

Seed Testing

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Seed Testing International
No. 137 April 2009

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Dear Reader,

With this issue of Seed Testing International, I would particularly like to draw your attention to the upcoming 2nd World Seed Conference in Rome. Following the 1st World Seed Conference, held a decade ago in 1999, the FAO, UPOV, the OECD, the ISF and ISTA agreed to organize a second conference. This is necessary to draw the attention of a wide range of people to the fact that continuous efforts in plant breeding and the production of high quality seed for farmers are necessary to ensure a functioning agriculture and agricultural production. The developments over the past 10 years are unfortunately characterized by continuous cuts in resources in seed science and technology, particularly in the countries of the developed world. This development has reached an unhealthy level, and is threatening the sustainability of the systems. It will be up to governments and the industry to decide on what to do, but this conference should create awareness of the importance of, and the threats to, the seed field. We hope that persons on a high political level from all five organizations will participate in the conference. Do not miss this important event, and be a part of the discussion.

However, remember that the next ISTA Annual Meeting is also coming up shortly. It will take place from 15–18 June in Zurich, Switzerland – the occasion to discuss the determination of seed quality and the performance of seed testing laboratories.

A focal point of this year's Annual Meeting will be a seminar on purity testing, but there will also be a workshop on seed analyst training on the day before. As pre-meeting events, two workshops have been organized: a Workshop on Molecular Markers for Variety Identity and Purity in Bologna, Italy, from 10–13 June, and a Quality Assurance Workshop here in Zurich from 11–13 June. So we believe that we have arranged an interesting programme to convince you to come to Zurich, and we hope for fruitful discussions and enjoyable days on this occasion. It will be my pleasure to personally welcome you to this exciting event.

In this issue you will also find a number of important technical papers, mostly in the field of germination. Furthermore, a number of reports from various ISTA meetings, workshops and seminars held around the globe – and announcements for even more to come.

For me personally, the Seminar for Africa held in Zambia was an unforgettable event, in particular to have the opportunity of a personal meeting with the Minister of Agriculture of Zambia, and to speak with such an impressive personality and discuss the situation in Zambia and Africa overall.

Please now enjoy reading of this latest issue of Seed Testing International – and I personally look forward to meeting you soon in Zurich.

Yours sincerely,

Michael Muschick



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President's Report

Dr. Katalin Ertsey



The new century has hardly begun, and the world is already facing big challenges. The crisis is deeper than expected, and extends to all sectors of the global economy. There are many different opinions on how to manage or solve the problem, but almost all economists agree on one thing: the financial system cannot continue in this way, and needs new structures and projects. Sustainable development looks like being one of the most important topics for society in the medium and long term, and it has a strong link to agriculture, including seed research and the seed business.

The crisis and its outcome affects all. Everyone is seeking to secure their achievements and find new resources.

This discussion was one of the most important issues of the ISTA Executive Committee Meeting, held in Zambia from 10–13 February, on invitation from the Zambian Ministry of Agriculture, and hosted by ECOM Member Mary Chilipi.

The main task of the ECOM Meeting is to prepare the documents (including the Rules Proposals) for voting and discussion at the forthcoming Annual Meeting in Zurich, Switzerland. This year, in addition, there was an emphasis on the evaluation and realization of the ISTA Strategy

2007–2010. On this topic, various items were discussed, such as:

- approved strategy;
- evaluation and results of the questionnaire on TCOM enhancement;
- reports on development in different regions of the world;
- ISTA publishing policy;
- distribution policy for the ISTA Rules;
- development of ISTA accreditation;
- budget questions;
- relations with other international organizations.

To maintain our reputation both inside and outside ISTA, and successfully achieve all the goals mentioned above, we need more and more resources.

At ECOM Meetings, the question often arises: who is ISTA? Is ISTA a group of members with similar interests, who do something for themselves, or is it a service provider? I fully agree with and support the idea that ISTA is the ISTA membership: the Member Laboratories, the Personal, Associated and Corporate members, and the Honorary Life Members. The idea that ISTA is a central body providing the Members with various services is misleading. That would require a different kind of organization, with much higher fees.

The basis of ISTA development from its foundation has been the voluntary work of its Members. Of course the world has changed, and nowadays financial and legal possibilities are often restricted.

The Technical Committees play a distinguished role: they are the backbone of the Association. The Chairs and active Members are highly educated and busy experts who use their spare time for ISTA work. There are the Member Laboratories, of which some support workshops and other events. The Designated Authorities and owners of company laboratories are also involved in ISTA work, and there is much non-financial support from various friends of ISTA, including university researchers, company decision makers and expert seed analysts.

Thanks to all these activities, ISTA is now a worldwide accepted organization. Our updated Rules can be found all over the world in laboratories and seed facilities, but also in research stations and universities. Proficiency tests are available also for non-members. There are over 100 accredited laboratories, and there is great demand for ISTA training and workshops. We made a big effort in our publishing policy: Seed Science and Technology is a widely recognized journal, designed for the needs of researchers, advisers and all others involved in the improvement and technical control of seed quality.

Under these conditions it is imperative to become more and more professional. To manage an international organization at a high level and maintain a good image and reputation costs money. Support from inside is essential, but not enough.

We need a bigger budget and more financial reserves to continue and progress with the proficiency test programme, especially in GM testing, with the revision of the tolerance tables, maintaining our accreditation system (fees have not changed since the beginning of the programme) or other important topics. We urgently need to solve the question of electronic publishing and the evaluation of a professional computer system for the Secretariat.

During the ECOM Meeting we discussed all these issues and agreed in some topics. Some of the documents are under preparation for discussion and/or voting at the upcoming Zurich Annual Meeting. I ask especially the voting delegates but also other ISTA Members, to study carefully the proposals and documents, and be active during the Annual Meeting. Our active participation and positive decisions will assure the future of ISTA in the interests of the seed sector.

It's a great pleasure for me to invite you in my capacity as President of ISTA to the ISTA Annual Meeting 2009. ■

ISTA purity analysis and determination of other seeds by number from 1924 to 2006

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The aim of this article is to present an outline of the development of the ISTA purity analysis and determination of other seeds by number, from the foundation of ISTA in 1924 to 2006.

The primary purpose of the project was to collect information on the publications and reports which, before the formal validation of Rules proposals was introduced (Hampton 2005; Steiner et al. 2008), served as the scientific background for changes of the ISTA Rules and the development of the testing methods. Further information on the subject and references to 217 scientific papers and reports can be found in *Development of ISTA Purity Analysis and Determination of Other Seeds by Number from 1924 to 2006* (Jensen 2008).

Before the formation of the ISTA Purity Committee in 1956, the development of the Rules for purity and determination of other seeds by number, as well as other technical and scientific work related to these tests, was from 1924 to 1950 dealt with by the Research Committee for Countries with Temperate Climate and the Research Committee for Countries with Warm Climate. From 1953 to 1956, the work was coordinated by the Rules Committee.

The Purity Committee was formed in 1956. In the period between 1956 and 2006, a total of 80 persons from 28 countries contributed to the development and interpretation of the ISTA Rules (Jensen 2008, Table 1). Among these, 47 were from Europe, 10 from Australia/New Zealand, 10 from North America, 4 from Africa, 2 from South America and 1 from Asia. For 6 persons no information on nationality was given in the Committee report.

The chairpersons were H. Esbo, Sweden (1956–1962), L.E. Everson, USA (1962–1977), O. Landenmark, Sweden (1977–1986), H.A. Jensen, Denmark (1986–1998), M.I. Moreno, Argentine (1998–2001), K. Allison, Canada (2001–2004) and M.R. Mannino, France (2004–present).

