal and endemic plants.



The winners of the oral awards. Left to right: Andreas Börner (Germany), Robert Geneve (USA) and Fernando Silveira (Brazil).

Seed vigour was the most popular topic for papers, followed by an equal number of papers on seed production, storage and priming. However, there are an increasing number of papers on the 'new' topics of molecular markers and image analysis.

An important aspect of the Seed Symposium is the Seed Symposium Awards, which are given to the presenters of three oral and three poster papers. The standard of the presentation of all the oral and poster papers was high, and the task of the two committees that judged the presentations for the awards must have been a difficult one. I have certainly been pleased that I have never had to make any decisions and only know the result of the committees' deliberations when I am given a piece of paper with names on! However, they were able to make decisions and we were pleased to make the awards to the authors for the papers that they presented.

Oral awards

Presenter: Andreas Börner
Genetic dissection of seed longevity and dormancy by applying new molecular marker technologies
Andreas Börner, Manuela Nagel, Mian Abdur Rehman Arif, Boris Kobiljski, Kerstin Neumann and Ulrike Lohwasser

Presenter: Robert Geneve
A comparison of seed mucilage production in several members of the Lamiaceae
Robert Geneve, David Hildebrand, Timothy Phillips and Jessime Kirk

Presenter: Fernando Silveira
Effect of seed storage on germination, seedling growth and survival of Mimosa foliolosa *(Fabaceae): implications for restoration ecology of the threatened rupestrian grasslands*
Fernando Silveira, Daniel Negreiros, Bernardo Ranieri, Celice Silva, Luzia Araújo and Fernandes G. Wilson

Poster awards

Alan Taylor, Hiromi Tasaki
Seed encapsulation and its effect on seedling performance

Arne Stensvand, Guro Brodal, Iben Margrete Thomsen, May Bente Brurberg, Venche Talgo
Aggressive Neonectria *sp. found to be seed borne on Nordmann fir*

Gulgun Baslar, Hulya Ilbi, Ibrahim Duman
The effects of harvest dates and drying methods on onion seed quality and yield

I think I would speak for most people if I said that the Seed Symposium in Antalya was a most enjoyable and satisfying one. There were clearly many stimulating discussions, participants renewed old friendships and made new ones, and we not only applied ourselves to discussions on seeds but also enjoyed ourselves. All this was encouraged by the excellent arrangements for coffee, lunch and the evening events.

Many thanks must go to everyone who helped in the organisation of the symposium, not just on the spot in Antalya, but in all the months of preparation and discussion beforehand. Their hard work was well worthwhile, and we all benefited from the results in a most successful symposium. ■

The refreshments also contributed to the success of the Symposium.

The newest ISTA Honorary Life Member

Steve Jones
Member, ISTA Executive Committee and Chair, ISTA Rules Committee

Canadian Food Inspection Agency
Saskatoon Laboratory
Saskatoon SK S7N 4L8
Canada
steve.jones@inspection.gc.ca

Alison relaxing amongst her flower beds at home in Aberdeen, Scotland.

At the ISTA Congress in Antalya, the ISTA Executive Committee (ECOM) was able to spring a pleasant surprise on Dr Alison Powell, by electing her as ISTA's newest Honorary Life Member. Although Alison was an ECOM member, the nomination was a well-kept secret, as anyone present could tell. The genuine look of surprise and emotional response from Alison when ISTA President Dr Joël Léchappé made the announcement at the official dinner, then presented Alison with her certificate of appreciation, affected many of those there.

The June Congress saw Alison step down from her position as Symposium Convenor and as a member of the 2010–2013 ECOM representing the UK. The scientific symposium in Antalya was another success to add to Alison's work for ISTA. ISTA is based on volunteers, with the support of governments and companies. Alison has always given her time generously, and within the ECOM Alison's was totally self-funded.

Alison shortly after being announced as ISTA's newest Honorary Life Member.

Alison believes in ISTA and what it can achieve. It is an honour for many of us to have worked with Alison and for many of us also to call her a friend. In the true tradition of the existing Honorary Life members, Alison will continue to be active in ISTA, will remain the Chair of the ISTA Vigour Committee, and has offered to help on ISTA's planned scientific liaison working groups and committees.

Alison's election to the status of Honorary Life Member was supported by the following nomination to the ECOM. For anyone wishing to nominate other colleagues, the detailed process can be obtained from the ISTA Secretariat. The ECOM looks forward to seeing everyone in Edinburgh in 2014, and especially Alison in her country of residence, Scotland.

Nomination

"Dr Powell has in our opinion made an outstanding, long-term contribution to ISTA as:

- ISTA Symposium Convenor (Organiser) for 2004, 2007, 2010 and 2013.
- Chair of the ISTA Vigour Technical Committee since 2001.
- Member of the ECOM of ISTA 2007–2013.
- Chief Editor of Seed Science and Technology (SST) from August 2010 to October 2011.
- A long-term member of the Editorial Board of SST.

"Alison has always been active in whatever ISTA work she has been involved; especially notable are her contributions to the ISTA ECOM and Vigour Committee. In addition, Alison has been a strong advocate for science in ISTA, and made a significant contribution to ISTA success over the years in the areas of science, workshops and training. For example by representing ISTA at ISSS meetings, promoting the ISSS session at the ISTA Symposium and leading the development of the Memorandum of Understanding with The Royal Botanic Gardens, Kew, UK, Alison has helped to strengthen ISTA's science through building strong and sustainable relationships."

The nomination was proposed by Joël Léchappé, and seconded by Steve Jones and Craig McGill. ■

Discussion forum: Do the current principles and requirements for the ISTA Rules meet with the future needs for developments in seed technology?

Steve Jones
Member, ISTA Executive Committee and Chair, ISTA Rules Committee

Canadian Food Inspection Agency
Saskatoon Laboratory
Saskatoon SK S7N 4L8
Canada
steve.jones@inspection.gc.ca

The ISTA Congress in June gave the ISTA membership the opportunity to discuss and think about how new technologies will be used and fit into the ISTA Rules or not. With contributions from Alison Powell, Craig McGill and Steve Jones, the discussion was set, issues laid out and options discussed. The presentations were:

- What is currently required for validation and proposals for the ISTA Rules?
- Why would you want to add something to the ISTA Rules?
- What are potential new developments that might be considered for validation and the ISTA Rules?

For those who could not be at the meeting the presentations are all available on the ISTA website at www.seedtest.org/2013.

The audience participated in the discussion and the questions of how, why, what and when came up. This forum linked well into the previous discussion forum on the use of in-house validated methods and how these could be used in the future within ISTA. At the moment the discussion on both topics have people with clear opinions but now comes the hard task for the next ISTA ECOM. How much effort is needed to bring these topics to a clear set of achievable, realistic actions that fit into the ISTA strategy for the next three to six years? What needs to be done, and is it a priority?

If ISTA members have ideas and views on this or other topics please contact Dr Beni Kaufman, our new Secretary General, at beni.kaufman@ista.ch. Beni is in listening and learning mode, ready to help the new ECOM to set up the future action plan for ISTA. ■

Discussion forum: use and international standardization of DNA technologies

Berta Killermann and Cheryl Dollard

[1]Chair, ISTA Variety Committee; [2]Chair, ISTA GMO Committee

Bayerische Landesanstalt für Landwirtschaft
Institut für Pflanzenbau & Pflanzenzüchtung
Saatgutuntersuchung/Saatgutforschung
85354 Freising, Germany
Berta.Killermann@lfl.bayern.de

The use of DNA markers in seed testing, e. g. variety ID, genetic purity, seed health, GMO testing and species identification, has rapidly increased in recent years. The main reasons for using these techniques include speed of results, high throughput, and lower cost. Development of molecular technologies for such applications are progressing quickly, making selection of a technology and/or markers a difficult choice. This is especially true in smaller labs, which may not have the resources needed for access to the most current scientific tools. Nevertheless, such technologies are increasingly being used in the seed world, and demand is increasing. As costs decrease, these approaches are becoming more accessible, even for smaller labs. As for any method used in seed testing, the use of DNA-based technology requires consideration of many factors, including standardization, accreditation, and the demands and use by other organizations. Considering that these tools have such a broad range of applications in the seed testing world, and that they are being increasingly used internationally, a discussion forum on the use and international standardization of DNA technologies in the area of seeds was held at this year's ISTA Congress in Antalya, Turkey, chaired by Dr. Berta Killermann and Ms. Cheryl Dollard.

The forum was introduced by Dr. Berta Killermann, who gave a brief background summary, to give context for the session. The first speaker was Prof. Dr. Kae-Kang Hwu from the National Taiwan University, Separate Customs Territory of Taiwan, Penghu, Kinmen & Matsu, who gave a broad overview about DNA technologies and its current uses and applications. He explained that variety verification is done by comparing the genetic "fingerprint" of the test variety to a short list of standard varieties, under the assumption that the tested variety is one of the standard varieties. If the tested variety is indistinguishable from one of the standard varieties, it is determined that the identity of the tested variety is found. In the past, markers with complex patterns have been used in variety verification, including randomly amplified polymorphic DNA (RAPD), and inter-simple sequence repeat (ISSR) to generate the fingerprints. Under the current trends of cost reduction for both marker development and genotyping, the use of highly repeatable DNA markers with simple inheritance, such as single sequence repeats (SSR) and single nucleotide polymorphisms (SNP), is encouraged. Hybrid purity is considered as a special case of variety verification, in which case the standards are only composed of the maternal parent and hybrid, sometimes extended to include the paternal parent. Single seeds are analysed using similar marker systems.

Variety identification differs from variety verification in two aspects: (1) the list of standards is usually a lot longer than in the case of variety verification, and more importantly, (2) the tested variety is not assumed to be one of the standards. Since the tested variety may be outside the range of standards, "standards may be fully distinguished" is no longer a sufficient validation standard for the analysis system. For variety identification, a systematic way of validating the analysis system is required. This would include generating a genotype database from a large number of representative varieties, selecting markers with high polymorphic information content (PIC) values, and the combination of all markers have a small enough possibility of not being able to distinguish any random pair of varieties. Under a validated system, if the genotype of the test sample doesn't match the standards , the tested variety should be incorporated into the database and treated as a standard variety later on. Since the scope of comparison is greater than in variety verification, multiple markers with high repeatability and simple inheritance, such as SSR and SNP, are usually required. In practice, since the list of standard varieties is long and the markers used in the analysis are highly repeatable, standard varieties no longer need to be analysed in parallel with the tested variety. Instead, a genotype database of standard varieties is used to be compared with the analysis results of the tested variety.

Prof. Dr. Hwu also discussed other DNA technologies that may be used in seed testing, including identification of plant pathogens isolated by inoculation on selective or semi-selective media, GMO testing – both

low level contamination and GM trait purity – and identifying species of other seeds by DNA sequencing, generally referred to as plant barcoding. All approaches are based on the use of DNA-based methods to answer seed testing needs.

Dr. Beni Kaufman, formerly Pioneer, United States, addressed in his speech the Seed Testing Standardization – Application to Molecular Testing Methods. He explained in more detail that standardization can be defined literally as to conform or compare to a standard. Or, by a more intricate definition as found in an "investopedia.com", talking about performance of service within set guidelines and in terms of consistent and comparable quality definition that is surprisingly relevant to our work. The cycle of standardization in ISTA's work is defined by creating methods, which translate into rules, which are being introduced and enforced across ISTA laboratories as part of our quest for uniformity in seed testing. With respect to the question whether this process can be applied to molecular methods, he explained that two kinds of challenges are in the way. Firstly, challenges related to the testing method: expensive instrumentation, highly specialized technical skills, fast evolving methodologies; and secondly, challenges associated with qualities of the biotechnologically modified seed, such as genotypic traits, freedom to operate, availability of (DNA sequence) information, and the controversy around it all. The solution that ISTA came up with is the performance-based approach (PBA) and proficiency tests (PT) that are defined in the newly written GMO testing chapter. This is a new approach to standardization that can be defined as standardization by quality equivalence, and it emphasizes good lab practices such as the method validation process, transparency and quality assurance. This approach represents another step in the evolution of standardization. Traditional standardization was set to be the end result of a defined validation process. As this approach is not yet possible, since there is no one validated process, a temporary solution is used in the form of standardization based on PBA, allowing time for a method or process to evolve and for the challenges related to the testing method to be overcome. How long such an evolution will take is unknown, but some elements that can expedite it will be redefining the relationship with the seed industry and engaging them as partners in this process. This also may present an opportunity for ISTA to get involved in areas not explored so far, for example by partnering with technology providers for developing ISTA-certified, reasonably priced instrumentation, and thus be proactively involved in bringing down the cost of advanced instrumentation.

Mr. Fuminori Aihara, from the International Union for the Protection of New Varieties of Plants (UPOV), highlighted in his talk the use of biochemical and molecular techniques in the distinctness, uniformity and stability (DUS) examination, and cooperation between relevant international organizations. After a short and interesting introduction about UPOV and the role of UPOV Technical Working Parties (TWPs), he gave an overview of the DUS examination. He clearly pointed out that for granting breeders' right, the criteria of distinctness, uniformity and stability (DUS) as well as novelty must be satisfied. He underlined that, basically, characteristics of new varieties are examined by field trials in the DUS examinations, but molecular techniques are sometimes used under certain conditions. He also reported that the harmonized approach for the use of molecular techniques is being pursued within UPOV, and discussed the information documents that summarize these requirements and stipulations.

The relevant UPOV information documents UPOV/INF/17/1 "Guidelines for DNA Profiling: Molecular Marker Selection and Database Construction - BMT Guidelines" and UPOV/INF/18/1 "Possible Use of Molecular Markers in the Examination of Distinctness, Uniformity and Stability" provide guidance for developing harmonized methodologies with the aim of generating high-quality molecular data for a range of applications and guidance on the possible use of biochemical and molecular markers in the DUS examination. The BMT Guidelines are also intended to address the construction of databases containing molecular profiles of plant varieties. Both documents have been adopted and published

Draft 4 of document TGP/15/1 (Technical Guidelines Protocol) "Guidance on the Use of Biochemical and Molecular Markers in the Examination of Distinctness, Uniformity and Stability (DUS)" gives guidance on the use of biochemical and molecular markers in the DUS examination on the basis of the models in document UPOV/INF/18 that have received a positive assessment and for which accepted examples have been provided. TGP/15/1 contains two models: characteristic-specific molecular markers, and combining phenotypic and molecular distances in the management of variety collections.

"Characteristic-specific molecular markers" implies that molecular markers can be used as a method of examining DUS characteristics that satisfy the criteria for characteristics set out in the General Instruction of the DUS examination under set conditions, whereas the use of new types of characteristics, including the possible use of molecular characteristics, is considered in document TGP/15, "New Types of Characteristics". Some of these characteristic-specific markers are already in use in some countries as a supporting tool, where appropriate.

"Combining phenotypic and molecular distances in the management of variety collections" predicates that a combination of phenotypic differences and molecular distances can be used to identify, within the variety collection, those varieties which need to be compared with candidate varieties in order to improve the selection of "Distinct plus" varieties under set conditions. This model is also used in some

countries on reference collections, for example of maize inbred lines. It is reported that 20–40 % of the required reference material can be reduced by using this method.

Mr. Aihara clearly stressed the importance of a harmonized approach in the use of molecular techniques within UPOV to facilitate cooperation in DUS examinations, (e.g. purchase of DUS reports) and to establish internationally recognized variety descriptions, which leads to effective protection. He pointed out that such international organizations as the ISO, ISTA, the OECD and UPOV are working on the closely-related topics molecular techniques applied for plants, so that at a coordination in Geneva from 18–20 March 2013, the Technical Committee of UPOV (TC) received presentations from relevant international organizations (ISO, ISTA and OECD). Copies of the presentations are available on the UPOV web site. He also reported that the TC, at its forty-ninth session, endorsed the initiative for a joint meeting with relevant international organizations and including breeders, and that it agreed to propose to hold a coordinated meeting of the 14th session of the Working Group on Biochemical and Molecular Techniques (BMT) of UPOV with meetings of those international organizations in 2014.

After a very interesting discussion, Cheryl Dollard summarized the forum and thanked the presenters as well as all discussants. She clearly pointed out that ISTA is on the right way in developing methods for the use and international standardization of DNA technologies in the area of seeds, together with the relevant international organizations UPOV, the ISO and the OECD. The ISTA President, Dr. Joël Léchappé, finally closed the discussion forum. ■

Changes to the Articles of the International Seed Testing Association

At this year's Ordinary General Meeting, a number of changes to the ISTA Articles were voted on and accepted by the Voting Delegates. The amended Articles are presented here.