Tasks of the Purity Committee

The tasks of the Purity Committee were formulated as Terms of Reference.

For a number of tasks it was realized that the formation of specialized working groups was necessary. Twenty-seven working groups, with their period of activity and chairpersons, are listed in Jensen 2008, Table 2. The working group on Pure Seed Definitions, for instance, has been active from 1965 to the present, while other groups functioned for a limited period (e.g. *Dactylis glomerata* purity analysis, 1965–1968). The activities in most of the working groups resulted in substantial changes to the ISTA Rules.

Before each Congress, the tasks dealt with and progress with the work on various subjects was summarized in the Purity Committee Report. Each report, including Rules proposals, was then discussed during meetings of the Technical Committees at the Congress, and the final report (sometimes with minor adjustments of the Rules proposals) was presented and voted on at the Ordinary Meeting. A list of the reports from the Purity Committee from 1956–2006 is provided in Jensen (2008).

Development of the ISTA Rules

Sizes of the working samples

Since the beginning of ISTA (and also before) it was known that the size of the working sample was a compromise between the time necessary to perform the test and the ability to reproduce the results.

In the first Rules, from 1931, the minimum sizes of working samples for purity and number-count tests are listed for 41



Since the dawn of seed testing, correct seed identification has been the basis for purity analysis. Seed collections, handbooks and other publications on seed morphology were valuable tools. Above: the Nobbe Seed Collection, Copenhagen.

species or species groups, whereas the 2005 Rules comprised 898 species or genera. The changes in working-sample sizes from 1931 to 2005 for selected species are illustrated in Jensen (2008), Tables 3 and 4.

In 1965, the ISTA Congress decided that the size of the purity working sample should be based on a sample corresponding to 2500 seeds, and the number count tests on 10 times the amount examined for purity, with a maximum of 1000 g.

Since 1990, it has been stated in the Rules that the working sample for number count tests shall be *either* a weight estimated to contain 25000 seed units, *or* not less than the weight prescribed in Table 2A Part 1, column 5. This allowed the laboratories to make adjustments in the mass of the working samples according to the considerable differences in thousand-seed weight between varieties of several grass species, which saved a lot of time for the analysts.

Tolerances

The accuracy of purity testing was of concern from the beginning of seed testing within ISTA, and a formula for calculating the permitted tolerance between two tests was presented in the first Rules of 1931.



The Seed Collection, Budapest.

Leggatt (1932) criticized that the equation did not take into account that *the larger the sample, numerically, the smaller the expected variation*, and pointed out that it would be more correct to use the equation for calculation of the standard deviation. In other words, if the size of the working sample for purity were increased, a smaller variation between tests could be expected.

During the following years, Leggatt and others published descriptions of the experimental error in seed analyses, including the normal, binomial and Poisson distributions, and a theoretical study of a purity tolerance with special reference to pure seed.

A revised set of tolerances was calculated by Miles and introduced into the ISTA Rules in 1962. The tolerances were based on results from seed testing obtained in Canada and USA and calculated by use of the binomial distribution (Miles 1963). These tolerances were still in use in the 2006 Rules.

From the stronger to the quicker method – a critical development in the ISTA Rules

Before ISTA was founded in 1924, two methods were in use for purity analysis in Europe: the *Continental method* and the *Irish method* (also called the *English method*).

The subject was intensively discussed during the Congresses at Copenhagen in 1921, Cambridge in 1924 and Rome in 1928. The Congress at Wageningen in 1931 was not able to reach an agreement about a preferred method, and both the *stronger* (corresponding to the Continental method) and the *quicker method* (a modified form of the Irish method from North America), were included in the first ISTA Rules of 1931.

The stronger method required that seeds, classified as pure seed, did not have any damage on vital parts of the seed. Undamaged seeds were, accordingly, considered to be able to germinate. As guidance, drawings of clover seeds with various degrees of damage were included in the Rules.

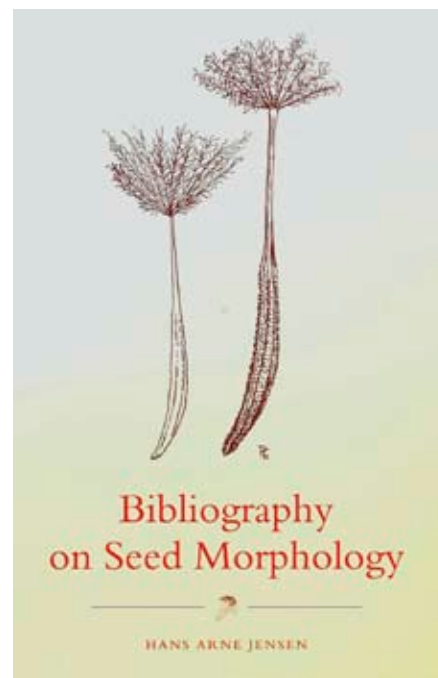
The quicker method was based on the assumption that all pieces of seeds of the species tested with a size of more than half the original size should be classified as pure

seed. Whether the seeds were able to germinate was supposed to be determined in the germination test.

The discussion continued at the following Congresses. At the first ISTA Congress after the 2nd World War, Franck (1950) recommended once more the quicker method as the only purity method allowed by the ISTA Rules. By this time the quicker method was already in use in the USA, Canada and Scandinavia.

ISTA's two methods for purity testing became an increasing inconvenience for the seed trade, and the Russian delegation in the International Organization for Standardization (ISO) raised the question whether ISO should enter the standardization of seed testing, and that they should begin with purity. This question was submitted via the ISTA member countries' standardization organizations to the ISTA laboratories and the ISTA Secretariat. It was taken as a serious warning that decisions on the formulation of the Rules could move to other organizations, and the 1950 Congress finally decided that the stronger method should be discarded, and that the quicker method should be the only method for purity analysis in the ISTA Rules (Franck 1950).

The half-seed rule for weed species and other crop seeds was accepted at the 1974 Congress.



Bibliography on Seed Morphology, published by an ISTA working group in 1998.



The ISTA Workshops have been very important for the development and implementation of the Rules for purity analysis and determination of other seeds by number. Workshop participants at (left) Angers, France 1994, and (right) Budapest, Hungary, in 1997.

The three-component rule – a serious conflict with the seed trade

At the 1974 Congress, the three-component rule was accepted, i.e. combining other crop seeds and weed seeds into one fraction *other seeds*, as it was impossible to obtain common agreement on a worldwide basis on classifying the species found as either crop species or weed species.

This Rules change was very much against the wishes of the seed trade. After the 1974 Congress, an attempt was made to persuade ISTA to arrange a new vote by post, to reverse this decision. This, however, was refused by the Executive Committee, as the technical reasons for the change of the ISTA Rules were still valid.

Arguments against the three-component rule mainly came from the seed trade. For example, it was claimed that use of the three-component rule would decrease the usefulness of the ISTA Certificates, since a four-component report could always be converted into a three-component report, but not the reverse.

The discussion continued at the 1977 Congress. Many arguments in favour of, but also against, the three-component rule were presented. It was finally agreed as a compromise that the content of other seeds, reported on the ISTA Certificate, could be – as a specification – divided into other crop species and weed species according to the definitions at the issuing laboratories or legal requirements. The acceptance of this change solved the serious conflict between the FIS (the seed trade) and ISTA. The specification on the ISTA Certificates of other crop seeds and weed seeds is still in use.

Pure seed definitions

A substantial step forward towards uniformity in purity testing was the introduction of pure seed definitions (PSD). A working group was appointed by the Purity Committee in 1965 to prepare botanical descriptions of structures classified as *pure seeds* or *other crop seeds* in the purity analysis. A report from the working group was presented at the 1968 Congress (MacKay 1968). The PSDs were included in the 1976 ISTA Rules.

The preparation of PSDs for the ISTA Rules was continued in a working group, chaired by Elizabeth M. Felfoldi, and later by W. Joost van der Burg and Steve Jones. An important activity was the publication of Handbooks of Pure Seed Definitions. The illustrations, especially of the tropical grasses with complicated morphological structures, were a considerable help in the analyses.

Multiple seed units and seeds with appendages – changes towards time saving and new technology

The ISTA Rules of 1931 prescribed for purity analyses that in grass seeds containing many-flowered spikelets, the sterile flowers were to be separated and counted as inert matter. Many-flowered spikelets were later named multiple seed units (MSUs).

The purity analysis of grasses with a high number of MSUs containing both fertile and sterile florets was time consuming, since the seed units had to be cut apart,

and only the units containing a caryopsis were classified as pure seeds. Therefore, in order to save time at the purity analysis, over the years, a number of Rules changes were introduced:

1956: sterile florets attached to a fertile floret of some grasses shall be left attached and included in the pure seed fraction. Only 80 % of the mass of MSUs in *Dactylis glomerata*, containing at least one caryopsis, should be considered pure seed.

1971: *Festuca rubra* and *F. ovina*: attached sterile florets, which did not extend to the tip of the fertile florets, were not to be removed and were to be considered part of pure seed.

1980–1995: Separating the MSUs with attached sterile florets extending to beyond the tip of the fertile florets was still a time-consuming task. Therefore, an MSU working group (set up in 1968) recommended that MSUs of *Festuca* and *Dactylis* should be included in the pure seed fraction, and the content of MSUs reported on the certificate if representing 1 % or more of the sample. The proposal was included in the 1980 Rules and slightly modified in 1983.

In 1995, it was accepted that *Lolium* should be reported in the same way as *Festuca* and *Dactylis*.

The adoption of testing multiple seed units in *Festuca* and *Dactylis* paved the way for the philosophy in purity testing: *do not perform an artificial threshing of the seed sample by cutting off awns, straw, wings or other appendages, but report what you see in the sample.*

In the following years, this idea was extended to other species in the ISTA Rules, and a number of PSDs were changed accordingly.

In order to save time during the analyses and in agreement with the seed trade, since 2003 the specifications of MSUs, inert matter and attached appendages are only reported on the Certificate if requested by the applicant.

Blowing of grasses

The purity test of chaffy grasses is difficult and time consuming. In order to overcome this problem, in the 1930s Leggatt from Ottawa, Canada developed a new seed blower, and introduced the climax blowing point for testing of grasses. Together with Porter from the Iowa Experimental Station, USA, he described the development of blowing, and a new concept of pure seed was introduced to seed technology.

Leggatt presented a paper on “The use of a controlled-pressure blower in testing grass seed” at the ISTA Congress in 1950. The work with blowing continued under the leadership of Prof. Everson, Iowa, specifically with the comparison of methods and blowers and comparison of the ‘hand’ and ‘climax’ methods for purity analysis of *Poa pratensis*. A number of experiments and comparisons between the hand method and the blowing method at a number of ISTA laboratories showed that both the time required and the variation between test results were much reduced by blowing (Everson 1968).

Based on those experiments, blowing of *Poa pratensis* was introduced into the ISTA Rules in 1966.

The Rules were modified in 2005 to cope with small-seeded varieties of *Poa pratensis*, and in 1992 the blowing of *Poa trivialis* was included.

A comparison of the uniformity of test results obtained by blowing and by the hand method allowed blowing of *Dactylis glomerata* to be included in the ISTA Rules of 1976.

Calibration samples of *Poa* and *Dactylis* were essential for setting the blowers. The ISTA calibration samples are composed of a mixture of the most commonly grown varieties, but is also attempted that a new stock of calibration samples produce results which do not deviate from the previous stock.

Blowing has also been used as an aid in purity testing of tropical and temperate grasses.

Relations with other ISTA Committees

Since 1924 to the present day the Purity Committee has cooperated in the development of the ISTA Rules with the Bulking and Sampling Committee on the sizes of working samples, with the Coated Seed Committee in the formulation of a new and specific set of Rules for seeds covered with pelleting materials, with the Flower Seed and Forest Tree and Shrub Seed

Committees on the formulation of PSDs, with the Nomenclature Committee on the use of correct internationally accepted plant names, and with the Rules Committee on the phrasing and harmonization of the Rules proposals with other parts of the Rules.

The Purity Committee has also assisted and cooperated with the working groups on Proficiency Testing and on Quality Assurance and Accreditation.

Conclusions

The valuable progress in the development and implementation of the ISTA Rules from 1924 to 2006 is based on contributions from many individuals and countries.

A consequence of this development is that it is now possible to adjust the testing method according to the species tested and to perform the analyses with improved accuracy, and at the same time to save time during the analyses.

Proficiency testing, the quality assurance programme, the technical development of, for example, microscopes, and the availability of seed images on the internet have contributed to this positive development. Progress in the development of computer imaging and sorting of seeds will without doubt continue. By avoiding the removal of inert material in grass MSUs and of wings and appendages, the ISTA rules for purity analysis are already prepared for this development.



Attempts have been made to mechanize the purity analysis, e.g. with devices which transport the seed sample under the magnification glass, by use of vibrators moving the seeds to be inspected under a microscope (Oregon Inspection Stations), or under a seed scanner with built-in sorting of the seeds. Above: two old models from Sweden (photos supplied by Karin Johansson).



The modern Swedish seed scanner (photos supplied by Karin Johansson).

Acknowledgements

My best thanks to colleagues and old friends for help and contributions.

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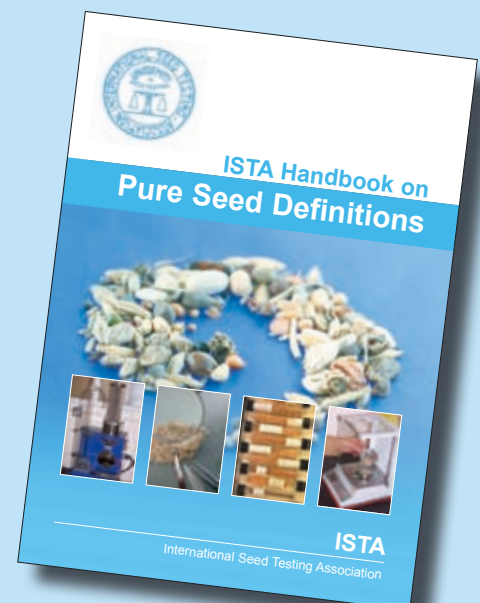
ISTA Handbook on Pure Seed Definitions, 3rd Edition, 2009

By the ISTA Purity Committee;
editors M.R. Mannino, J. Taylor & S. Jones

This handbook will expand on and illustrate the pure seed definitions (PSDs) of the International Rules for Seed Testing. This will help in the training in purity testing according to international principles. Illustrations of the most relevant genera within a PSD will provide practical guidance on the application of each definition. Each PSD is illustrated with scaled colour photographs or line drawings. A comprehensive glossary of scientific terms applying to seed purity is also included.

CHF 270.00 (approx. USD 245.00/EUR 167.00) from the ISTA Secretariat (for contact details, see back cover)

Publication planned for 2009



The Digital Plant Atlas: an international project

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The *Digital Plant Atlas* is a joint project of the Groningen Institute of Archaeology (GIA), the Community and Conservation Ecology Group (COCON), both of the University of Groningen (the Netherlands), and the Deutsches Archäologisches Institut (DAI, Berlin, Germany). This atlas makes a unique contribution to the identification of seeds, fruits, roots, tubers, bulbs, stem fragments, leaves, flowers, buds and resins. The plant parts are illustrated with high-quality colour photographs and accompanied by a scale and their scientific

name. Examples are given in Figures 1 and 2.