Original	Amended
Article 11 Meetings	**Article 11 Meetings**
… (10) Any other business raised by a Member, of which notice in writing has been received by the Secretary General at least ~~two~~ months prior to the date of the General Meeting.	… (10) Any other business raised by a Member, of which notice in writing has been received by the Secretary General at least three months prior to the date of the General Meeting.
Article 12 Voting	**Article 12 Voting**
(a) … (b) The following categories of motions require for adoption a two-thirds majority of those voting: (1) Motions to alter these Articles. ~~(2)~~ Motions to dissolve the Association. ~~(3)~~ Motions arising during General Meetings and relating to temporary adjournment, closing of debate, or postponement of action.	(a) … (b) The following categories of motions require for adoption a two-thirds majority of those voting: (1) Motions to alter these Articles. (2) Motions that do not alter these Articles but will create a need to change these Articles. (3) Motions to dissolve the Association. (4) Motions arising during General Meetings and relating to temporary adjournment, closing of debate, or postponement of action.
All other motions require a simple majority of those voting for adoption. (c) …	(5) Motions to exclude a member under the provisons of Article 7 of these Articles. All other motions require a simple majority of those voting for adoption. (c) …
Article 13 Officers …	**B. Officers and Executive Committee** **Article 13 Officers** …
~~B.~~ Auditors	**C. Auditors**
Article 17 Figures …	**Article 17 Figures** …
Articles 4, 15, 20, 23	**Articles 4, 15, 20, 23**
…~~the Constitution~~….	… these Articles….
Article 22 Coming into Effect	**Article 22 Coming into Effect**
… The Articles adopted as Constitution in previous meetings of the Association are therefore annulled once the Articles are signed.	… The Articles adopted as Constitution or Articles in previous meetings of the Association are therefore annulled once the Articles are signed.

Changes to the *International Rules for Seed Testing* 2014 Edition

Jonathan Taylor
ISTA Publications Unit

ISTA Secretariat
8303 Bassersdorf
Switzerland
ista.office@ista.ch

Again this year, a number of changes to the ISTA *International Rules for Seed Testing* were accepted by the nominated ISTA Designated Members on behalf of their respective Governments, under Agenda point 11.

In addition to the changes to the testing procedures, there were a large number of changes to species names following the update to the ISTA Stabilized List, which takes place every six years. These changes affect primarily Tables 2A, 3B and 5A.

There were also a number of late, mostly editorial, modifications which were discussed and agreed on at the meeting of the Rules Committee, two days before the Ordinary General Meeting. These include:

- inclusion of *Festuca trachyphylla* in the Rules (was previously a subvariant of *F. ovina*);
- amendments to the text on positives controls for all seed health methods;
- minor amendments to the new variety testing methods.

A proposed change to Chapter 5: Germination (5.2 in the Rules Proposal document) regarding water content of germination media was withdrawn.

Thus, the changes to the ISTA Rules for 2014 are:

Chapter 1: Certificates

- Amendments to "Reporting results" following changes to Chapters 11 and 18, and new Chapter 19

Chapter 2: Sampling

- Changes to species names
- Storage of samples after testing
- Changes to the minimum submitted sample sizes of coated seeds

Chapter 3: The Purity Analysis

- Adding the use of an anemometer for the uniform blowing method

Chapter 5: The Germination Test

- Harmonisation between ISTA Rules and ISTA Handbook on Seedling Evaluation in respect to the evaluation of the cotyledons (50% rule)
- Shortening the duration of germination test for certain grass species

Annex to Chapter 7: Seed Health Testing Methods

- Editorial corrections to several methods, following reviews
- Addition of positive controls in all methods
- Modifications to seed health methods 7-019b, 7-021 and 7-028
- New seed health method 7-029: Detection of *Pseudomonas syringae* pv. *pisi* on *Pisum sativum* (Pea) seed
- New seed health method 7-007: Detection of *Alternaria linicola*, *Botrytis cinerea* and *Colletotrichum lini* on *Linum usitatissimum* (Flax) seed. This method combines and replaces methods 7-007, 17 and 18.

Chapter 8: Species and Variety Testing

- Complete review of Chapter 8
- New improved A-PAGE method for the verification of *Triticum*
- New SDS-PAGE method for the verification of *Triticum* and ×*Triticosecale* varieties

Chapter 11: Testing Coated Seeds

- Testing methods and reporting for the tetrazolium test for coated seeds

Chapter 18: Seed Mixtures

- Testing methods and reporting for the tetrazolium test for seed mixtures

Chapter 19: Testing for Seeds of Genetically Modified Organisms

- New Chapter for the ISTA Rules

Auditors' Meeting 2013

Rasha El-Khadem

ISTA Accreditation and Technical Department

ISTA Secretariat
8303 Bassersdorf
Switzerland
rasha.elkhadem@ista.ch

The ISTA auditors met on June 17, 2013 for their yearly auditors' meeting. In the beginning changes to the auditors' group were announced. The new system auditor Florina Palada, who started in August 2012, introduced herself to the technical auditors. The new technical auditor candidate Karen Hill has started her training this year, and is expected to join the ISTA auditors' group by the end of the year.

The auditors discussed items that they brought up as well as questions that laboratories raised. Some of the topics discussed were related to internal procedures of the audit programme, and are not mentioned in this report.

Seed mixtures

In 2012, testing of seed mixtures was introduced into the ISTA Rules as Chapter 18. The application form for re-accreditation that must be filled in to apply for an ISTA audit was updated to allow laboratories to apply for seed mixtures. However, up to now any laboratory can test seed mixtures and can issue ISTA Certificates, provided it holds ISTA accreditation for the tests in question. The Accreditation and Technical Department did not contact all accredited laboratories to ask them to indicate whether their scope of accreditation should be adjusted to include the testing of seed mixtures. However, within a period of three years all laboratories will have indicated whether they wished to be accredited for mixtures. All applicants will be checked by the ISTA auditors whether they perform the test on mixtures appropriately and whether the reporting is suitable.

Temperature specification

The auditors' experience is that there is a lack of clarity regarding temperature ranges such as 20 ± 2 °C. Does a range of ±2 °C mean that the permitted temperature readings are 18–22 °C? Or would only ±1 °C or 17.5–22.5 °C be allowed, taking the uncertainty of measurement into account? Laboratories deal with this in many different ways, which is the reason why the auditors raised this for discussion.

The auditors agreed that the laboratories must know the uncertainty of measurement of their temperature devices. This means that detailed calibration certificates of the temperature devices are needed. In theory the uncertainty is included in the ±2 °C. However, the auditors will accept any reading taken within the ±2 °C. The Germination Committee and the Accreditation and Technical Department exchanged their views and agreed to this procedure.

Reporting of duration of oven

The ISTA Rules require for moisture determination for example a duration of 1 h ± 3 min. Does the laboratory need to record this time or is it enough if they say that they have checked it?

The auditors agreed that the laboratory has to check and record the time that the sample stays in the oven.

Signatures of samplers

The Accreditation Standard requires a list of signatures to be available. The following example was discussed. A laboratory is working with secured electronic sampling forms with no signatures. The forms are sent together with the sample to the laboratory using a secured mailing system. The laboratory does have a list of signatures of the samplers but never looks to that as they do not need it. Do they need to maintain the list of signatures?

The auditors discussed the reason for the requirement stated in the ISTA Accreditation Standard to have a list of signatures. The auditors came to the conclusion that this requirement ensures traceability about who performed the sampling. The auditors decided that if this traceability is provided by other means (without signature but with a sampler's unique code), than it would be acceptable and the laboratory would not need to maintain a list of samplers' signatures.

The auditors discussed the fact that with this decision they would accept a deviation from the Standard, and that in principle it would be the correct way to revise the Standard accordingly. This change will be suggested for the next revision of the Accreditation Standard.

Usage of plastic containers

The auditors discussed the use of plastic containers and electrostatic effects.

The auditors decided to contact the Bulking and Sampling Committee as well as the Purity Committee and to ask them for some guidance regarding the use of buckets (e.g. plastic or metal buckets).

Phytotoxicity test

The auditors discussed whether a laboratory must perform the phytotoxicity test on its substrate using the species mentioned in the 'ISTA Handbook on Seedling Evaluation' even if they only test, for example, maize in their laboratory. The auditors agreed that in this case the laboratory shall perform its phytotoxicity check on the substrate using the species they test. If the laboratory tests too many different species, than the check on the substrate shall be performed using a sensitive species listed in the ISTA Handbook.

Can tolerance tables be used to evaluate the results of the phytotoxicity test?

Tolerance tables are not sensitive enough to detect differences caused by phytotoxic effects of the substrate. These changes can only be determined using an analysis of variance (ANOVA) test. The auditors agreed that many laboratories have difficulties to make an ANOVA. The Accreditation and Technical Department will investigate whether there are possibilities to have a small program or Excel sheet posted on the ISTA web site that can be used for an ANOVA to check substrate phytotoxicity.

Addressing non-conformities by the laboratory

The auditors suggested once more that the laboratory should name their corrective actions in such a way that they would correspond to the number of the non-conformity (e.g. example for the non-conformity number 1.1 evidence 1.1.A, 1.1.B etc.) The auditors agreed that this would facilitate the review of the non-conformities. During the closing meeting of the audit, the lead auditor should explain this procedure to the laboratory and emphasize the appropriate numbering of the corrective actions.

What must be followed: ISTA Rules or ISTA handbooks?

During the on-site assessment, auditors frequently refer to ISTA handbooks. It became obvious that laboratories are not sure about the status of ISTA handbooks and whether they must be followed. For accredited laboratories, the ISTA Accreditation Standard and the ISTA Rules are the documents that define requirements that must be fulfilled. In some cases, both documents might require the laboratory to fulfil specific needs (e.g. verification or calibration of laboratory equipment) without giving detailed information about how to achieve these. The ISTA handbooks are published by the ISTA Technical Committees to give guidelines on how specific requirements can be fulfilled. These are for guidance, and the laboratory is not requested to adhere to the suggestions mentioned in the handbooks. However, the laboratory must provide the auditors with a method giving equivalent certainty that the requirements of the Rules and Standard are fulfilled. It is the laboratory's choice to either select the method described in the handbook or to invent a different procedure that is suitable.

At the end of the auditors' meeting, the auditors were provided with a list of selected audit findings which were also submitted to the Technical Committee chairs. This should give auditors the possibility to check which non-conformities were described by other colleagues. This might initiate a discussion among the auditors' group about technical requirements. ■

ISTA Executive Committee 2013–2016

Joël Léchappé

President

Joël Léchappé, currently President of ISTA from 2010 to 2016, graduated at the Universities of Nantes and Rennes (France) in Botany, Zoology, Ecology, Biochemistry and Plant Physiology.

After a PhD in Plant Pathology (root diseases on *Phaseolus*), he joined INRA (National Institute for Agronomical Research) in the Group for Study and Control of Varieties and Sees (GEVES) as head of the Germination Laboratory of the National Seed Testing Station. He is currently the Director of the National Seed Testing Station, and a member of the GEVES Board of Directors.

He made contact with ISTA in 1987 with Professor Lennart Kåhre in Uppsala. Since then, he has contributed to ISTA work via the Germination, Proficiency Test, Vigour and Rules Committees. He has been a Member of the Executive Committee since 2001.

Being part of the ISTA team of technical auditors offers him a great opportunity to learn and exchange more about the situation in the seed world and the world in general.

Spare time is shared with family and hobbies, among which are botany, badminton and fly fishing.

Craig McGill

Vice-President

New Zealander Craig McGill is a Research Officer in Seed Science and Technology in the Institute of Agriculture and Environment at Massey University, Palmerston North. He completed a Bachelor's Degree in Science at Massey University, and in 1986 joined the Massey University Seed Technology Centre. Since then, Craig has completed a Master's of Applied Science in Plant Science, also at Massey University.

Craig teaches in the area of seed science and technology at undergraduate and postgraduate levels, as well as supervising postgraduate students in this area. In addition Craig has organized training courses for industry in seed technology.

The first ISTA Congress that Craig attended was in Angers in 2001, where he joined the Moisture Committee. Craig was Chair of the Moisture Committee from 2008 to 2013, and is now Vice-Chair. He is also Vice-Chair of the Rules Committee. Craig joined the Executive Committee in 2011, and was elected ISTA Vice-President in 2013.

Margus Friedenthal

Member-at-Large

Margus Friedenthal has been working for the Agricultural Research Centre (ARC) of Estonia as Deputy Director since 2003. His scientific career was at Tallinn University of Technology as Associate Professor in Food Science and Technology. His particular scientific interest was related to applied biochemistry, and he obtained a PhD in Dairy Chemistry in 1982. From 1983 to 1984, Margus Friedenthal worked in post-doctoral research at the Netherlands Dairy Research Institute NIZO at Ede, Holland, and in 1992 was nominated a member of the International Dairy Federation. In 1996 he was a guest researcher at Lund University (Sweden). He has initiated a number of international contacts as a national coordinator in the EU frame programmes Nitus, FoodNet and FoodMac.

At the ARC, Margus Friedenthal is responsible for laboratory activities providing analytical service on a broad scale (seeds, soils, residues and contaminants, plant health etc.) to the state inspection authorities, the agricultural sector and science institutions. The ARC is a state agency under the Ministry of Agriculture with associated laboratories, field testing centres and departments which carry out various agri-environmental tasks. Reliability of service is assured through the ARC's quality system in accordance with standards EVS-EN ISO/IEC 17025, EVS-EN ISO/IEC 17020 and EVS-ISO 9001. Additionally, the ARC seed testing laboratory is ISTA accredited, and has been a Laboratory Member of the Association since 1993. Margus Friedenthal has been a project leader for EU-funded twinning & research projects and training courses on various plant health issues.

Margus Friedenthal is the Chair of the National Organizing Committee of the 31st ISTA Congress, to be held in Estonia in 2016.

Cecilia Jones

Member-at-Large

Cecilia Jones received a Bachelor's in Agronomy and Animal Husbandry from the Universidad de la República in Uruguay, and also holds a Master of Science degree from the University of Minnesota. She taught university courses of plant physiology and plant pathology at the Universidad de la República. She later worked for seven years in the private seed industry as a plant pathologist, working on improving resistance to bacterial disease in various vegetables. Cecilia has been Executive Director of the National Seed Institute of Uruguay since 2005. There, she works with a team of agronomists and seed experts to manage seed certification, seed testing and the national seed catalogues, and enforce the national seed law. Uruguay is recognized in South America for its national seed system and its strong integration of the private and public seed sectors.

Steve Jones

Member-at-Large

Steve Jones is originally from the UK and is now based in Canada. He has been actively involved in ISTA work as ISTA Rules Chair since 2000, a past member of the Purity Committee, editor of the ISTA Pure Seed Definition Handbook and a current member of the Bulking and Sampling Committee. Steve has also been an elected or ex-officio member of the Executive Committee (ECOM) since 2004.

Steve's gained his education mainly on the job, having completed an honours degree in biology by day-release and evening study, and then a Ph.D. on the seed physiology and dormancy of Sitka spruce seeds at the University of Reading, UK, with Prof. Richard Ellis and Dr. Peter Gosling.

Steve's career in the UK covered 31 years, and was split into three sections covering the areas of horticulture, forest tree seeds and agricultural seed testing. The UK work was all in government-funded laboratories, as a researcher, tree seed tester, sampler, sampler trainer, laboratory auditor and manager.

After joining the National Institute of Agricultural Botany (NIAB) at Cambridge, UK, in 1997 Steve became the Chief Officer of the Official Seed Testing Station for England and Wales in 2000 (ISTA-accredited laboratory GBDL01). At that time he also took over the ISTA Rules Chair role, and later served on the

ECOM for the UK (2004–2007). Then, in 2008, Steve moved to work for the Canadian Food Inspection Agency, Seed Science and Technology Section, Saskatoon, as Chief of Purity, Germination and Accreditation in the ISTA-accredited laboratory CADL08. In Canada, Steve has continued with his role as ISTA Rules Chair and serves on the ECOM (2010 to present) as an elected representative for Canada, which includes being the ECOM regional representative for North America.

Berta Killermann

Member-at-Large

Berta Killermann, from Bavaria, Germany, studied agricultural science at the Technical University Munich-Weihenstephan, majoring in crop science and plant breeding. Thereafter she worked at the Bavarian Plant Breeding Association, and then moved to the Bavarian State Research Centre for Agriculture, Institute for Crop Science and Plant Breeding, where she became the head of the electrophoresis lab. In 2000 she took over the leadership of the ISTA Seed Testing Station Freising, Germany, as well as the working group Seed Research. At the same time she started as a lecturer at the University for Applied Science, Weihenstephan-Triesdorf, for the subjects seed production, seed certification and seed testing. In 2002 she finished her doctorate thesis at the Justus Liebig University in Giessen, Germany, on marker-assisted selection in quality wheat breeding by using biochemical markers. Since 2011 she is the Chair of the group of the German seed testing labs organized in the Association of German Agricultural Analytic and Research Institutes (VDLUFA).

Berta started her activities within ISTA in 2004, when she became a member of the Variety Committee. In 2007 she became Chair of the Variety Committee. At the ISTA Congress 2013, Berta was elected to the Executive Committee, but she remains a member in the Variety Committee.

Alexander Malko

Member-at-Large

Alexander Malko was born in 1964 in the USSR. From 1982 to 1987 he studied agronomy at Timiriazev Agricultural Academy of Moscow (now Timiriazev Agricultural University), specializing in plant selection, and thereafter joined the laboratory staff of the Chair of plant selection there for one year.

From 1988 to 1992 he was a post-graduate on plant selection, receiving a PhD degree from Timiriazev Agricultural University for his work on the methodology of research in cereal breeding. He remained there at the plant breeding laboratory for the next ten years, working with cereals, first as a researcher, then from 1996 to 2003 as head of the laboratory.

At the same time he took part in the development of the legislation of the Russian seed industry, based on seed certification in Russia as well as the University's scientific knowledge. He obtained the Russian degree of a doctor of science and professor in 2005.

He was then appointed Chief of the State Seed Inspection of the Russian Federation (2003–2007). This organization was responsible for the quality control of seed variety and purity. After an administrative reform, the it was transformed in 2007 into a federal organization, the Russian Agricultural Centre.

Alexander Malko is now Director of the Russian Agricultural Centre, with headquarters in Moscow and 78 representative offices at the regional level. It is one of the largest organizations in the agrarian sector in the country. Its primary goals consist in the definition of varietal-purity qualities and sowing qualities of seeds, i.e. their certification.

Besides this, the Centre carries out phytosanitary monitoring of Russian territory, and develops forecasts of phytosanitary conditions. It develops uniform standards of seed quality and phytosanitary monitoring, provides methodological guidance, and organizes and carries out work on seed certification. Users of its services are all agricultural enterprises in Russia.

Alexander Malko is also head of the National Technical Committee for Standardization "Seeds and planting stock" (TC-359), and the International Technical Committees for Standardization "Seeds and planting vegetables, melons and fodder root crops" (ITC-124) and "Oilseeds" (ITC-266). He is also professor of the Peoples' Friendship University of Russia in Moscow, and the author of many scientific and educational articles and papers in the fields of plant selection, seed production and plant protection. He wrote and co-edited several scientific books. He is a member of the editorial boards of the journals *Plant breeding and seed production* and *Plant protection and quarantine*. He has also worked as an expert on the programmes of international projects in Russia: TACIS, ARIS, TRANSFORM.

Masatoshi Sato

Member-at-Large

Masatoshi Sato has been a seed inspector at the National Center for Seeds and Seedlings (NCSS), Incorporated Administrative Agency, since 2003, and is now Director of the Seed Health Testing Laboratory at the NCSS. His first ISTA meeting was the Congress in Budapest in 2004, since when year he has been involved in ISTA activities. He is a member of the Seed Health Committee, and has organized some Proficiency Tests. Participating in ISTA provides him with a good opportunity to learn about the global situation of seed testing, and he wishes to become a hub connecting with the ISTA family in the Asia region. This is his third three-year term as a member of the ISTA Executive Committee, and he is a member of the Accreditation Review Working Group and the In-house Method Working Group.

In his spare time he enjoys playing tennis every weekend and taking photos of wild flowers. In addition, he sometimes finds time to make flies, imitating natural food items, for fly fishing in the hope of big fish.

Mable Simwanza

Member-at-Large

Mrs. Mable M. Simwanza is currently Chief Seeds Officer and Head of the ISTA-accredited Official Seed Testing Station at the Seed Control and Certification Institute (SCCI) at Chilanga, near Lusaka, Zambia. The laboratory is the only accredited laboratory in Zambia, and handles all seed testing activities for issuance of ISTA certificates for the international seed trade and for the local market.

Mrs. Simwanza has been working in the seed industry at the SCCI, the regulatory department of the Ministry of Agriculture and Livestock, for the past 26 years, and has vast experience in seed issues. She was employed in 1986 as a seed inspector, and rose through the ranks over the years to her current position of Chief Seeds Officer and head of the seed testing facility.

Mrs. Simwanza holds an MSc degree in crop production from the Hebrew University of Jerusalem, Israel. She also holds a BSc in Seed Technology from Mississippi State University, USA and a Diploma in Crop Science from the Natural Resources and Development College (NRDC) in Zambia.

Throughout her career, Mrs. Simwanza has executed several special seed technology assignments both in her home country and abroad. She is currently an ISTA Personal Member, and has been an active member of the ISTA Bulking and Sampling Committee for over 4 years.

Grethe Tarp

Member-at-Large

Grethe Tarp from Denmark has a Ms. Degree in horticulture from the Danish Royal Veterinary and Agricultural University. She started working with seed quality control in 1978 in Swaziland and Mozambique. She went back to Denmark in 1988 to work in the Danish Seed Testing Station, first with seed certification, then as Head of the Germination Laboratory. In 1993 she became Head of the Seed Department at the Danish Plant Directorate.

Grethe attended her first ISTA Congress in 1981 in Ottawa; and has participated in all the ISTA Congresses and Annual Meetings since then. Over the years she has been Chairman of the Equipment Technical Committee and the Moisture Committee and has also been a member of the Germination Committee. She has been a member of the Executive Committee since 1995.

From Denmark she also had the opportunity to assist in training courses and work as a seed consultant in a number of countries in Africa and Asia. She worked as a senior seed consultant in Vietnam from 2000 to 2003.

After reorganization of the Danish Ministry of Food, Agriculture and Fisheries she retired from her Government position in 2012. She is now working as a private seed consultant and has recently been back in Mozambique for training new staff at the National Seed Service in seed testing in accordance with the ISTA Rules. She is supported as a candidate for the Executive Committee by the Danish Ministry of Food, Agriculture and Fisheries and the Danish seed trade.

Rita Zecchinelli

Member-at-Large

Rita Zecchinelli is from Italy. Since 1985 she has been working for the Italian seed certification institute (previously ENSE, Ente Nazionale Sementi Elette, today merged with CRA, Consiglio per la Ricerca e la Sperimentazione in Agricoltura).

She studied agricultural science at the University in Milan (Italy), focusing on crop production and seed science and technology. She worked in the seed certification unit in Milan, being active in field inspections, post control test, sampling and other seed certification related tasks.

In 1998 she moved to the laboratory in Tavazzano, and became head of the laboratory in 1999. The laboratory has been ISTA accredited since 2000, and the scope of accreditation includes sampling, traditional testing, variety testing and GMO testing. The laboratory is involved in seed testing for various purposes, such as seed certification, variety registration and GMO monitoring programmes.

Rita started to co-operate with ISTA in 2001, and has participated in all the ISTA Congresses and Annual Meetings since then. Today, she is the Chair of the ISTA Flower Seed Committee and a member of other Technical Committees (Proficiency Testing, Germination, Rules). Rita is also an ISTA technical auditor. She has been a Member-at-Large of the ISTA Executive Committee since 2004.

New Technical Committee Chairs

Valérie Grimault

Seed Health Committee

After a PhD and postdoctorates in phytopathology, electron microscopy and molecular biology, I worked for nine years in a French vegetable seed company, dealing with variety resistance for breeding programs. Since 2005 I have been managing the phytopathology laboratory at GEVES, with one team working on seed health (130 different pathogen species detected) and another on variety resistance for registration and protection. I am involved in various French and international research projects and the organization of proficiency tests, and I am Chair of the ISHI-Veg group on bean, brassica, pea and radish, of the UFS seed health group, of an IPPC working group, and of the French plant health network.

Jette Nydam

Moisture Committee

I was born in 1955 on a farm on an island in Denmark. I have been involved in seed testing since I graduated as an agronomist. I worked at the Danish Seed Testing Station and the Danish Plant Directorate from 1983 to 2012. Here I worked with variety testing for more than 12 years and traditional seed testing (purity, germination and moisture) for more than 15 years. One of my first tasks for ISTA was to edit the Seed Cleaning Handbook and develop ISTA Rules for Seed Cleaning. I have been a member of the ISTA Moisture Committee since the mid-nineties. My former laboratory was very much engaged in the calibration of moisture meters and in developing quality assurance for moisture laboratories. I also edited the ISTA Handbook on Homemade Equipment, and I was co-editor of the Moisture Handbook.

In spring 2007 I was approved as technical auditor for ISTA. From autumn 2007 to 2009 I was employed by ISTA as a system auditor and lived for two years in Zurich. When I returned to Denmark, I worked for three years with variety testing in post-control fields and monitoring of authorized private seed testing laboratories and seed samplers.

Since 2000 I have been asked to do many consultancies for seed testing laboratories, mainly in Africa and Asia. Since 2012 I have been employed by NordGen, the Nordic Genetic Resource Center.

Ana Laura Vicario

Variety Committee

I am the head of the Molecular Markers and Phytopatology Laboratory at National Seed Institute (INASE), Argentina. In this Lab we run protein and DNA based tests for identity and purity determination. We also use PCR and ELISA tests for determination of seed pathogens and GMOs.

I have a degree and a PhD in Biology, both issued by Buenos Aires University.

I have been working with ISTA since 2001, when during the Seed Congress at Angers I gave an oral presentation about the use of molecular markers in soybean.

I am a member of the Variety and GMO Committees, and I was Vice-Chair of the Variety Committee from 2007 to 2013.

Jane Taylor

Purity Committee

Jane has worked for 45 years in the Official Seed Testing Station for England & Wales (OSTS) at the National Institute of Agricultural Botany (NIAB), and during this time she has developed her skills and knowledge in seed analysis and seed sampling, covering a wide range of species. Since 2008 she has been the Chief Officer of the OSTS and provides technical advice on seed regulations and seed testing to industry and to government departments and agencies such as Defra and Fera. She lectures on a range of OSTS courses on seed testing, seed identification and seed sampling, providing training for national and international students, and advising on the practical application of ISTA seed testing methodology. She has been a member of the ISTA Purity Committee since 2001, and Vice-Chair since 2004.

Eddie Goldschagg

Bulking and Sampling Committee

Eddie Goldschagg has been an active member of the Bulking and Sampling Committee since the ISTA Congress at Angers in 2001. He is currently Technical Manager at SANSOR (South African National Seed Organization) where he is in charge of seed certification. He is also the South African Technical Representative at the OECD Seed Schemes. ■

7th ISTA Seed Health Symposium
Edinburgh, United Kingdom, 12–14 June 2014

Valerie Cockerell
Chair of the Organising Committee

Science and Advice for Scottish Agriculture
Roddinglaw Road
Edinburgh, United Kingdom EH12 9FJ
valerie.cockerell@sasa.gsi.gov.uk

The Organising Committee is proud to invite you to the 7th ISTA Seed Health Symposium on 12–14 June 2014 in Edinburgh. The symposium provides a unique opportunity to bring together scientists, technicians, managers and policy makers from research institutes, government, the seed trade, and international organisations who are involved with the health status of seed.

The programme will be of a high technical and scientific quality discussing the latest scientific research on seed-borne pathogens; progress in seed health testing; and (both) phytosanitary and practical issues confronting the industry worldwide.

Finally, we hope Edinburgh will provide an ideal environment for scientific exchange and hospitality. We will do all we can to ensure your visit is a pleasant one.

Venue

The 7th Seed Health Symposium will take place from 12 to 14 June 2014 at the National Museum of Scotland, in the heart of Edinburgh and within walking distance of the railway station and local hotels.

Programme

Thursday 12 June 2014 (afternoon)
- Tea/coffee on arrival
- Opening and welcome
- Day 1 Invited speaker
- Session 1

Friday 13 June 2014
- Day 2 Invited speaker
- Sessions 2, 3, 4
- Poster Session
- Evening dinner barbecue at the Caledonian Hall in the Royal Botanic Garden, Edinburgh; coach transport to the dinner in the Botanic Garden will be provided.

Saturday 14 June 2014 (morning)
- Day 3 Invited speaker
- Sessions 4 (cont.), 5
- Closing Session

Papers and posters

Offers of papers are now being requested for the following list of topics:
- Seed health and climate change
- Emerging seed-transmitted diseases
- Novel approaches to the evaluation of seed health
- Test method standardisation and laboratory evaluation
- Seed treatments for conventional and organic seed production
- Seed health and the international movement of seed
- Seed-borne diseases transmission and epidemiology.

Deadline for submission of your paper (abstract) is 31 December 2013.

Offers of papers are to be submitted in the form of an abstract in English of 400 words (maximum). As the number of oral presentations is limited by time constraints, oral presentation of your paper may not be possible, and you may be asked to present your paper as a poster. Papers presented orally and in poster form have equal status. The selection of papers for oral presentation will be by the Scientific Programme Committee.

Please submit your abstract (400 words maximum) using the template available on the web site.

Registration

ISTA Members: GBP 220
Non-members: GBP 255
Students: GBP 75
Exhibitors: GBP 1250

Registration can be made through the ISTA website. Registration includes tea and coffee breaks, lunches, dinner barbecue (Friday evening) and visit to the Royal Botanic Garden.

Sponsors and exhibitors

There are possibilities to sponsor the 7th ISTA Seed Health Symposium, with a variety of sponsoring packages to choose from.

Reach seed health professionals from laboratories and organisations in the UK and worldwide. Only a limited number of exhibition stands are available. The exhibitor registration fee includes one exhibitor for the duration of the Seed Health Symposium as well as coffees, lunches and dinner barbecue.

For detailed information about sponsorship and/or exhibiting, please contact Valerie Cockerell (valerie.cockerell@sasa.gsi.gov.uk).

More information

For more details please visit the ISTA website at ww.seedtest.org/SHS ■

ISTA Annual Meeting 16-19 June 2014

EDINBURGH

ISTA Annual Meeting 2014 Edinburgh, United Kingdom 16–19 June 2014

Overview

Thurs–Fri 2–14 June	7th ISTA Seed Health Symposium (see page 35)
Sunday 15 June	Day tour to Kingdom of Fife (see page 37) Welcome reception
Monday 16 June	Opening ceremony
Monday 16 June	ISTA Sampling Seminar
Tues–Wed 17–18 June	Presentation of ISTA's technical work (see page 38)
Wednesday 18 June	Official Dinner
Thursday 19 June	ISTA Ordinary General Meeting (see page 38)
Friday 20 June	Tour to Royal Highland Show (see page 37) Visit to SASA (morning; see page 37)
To be announced	ISTA Seed Sampling Workshop

Edinburgh's historic street, the Royal Mile, leading from the Castle to Holyrood Palace.

ISTA Annual Meeting 2014, Edinburgh, UK, 12–19 June 2014
Online registration now open: www.seedtest.org/AM14

EDINBURGH

ISTA Annual Meeting

16-19 June 2014

The venue of the ISTA Annual Meeting 2014: the Assembly Rooms in George Street, in Edinburgh's New Town.

Edinburgh Castle, viewed from Princes Street Gardens.

Meeting venue

The meeting will take place in the Assembly Rooms, George Street, in the centre of Edinburgh's World Heritage site. The Assembly Rooms opened in 1787. Throughout its history the venue has catered for balls, music festivals, banquets and Royal Occasions, as well as conferences.

The venue has recently undergone an eighteen month refurbishment resulting in modernised spaces which retain the buildings character and beauty. The venue provides the perfect space for the ISTA Annual Meeting 2014 with state of the art lighting and sound systems throughout and in house audio visual and wireless internet.

Edinburgh

The City of Edinburgh, Scotland's inspiring capital city, is one of the leading cities in the world in which to visit. Explore the fascinating cobbled streets of the medieval old town of this UNESCO World Heritage City and stroll across to the elegant New Town to marvel at James Craig's stunning architecture.

The Botanic Garden offers a wondrous experience in an oasis of plants and trees or visit the Giant Pandas at Edinburgh Zoo. Wherever you choose to visit, the backdrop of Arthur's Seat, the Pentland Hills and Edinburgh Waterfront make the city a unique visitor destination.

For further information on Edinburgh and Scotland please visit:
www.edinburgh-inspiringcapital.com
and
www.visitscotland.com

Flight information

There are direct flights from many European cities to Edinburgh, and Edinburgh is approximately a 1 hour 15 minute flight from London. The taxi fare from the airport to Edinburgh city centre will cost approximately £16 - 20. There is also an airport bus every 10 minutes that heads directly to the city centre which may be a cheaper option at £3.50 depending on the hotel you have chosen. See the link below for Edinburgh airport and up to date information:
http://www.edinburghairport.com/transport-and-directions/travel-into-edinburgh-city

Representatives from SASA will be available at the airport to advise on the best form of transport for you and to try to answer any other questions you may have on arrival (depending on your flight arrival time).