The *Digital Plant Atlas* consists of three volumes: the *Digital Seed Atlas of the Netherlands*, the *Digital Atlas of Economic Plants* and the *Digital Atlas of Economic Plants in Archaeology*. In 2006, the *Digital Seed Atlas of the Netherlands* appeared; this year (2009), the *Digital Atlas of Economic Plants* will be published, while the *Digital Atlas of Economic Plants in Archaeology* is due for publication in 2011.

Each part of the *Digital Plant Atlas* is published as a combination of book and web site. The books contain full-colour photographs of all the plant parts presented. On the web site, all the photos can be examined in more detail, and the measurements and the provenance details can also

be consulted. In each book, plants are dealt with in taxonomic order. The web site, on the other hand, makes it possible to select photographs by specific criteria. The web site repository is incorporated in the digital library of the University of Groningen.

The web sites of the Digital Plant Atlas project can be found at:

- www.plantatlas.eu (English),
- www.pflanzenatlas.eu (German),
- www.plantenatlas.eu (Dutch).

The web sites of the *Digital Seed Atlas of the Netherlands* are available at:

- www.seedatlas.nl (English), and
- www.zadenatlas.nl (Dutch).

The other two atlases will have their own web sites, with unique web addresses.



Figure 1. a Spelt (*Triticum aestivum* ssp. *spelta*). b Sweet William catchfly (*Silene armeria*). c Wild radish (*Raphanus raphanistrum*).

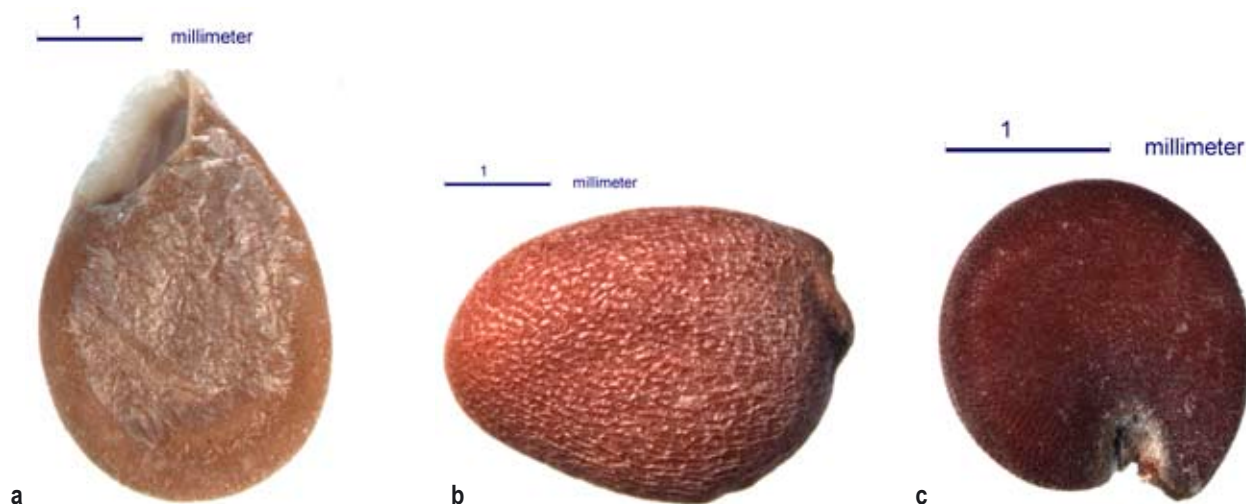


Figure 2. a Tomato (*Solanum lycopersicum*). b Podding radish (*Raphanus sativus* 'Caudatus'). c French mallow (*Malva nicaeensis*).

The Digital Seed Atlas of the Netherlands

In 2006, the *Digital Seed Atlas of the Netherlands* appeared. This atlas contains digital photographs, taken with a microscope, of 1828 Dutch wild plants, adventitious plants, and cultivated plants that have gone wild. In principle, the diaspore (dispersal unit) of every species has been illustrated. The diaspore can be a seed, a fruit or a fruit with external parts. The seeds of plant species whose seeds are released from the fruits during dispersal have been illustrated. As far as possible a representative fruit of every plant genus whose seeds are released from fruits has also been illustrated. The fruit and the seed of the species in question are thus first presented within the genus so that the transition between the genera is highlighted. When the seed remains enclosed by the fruit during

the dispersal process, as for example with the schizocarps of the umbelliferous plants (*Apiaceae*) and the nuts of the composites (*Asteraceae*), then only the fruit is illustrated. In order to emphasize the difference between the fruits and seeds of such fruits, typical seeds from such fruits have been dissected and also illustrated. When it is also possible to confuse parts of fruits with seeds, such as the hard, innermost parts (endocarps) of juicy drupes, illustrations of both the fruit and the seed are included.

If other parts of the fruit and seed also have a diagnostic value, they are also shown. Thus, of all the sedges (*Carex* spp.), both the utricles and the fruits are illustrated, and of all clover species (*Trifolium* spp.), the calyx (if necessary with corolla), the fruit and the seed (Fig. 3). Of the grasses (*Poaceae*), illustrations have been included in principle of the spikelets (floret(s) surrounded by glumes), the florets (fruit(s)

surrounded by lemma and palea) and the fruits. When there is a question of seed dimorphism, as with Knotted Hedge Parsley (*Torilis nodosa*) and the Lesser Hawkbit (*Leontodon saxatilis*), all the different seed or fruit types are illustrated.

The photographs in the book are arranged in accordance with the system in the latest (23rd) edition of *Heukels' Flora van Nederland* (Van der Meijden, 2005). This new, systematic arrangement is based on recent DNA research and has resulted in a new plant genealogy, which is generally accepted internationally. The *Digital Seed Atlas of the Netherlands* thus provides important supporting visual material for the new arrangement. In a very few instances this arrangement has not been followed at genus and species level, for example if the morphological relationship between seeds and fruits could then be better expressed.

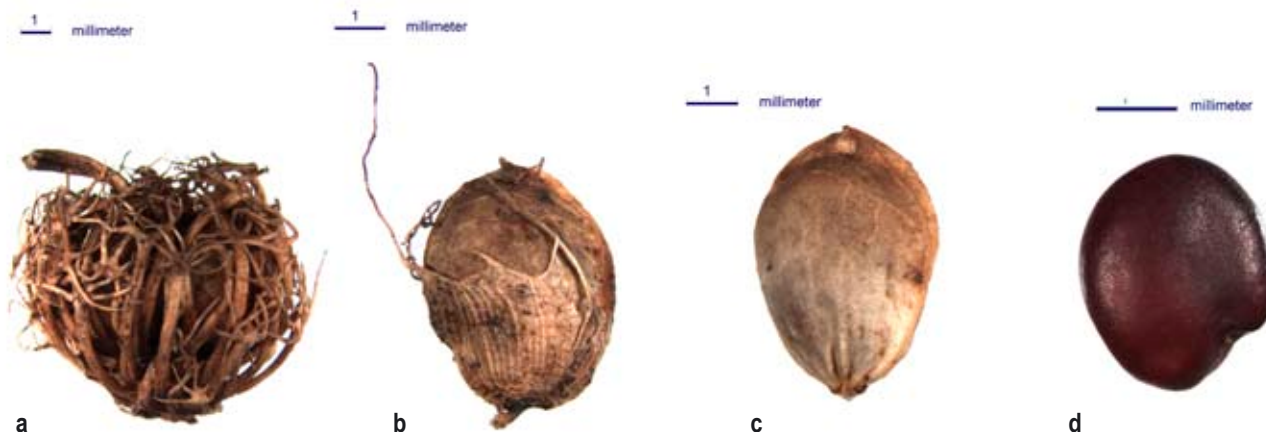


Figure 3. Infructescence (a), fruit with calyx (b), fruit (c) and seed (d) of Subterranean clover (*Trifolium subterraneum*).