Registration fees (online registration at www.seedtest.org/AM14)

Periods	Events	EARLY registration (up to 28 February 2014)	LATE registration (1 March–15 May 2013)
ISTA Members			
12–18 June	Annual Meeting incl. Seminar	GBP 580	GBP 660
12–17 June	Seminar only	GBP 225	GBP 225
Non-members			
12–18 June	Congress incl. Seminar	GBP 870	GBP 990
12–17 June	Seminar only	GBP 340	GBP 340
Students			
12–17 June	Seminar only	GBP 50	GBP 50
Accompanying persons			
12–18 June	Social events, lunches etc. only	GBP 200	GBP 200
Exhibitors (incl. 1 person)			
12–18 June	Exhibition booth	GBP 3000	GBP 3000

Climate

Edinburgh in June enjoys temperatures in the range of 10–20 °C and the average rainfall for the month is 50 mm. The Scottish weather can be changeable and is often localised. This means you may well have a morning of rain and an afternoon of sunshine, and that the weather may be quite different 10 miles away. So remember to pack your waterproof or an umbrella and something to keep you warm as well as sun cream! The days are at their longest in June, and with 17 hours of daylight there is plenty of time to enjoy your visit.

Currency and exchange

The currency in Scotland is pounds Sterling (£), and the exchange rate is approximately £1 to 1.56 USD or £1 to 1.18 Euros.

The Ballroom at the Edinburgh Assembly Rooms.

Visas

Visitors are advised to check with the UK Border Agency for visa requirements. A letter of invitation can be requested upon successful registration and payment from the ISTA Secretariat.

Accommodation

A variety of accommodation is available in central Edinburgh from student accommodation to 4 star hotel accommodation. Marketing Edinburgh has negotiated rates for the International Seed Testing Association Annual Meeting 2014 and the 7th ISTA Seed Health Symposium) and is pleased to offer a free online accommodation booking service to delegates attending this meeting.

To view and book the various accommodation options please use the link below: https://cabs.conventionedinburgh.com/ei/

Credit card details are required to make a booking, and confirmation shall be sent to your e-mail address. Payment is paid directly to the accommodation provider at the time of your stay.

To contact Marketing Edinburgh, either e-mail: bookings@conventionedinburgh.com or telephone on +44 (0) 131 473 3874.

Please note that there is no organised transport from the hotels to the ISTA Meeting venue. There is an excellent public transport system if you do not wish to walk. Directions to the ISTA Meeting venue and details of suitable public transport from your hotel will be waiting for you in your room (if booked through the above link).

Book early as accommodation in Edinburgh is very popular during the summer months!

Tours and visits

If there is sufficient interest we will organise one or more of the visits below. Costs given are approximate and will be confirmed should the visit go ahead.

Visit the Kingdom of Fife!

Sunday 15 June 2014 (full day 09:00 to 18:00)

Stopping at South Queensferry to view the Forth Railway Bridge, then follow the coastal route through picturesque old fishing villages in the East Neuk to the Medieval City of St. Andrews, home of golf. Enjoy free time and lunch in St. Andrews. Finally, the tour will head to the village of Falkland, home of James V's renaissance palace, before heading back to Edinburgh.

Cost £ 35–40 (includes entrance to Falkland Palace, excludes lunch).

Visit to the Royal Highland Show

Friday 20 June 2014 (full day 09:30 to 16:30)

This agricultural show has a worldwide reputation for showcasing the very best of Scottish food, farming and culture.

Cost: £35 estimate; prices not confirmed for show (includes entry to show and bus to and from central Edinburgh).

Visit to Science and Advice for Scottish Agriculture

Friday 20 June 2014 (morning)
Cost: free

Please note your interest by e-mailing Valerie Cockerell with your name, e-mail address and which visit or tour you are interested in before 15 February 2014.
valerie.cockerell@sasa.gsi.gov.uk

EDINBURGH

ISTA Annual Meeting

16-19 June 2014

Preliminary programme

Venue: Assembly Rooms, George Street, Edinburgh

Unless otherwise stated, all activities mentioned in the programme will be held at the venue

Sunday, 15 June 2014

16:00–19:00	Registration of participants at conference venue
19:00	**Welcome reception**

Monday, 16 June 2014

08:00–18:00	Registration of participants at conference venue
08:30–18:00	**ISTA Sampling Seminar**

Tuesday, 17 June 2014

08:00–18:00	Registration of participants at conference venue
08:30–18:30	**Presentations of ISTA's technical work and meetings of ISTA Technical Committees**
08:30	Opening by the ISTA President, Joël Léchappé (France)
08:30–10:00	Purity Committee (Chair: Jane Taylor) Germination Committee (Chair: Sylvie Ducournau) Moisture Committee (Chair: Jette Nydam)
10:00–10:30	Coffee break
10:30–12:30	Tetrazolium Committee (Chair: Stefanie Krämer) Seed Vigour Committee (Chair: Alison Powell) Seed Health Committee (Chair: Valérie Grimault) Variety Committee (Chair: Ana Laura Vicario)
12:30–13:30	Lunch break
13:30–14:00	GMO Committee (Chair: Cheryl Dollard)
14:00–15:00	Flower Seed Committee (Chair: Rita Zecchinelli) Forest Tree & Shrub Seed Committee (Chair: Fabio Gorian)
15:00–15:30	SST Editorial Board (Chair: Fiona Hay)
15:30–16:00	Coffee break and official photo session
16:00–18:30	Individual ISTA Technical Committee meetings

Wednesday, 18 June 2014

08:00–17:00	**Presentations of ISTA's technical work (cont.)**
08:30	Opening by the ISTA President, Joël Léchappé (France)
08:30–10:00	Bulking and Sampling Committee (Chair: Eddie Goldschagg) Statistics Committee (Chair: Jean-Louis Laffont) Nomenclature Committee (Chair: John Wiersema)
10:00–10:30	Coffee break
10:30–11:30	Seed Storage Committee Chair: (Hugh Pritchard) Advanced Technologies Committee (Chair: Bert van Duijn)
11:30–12:30	Proficiency Test Committee Chair: (Günter Müller) Laboratory Accreditation and Quality Assurance Programme (Chair: Rasha El-Khadem)
12:40–13:30	Lunch break
13:30–15:30	Rules Committee (Chair: Steve Jones)
15:30–16:00	Coffee break
16:00–18:00	Rules Committee (cont.) (Chair: Steve Jones)
19:00–23:00	**Official Dinner**

Thursday, 19 June 2014

09:00–17:30	**ISTA Ordinary General Meeting**
09:00–09:30	**Welcome by the ISTA President, Joël Léchappé**
09:30–10:00	**Presentation on the development of the seed industry in Scotland**
10:30–12:30	1. Call to order 2. President's address 3. Roll call of Designated Members entitled to vote 4. Comments about the minutes of the previous General Meeting 5. Report of the Executive Committee 6. Report of the Secretary General
12:30–13:30	Lunch break
13:30–15:00	7. Changes to the Articles 8. Fixation of annual subscriptions 9. Consideration and adoption of the proposed Rules changes 2015
15:00–15:30	Coffee break
15:30–17:30	10. Consideration and adoption of reports 11. Announcement of the place and date of the next Ordinary General Meetings 11.1 Annual Meeting 2015 11.2 Congress and Seed Symposium 2016 12. Any other business raised by a Member, of which notice in writing has been received by the Secretary General at least two months prior to the date of the General Meeting 13. Any other business raised by consent of the Executive Committee 14. President's closing address 15. Adjournment

Moisture Committee welcomes new members

Jette Nydam
Chair, ISTA Moisture Committee

Nordic Genetic Resource Center
SE-230 53 Alnarp, Sweden
jette.nydam.hansen@nordgen.org

The Moisture committee has some vacancies for new active members. The Committee has had several requests for new topics to be dealt with, especially on developing moisture methods for new species. The following species are on our wish list: *Cleome hassleriana, Carica papaya* and *Jatropha curcas*. The list is not exclusive; you may have one of your own, with, for you, more important species.

So if you are missing a method for moisture determination in a species not covered by the ISTA Rules, we invite you to assist us to develop the method. We have protocols for how to test new species for moisture methods; what we need is a test leader and participating laboratories (preferably with ISTA accreditation for moisture determination). For some of the species the Moisture Committee can assist in finding seed lots, and maybe also participating laboratories. Some laboratories are willing to assist, even if a species is not relevant for their scope.

So if you want new species, or changes to the methods of existing species, contact the Chair of the Moisture Committee, Jette Nydam or the TCOM Coordinator Nadine Ettel at the ISTA Secretariat, and tell us what you can offer. ■

ISTA membership changes

Status 31 August 2013

New Member Laboratories

Brazil BRML1100/ BRML1101

Laboratory representative: Rosinha Mesquita
National Agricultural Laboratory, Official Seed Testing Laboratory
Av. Farrapos, 285
Porto Alegre RS 90220-004
Phone/Fax: +55 51 3286 6399
E-mail: rosinha.mesquita@agricultura.gov.br

China CNML0600/CNML0601

Laboratory representative: Dr. Xinmiao Liang
Beijing Inspection and Quarantine Testing Center
No. 6 Tianshuiyuan Street, Chaoyang District
Beijing, 100026
Phone: +86 1058819239
Fax: +86 1065853718
E-mail: liangxm@bjciq.gov.cn

India INML3300/INML3301

Laboratory representative: Madhuri Devi Karlapudi
Dhaanya Seeds Limited, Seed Quality Assurance Survey No. 25
Gundlapocham Pally (Village), Medchal Road
Hyderabad, 501401
Phone: +91 91 7777 1804
Fax: +91 22 3916 7446
E-mail: madhuri.devi@meta-helix.com

Sudan SDML0100/SDML0101

Laboratory representative: Mona Jaber
Khartoum Central Seed Testing Laboratory
Ministry of Agriculture and Irrigation
National Seed Administration
Al Jammaa Street
Khartoum, 285
Phone: +249 01 55 10 68 47
Fax: +249 01 55 10 68 47
E-mail: mohamed121979@yahoo.com

Ukraine UAML0500/UAML0501

Laboratory representative: Viktor Borysov
Mais Novomoskovsk Laboratory, SPFE Company "Mais", Quality Test Department
12 Turgeneva Str.
Novomoskovsk, 51200
Phone: +380 5663 222 14
Fax: +380 5663 222 14
E-mail: v.borysov@maize.com.ua

New Personal Members

Estonia EEDM0001

Dr. Margus Friedenthal
Agricultural Research Centre
Estonian Seed Testing Laboratory
Teaduse 4/6, Harjumaa
75501 Saku
Phone: +372 672 9172
Fax: +372 672 9149
E-mail: margus.friedenthal@pmk.agri.ee

France FRDM0012

Dr. Sylvie Ducournau
GEVES-SNES
Station Nationale d'Essais de Semences
Rue Georges Morel, P.O. Box 90024
49071 Beaucouzé CEDEX
Phone: +33 2 41 22 58 00
Fax: +33 2 41 22 58 01
E-mail: sylvie.ducournau@geves.fr

Separate Customs Territory of Taiwan, Penghu, Kinmen and Matsu TWDM0003

Dr. Tso-Chi Yang
Taiwan Seed Improvement and Propagation Station, Council of Agriculture
46 Singjhong St., Sinshe
Taichung, 42642
Phone: +886 42 58 25 402
Fax: +886 42 58 10 261
E-mail: tcyang@tss.gov.tw

Thailand THPM0006

Wicharn Taengtum
Bureau of Rice Seed, Rice Department, Ministry of Agriculture and Cooperatives
Chatuchak
10900 Bangkok
Phone: +66 2 561 4133/3960
Fax: +66 2 561 4229
E-mail: spcg@ricethailand.go.th

New Associate Members

Argentina ARAM0002

Liliana Ferrari
Univ. Nacional de Lomas de Zamora
Facultad de Ciencias Agrarias
Ruta Prov No 4, Km 2
Llavallol, Buenos Aires, 1836
Phone: +54 11 4282 7905
E-mail: calilianaferrari@gmail.com

Belgium BEAM0001

Mr. Karel De Rudder
Bayer CropScience NV, Seeds Stewardship
Technologiepark 38
9052 Zwijnaarde (Gent)
Phone: +32 9 335 23 31
Fax: +32 9 224 06 94
E-mail: karel.derudder@bayer.com

France FRAM0011

Mr. Nicolas Ponserre
GNIS, Service Documentation
44, rue du Louvre
75001 Paris
Phone: +33 1 42337844
Fax: +33 1 40284016
E-mail: nicolas.ponserre@gnis.fr

Philippines PHAM0003

Dr. Lingyu Zhang
Pioneer Hi-Bred International
Production
Pioneer Hi-Bred Philippines
Luisita Industrial Park
San Miguel
2301 Tarlac City
Phone: +639175920920
E-mail: lingyu.zhang@pioneer.com

Switzerland CHAM0007

Dr. Francesco Dell'Endice
QualySense AG, c/o EMPA
Überlandstrasse 129
8600 Dübendorf
Phone: +41 44 824 35 80
E-mail: francesco.dellendice@qualysense.com

United States of America USAM0024

Deborah J. Meyer
California Department of Food and Agriculture (CDFA), Plant Pest Diagnostics Center
3294 Meadowview Road
Sacramento, California, 95832-1448
Phone: +1 916 2621137
Fax: +1 916 2621190
E-mail: deborah.meyer@cdfa.ca.gov

Laboratory cancellations and terminations

Bosnia and Herzegovina BADL0100/BADL0101

Laboratory representative: Zeljka Kremenovic
Agri. Inst. of Republika Srpska, Laboratory for Seed Testing
Knjaza Milosa 17
Banja Luka, 78000
Phone: +387 51 303 112
E-mail: polj.institut.bl@blic.net

India INML2100/INML2101

Laboratory representative: Iftekhar Ulla Sardar Mohammed
Karnataka State Seed Certification Agency
Director of Seed Certification
KAIC Compounds, Opp.Baptist Hospital,
Canara Bank, Bellary Road, Hebbal
Bangalore, 560 024
Phone: +91 80 234 155 05
E-mail: saradarif@yahoo.co.in

India INML2800/INML2801

Laboratory representative: Rita Pawade-Tonge
Yashoda Hybrid Seeds Pvt. Ltd Hinganghat
Seed Testing Laboratory, Quality Control
248 Near Laxmi Talkies Dist. Wardha
Hinganghat, 442301
Phone: +91 94 2290 3931
E-mail: ritatonge@gmail.com

Netherlands NLML0700/NLML0701

Laboratory representative: Dr. Henk Burg
Monsanto Holland B.V., Germination Laboratory Enkhuizen, Quality Assurance
P.O. Box 22
1600 AA Enkhuizen
Phone: +31 228 357794
E-mail: Henk.Burg@seminis.com

Tajikistan TJML0100/TJML0101

Laboratory representative: Favzia Gulomalishoeva
Republican Seed Inspectorate, Central Seed Laboratory
Mirzobek set. 1
734063 Dushanbe
Phone: +992 37 225 8249
E-mail: bahromiddin@gmail.com; favziya02@mail.ru

Other membership cancellations

Egypt EGDM0001

Prof. Dr. Olfat H. El Bagoury
Central Administration for Seed Certification (CASC), Giza Seed Testing Station
8 Gamaa Street, P.O. Box 237
Rabee EL Gezee-Giza, 12211
Phone: +20 10 1429421
E-mail: olfatelbagoury@hotmail.com

Mexico MXAM0002

Ms. Carmen Avila
Agricola Nuevo Sendero Laboratory
Paseo San Pedro 264, Fraco. San Carlos
Metepec, Mex., 52140
Phone: +52 722 216 25 92
E-mail: cavila@asprossemillas.com

Rwanda RWAM0001

Mr. Jason Manto
One Acre Fund, Seed Department
B.P. 6640
Kigali
Phone: +250 783775634
E-mail: jason.manto@gmail.com

United Kingdom GBPM0003

Mr. Giles Laverack
Scotia Seeds
Mavisbank, Farnell, Brechin
Angus, Scotland, DD9 6TR
Phone: +44 1356 62 6425
E-mail: scotiaseeds@btconnect.com

Radicle emergence test: physiological basis and development guidelines for new species

Alison Powell[1] and Stan Matthews[2]

[1]ISTA Honorary Life Member and Chair, ISTA Vigour Committee; [2]Member, ISTA Vigour Committee

School of Biological Sciences
University of Aberdeen
Aberdeen, AB24 3UU, UK
a.a.powell@abdn.ac.uk

The Vigour Committee is frequently asked what would be an appropriate vigour test for a species for which no test is currently validated or recommended. Evidence is now available that indicates that the radicle emergence (RE) test, currently validated for maize, could be developed for a very wide range of species. There is, however, a limit to the number of species that can be worked on at any one time by the Vigour Committee. This article aims (1) to summarise the physiological basis of the RE test and present the evidence for its application as a vigour test in a range of species, and (2) to present guidelines for the development of the RE test for additional species.

Physiological basis of the RE test and its use in vigour testing

The basis of the RE test is the germination progress curve (Figure 1). This illustrates the proportion of seeds that have produced a radicle at different times during the germination test and hence illustrates the rate of germination (radicle emergence). The germination progress curve or rate of germination can be described in a number of ways, including the calculation of the mean germination time (MGT) using the data from every radicle emergence count. Thus a lot such as lot A (Figure 1) will have a low MGT (rapid germination) compared to lot E (high MGT, slow germination). The rates of germination of the lots can also be compared by single counts of radicle emergence made at one appropriate time during germination, for example at 66 h in Figure 1. Significant R^2 values between single counts of RE and MGT for maize, cotton, watermelon, melon, cucumber, radish and viola (Matthews and Powell, 2011) have illustrated that single counts of RE are predictive of the rate of germination calculated from germination counts over the whole germination progress curve. Furthermore, the R^2 values between a single RE count and both the rate of emergence and final emergence (i.e. vigour) of eight species were highly significant in six out of seven species for rate, and seven out of eight species for emergence (Table 1). This evidence supports the proposal that the RE test can be applied to reveal vigour differences in many species.

The explanation for why the radicle emergence vigour test can be applied to a wide range of species lies in the seed ageing/repair hypothesis (Matthews *et al.*, 2012), which can provide an explanation for all existing vigour tests (Powell and Matthews, 2012; Matthews *et al.*, 2013). Seed ageing as a result of deterioration is the main cause of reduced vigour in most species. Aged seeds germinate more slowly, as shown by the significant R^2 values for the relationship between MGT and the extent of ageing (revealed by the results of accelerated ageing and controlled deterioration tests) in lots of eight species (Table 1). The slower germination of aged seeds is due to an increase in the length of the lag period before radicle emergence (RE) occurs in aged seeds. The deteriorated lot E (Fig 1) has a much longer lag period than lot A, as more time is needed to repair damage resulting from deterioration before radicle emergence can take place.

In summary, ageing is the major cause of reduced vigour, aged seeds germinate more slowly, and there is evidence that the RE test applies to a range of species. There is clearly potential for the test to be developed for other species and there are two ways in which individual laboratories could develop the test for themselves.

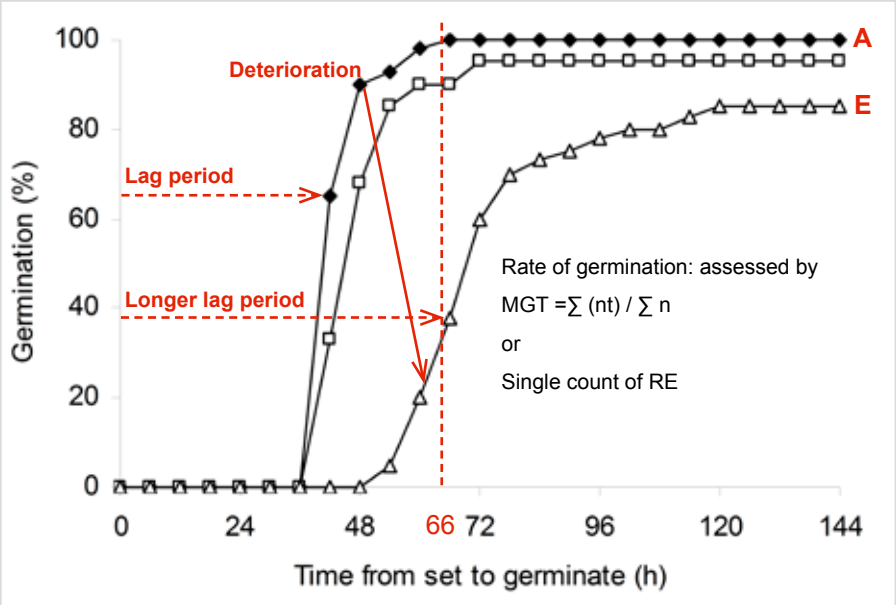


Figure 1. Germination progress curves at 20 °C for three commercial seed lots of maize differing in vigour and field emergence. The vertical line at 66 h indicates the appropriate time for a single count of germination (radicle emergence). The mean germination time (MGT) is calculated from the number of newly germinated seeds (n) at the time of counting (t) from which the seeds were set to germinate.

Guidelines for RE test development for additional species

Approach 1

1. Test development should always use commercial seed lots, with a high germination (normal seedlings) in the standard germination test. It is advisable to use 9 – 12 seed lots in the development work. If it is possible, select lots that you think may show vigour differences due to their prior history or your observations during previous testing e.g. if you have observed differences in rate of germination from the early normal seedling count and there is a range in normal germination above the accepted minimum standard.
2. Complete the standard germination test for each lot, using both the recommended temperature and one that is a few degrees below that recommended. The reason for using two temperatures is that a lower temperature will slow down the rate of germination, particularly in the low vigour lots. This will enhance the differences between high and low vigour seed lots and can make it easier to identify a time when the seed lots differ in their radicle emergence. You will have to judge how much you lower the germination temperature, depending on the species you are testing. It may be up to 5–7 °C lower. You will need to use a germination test method that enables radicle emergence to be observed, e.g. not in sand.

   During the germination test, count radicle emergence frequently, particularly during the early stages of germination. Make sure that you clearly define, and consistently use, what you regard as radicle emergence, e.g. first appearance of the radicle through the seed coat or production of a radicle at least 2 mm long.
3. Draw the germination progress curves based on your germination data. Select a time that reveals differences between the seed lots. No lots should have 0% germination at the time you select.
4. The time you have selected reveals differences between the seed lots, but you must establish that it also relates to seed vigour, either in terms of emergence, or storage potential. To do this, select 6 lots from the original 9–12 that show clear differences in RE. Use these lots to:

a) Test emergence in the field, modules or soil trays.

If possible, try to test field emergence in less than ideal conditions, or if using soil trays, impose a high soil moisture and/or low temperature. Assess rate of emergence by frequent emergence counts as well as final emergence. Rate of emergence is particularly significant where seedling size and its variation is a significant aspect of production (e.g. of vegetable seedlings) or if early establishment of a complete canopy is important. Even if field conditions do not influence final emergence, the rate of emergence may show differences.

Or

b) Carry out a storage experiment to compare seed storage potential.

Seeds could be stored in a commercial store for 1 year or longer; alternatively adverse storage conditions could be applied by storing seeds at raised moisture content and temperature. Test germination at intervals during the storage period.

5. Once you have emergence and/or storage data, you can test the relationship between the RE test results and the vigour of the seed lots.

Approach 2

This approach can be used if you already have emergence data for seed lots that have caused problems in the field. This approach is not suitable for comparing with seed lot storage potential as the initial condition of the lots before storage cannot be tested.

1. Use data from only 9–12 lots, which, in this case you know have contrasting field data. There must not be a prolonged period of time between the field observations and testing the lots for vigour.
2. Run a standard germination test on the seed lots, as described in point 2 above. Identify times when their RE values differ.
3. Compare the RE at different times to the emergence data from the field or glasshouse.

Table 1. R^2 values between mean germination time and rate of emergence, final emergence and germination after accelerated ageing (AA) or controlled deterioration (CD) tests for seed lots of eight species. Numbers in parentheses indicate the number of seed lots from which the data was calculated.

Species (lots)	Rate of emergence	Final emergence (%)	Germination (%) after AA or CD test
Oil seed rape (9)	0.93	0.75	0.85
Cotton (13)	–	0.83	0.83
Maize (9)	0.62	0.72	0.63
Pepper (11)	0.94	0.45 (modules)*	0.95
Watermelon (10)	0.83	0.81	0.90
Melon (10)	0.74	0.70	0.57
Cucumber (9)	0.76	0.64	0.88
Viola (9)	0.91	0.92	0.91

*Emergence in modules is achieved under glasshouse conditions, and hence differences in vigour are most commonly reflected in the rate of emergence, seedling size and variation. Differences in final emergence are often small.

Concluding comments

The steps described above that allow individual laboratories to work on test development for new species are only guidelines. They are basically the steps that the Vigour Committee has followed in working with a number of species. However, progress is not always smooth, as we know very well, and answers may not be gained straight away. It may be that the seed lots you use are not clearly different in vigour; you may not select a suitable 'reduced temperature'; the emergence experiments may not show differences or fail due to weather (or mice!!). There are many reasons why you may have to select new seed lots, or start again using different test conditions. Unfortunately test development for a new species is not always straightforward and if one attempt at determining an appropriate time for the test does not work, this does not mean that the test does not work! Persistence and patience is needed!

References

Matthews, S., Noli, E., Demir, I., Khajeh-Hosseini, M. and Wagner, M.-H. (2012). Evaluation of seed quality: from physiology to international standardisation. *Seed Science Research*, **22**, S69–S73.

Matthews, S., Wagner, M.-H., Kerr, L., McLaren, G., Powell, A. A. and Waterworth, W. (2013). Ageing and repair provide a physiological explanation for seed quality differences in oilseed rape and other species, as revealed in the laboratory and the field. In *Seed Symposium Abstracts* pp. 25. 30th ISTA Congress, Antalya, Turkey, 2013. International Seed Testing Association, Zurich.

Matthews, S. and Powell, A. A. (2011). Towards automated single counts of radicle emergence to predict seed and seedling vigour. *Seed Testing International*, **142**, 44–48.

Powell, A. A. and Matthews, S. (2012). Seed ageing/repair hypothesis leads to new testing methods. *Seed Technology*, **34**, 15–25.

Seed Health Committee Official Method Review 2012

T. A. S. Aveling
Vice-Chair, ISTA Seed Health Committee

University of Pretoria
Department of Microbiology and Plant Pathology
Pretoria, South Africa
Terry.aveling@fabi.up.ac.za

The Seed Health Method Validation Programme requires that methods approved as Official Methods should be reviewed every 5 years to ensure their continuing effectiveness and suitability. Official Seed Health Testing Methods are found in the International Rules for Seed Testing 2012, Annexe to Chapter 7, Seed Health Testing Methods. There are 11 ISTA Official Seed Health Testing Methods that were approved in 2002 and 2007 (Table 1) and were therefore due for review in 2012. As part of the review process a questionnaire (appendix 1) was sent to all ISTA Member Laboratories and a copy was posted on the ISTA web site for other interested bodies to respond.

Report on the 2012 Review Questionnaire

Table 1 reports the 11 Seed Health Methods reviewed in 2012.

Replies to the 2012 method review questionnaire

Twenty-one laboratories from 16 countries answered the 2012 review questionnaire (Table 2).

7-001a (Blotter)

Nine laboratories found the method fit for purpose.

The following comments were made by two laboratories:

1. NUV should be regarded and explicitly mentioned as a CCP.
2. From our point of view we could abolish the deep freezing, we do not prefer this as seedlings do not grow that quick during the test. Filter paper dries out and must be rewetted.

7-001b (Malt agar)

Seven laboratories found the method fit for purpose.

The following comment was made:

1. CCP- Page 4: "The malt agar source can influence the results. Whenever a new batch of malt agar is used a check on the quality should be made using a reference lot with a known infection level" or a reference culture. HIGH PRIORITY.

Table 1. The 11 ISTA Official Seed Health Testing Methods to be reviewed in 2012 and further improvements to methods after the 2007 review

Method No.	Pathogen	Host	Actions taken since last review
7-001a (Blotter)	*Alternaria dauci*	*Daucus carota*	
7-001b (Malt agar)	*Alternaria dauci*	*Daucus carota*	Streptomycin added to Rules 2013
7-002 a (Blotter)	*Alternaria radicina*	*Daucus carota*	
7-002b (Malt agar)	*Alternaria radicina*	*Daucus carota*	Streptomycin added to Rules 2013
7-015	*Neotyphodium* spp.	*Festuca* and *Lolium* spp.	
7-016	Phomopsis complex	*Glycine max*	
7-017	*Alternaria linicola*	*Linum usitatissimum*	New method to be voted in June 2013 to align methods 7-007, 7-017 &7-018.
7-018	*Colletotrichum lini*	*Linum usitatissimum*	New method to be voted in June 2013 to align methods 7-007, 7-017 &7-018.
7-022	*Microdochium nivale*	*Triticum* spp.	Not applicable, first review
7-023	*Pseudomonas savastanoi* pv. *phaseolicola*	*Phaseolus vulgaris*	Not applicable, first review
7-024	Pea Early-Browning Virus and Pea Seed-borne Mosaic Virus	*Pisum sativum*	Not applicable, first review

Table 2. Number of respondent laboratories using individual methods and whether they consider them fit for purpose

Method	Pathogen/host	No. of laboratories using method	Fit for purpose?	
			Yes	No
7-001a (Blotter)	*Alternaria dauci/ Daucus carota*	9	9	0
7-001b (Malt agar)	*Alternaria dauci/ Daucus carota*	7	7	0
7-002 a (Blotter)	*Alternaria radicina/ Daucus carota*	9	9	0
7-002b (Malt agar)	*Alternaria radicina/ Daucus carota*	8	8	0
7-015	*Neotyphodium* spp./ *Festuca* and *Lolium* spp.	2	2	0
7-016	*Phomopsis* complex/ *Glycine max*	8	8	0
7-017	*Alternaria linicola/ Linum usitatissimum*	10	9	1
7-018	*Colletotrichum lini/ Linum usitatissimum*	10	9	1
7-022	*Microdochium nivale/ Triticum* spp.	6	4	2
7-023	*Pseudomonas savastanoi* pv. *phaseolicola/ Phaseolus vulgaris*	3	2	1
7-024	Pea Early-Browning Virus and Pea Seed-borne Mosaic Virus/ *Pisum sativum*	3	3	0

7-002 a (Blotter)

Nine laboratories found the method fit for purpose.

The following comments were made by two laboratories:

1. NUV should be regarded and explicitly mentioned as a CCP
2. From our point of view we could abolish the deep freezing, we do not prefer this as seedlings do not grow that quick during the test. Filter paper dries out and must be rewetted.

7-002b (Malt agar)

Eight laboratories found the method fit for purpose.

The following comments were made by one laboratory:

1. CCP- Page 4: "The malt agar source can influence the results. Whenever a new batch of malt agar is used a check on the quality should be made using a reference lot with a known infection level" or a reference culture.
2. A better photograph of the spores should be included. HIGH PRIORITY.

7-015

Two laboratories found the method fit for purpose.

7-016

Eight laboratories found the method fit for purpose.

The following comments were made by three laboratories:

1. Due to sensitivity – to place 5 seeds in 1 Petri dish instead of 10 seeds. LOW PRIORITY.
2. Often a mixed culture is obtained – is there a more specific selective medium known?
3. More obviously for observing (Make it easier to observe? added by Editor). Because the morphology of the colonies on the medium sometimes is not easy to identify, especially when the pycnidia reproduce late. LOW PRIORITY.

7-017

Nine laboratories found the method fit for purpose.

One laboratory found the method not fit for purpose stating that:

1. 7-017 and 7-018 New method to align methods 7-007, 7-017 & 7-018 to be introduced 2013.

The following comment was made by one laboratory:

1. Combine with 7-018.

7-018

Nine laboratories found the method fit for purpose.

One laboratory found the method not fit for purpose stating that:

1. 7-017 and 7-018 New method to align methods 7-007, 7-017 & 7-018 to be introduced 2013.

The following comment was made by one laboratory:

1. Combine with 7-017.

7-022

Four laboratories found the method fit for purpose.

Two laboratories found the method not fit for purpose stating that:

1. Nomenclature should be updated: The current name of *Microdochium nivale* is *Monographella nivalis* (Index Fungorum].
2. Time of pretreatment should be reduced; at 10 min a lot of spores and hyphae of *M. nivale* on seed surfaces are killed. 30 sec are sufficient.
3. Incubation temperature should be reduced to 15 °C; at 20 °C a lot of other *Fusarium* species are growing too.
4. Page 07-022-8. Colonies of *M. nivale* should be indicated e.g. by arrows

because there are other colonies of *Fusarium* spp.
5. Additional pictures of spores would be helpful.
6. It is not possible to differentiate *Microdochium nivale* from *Microdochium majus* with just morphological criteria; PCR is needed. HIGH PRIORITY.

7-023

Two laboratories found the method fit for purpose.

One laboratory found the method not fit for purpose stating that:

1. Specification for maximum number of saprophytes in CFU! Beyond this limit no valid results. In theory and in practice Psp will not be detected in samples with a high saprophyte background. HIGH PRIORITY.
2. Option for molecular characterisation of suspected colonies of target bacterium should be added. LOW PRIORITY.
3. More laboratories go into direct or bioPCR applications in which Psp will be detected in saprophyte rich samples. HIGH PRIORITY.

7-024

Three laboratories found the method fit for purpose.

To the question: 'is there a need to respond to a technological change in one or more methods? If yes explain in a few words.', 14 responded 'No'.

Comments from four laboratories:

1. In method 7-016, we found that the pycnidia of *Phomopsis* reproduced later than that described in the method, but we are not sure what is wrong in our operation. We are going to keep trying to find the mistake.
2. Forward PCR methods in seed health.
3. 7-022: It is not possible to differentiate *Microdochium nivale* from *Microdochium majus* with just morphological criteria; PCR is needed.
4. In some publications recommended to use 2,4D salt to prevent germination of dicotyledons during the incubation period in the agar test. Can we use this salt in methods 7-001b, 7-002b, 7-016, 7-017 and 7-018?

SHC does not recommend the use of 2-4D as it is a hazardous chemical. Deep freeze would be preferred for blotter methods. For media methods, germination of seeds does not affect recognition of fungi.