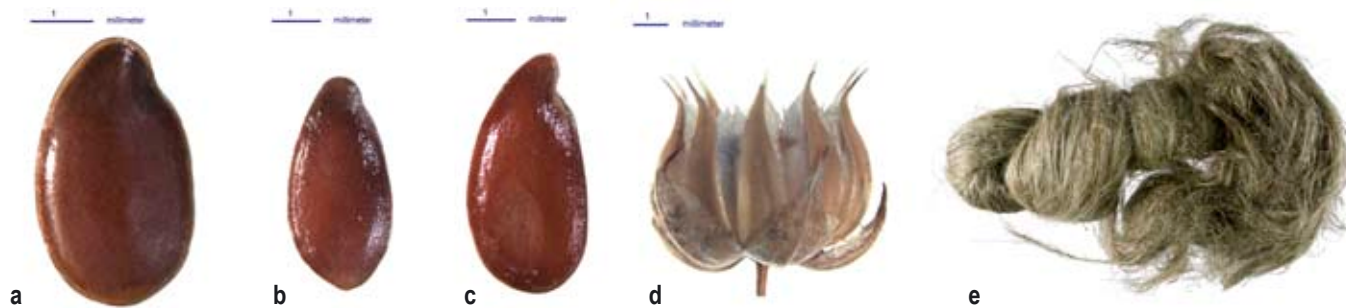


Figure 4. Seeds (a–c), fruit (d) and fibres (e) of flax (*Linum usitatissimum*).

Both book and web site are bilingual. The introduction and glossary are in English and Dutch, whereas the description of the photographs is in English. Photographs can be looked up by a Dutch index and by an index of scientific plant names. The web site of the *Digital Seed Atlas of the Netherlands* also has a Dutch and English search key based on seed and fruit characteristics, thus helping to name unknown examples.

The Digital Atlas of Economic Plants

This year the *Digital Atlas of Economic Plants* will be published. This atlas presents the plant parts that have an economic value and are offered for sale at markets and in shops. They include plants that are used as food, spices, stimulants, medicines, poisons, offerings, dyes, tannins, building materials and ground coverings. In order to best illustrate the variety in seed and fruit types within families, one or more representatives of many decorative plants have also been included. How the different plants are used is indicated by pictograms.

In addition to seeds and fruits, this atlas also illustrates other plant parts, such as underground plant parts, stem fragments, leaves, flowers and buds (Fig. 4). Typical examples of objects of daily use made from plant parts are also presented, such as beads and ritual objects.

Although plants from all over the world have been included, the emphasis is on the Old World (Europe, Asia and North Africa). It goes without saying that completeness was not the aim – there are simply too many plants with economic value. The selection is based on *World Economic Plants. A Standard Reference* by J.H. Wiersema and B. León (1999).

In recent years, many markets and herb shops in the Old World were visited to expand the comparative collection with what is currently on offer in trade plants. It turns out that the range has been changing in the last 10 years. On the one hand, globalization has resulted in a wider variety of mainly food plants through the

migration of people and increased international transport of goods. However, the same globalization has also resulted in a certain degree of impoverishment of the range – medicinal plants in particular are vanishing from the shelves (Fig. 5).

This atlas documents both the plants currently dominating the market and those that are now only offered in specialist shops. It can thus be regarded as an important period document which is important not only for all kinds of specialists, such as paleobotanists, plant taxonomists, plant ecologists, pharmacists, ethnologists and traders, but also for a wider audience.

This atlas consists of three volumes. The first two volumes, each comprising some 750 pages, contain about 10000 full-colour photographs and represent some 3750 plant taxa. The third volume contains an introduction and glossary in English, German and Dutch, and indexes for Latin, English, German, Dutch, Spanish, Arabic, Turkish, Hindi, Malayalam, Sanskrit and Chinese.

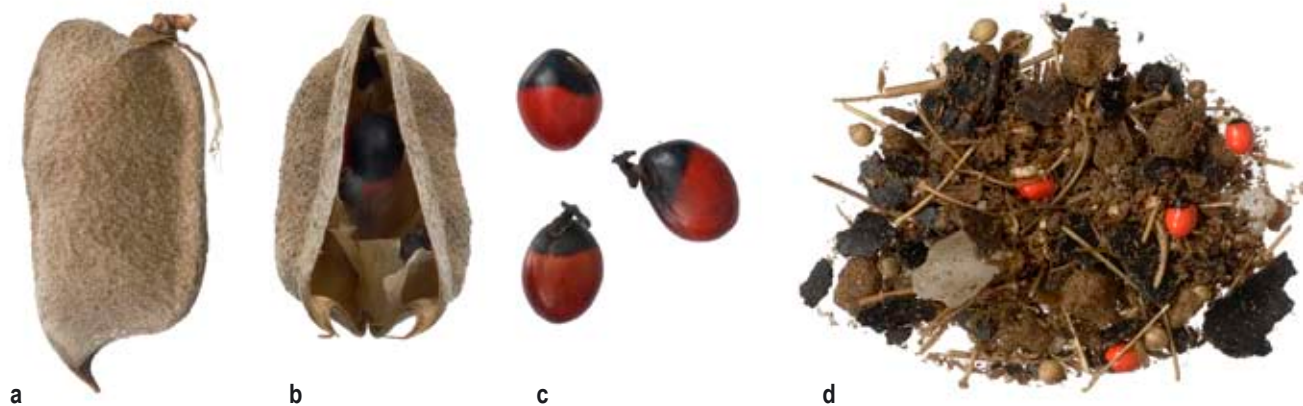


Figure 5. Fruit (a, b) and seed (c) of Rosary pea (*Abrus precatorius*). d Incense mixture from Cairo with seeds of Rosary pea as a remedy against the “evil eye”.

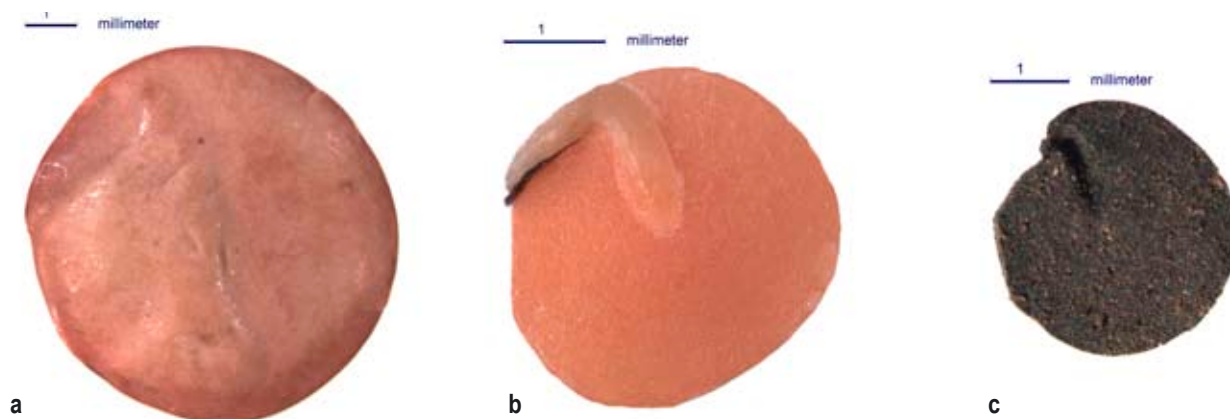


Figure 6. Recent seed (a), cotyledon with embryo (b) and subfossil seed (c) of lentil (*Lens culinaris*).

The Digital Atlas of Economic Plants in Archaeology

The third part of the *Digital Plant Atlas* presents illustrations of subfossil remains of plants with economic value. These plant remains mainly come from excavations in the Old World (Europe, Western Asia and North Africa) that the DAI and the GIA have conducted or participated in.

Plant material is usually very perishable, but can nevertheless be preserved in archaeological sites if the biological decay of the material is halted. Many plant remains are discovered during excavations in carbonized form, where despite having been in contact with fire, they have not been completely reduced to ash. Extremely dry climatic conditions, such as those in Egypt, can also preserve plant material in

a completely desiccated condition. Most of the economically valuable plants illustrated here have been preserved in this way. Thus, this atlas follows on well from the *Digital Atlas of Economic Plants*.

As in Part 2 of the series, this volume will include illustrations not only of seeds and fruits, but also of other plant parts. The resulting variety in seed and fruit forms will be illustrated by examples from various excavations. If relevant, photographs of recent samples will be presented, thus illustrating the increase in size as a result of selection and domestication processes (Fig. 6). The illustrations of the subfossil plant remains will be supplemented by photographs of the traditional cultivation and processing of a number of cultivated plants.

To supplement the photographs, the web site will also include morphometric measurements of the subfossil seeds and fruits. These measurements can be compared with one's own measurements of the plant taxonomy in question.

References

- The Digital Plant Atlas project. English www.plantatlas.eu, German www.pflanzenatlas.eu, Dutch www.plantenatlas.eu.
Digital seed atlas of the Netherlands. 2006. 26 + 502 pages. Hardcover. Bilingual (English and Dutch). EUR 148 (private persons), EUR 203 (institutions). English language version www.seedatlas.nl, Dutch www.zadenatlas.nl.
 The *Digital Atlas of Economic Plants* will be published this year (2009).
 The *Digital Atlas of Economic Plants in Archaeology* is due for publication in 2011.

www.plantatlas.eu

The Digital Plant Atlas is a joint project by the University of Groningen (the Netherlands), and the Deutsches Archäologisches Institut (DAI, Berlin, Germany). All books are published by Barkhuis, Groningen, the Netherlands.

DIGITAL SEED ATLAS OF THE NETHERLANDS

R.T.J. Cappers, R. Neef & R.M. Bekker



2006. XXVI + 502 pp.
 Hardbound, 21 x 29.7 cm
 € 148.- private individuals,
 € 203.- institutions
 ISBN 9789077922118

Bilingual (English and Dutch) and scientific plant names. Purchase of the book grants access to the protected part of the websites www.zadenatlas.nl and www.seedatlas.nl.

DIGITAL ATLAS OF ECONOMIC PLANTS

R.T.J. Cappers, R. Neef & R.M. Bekker



2009 (forthcoming). 3 parts, over 1,800 pp.
 Hardbound, 21 x 29.7 cm
 € 245.-; after 1 July 2009 € 325.-

Trilingual Introduction and Glossary (English, German, and Dutch), and 12 indices (scientific plant name, pharmaceutical plant name, English, German, Dutch, Spanish, Arab, Turkish, Chinese, Hindi, Tamil, and Malayalam). 272 plant families. 3,767 plant species (taxa). Over 10,000 plant photographs. Purchase of the book grants access to the protected parts of the websites.

For background information about both publications, see the feature article here above.

For a preview and order form, visit www.plantatlas.eu.



ISTA ANNUAL MEETING 2009

15–18 June, Zurich, Switzerland



Overview

Thur–Sat ISTA Quality Assurance Workshop
11–13 June (see page 45)

Sunday ISTA Seed Analyst Training Workshop/
14 June Seminar (see page 46)
Registration and welcome cocktail

Monday ISTA Seminar on Purity Testing
15 June (see page 13)

Tuesday Presentation of ISTA's technical work
16 June Meetings of individual ISTA Committees
(see page 15)

Wednesday Presentation of ISTA's technical work
17 June Meeting of the Rules Committee
Official Dinner (see page 15)

Thursday ISTA Ordinary Meeting (see page 16)
18 June Presentation on the development of the
seed industry in Europe, by Garlich von
Essen, Secretary General of ESA

ISTA Seminar on Purity Testing

Glattbrugg-Opfikon (Zurich), Switzerland, 15 June 2009

The ISTA Seed Purity Committee is pleased to invite you to their Seminar on Purity Testing in Glattbrugg (Zurich), Switzerland, as part of the ISTA Annual Meeting 2009.

Venue

The workshop will be held at the venue of the ISTA Annual Meeting 2009 (15–18 June): NOVOTEL, Lindbergh-Platz 1, 8152 Glattpark-Opfikon-Zurich, Switzerland.

Content

Presentations will be given on various aspects of seed purity by experts in the field. The work of the Purity Committee and topical issues currently being addressed by the Committee will be presented.

Participants will also be able to put questions to a panel of experts and discuss issues related to the purity test. It is hoped that this Seminar will be invaluable both to those involved in the technical aspects of the work and to stakeholders who make use of the results of purity analyses.

Organizer

ISTA Purity Committee; e-mail: maria-rosaria.mannino@geves.fr or jane.taylor@niab.com

Local organizer

ISTA Secretariat, Zürichstrasse 50, 8303 Bassersdorf, Switzerland. E-mail: ista.office@ista.ch

Lecturers

- Adriel Garay, USA (Oregon State University)
- Norbert Leist, Germany (Seed Testing and Quality Management, Bad Schönborn; ISTA Past President)
- Maria Rosaria Mannino, France (French National Seed Testing Station GEVES; Purity Committee Chair)
- Monica Moreno, Argentina (Instituto Nacional de Semillas; ISTA Technical Auditor and Purity Committee Member)
- Zdenka Prochazková, Czech Republic (Forestry and Game Management Research Institute; Forest Tree and Shrub Seed Committee Chair)
- Jane Taylor, UK (National Institute of Agricultural Botany; Purity Committee Vice-Chair)
- Joost van der Burg, Netherlands (Plant Research International; Advanced Technologies Committee Member)

Programme

08:20–08:30

Welcome by the Chair of the Seminar, Maria-Rosaria Mannino, GEVES, France, Chair of the ISTA Purity Committee

Part 1: Pure Seed Definitions

08:30–09:00

1.1 Review of Pure Seed Definitions in the ISTA Rules (Joost van der Burg)

The lecture will illustrate the history and philosophy of PSDs: cleaning possibilities or impossibilities and practical issues related to the analysis (diminishing the work load). Details of seed descriptions for the main groups will also be presented: in *Poaceae*, presence or absence of caryopsis, size of the caryopsis, spikelets or florets, MSU; in other families, presence or absence of pericarp, etc. The possibilities of PSD improvement will be also underlined as suggestions for Purity Committee work.

09:00–09:30

1.2 Botanical criteria for Pure Seed Definitions (Joost van der Burg)

The objective of the lecture is to give the botanical background of Pure Seed Definitions (PSDs) and to elaborate on the terminology chosen. The lecture will add to the information given in the PSD Glossary of the ISTA Rules, especially on the morphology of flowers, fruits and seeds.

09:30–10:00

1.3 Purities of tropical/subtropical species such as *Panicum*, *Brachiaria* and *Chloris* (Monica Moreno)

The lecture will illustrate the importance of these crops for tropical and subtropical regions, the physiological basis, the Pure Seed Definitions and the main analysis difficulties for these species.