To the question: 'most methods are not validated for use on treated seed. Do you have a need to test treated seeds for these pathogens? If yes please give brief explanation.', Nine laboratories responded 'No'.

Comments from other laboratories:

1. Yes for treated seeds with chemical and disinfested seeds
2. Yes. We do have a need to test treated carrot seeds and then we add to the result's report the following remark: "Seed treatments may affect the performance of this test and hence the reliability of the results".
3. YES. There are some cases that seed companies asked me to test whether chemical treatment for seeds is effective or not against fungi and/or bacteria.
4. Most methods have not been validated for determination of fungi on treated seeds. Test results may be influenced by treatment applied to the seed lots. Seed health tests on treated seeds will generally deliver unreliable test results caused by masking or inhibition of the target organism growth. In Iran some of the seed samples which are submitted to the seed health lab are subjected with chemical substances. Our need is to test these treated seeds by methods which will be reliable, accurate, easy and fast specially for cereals which we done in our lab.
5. Yes, sometimes we receive treated *Linum* seeds that need to be examined.
6. Yes, customer request for testing to be carried out on treated seed for linseed disease testing for UK Certification purposes.
7. No not yet but this may be a possibility in the future.
8. Sometimes our clients ask for seed health testing on treated seeds to evaluate the efficiency of treatment.
9. Yes, because this seeds Treated with control material and the control material is disable so we most make pathogenic tests.
10. First it is clear to differentiate between chemical treatment and methods like maybe hot water treatment – I think you are talking about chemical. You have the cases that seed is already treated and customers are interested in proof of the efficiency – but in many seed health tests you will have to remove the treatment, then this does not give the result that would be of interest. This is a question of the correct application of the right chemical and is maybe to be solved by other methods. Is it worth to do all that validation work for – how many samples? Is there high need from our customers. Our opinion was more no than yes to validate and establish separate methods for treated seeds.

Seed Health Committee proposals

As a result of the review and in particular comments received via the Questionnaires the SHC makes the following proposals for each Method.

Method 7-001a (Blotter) *Alternaria dauci/ Daucus carota*

1. Accept Method with new review date (2017).

Method 7-001b (Malt agar) *Alternaria dauci/ Daucus carota*

1. Accept Method with new review date (2017).
2. Use of reference culture adopted during June 2013 votes

(Continued on page 47)

ISTA Rules go electronic

Steve Jones[1] and Jonathan Taylor[2]

[1]Member, ISTA Executive Committee and Chair, ISTA Rules Committee; [2]ISTA Publications Unit

ISTA Secretariat
8303 Bassersdorf
Switzerland
jonathan.taylor@ista.ch

Since the International Rules for Seed Testing were first adopted in 1931, they have appeared in several different forms. Originally, they were published as Meeting proceedings or supplements to the ISTA scientific journal Seed Science and Technology, and were updated only every three years. From 2002 onwards, changes to the Rules were implemented every year, and therefore they were supplied as ring binders with exchangeable pages, allowing updating to be more economical. And so, for the past decade or so, each year Member Laboratories and Personal Members have received a packet of new Rules pages to insert into their Rules binders.

This is now to change.

Starting with the 2014 edition, ISTA will have 19 chapters of the Rules with fully integrated rules and annexes available to the membership as an electronic, downloadable, printable PDF copy. Fully searchable, so if you are not sure where it mentions a particular species in the Rules, you can now find it easily. Electronic versions of the Seed Health Methods have already been available for free download for several years, and the ISTA seed lot and sample weights in Table 2A are now also available for free download from the ISTA web site.

However, up to now, electronic versions of the complete Rules have only been available for internal use for TCOM Chairs and auditors. Now, as part of the membership benefits, the electronic Rules will be available for all Member Laboratories and Personal Members, reformatted and in more than one language.

There is a cost to ISTA in doing this; therefore, to offset the costs, the Rules will no longer be routinely printed and distributed to the membership. The 2014 edition will be completely updated, and 'Effective from dates' will be re-set to 1 January 2014. This change is timely as there are many changes needed throughout the new 2014 Edition following, for example, the ISTA Stabilized List changes approved at the June 2013 meeting, the changes to Chapter 8, and the inclusion of the new Chapter 19: Testing for Seeds of Genetically Modified Organisms.

First, here is an overview of the improvements and advantages, and how users will get access to the new electronic Rules.

Access to the electronic Rules

This is, of course, not the first time that ISTA has made use of the Web for distributing documents. As part of their membership, Member Laboratories and Personal Members already receive an online subscription to SST, which is handled by the web hosting service IngentaConnect.

The ISTA Rules will be made available in exactly the same way. Members must first register as users with IngentaConnect, if they have not already done so as SST subscribers. After registration, they can request activation of their online access to the Rules by stating their ISTA membership code. When their request has been verified, they will have full access to the electronic Rules, for opening, printing and downloading, using the program Adobe Reader, which is freely available for download at www.adobe.com.

Member Laboratories can register as an institution. This gives all staff members access to the Rules.

The Rules will have an International Standard Serial Number (ISSN). In principle, the ISTA Rules will become an ISTA periodical, like SST, but an annual one.

But what benefits will there be for Members?

Individual Rules chapters

The electronic Rules will be available not only as one complete document, but also as individual chapters, complete with their own Tables of Contents. Individual chapters may be more convenient for some users, being smaller and easier to navigate. They may also allow more reliable downloads if Internet connections are poor.

Languages

The PDF files of the Rules will actually contain all three versions currently available: English, French and German. These can be quickly and easily selected by the user, at any point in the Rules. It will thus be easy to compare a translation with the official English original, if something is not clear. Details how to select the languages will be provided in the PDF files themselves and on the ISTA web site.

Annual Rules changes in the electronic edition

The changes to the Rules adopted at the annual Ordinary General Meetings will be marked by yellow backgrounds and so-called Sticky Notes or comments, describing the change. Both the yellow backgrounds and Sticky Notes can be switched off.

Each year, complete new chapters and files will be provided, so no more ring binders to update with new pages, and no more potential for errors.

Direct access to pages and sections

Users can jump directly to individual pages and numbered sections, using the thumbnail and bookmark features. The Table of Contents also gives direct access to numbered sections.

At a later stage, cross references to other numbered sections, within and across chapters, will be connected with hyperlinks.

Printing and copying files

Following the principle of fair use, users may make printed copies of the Rules for personal use, and may also make multiple copies of the Rules PDF files for use on multiple devices (office and home workstations, laptops, tablets etc.) for personal use and as backups.

Laboratory staff of Member Laboratories may likewise make printed copies and multiple file copies on multiple devices, for

use both on and off the laboratory premises. This means that those Member Laboratories which previously purchased additional sets of Rules will no longer need to do so, thus reducing costs.

Purchasing the electronic Rules

As with individual articles of SST, non-members will be able to purchase the Rules PDF files online and download them. The prices of the individual chapters will be proportional to their numbers of pages.

Associate Members, who like other Members may purchase ISTA publications at a 50% discount, should contact Publications Sales at the ISTA Secretariat.

Support and contact

The ISTA Executive Committee hopes that the membership finds having the ISTA Rules in electronic format useful and a step forward in membership services. The Secretariat staff will do its best to ensure that everything works smoothly. Further information will be provided on the ISTA web site.

If you have any comments or ideas about the electronic Rules, please contact Jonathan Taylor at:
jonathan.taylor@ista.ch ■

Seed Health Method Review
(continued from page 45)

Method 7-002 a (Blotter) *Alternaria radicina/ Daucus carota*
1. Accept Method with new review date (2017).

Method 7-002b (Malt agar) *Alternaria radicina/ Daucus carota*
1. Accept Method with new review date (2017).
2. Use of reference culture adopted during June 2013 votes

Method 7-015 *Neotyphodium* spp./ *Festuca* and *Lolium* spp.
1. Accept Method with new review date (2017).

Method 7-016 *Phomopsis* complex/ *Glycine max*
1. Accept Method with new review date (2017).
2. A more selective medium is not known. Pycnidia are indeed not seen after 3 to 7 days of incubation. A SHC workshop is planned in September 2014 and one of the subjects will be the *Phomopsis* complex. Proposal to update the method as editorial modification after the workshop to better describe the pycnidia issue.

Method 7-017 *Alternaria linicola/ Linum usitatissimum*

Method 7-018 *Colletotrichum lini/ Linum usitatissimum*
1. Alignment of method with methods 7-007 (Botrytis cinerea/ Linum usitatissimum) and 7-018 voted into rules ISTA 2014.
2. New method with new review date (2017).

Method 7-022 *Microdochium nivale/ Triticum* spp.
1. Accept Method with new review date (2017).
2. Nomenclature to be updated for rules proposals 2015 as editorial modifications: The current name of *Microdochium nivale* is *Monographella nivalis* var *nivalis* and *Microdochium majus*
3. Photos and arrows on photos: to be updated for rules proposals 2015 as editorial modifications

Method 7-023 *Pseudomonas savastanoi* pv. *phaseolicola/ Phaseolus vulgaris*
1. Accept Method with new review date (2017).
2. Peer validation needed to change conditions.

Method 7-024 Pea Early-Browning Virus and Pea Seed-borne Mosaic Virus/ *Pisum sativum*
1. Accept Method with new review date (2017).

General editing

All methods will be subject to editing of errors, correction of taxonomy and updated formatting where necessary.

In conclusion, no formal requests for changes or withdrawal of any of the methods under review were submitted to the ISTA Secretariat or the ISTA-SHC since their adoption in 2002, and 2007. It may appear that all the methods are thus considered fit for purpose. However, it was brought to the attention of the SHC that various laboratories were not entirely happy with all methods. The reviews were therefore intended to give all seed health laboratories the opportunity to contribute to the second five year review of Methods approved in 2002, and to those approved in 2007.

The Seed Health Committee wishes to thank all the laboratories for taking the time to complete the questionnaires. Their inputs are greatly appreciated. ■

Document changes related to accreditation

Rasha El-Khadem

ISTA Accreditation and Technical Department

ISTA Secretariat
8303 Bassersdorf, Switzerland
ista.office@ista.ch

There have been changes to some of the ISTA accreditation documents (www.seedtest.org/accred-docs).

The **'ISTA Laboratory Accreditation Standard'** was revised on 4 October 2012, to reflect the replacement of the ISTA Constitution by the ISTA Articles.

The document **'How to Respond to Audit Findings'** was updated on 12 July 2013. The document emphasizes the difference between corrections and corrective actions. It explains also that corrective actions taken by the laboratory should always be numbered in the same way as the corresponding non-conformities identified by the auditors.

A new version of the procedure **'ISTA Proficiency Test Programme'** has been uploaded to the ISTA web site and is valid as of 15 August 2013. The scope of this procedure was described in a better way, as it explains that this document is only valid for basic tests. Thus, proficiency tests on tests following the performance-based approach and seed health testing are not covered in this document. The major change is related to the naming of the preliminary results, which are now named heterogeneity results. The procedure also makes reference to the directive 'Procedure for Termination, Suspension and Withdrawal of ISTA Accreditation', as poor performance in the proficiency test programme may result in suspension or withdrawal of ISTA accreditation.

The document **'Explanatory note on how to complete ISTA Orange International Seed Lot Certificates and ISTA Blue International Seed Sample Certificates'** has been removed from the ISTA web site. This document is always only valid for the period of one year, as it is based on the requirements defined in the ISTA Rules. ■

Laboratory accreditation changes

Status 1 September 2013

Re-accreditations

Denmark DKDL0100

Ministry of Food, Agriculture and Fisheries
Danish AgriFish Agency
Nyropsgade 30
1780 Copenhagen V
Phone: +45 33 95 80 00
Fax: +45 33 95 80 80
E-mail: mail@naturerhverv.dk

DKML0600

Hunsballe Seed Laboratory, Hunsballe Frø A/S
Hunsballevej 6, Sørbymagle
4200 Slagelse
Phone: +45 58 57 1470
Fax: +45 58 57 1489
E-mail: cb@hunsballe.dk

Egypt EGDL0100

Central Administration for Seed Certification (CASC), Giza Seed Testing Station
8 Gamaa Street, P.O. Box 237
Rabee EL Gezee-Giza, 12211
Phone: +202 35 72 4721
Fax: +202 35 72 4721
E-mail: essawi010@yahoo.com

France FRDL0200

G.E.V.E.S.
Station Nationale d'Essais de Semences
rue Georges Morel, B.P. 90024
49071 Beaucouzé CEDEX
Phone: +33 241 22 5800
Fax: +33 241 225801
E-mail: joel.lechappe@geves.fr

Germany DEDL0300

LUFA Nord-West, Institut für Düngemittel und Saatgut
Saatgutprüfung
Finkenborner Weg 1a, Postfach 100655
31787 Hameln
Phone: +49 51519871920
Fax: +49 51519871927
E-mail: axel.goeritz@lufa-nord-west.de

DEDL0600

LUFA-ITL GmbH, Arbeitsbereich Saatgut
Dr. Hell-Strasse 6
24107 Kiel-Suchsdorf
Phone: +49 431 12280
Fax: +49 431 1228498
E-mail: IZ@LUFA-ITL.de

DEDL0900

Landwirtschaftskammer Nordrhein-Westfalen
LUFA NRW
Nevinghoff 40, P.O. Box 59 80
48135 Münster
Phone: +49 251 2376 642
Fax: +49 251 2376 19642
E-mail: andrea.janssen@lwk.nrw.de

DEDL1300

Staatliche Betriebsgesellschaft für Umwelt und Landwirtschaft, Fachbereich 64: Saatgut
Waldheimer Straße 219
01683 Nossen
Phone: +49 351 205 0291
Fax: +49 351 2050 299
E-mail: gisela.wustmann@smul.sachsen.de

DEDL1500

Landesamt für Ländliche Entwicklung, Landwirtschaft und Flurneuordnung
Referat 44 Saatenanerkennung
Steinplatz 1
15806 Zossen-Wünsdorf
Phone: +49 33 70273650
Fax: +49 33 70273651
E-mail: Christine.Belkner@LELF.Brandenburg.de

DEDL1700

LLFG Sachsen-Anhalt, Prüf- und Anerkennungsstelle für Saat- und Pflanzgut
Saatgutlabor, Haus 2
Schiepziger Strasse 29
06120 Halle
Phone: +49 345-5584-0
Fax: +49 345-5584-230
E-mail: gunter.assmann@llfg.mlu.sachsen-anhalt.de

India INML1400

Bejo Sheetal Seeds Pvt. Ltd.
Bejo Sheetal Corner, Mantha Road
Jalna 431203, Maharashtra
Phone: +91 2482 232588 / 236588
Fax: +91 2482 230398
E-mail: bejosheetalsales@gmail.com

Israel ILDL0100

Official Seed Testing Laboratory
The Volcani Center A.R.O.
P.O. Box 6
Bet-Dagan 50250
Phone: +972 3 9683463
Fax: +972 3 9683889
E-mail: leamazor@volcani.agri.gov.il

Japan JPDL0100

National Center for Seeds and Seedlings
Independent Administrative Institution
2-2, Fujimoto, Ibaraki Pref. 305
Tsukuba City
Phone: +81 298 386581
Fax: +81 298 386583
E-mail: inspector@ncss.go.jp

Malawi MWDL0100

Chitedze Agricultural Station
Seed Testing Laboratory
P.O. Box 158
Lilongwe
Phone: +265 995522844
Fax: +265 1 707378
E-mail: luciamtambo@yahoo.com

Moldova MDML0100

State Center for Certification of Seed Material
str. Mesterul Manole 4
2004 Chisinau
Phone: +373 22 47 60 35
Fax: +373 22 47 60 35
E-mail: sccsm.rm@gmail.com

Netherlands NLDL0200

Naktuinbouw
Sotaweg 22, P.O. Box 40
2370 AA Roelofarendsveen
Phone: +31 71 3326158
Fax: +31 71 3326363
E-mail: m.buimer@naktuinbouw.nl

NLDL0300

NAK, Seed Testing Station
Randweg 14, P.O. Box 1115
8300 BC Emmeloord
Phone: +31 52 76 35 400
Fax: +31 52 76 35 411
E-mail: tstolte@nak.nl

Poland PLDL0700

Plant Protection and Seeds Service
Seed Testing Station Warszawa
ul. Zólkiewskiego 17
05-075 Wesola, Warszawa
Phone: +48 22 7739561
Fax: +48 22 7735909
E-mail: son-warszawa@piorin.gov.pl

Romania RODL05

Central Laboratory for Quality of Seeds and Planting Material
Al. Sandu Aldea 10, sector 1
012065 Bucharest
Phone: +40 21 2228420
Fax: +40 21 2240291
E-mail: lccsms@b.astral.ro

Slovakia SKDL0100

Seed Testing Laboratory, Central Controlling and Testing Institute of Agriculture
21 Matuskova
83316 Bratislava
Phone: +421 7 54775485
Fax: +421 754777436
E-mail: Monika.Holubicova@uksup.sk