10:00–10:30 Coffee break

10:30–11:00

1.4 Testing forest tree and shrub species (Zdenka Prochazková)

The lecture will illustrate the purity of tree and shrub seeds, with a possible discussion on the analysis method for these species.

Part 2: Seed identification

11:00–11:30

2.1 Identification of seeds to the genus or species level (Norbert Leist)

The objective of the lecture is to give indications on the methodology that should be adopted to identify seeds, and also to underline the difficulties of identification at the species level. Some examples will be illustrated from species of the Universal List.

11:30–12:00

2.2 Tools for seed identification (Norbert Leist)

The lecture will contribute to answering the following questions: where is it possible to find seed samples for collections, how to check and validate them before adding them to a seed collection, how to promote seed specimen exchange, which tools for seed identification (botanical keys, literature, web sites) and other possible sources of information to help analysts in their work.

12:00–12:30

2.3 The Universal List of Species: role and impact (Maria Rosaria Mannino and Jane Taylor)

The lecture will present the Universal List of Species published by ISTA. Information will be given on the use of this list and its impact on ISTA laboratories: seed collection contents, guidance to the ISTA Proficiency Programme, level of seed identification.

12:30–13:30 Lunch

13:30–14:00

2.4 Species classification and nomenclature (Norbert Leist)

The lecture will present the rules for species nomenclature and classification.

Part 3: Seed blowing

14:00–14:45

3.1 Innovation in standard blowing procedures for *Poa pratensis* and *Dactylis glomerata* (Adriel Garay)

The Uniform Blowing Method is an important technological opportunity to innovate purity testing in grass seeds. The innovation presented has been the official AOSA procedure since 2006. The method introduces the concept of using master calibration samples as the primary standard to find the calibration point in the blower and the use of the equivalent air velocity (EAV) as the secondary or working standard.

14:45–15:45

3.2 Demonstrations on the value of equivalent air velocity to calibrate a blower (Adriel Garay)

15:45–16:15 Coffee break

16:15–17:15

3.3 Methodology for developing a uniform blowing procedure for grass species (Adriel Garay)

The purpose of this presentation will be to illustrate the steps needed to develop a procedure for new species: how to find the point, validate the point across samples, develop the master calibration samples, verify the uniformity of the master samples and carry out an inter-laboratory validation.

Part 4: Discussion forum and conclusion of seminar

17:15–18:00

4.1 Discussion and conclusion

Seminar participants will be given the opportunity to put questions to a panel of experts on aspects of purity analysis. It is anticipated that items covered will include the future of purity testing and the role of machine vision, the reporting of purity results, calculations and the use of statistics and tolerances.

Registration

Includes Seminar, lunch and coffee breaks on Monday 15 June ONLY.

Registration deadline: 15 May 2009

ISTA Members: EUR 180

Non-members: EUR 230

Students: EUR 99 (current student identification required)

To register for the full Annual Meeting (15–18 June), including the Seminar on Purity Testing, please see page 16.

Accommodation

For hotel information, please see page 16.

Trade fair at the ISTA Annual Meeting 2009

Reach up to 200 seed science professionals from labs and organizations worldwide

Limited number of exhibition stands available

Prime location immediately outside auditorium: space size 3.10 m x 2.75 m

1400€ for ISTA Members – 1600€ for non-members

includes 1 booth and 1 exhibitor at all events:

welcome reception, official dinner and all coffee breaks and lunches

Please contact the organizers at meetings@ista.ch

ISTA Annual Meeting 2009

Glattbrugg-Opfikon (Zurich), Switzerland, 15–18 June 2009

The International Seed Testing Association (ISTA) takes pleasure in inviting you to participate in the ISTA Annual Meeting 2009, to be held from 15–18 June in Glattbrugg (Zurich), Switzerland.

The meeting is aimed at discussing and deciding on proposals for changes to the ISTA *International Rules for Seed Testing*, and business items of the Association, with the international participation of ISTA delegates and representatives from both the seed industry and governments, including experts in seed technology, scientific research and laboratory accreditation. Focal points of

the discussion and voting will be the implementation of the ISTA Seed Analyst Training Programme, the voting on the position paper of the GMO Task Force regarding the unit of measurement and report on the progress on developing Rules for Seed Mixtures.

Furthermore, a one-day Seminar will be held on 15 June which will cover aspects in the important areas of analytical seed purity testing, seed identification and application of the pure seed definitions based on botanical seed structure.

We look forward to seeing you in Zurich!

Final programme

Meeting venue: Novotel Zurich Airport Messe, Lindberghplatz 1, 8152 Glattpark-Opfikon, Switzerland

Sunday 14 June 2009

16:00–20:00 Registration of Participants

19:00 Welcome Cocktail

Monday 15 June 2009

08:30–18:00 ISTA Purity Seminar (see page 13)

Tuesday 16 June 2009

Presentation of ISTA's technical work

08:30 Opening by the ISTA President, Dr. Katalin Ertsey

08:30–10:00 Session I

- a) Report from the Purity Committee
- b) Report from the Germination Committee
- c) Report from the Moisture Committee

10:00–10:30 Coffee Break

10:30–12:30 Session II

- a) Report from the Tetrazolium Committee
- b) Report from the Vigour Committee
- c) Report from the Seed Health Committee
- d) Report from the Variety Committee

12:30–13:30 Lunch break

13:30–14:00 e) Report from the GMO Task Force

14:00–15:00 Session III

- a) Report from the Flower Seed Committee
- b) Report from the Forest Tree And Shrub Seed Committee

15:00–15:30 Session IV

- a) Report from the Editorial Board of Seed Science and Technology

15:30–16:00 Coffee break and official photo

16:00–18:30 Meetings of individual ISTA Committees

Wednesday 17 June 2009

Presentation of ISTA's technical work

08:30 Opening by the ISTA President, Dr. Katalin Ertsey

08:30–12:30 Session V

- a) Report from the Bulking and Sampling Committee
- b) Report from the Statistics Committee
- c) Report from the Nomenclature Committee

10:00–10:30 Coffee break

10:30–12:00 d) Report from the Storage Committee

- e) Report from the Advanced Technologies Committee

f) Report from the Method Validation Advisory Group

12:00–13:30 Lunch break

13:30–14:30 Session VI

- a) Report from the Proficiency Test Committee
- b) Report from the Accreditation Department

14:30–15:00 Session VII

a) Report from the Seed Analyst Training Committee

15:00–15:30 Coffee break

15:30–18:30 Session VIII

a) Meeting of the Rules Committee

19:30 Official Dinner at the Uto Kulm (Uetliberg/Zurich)

Thursday 18 June 2009

ISTA Ordinary Meeting

09:00–10:00 Welcome by the ISTA President, Dr. Katalin Ertsey
 Presentation on the development of the seed industry in Europe, by Garlich von Essen, Secretary General of ESA

10:00–10:30 Coffee break

10:30–12:30 1. Call to order
 2. President's Address
 3. Roll call of Designated Members entitled to vote
 4. Reading of Minutes
 5. Report of the Executive Committee
 6. Report of the Secretary General

12:30–13:30 Lunch break

13:30–14:30 7. Constitution changes
 8. Fixation of annual subscriptions
 9. Consideration and adoption of the proposed Rules Changes 2009

15:00–15:30 Coffee break

15:30–17:30 10. Consideration and adoption of reports
 11. Announcement of the place and date for the next Ordinary Meeting of the Association
 12. Any other business raised by a Member, of which notice in writing has been received by the Secretary General two months prior to the date of the meeting
 13. Any other business raised by consent of the Executive Committee
 14. President's closing address
 15. Adjournment

Preparatory documents for the Ordinary Meeting

The following 8 documents have been endorsed by the ISTA Executive Committee to be submitted to the ISTA Ordinary Meeting 2009 for acceptance by the nominated ISTA Designated Members voting on behalf of their respective Governments:

- 01-2009-OM Agenda of the Ordinary Meeting 2009 [voting document]
- 02-2009-OM Draft Minutes of the Ordinary Meeting 2008 [voting document]
- 03-2009-OM Activity Reports 2008 of the ISTA Committees [voting document]

- 04-2009-OM Proposal for the Membership Fees 2010 [voting document]
- 05-2009-OM Proposed Changes to the ISTA International Rules for Seed Testing 2010 Edition [voting document]
- 06-2009-OM Method Validation Reports on Proposed Changes to the ISTA International Rules for Seed Testing 2010 Edition [information document]
- 07-2009-OM Constitution Change Proposals 2009 [voting document]

- 08-2009-OM Final Draft ISTA Position Paper on ISTA's view regarding the units for the reporting of quantitative results on adventitious presence of seeds with specified traits in conventional seed lots [voting document]

Registration

Full Annual Meeting

Includes welcome cocktail, the one-day Seminar on Purity Testing, all sessions, lunches and coffee breaks, and the Official Dinner.