Slovenia SIDL0100

Kmetijski Institut Slovenije
Agricultural Institute of Slovenia
Seed Testing Laboratory
Hacquetova ulica 17
1001 Ljubljana
Phone: +386 1 2805257
Fax: +386 1 280 5255
E-mail: seme@kis.si

South Africa ZADL0100

Directorate Plant Production, Department of Agriculture, Forestry and Fisheries
Private Bag X250
Pretoria 0001
Phone: +27 12 8085395
Fax: +27 12 8085383
E-mail: PamelaS@nda.agric.za

Turkey TRDL0100

Seed Registration and Certification Centre
P.O. Box 30
06172 Yenimahalle/Ankara
Phone: +90 312 3154605
Fax: +90 3123150901

Ukraine UADL0100

Ukrainian State Seed Inspectorate Laboratory
26, Sadova Str.
Sofiivska Borschagivka
Kyiv region, 08131
Phone: +380 44 400-88-31
Fax: +380 44 400-88-31
E-mail: ua01lab@gmail.com

Zambia ZMDL0100

Seed Control and Certification Institute
Official Seed Testing Station
Mount Makulu, P.O. Box 350199
13201 Chilanga
Phone: +260 211 278170
Fax: +260 1 278112
E-mail: scci@zamnet.zm

Zimbabwe ZWDL0100

Zimbabwe Seed Testing Section
Seed Services, Ministry of Agriculture
5th St. ext., P.O. Box CY 550, Causeway
Harare, 550
Phone: +263 4 720370
Fax: +263 4 791223
E-mail: seedserv@mweb.co.zw

Newly accredited

China CNML0500

INCOTEC China
Room 611, Longguan ZhiYe Building, No.118
Huilongguan West Street
Huilongguan, Changping District
102208 Beijing
Phone: +86 10 89787756
Fax: +86 10 89787756
E-mail: emma.chen@incotec.com

Russian Federation RUML0700

FSI, Federal Service for Veterinary Phytosanitary Surveillance, Rosselkhoznadzor
Ministry of Agriculture of Russian Federation
Street of Montagnicov 34
460052 Orenburg
Phone: +3532 75 73 95
Fax: +3532 75 73 95
E-mail: fgu-orengsi@mail.ru

United States USML0900

US Agriseeds Seed Laboratory
3424 Roberto Court
93401 San Luis Obispo
Phone: +1 805-547-9391
Fax: +1 805-547-9319
E-mail: SAlvarez@USAgriseeds.com

ISTA Quality Assurance Workshop for advanced laboratories

Bassersdorf, Switzerland, 3–6 December 2013

Organizer

ISTA Secretariat
Zürichstrasse 50
8303 Bassersdorf, Switzerland

Contact person

Nadine Ettel (nadine.ettel@ista.ch)

Lecturers

Ronald Don, Technical Auditor, ISTA Honorary Life Member, Member of several ISTA Technical Committees
Rasha El-Khadem, Head of ISTA Accreditation and Technical Department, System Auditor

Aim of the workshop

To give experienced laboratories the opportunity to discuss and obtain inspiration on how to improve their quality assurance system and benefit from it.

Target groups

The workshop is for members of experienced laboratories that have already a well-running quality management system in place. The lecturers will focus on selected topics to be discussed.

Content

The workshop will consist of oral presentations, group work and exercises. The lecturers will try to involve the participants as much as possible. Participants are invited to bring their laptops along. We will do some evaluation using the software Excel.

Some of the workshop content will deal with:

General management

Technical aspects:

- Statistical aspects of seed testing
- Calibration/verification of equipment etc.
- How to read uncertainty on calibration certificates
- How to evaluate statistically whether germination substrate shows phytotoxic effects

Internal quality control:

- Check testing, blind tests etc.
- Analysis
- Trends
- Monitoring of staff (seed samplers and analysts)

Internal Audits:

- Requirements of Accreditation Standard
- Preparation for an internal audit
- Performance of an internal audit
- Writing non-conformities

The workshop will include a visit to the ISTA-accredited seed testing station Agroscope and an excursion to the city of Zurich.

Location

ISTA Secretariat, Zurichstrasse 50, 8303 Bassersdorf, Switzerland

Accommodation:

Participants are asked to book accommodation directly with the hotels. Please indicate 'ISTA Workshop' when booking.

Hotel Fly away Zurich Airport
Marktgasse 19, 8302 Kloten, Switzerland
Tel. +41 44 804 44 55
Fax +41 44 804 44 50
www.hotel-flyaway.ch
E-mail: flyaway@welcomehotels.ch
Single room including breakfast: CHF 145
Single room without breakfast: CHF 127

Gasthof Löwen
Winterthurerstrasse 1, 8303 Bassersdorf, Switzerland
Tel. +41 44 805 85 85
Fax +41 44 805 85 80
http://www.loewen-bassersdorf.ch
E-mail: info@loewen-bassersdorf.ch
Single room including breakfast: CHF 130

The Hotel Fly away offers a shuttle bus connection to and from the airport.

Bassersdorf can be reached by train (one stop) from Kloten station near the Hotel Fly away. The ISTA Secretariat is 5 minutes' walk from Bassersdorf station, and 15 minutes' walk from the Gasthof Löwen in Basserdorf.

Further information (map, train schedule, meeting points etc.) will be provided once the participants have registered and booking has been finalised.

Registration fee (Swiss francs)

ISTA members: CHF 500
Non-members: CHF 750

The registration fee includes all literature and supporting material for the workshop, lunches and coffee breaks, excursion, workshop dinner and transfer between the workshop venue and hotels (except airport transfer).

It does not include accommodation or meals other than those specified.

Registration

If you would like to attend the workshop please fill in the registration form. An invoice will be sent to you, which has to be paid before registration is confirmed.

Registration and payment deadline is 15 November 2013.

For more information, go to:
www.seedtest.org/en/workshop.html

ANNOUNCEMENT

ISTA Quality Assurance Workshop
Depok, Indonesia, 12–16 May 2014

We are pleased to invite you to the ISTA Quality Assurance Workshop at the seed testing laboratory Balai Besar PPMB-TPH, Depok, Indonesia.

This workshop presents and discusses basic principles of quality management and focuses on the needs of seed testing laboratories preparing for attaining and maintaining ISTA accreditation. Successful participants will:

- know about the ISTA Accreditation Scheme;
- understand the requirements of the ISTA Accreditation Standard;
- be able to evaluate the situation of their laboratory with regard to conformity with the ISTA Accreditation Standard;
- be able to document the quality management system for their laboratory in a manual and related documents;
- be able to implement a quality management system;
- be able to implement the checks required for laboratory equipment.

Local organizer and venue

Balai Besar PPMB-TPH
Jalan Raya Tapos
Depok
Indonesia

Provisional programme

The theoretical background will be given through lectures. The workshop language is English. Participants will be actively involved in group work, discussions and presentations. The ISTA Accreditation Standard will be used during the group work.

System part

- Document control requirements
- Training and maintenance of analyst's competence
- How to read the ISTA Proficiency Test results
- How to fill in ISTA Certificates

Technical part

- Dealing with the calibration of equipment, e.g. how to calibrate balances, seed dividers, thermometers internally
- How to read calibration certificates
- How to perform media checks for germination?

General matters

We will focus on the different paragraphs in the Accreditation Standard, e.g. those that are difficult to deal with and how participants have solved specific problems etc.

Lecturers

Ronald Don, ISTA Technical Auditor
Rasha El-Khadem, Accreditation and Technical Department

Participation

A minimum number of 20 participants is required for this workshop to take place.

The maximum number of participants is 24.

ANNOUNCEMENT

Registration fees

600 USD for ISTA members
900 USD for non-members

The registration fee includes all literature and supporting material for the workshop, lunches and coffee breaks, excursion, workshop dinner and transfer between the workshop venue and hotels (except airport transfer).

Please note: For cancellations made before 15 March 2014, registration fees are refundable less an administration fee of USD 50. For cancellations made after 15 March 2014, registration fees are non-refundable.

Registration

For workshop registration please register online.

The registration deadline is 15 March 2014, and the payment deadline is 20 March 2014.

The payment instructions will be given in the invoice.

For more information, go to: www.seedtest.org/en/workshop.html

Accommodation

There are three recommended hotels at Bogor. Participants are welcome to make their own hotel reservations.

Hotel Santika
Botani Square, Jalan Padjadjaran
Bogor 16127
Phone: +62 251 8400707
Fax: +62 251 8400706
E-mail: bogor@santika.com
Web site: www.santika.com

IPB Convention Hotel
Botani Square, Jalan Padjadjaran
Bogor 16127
Phone: +62 251 8345698, 8345699
Fax: +62 251 8345636
E-mail: reservation@ipbch.com
Website: www.ipbch.com

Hotel Royal Amaroossa
Jalan Otto Iskandardinata No. 84
Bogor 16127
Phone : +62 251 8354333
Fax: +62 251 8351799
E-mail: royalbogor@amaroossahotel.com
Website: www.amaroossahotel.com/royalbogor

ISTA Workshop on Tree and Shrub Seeds from the Mediterranean Basin

Madrid, Spain, 19–21 May 2014

SEMILLAS MONTARAZ, S.A and the Forest Tree and Shrub Seed Committee invite you to an ISTA Workshop on Tree and Shrub Seeds from the Mediterranean Basin: development of test methods to be introduced into the ISTA Rules in Madrid, Spain from 19 to 21 May 2014.

Local organizer

Mrs. Joëlle Schmitt
Semillas Montaraz, S.A., Torremocha de Jarama, Madrid, Spain
E-mail: joelle@montaraz.com
Phone: +34 629 135 627

Main lecturers

Fabio Gorian (Chair, ISTA Forest Tree and Shrub Seed Committee, Centro Nazionale per lo Studio e la Conservazione della Biodiversità Forestale, Peri, Verona, Italy)
Sergio Pasquini (Vice-Chair, ISTA Forest Tree and Shrub Seed Committee, Centro Nazionale per lo Studio e la Conservazione della Biodiversità Forestale, Peri, Verona, Italy)
Rosa Colomer (Member, ISTA Forest Tree and Shrub Seed Committee, Semillas Montaraz, S.A.)
Félix Pérez (EUIT Agrícola, Madrid, Spain)
M. Elena González (EUIT Agrícola, Madrid, Spain)
Nieves Herrero (Forestry Seed Laboratory, Ministry of Agriculture, Food and Environment, Guadalajara, Spain)
Jaume Tormo (University of Alicante, Spain)
Joëlle Schmitt (Semillas Montaraz, S.A.)

Other lecturers to be confirmed.

Aim

The workshop is aimed at analysing the current situation of the species of Mediterranean trees and shrubs in the current ISTA Rules and promoting the development of protocols to ensure the quality of the seed of these species. Participants will learn the characteristics and reproduction strategies of Mediterranean species. The management of these species and their current status in the ISTA Rules will be covered.

Target groups

Quality managers; laboratory managers and seed testing analysts; researchers with experience or interest in the reproduction biology of Mediterranean species.

Content

The theoretical background will be given in lectures. The workshop language is English. The practical laboratory work will be done on Mediterranean species.

Preliminary programme

- Current status and representation of Mediterranean tree and shrub species in the ISTA Rules
- Relevance of Mediterranean species in climate change and desertification issues. Need for further study and knowledge of such species
- Special characteristics of the reproductive biology of Mediterranean species

– Specific considerations in seed quality tests for Mediterranean species
– Experiences in dormancy-breaking techniques in Mediterranean species
– Proposals of species to be included in the future in the ISTA Rules

Location

Universidad Politécnica de Madrid,
Escuela Universitaria de Ingeniería Técnica Agrícola, Plant Biology Department
Ciudad Universitaria, s/n.
28040 Madrid, Spain

Metro Line 6, stop: Ciudad Universitaria

Travel information

Madrid Barajas Airport is located 12 km from the city center. Terminals 1–3 handle all airlines. Terminal 4, located 25 km from the city center is mainly used for Iberia Airlines and long-distance flights. A shuttle train takes you from the airport to Madrid Atocha central railway station for EUR 5.

Hotel information

The hotel is located two metro stations from the University. Metro tickets are included in the registration fee and will be provided upon arrival.

On the first day, the local organizing committee will provide a guide to the University. More information will be provided closer to the date of the workshop.

VP Hotel Jardín Metropolitano****
Av. de Reina Victoria, 12, 28003 Madrid, Spain
Phone: +34 91 1831810
Fax: +34 91 1831811
E-mail: metropolitano@vphoteles.com
Web site: www.vphoteles.com/en

Rooms with breakfast cost EUR 95 per night (single) and EUR 105 per night (double).

Participants must make hotel reservations themselves. Please use the booking reference "ISTA Workshop" to obtain the special rate. Please book the hotel as soon as possible and by 3 May 2014 at the latest.

Please also check the prices on www.booking.com, which may be even cheaper.

Official workshop dinner

An official course dinner is included in the registration fee.

Registration fees

ISTA members (includes ISTA laboratory member staff): EUR 475
Non-members: EUR 720

The registration fee includes all literature and supporting material, lunches and coffee breaks, excursion, official workshop dinner, and transfers between the workshop venue and hotels (except airport transfer). **It does not include accommodation or meals other than those specified.**

The number of participants is restricted to **a minimum of 20 and a maximum of 23**.

If you would like to attend the workshop please fill in the registration form on the ISTA web site. An invoice will be sent to you, which has to be paid before the participation confirmation will be generated.

You can pay by credit card upon individual request to the ISTA Secretariat.

Deadline

The deadline for **registration and payment is 15 April 2014.**

Please note: For cancellations made before 15th April 2014, registration fees are refundable less an administration fee of EUR 50. For cancellations made after 15 April 2014, registration fees are non-refundable.

For more information, go to:
www.seedtest.org/en/workshop.html

ANNOUNCEMENT

ISTA Workshop on Seed Health Testing
Poznan, Poland, 4–7 September 2014

Organizer
Department of Phytopathology, Seed Science and Technology
Poznań University of Life Sciences
Szamotulska 28, Baranowo
62-081 Przeźmierowo
Tel. +48 61 8163591

Contact person: Dr. Dorota Szopinska
E-mail: dorota.szopinska@up.poznan.pl

Please note: This workshop is to be held in the week before the 11th Conference of European Foundation for Plant Pathology (9–11 September 2014) and 5th International Seed Health Conference (12 September 2014) which will take place in Cracow, Poland (www.efpp11-krakow.pl).

Objectives and format:
The workshop subjects are diseases of economically important crops (barley, cabbage, carrot, flax, pea, soybean). There will be lectures on seed-borne diseases, followed by hands-on practical work focused on recognizing fungal pathogens on seeds and based mostly on various incubation methods.

Lecturers
Prof. Theresa Aveling (Republic of South Africa)
Prof. Reyes Blanco (Spain)
Prof. Krystyna Tylkowska
Dr. Dorota Szopinska (Poland)
Ms Isabelle Serandat (France)
Ms Karin Sperlingsson (Sweden)

Location
Poznań is one of the oldest and largest cities in Poland (population approx. 560 000), a historical capital of the Wielkopolska region, in which the Polish state was established over a thousand years ago. Poznań is an important industrial and trade centre, and a seat of numerous regional administrative, business, science and research, cultural and entertainment institutions. The city is a key academic centre with a student population of over 140 000.

The workshop will be held at the Poznań University of Life Sciences (PULS). The University is one of the leading universities of life sciences and biological sciences in Poland. At present the University comprises a community of over 12 000 students, and 1500 employees. Eight faculties offer a wide scope of education within 22 fields of study and over 30 specialisations, including biology, biotechnology, landscape architecture, agriculture, horticulture, forestry, wood technology, environmental protection, animal science, food technology etc.

More information about Poznań and the University is available at:
– www.en.wikipedia.org/wiki/Poznan
– www.poznan.pl
– www.puls.edu.pl

Accommodation
Hotel PAN, Poznan
Single room: 160 Polish Zloty (approx. 40 EUR), breakfast included
Twin/double sharing room: 200 Polish Zloty (approx. 50 EUR), breakfast included
Suite: 230 Polish Zloty (approx. 60 EUR), breakfast included

Student house, Poznań
Single room: 60 Polish Zloty (approx. 15 EUR), breakfast not included
Twin/double sharing room: 30 Polish Zloty (approx. 7.5 EUR) per person, breakfast not included

Breakfast and dinner are available in the students' canteen.

Registration
There is a minimum number of 20 participants required for this workshop to take place, with a maximum number of 25.

Registration fees
ISTA Members: 200 EUR
Non-members: 300 EUR

The registration fee covers workshop materials, coffee breaks, lunches, workshop tour and the workshop dinner.

Deadline for registrations: 30 March 2014

For more information, go to:
www.seedtest.org/en/workshop.html

Hotel reservations
Please contact:
Dr. Dorota Szopinska
Department of Phytopathology, Seed Science and Technology, Poznań University of Life Sciences
Szamotulska 28, Baranowo
62-081 Przeźmierowo
Tel. +48 618163591
dorota.szopinska@up.poznan.pl

ISTA Workshops on Seed Sampling and Quality Assurance in Seed Sampling Odense, Denmark, 16–19 & 22–25 April 2013

Dot Vittrup Pedersen[1] and Max Soepboer[2]

[1]Member and [2]former Member, ISTA Bulking and Sampling Committee

DLF-TRIFOLIUM A/S
4000 Roskilde, Denmark
dot@dlf.dk

In November 2012, Dot Vittrup, Quality Manager of the grass seed company DLF-TRIFOLIUM A/S and member of the Bulking and Sampling Committee (BSC), announced that DLF-TRIFOLIUM was interested in hosting an ISTA Workshop on Seed Sampling. As Denmark is one of the founding fathers of ISTA and a major seed producer, especially of grass seed, this invitation was warmly welcomed by both the BSC and ISTA. Once the announcement had been published on the ISTA web site, the interest turned out to be overwhelming. In order to be able to host all participants, it was decided to organize two workshops during two consecutive weeks in April 2013.

DLF-TRIFOLIUM hosted both workshops at its Odense plant, one of the company's eight seed processing plants. DLF-TRIFOLIUM also has two ISTA accredited laboratories in Denmark itself as well as one in the Netherlands.

Several countries were represented at the workshops, which had two main focal points: seed sampling, and quality assurance in seed sampling. These two topics were dealt with both theoretically and in practice.

There were 27 participants in the first of the two workshops, from 15 different countries: Belgium, Bulgaria, Denmark, France, Germany, Ireland, the Netherlands, Norway, Serbia, Spain, Sweden, Switzerland, the United Kingdom, Zambia and Zimbabwe. The second workshop had 18 participants from 11 countries: Denmark, France, Germany, Italy, Latvia, the Netherlands, Romania, Serbia, Slovenia, Sweden and Switzerland. All participants were associated with either agriculture ministries, governments, private seed companies, seed-testing laboratories, research centres, certification agencies and quality assurance departments of the seed industry.

At the first workshop the lecturers were Gerry Hall (SASA, United Kingdom), Eddie Goldschagg (SANSOR, South Africa), Max Soepboer (formerly NAK, the Netherlands), Jette Nydam (Nordic Genetic Resource Center, Denmark) and Lotta Claesson (Swedish Board of Agriculture, Sweden). The lecturers at the second workshop were Eddie Goldschagg (SANSOR, South Africa), Jette Nydam (Nordic Genetic Resource Center, Sweden), Leena Pietilä (EVIRA, Finland), and Dot Vittrup (DLF-TRIFOLIUM A/S, Denmark). All of them are members of the Bulking and Sampling Committee.

The academic content

The theoretical lessons were held in the conference rooms at DLF-TRIFOLIUM. The practicals took place in DLF-TRIFOLIUM's new warehouse in Odense, covering 21 000 m^2 with state-of-the-art seed cleaning, mixing and packing facilities.

Participants of the first workshop

Participants of the second workshop

The following aspects of seed sampling were covered:
- general principles of seed sampling;
- introduction to sampling methods;
- seed sampling: sealing and labelling of seed lots;
- general principles and types of automatic seed samplers;
- testing and approval of automatic seed samplers;
- methods for reduction of the composite sample;
- training, examination and authorization of seed samplers.

Since the new ISTA protocol for approval of automatic seed samplers had shortly before come into force, special attention was paid to this document and its practical implications.

With regard to concerning quality assurance in seed sampling, the following points were addressed:
- checks, calibration and maintenance of sampling equipment;
- check of sample dividers;
- tolerances for the check of balances;
- procedures and instructions for sampling;
- internal quality control and monitoring;
- monitoring of seed samplers (internal audits and assessments);
- non-conformities;
- the ISTA Accreditation Standard.

Each item was presented at the lectures and supported by relevant handouts. The participants were invited not only to ask questions, but also to present their working methods and to share experiences with each other. This resulted in lively discussions, enriching each others' knowledge and views. From a learning point of view these discussions were most valuable, as participants not only presented their (sometimes) different working methods, but gave an explanation of the rationale behind the methods.

The practical exercises

The practicals on seed sampling were held at the seed processing plant, at the laboratory and even outside when the weather permitted. Participants practised various methods of sampling, such as sampling bags with the Nobbe trier, boxes with the sampling stick, big bags with the extended Nobbe trier, and small containers. Also, the handling of automatically taken samples was explained on the spot and practised. Besides this, participants tried out various methods of sample homogenization and reduction.

The practicals on quality assurance consisted of drafting a check list for an audit, calibration of various sample reduction methods (soil divider, centrifugal divider, hand-halving method and variodivider), classifying non-conformities and trying to detect their root cause, how to prevent the same non-conformity in the future etc. For this the group was divided into small subgroups, each working on a certain assignment. The results of the work of the subgroups were subsequently discussed in the plenary group.

At the location Dot Vittrup, the host of the workshop, had organized an exhibition of sampling equipment, sample dividers, labels and seals, as well as an exhibition of various types of packaging for small packets, foil, cardboard, small bags etc. This was all very interesting and informative, as it created an overview of the various kinds of equipment, also with regard to types that might not always be used or available in the home countries of the participants.

Social events

Despite the full and comprehensive learning programme, there was also time for social events. These consisted of an interesting bus tour on part of the island of Funen, and a visit and guided tour of the birthplace, and now a beautiful museum, of the world famous fairy tale writer Hans Christian Andersen in the old city of Odense. Besides that, a visit was paid to Jensen Seeds, the world's number one spinach seed producer. Jensen Seeds also produces a wide range of flower and herb seed in Denmark. And last but not least an excellent and exquisite workshop dinner was organized and enjoyed.

Positive evaluation

At the end of each workshop, participants were invited to share their opinion regarding the programme and give suggestions for improvements. The general feeling was that the workshop had been valuable, informative and supportive for their daily work at home. The suggestions for improvement will be appreciatively applied in future workshops on seed sampling. Furthermore, the participants were asked to complete evaluation forms online and provide feedback regarding various quality parameters of the workshop. The results for both workshops were successful. Most participants replied that their expectations of the workshop had been met or even exceeded. All participants agreed or strongly agreed that the lectures had been very helpful, well prepared and well organized. Furthermore, the opinions on the organisation, the facilities and the social events were positive. ■

ISTA Vigour Workshop

Izmir, Turkey, 4–6 June 2013

Alison Powell

ISTA Honorary Life Member, Chair, ISTA Seed Vigour Committee

School of Biological Sciences
University of Aberdeen
Aberdeen, AB24 3UU, UK
a.a.powell@abdn.ac.uk

Participants of the Vigour Workshop

An ISTA Vigour Workshop was held in İzmir, Turkey on 4–6 June 2013, prior to the ISTA Congress in Antalya. The workshop was hosted by the Seed Technology Centre, within the Department of Horticulture, part of the Faculty of Agriculture at Ege University, İzmir. The workshop was presented by Alison Powell, Chair of the Vigour Committee, and committee members Stan Matthews and Hülya İlbi. Our 19 participants came from eight countries, from as far afield as Korea and Australia, as well as Belgium, Croatia, France, Serbia, Turkey and Greece. In common with other recent vigour workshops, the majority of the participants came from seed companies.

Following a welcome to the Seed Technology Center by its Head, Prof. Dr. Esen Celen, we started the workshop with an introduction to ISTA and the work of the Technical Committees, which was particularly appropriate since most participants were not ISTA members. The aim of the workshop was to present new developments in seed vigour that have occurred over the last two years, in particular the radicle emergence test, and to discuss potential future developments in vigour testing, as well as to present the established vigour tests. The workshop was made up of a mixture of both lectures and practical work. There were lectures on the validated vigour tests (conductivity, accelerated ageing, controlled deterioration, radicle emergence) as well as the cool and cold tests, how to avoid production of low vigour seeds, the steps towards validation and the ISTA Rules, the use of vigour tests, and

Groups preparing and agreeing (or not!) their opinions during the interactive seminar

Assessing a radicle emergence test

Many thanks to (left to right) Damla Kantürer, Gülgün Baslar, Dr. Hülya İlbi and Ali Kun for organising the workshop and preparing all our material!

future developments. Stan Matthews also presented the seed ageing/repair hypothesis, and provided evidence to demonstrate how all the expressions of seed vigour in vigour tests can be explained on the basis of seed deterioration and its repair.

In our practical work, the participants were able to complete the conductivity test and assess results from controlled deterioration, accelerated ageing, radicle emergence, and cold tests. Gülgün Baslar very ably demonstrated setting up the controlled deterioration and accelerated ageing tests.

The programme also included an interactive seminar led by Stan Matthews. In previous workshops these sessions have been found to be enjoyable and stimulating, when participants and lecturers learn from each other. During this seminar, the participants divided into small groups and discussed topics including the characteristics of useful vigour tests, the barriers to implementation of vigour tests and what should be the research and development priorities, before reporting back to the whole group. As we have seen before, this provoked considerable discussion and sharing of experiences.

We worked hard for the three days of the workshop, but took the chance to finish early on day 2 to see a little more of İzmir. Unfortunately we had to change our plans to visit the old part of the city in the Konak area due to severe traffic congestion. Nevertheless, we travelled to the opposite side of the bay to walk through the gardens that line the coastline, admire the view and finish in a café for ice-creams in the sunshine. The most enjoyable afternoon ended when we returned to one of the historic houses on the university campus where there is now an excellent restaurant. We finished the day enjoying a delicious meal, including wonderful meze, al fresco.

We are very grateful to our hosts from the Seed Technology Centre and the Department of Horticulture for allowing us to use their lecture rooms and laboratories for our workshop. In particular we would like to thank Dr. Hülya İlbi and Gülgün Baslar, the workshop organisers, for all their thoughtful, hard work before and during the workshop. Hülya and Gülgün were very ably assisted by students Damla Kantürer and Ali Kun; thanks also to them. To everyone, we would like to say thank you for your wonderful hospitality and a warm welcome to İzmir! ■

ISTA Workshop on Purity and Germination
Ankara, Turkey, 6–9 June 2013

Sylvie Ducournau[1] and Jane Taylor[2]

[1]Chair, ISTA Germination Committee; [2]Chair, ISTA Purity Committee

[1]GEVES-SNES
49071 Beaucouzé CEDEX, France
sylvie.ducournau@geves.fr

The workshop participants outside the Variety Registration and Certification Centre

Twenty-five participants from thirteen countries and distinct economies joined this ISTA Workshop in Turkey, prior to the ISTA Congress in Antalya. They came from Belgium, Brazil, Denmark, Finland, France, Macedonia, Norway, Serbia, Sweden, Russia, the Separate Customs Territory of Taiwan, Penghu, Kinmen and Matsu, Turkey and the USA. The workshop was hosted by the Variety Registration and Certification Centre (VRCC) in Ankara, where the seed testing laboratory is accredited by ISTA. The centre has nice facilities for lectures and practical work, but due to the high number of participants, the group needed to be split in two parts for the practical sessions: one in the purity laboratory and the other one in the germination laboratory.

The workshop presentations provided a short introduction on the history of ISTA, its Aims and Rules, and Orange International Certificates, it was interesting to look back at examples of the first ISTA certificates from 1931 and how they related to the development in seed testing.

Other topics covered related to purity were a brief introduction to the purpose and principles of purity analysis, determination of other species, purity calculations, tolerances and reporting results. Quality assurance for purity testing reviewed the calibration of balances.

The practical purity topics of the workshop focused on the ISTA pure seed definitions, species identification and separation in the following range of species: *Triticum* spp., *Hordeum vulgare, Medicago sativa, Trifolium pratense, Vicia sativa, Beta vulgaris, Lolium* spp., *Festuca* spp. and *Poa* spp. The testing of coated seed was also included on *Beta vulgaris*. Presentations were selected to explain some aspects of the ISTA Rules, for example the ISTA Rules for testing indistinguishable species (*Lolium* spp. and *Poa* spp.), together with short introductions for each of the practical sessions.

Although not able to be present, Deborah Meyer, member of the Purity Committee, also contributed to the workshop by providing excellent presentation material on the botanical terminology for purity testing and the handouts on identification of small-seeded legume species.

The workshop progamme had been planned to include as much practical work as possible and the degree of difficulty of the purity work meant that the participants were kept fully involved.

The help of all the staff from the purity laboratory of the VRCC in preparing the material and checking the participants' work was much appreciated.

Practical work in purity testing

Practical work in germination testing

For germination testing, different aspects were covered during the workshop, starting from the general principles of germination tests described in the ISTA Rules, to quality assurance, calculations and reporting results. For practical seedling evaluation, species were chosen according to the needs expressed by our Turkish colleagues, but also by some of the participants. The species selected were *Triticum aestivum, Medicago sativa, Vicia sativa, Beta vulgaris* (pelleted and non-pelleted seeds), *Lolium perenne, Lycopersicon esculentum* and *Citrullus lanatus*. Each of the practical sessions was introduced with lectures on seedling evaluation focused on each species. The samples for germination were very well selected by the laboratory staff, providing many good examples of seedling defects and leading to interesting discussions.

The work during the workshop was very intensive, but luckily our hosts managed to relax the participants with nice coffee and tea breaks and restful lunch breaks under the trees surrounding the Centre. We were also invited to a wonderful evening in the upper part of Ankara, in the old city, where we enjoyed very nice Turkish cuisine and traditional music with an improvised dancing show from some of our Turkish colleagues.

We are most grateful to our hosts, in particular Kamil Yilmaz, for inviting us to his station, and our special thanks are also for Mustafa Kizmaz, Havva Aydogmus, Selma Yildirim and the staff of the laboratories for all their work for the overall organization, for preparing all the material and for their warm hospitality during our stay. ■

2013	18–22 November	**APSA Annual Congress** Kobe, Japan www.apsaseed.org
	3–6 December	**ISTA Quality Assurance Workshop for advanced laboratories** Bassersdorf, Switzerland www.seedtest.org/workshops (see page 50)
2014	4–7 March	**AFSTA Congress** Tunis, Tunisia www.afsta.org
	12–16 May	**ISTA Quality Assurance Workshop** Depok, Indonesia www.seedtest.org (see page 51)
	19–21 May	**ISTA Workshop on Tree and Shrub Seeds from the Mediterranean Basin** Madrid, Spain www.seedtest.org/workshops (see page 52)
	26–28 May	**ISF World Seed Congress** Beijing, China www.worldseed.org/isf/congress.html
	12–14 June	**ISTA Seed Health Symposium** Edinburgh, UK www.seedtest.org (see page 34)
	16–19 June	**ISTA Annual Meeting** Edinburgh, UK www.seedtest.org (see page 35)
	4–7 September	**ISTA Workshop on Seed Health Testing** Poznan, Poland www.seedtest.org/workshops (see page 54)
2015	25–27 May	**ISF World Seed Congress** Poland www.worldseed.org
	15–18 June	**ISTA Annual Meeting** Uruguay www.seedtest.org
2016	June	**31st ISTA Congress** Tallinn, Estonia

Advertising rates 2014

Position/size	Monochrome (euros)	Colour (euros)	Dimensions (trimmed)	Dimensions of artwork (+ 3 mm bleed overall)
Outside back cover	–	2120	210 × 297 mm	216 × 303 mm
Inside front/back cover	–	1820	210 × 297 mm	216 × 303 mm
Full page	810	1210	210 × 297 mm	216 × 303 mm
⅔ page (vertical)	610	1010	133 × 297 mm	139 × 303 mm
⅓ page (vertical)	250	500	71 × 297 mm	77 × 303 mm
½ page (landscape)	400	810	210 × 148.5 mm	216 × 154.5 mm
⅓ page (landscape)	250	500	210 × 99 mm	216 × 105 mm

All rates include bleed if required.
Front of page (right-side page): +10%
For other sizes or special requests, please contact us directly.

Discounts
ISTA Members: –10%
2 ads in same issue (can be different): –5%
Repeat ad in following issue: –5%

Artwork specifications
PDF; images 300 dpi; text & line art 600 dpi; all fonts and images embedded; colour space CMYK Euroscale coated

Technical information
Circulation: 1500 copies worldwide
Inside pages: semi-matt coated 135 g/m^2
Cover pages: glossy coated 170 g/m^2

Deadlines
Publication dates: April/October
Booking advertising space: 15 February/15 August (confirmation of placement by e-mail)
Artwork delivery: 1 March/1 September

Contact details
Phone: +41 44 838 60 00
Fax: +41 44 838 60 01
E-mail: jonathan.taylor@ista.ch

Seed Testing
INTERNATIONAL

ISTA News Bulletin No. 146 Autumn 2013
ISSN 1999-5229

International Seed Testing Association (ISTA)

ISTA Secretariat
Zürichstrasse 50
CH-8303 Bassersdorf
Switzerland

Phone: +41 44 838 60 00
Fax: +41 44 838 60 01
E-mail: ista.office@ista.ch

www.seedtest.org