Late registration (after 15 April 2009):

ISTA Members: EUR 600
 Non-members: EUR 1200

Accompanying persons

Includes welcome cocktail, all lunches and coffee breaks and the Official Dinner: EUR 200

The fee does not include technical sessions. Please note that there is no official programme for accompanying persons. However, for tour suggestions please visit <http://www.zuerich.com>, or enquire at the

hotel or the Zurich Tourism Office: Zürich Tourismus, Tourist Service in Central Station, 8021 Zurich, phone: +41 (0)44 215 40 00, fax: +41 (0)44 215 40 44, e-mail: information@zuerich.com

Cancellation policy

There will be no charge for a cancellation up to 15 April 2009. For a cancellation between 15 April and 15 May 2009, the accompanying-person fee will be charged; between 15 May and 15 June 2009 50 % of the registration fee, and for a no-show 100 % of the registration fee.

Accommodation

Prices are per room and per night, and valid only for the dates of the Quality Assurance Workshop (11–13 June; see p. 45), the Seed Analyst Training Workshop/

Seminar (14 June; see p. 46) and the ISTA Annual Meeting (15–18 June 2009) inclusive.

Novotel (Annual Meeting venue)

Lindberghplatz 1, 8152 Glattpark-Opfikon-Zurich, Switzerland, phone: +41 (0)44 829 90 00, www.novotel.com
 Single room: CHF 226 (incl. breakfast)
 Double room: CHF 252 (incl. breakfast)

For reservations, please fax the reservation form (www.seedtest.org/am2009) to +41 44 829 99 99 by 15 May 2009.

The Novotel Zurich Airport Messe is conveniently situated within the Glattpark international office and commercial development and World Trade Center, close to the A1/A4/A53 highway with ideal tram and rail links to Zurich city centre and Zurich Airport.

Ibis Hotel Zurich Messe-Airport

Heidi Abel-Weg 5, 8050 Zurich, Switzerland, phone: +41 (0)44 307 47 00, fax: +41 (0)44 307 47 47, www.ibishotel.com
Single or double room: CHF 130
Breakfast: CHF 15

For reservations, please fax the reservation form (www.seedtest.org/am2009) to +41 44 838 60 01 before 15 April 2009.

For reservations please contact Mr Andreas Pfluger via fax at +41 44 829 99 99 or via e-mail at h0884-re@accor.com (reference code: ISTA meeting).

About Zurich City, Switzerland

Zurich is conveniently located at the heart of Europe. Nestling beside Lake Zurich with stunning views of the Swiss Alps, this exciting city is just 10 minutes away from its international airport. In Zurich everything is that bit smaller – but with so many things to do, this simply means you have all the more time for an unforgettable visit.

Enjoy the picturesque old town, the trendy new Zurich West district and the glorious lake. With opera, ballet, theatre premieres, shows, musicals, art exhibitions in over 50 museums and 100 galleries, time never drags in Zurich. The famous Bahnhofstrasse and Limmatquai are a shopper's paradise. Over 1700 restaurants and bars serve both traditional Zurich and Swiss dishes and well as exotic specialties. The evenings will leave you spoilt for choice: indoors or outdoors, anything is possible as far as the nightlife in Zurich goes.

Key attractions

Grossmünster Church, Fraumünster Church, St. Peter's Church, Opera House, Arthouse Zurich, Swiss National Museum, Niederdorf – Old Town, Bahnhofstrasse, Zurich Zoo with the Masoala Rain Forest Hall, trip to Uetliberg, Lake Zurich boat cruise.

Getting there

By air

Regular scheduled flights from every continent, most countries and major cities of the world land at Zurich's international airport. A train service every quarter of an hour whisks passengers to the Zurich city centre in just ten minutes. The Novotel and Ibis Hotel provide free airport transfers from Zurich airport from 05:00 to 23:10 every 30 minutes (5 minutes travel) from Terminal 2, Zone 2.

By public transport

Over a thousand trains stop daily at Zurich's centrally located main railway station. Direct and frequent services to all large Swiss cities and major European destinations guarantee a pleasant journey.

The **Novotel** is served by the No. 10 tram, which runs from Zurich main station to the airport and stops at Lindberghplatz, directly in front of the **Novotel**.

The **Ibis Hotel** is served by the No. 781 bus, which runs from Oerlikon station to Glattbrugg station and stops at Riedbach, 3 minutes from the hotel. The No. 781 also stops at Lindberghplatz, thus connecting the two hotels.

Both the No. 10 tram and the No. 781 bus also stop at Oerlikon, Opfikon and Glattbrugg stations. From these stations there are also numerous connections on various suburban train lines to Zurich main station and the airport.

By car

Novotel (meeting venue)

From all directions (Zurich city centre, A1, A3 or A4 highways), follow signs to the airport (Flughafen), then head north towards the A51 highway and Flughafen. Take exit No. 8 towards Glattbrugg. Cross the highway bridge and immediate turn

right towards Zurich and the A51 highway (heading south). Take the next exit, No. 9, and head towards Oerlikon. After 600 m, the Novotel is on the right-hand side.

Ibis Hotel

From Bern/ Basel/ Zurich Airport/Winterthur: direction St. Gallen, take exit Wallisellen, direction Zurich-Oerlikon 3 km straight ahead. From Zurich City: highway direction Flughafen, take exit Schwamendingen and follow Messe-Oerlikon.

By taxi

The taxi journey from the airport to the Novotel and Ibis Hotel takes about 5 minutes and should cost approx. 30 CHF. A taxi from the train station or city centre to either hotel will cost you approx. 50 CHF.

Currencies

Accepted currencies in Zurich (in most shops, restaurants, hotels): Swiss franc (CHF), euro (€), major credit cards such as Mastercard, VISA, Eurocard, American Express.

Visas and letters of invitation

The Secretariat will send out letters of invitation to participants upon written request. However, it should be understood that this letter is only to help delegates to raise travel funds or to obtain a visa, and is not a commitment on the part of the organizers to provide any financial support.

Delegates requiring invitations for visa applications must pay the registration fee before the invitation letter is issued. Please take into consideration that the Secretariat will NOT deal directly with Embassies for visa requests for participants.

Need more information? E-mail us at meetings@ista.ch. ■

**Latest information for Annual Meeting 2009:
registration — all documents
www.seedtest.org/AM2009**

ISTA Seed Analyst Training

John Hampton

ISTA 1st Vice-President and Chair, ISTA Seed Analyst Training Committee

The world's seed trade relies on the fact that in ISTA's accredited laboratories, skilled personnel (i.e. seed analysts) are available to test seed lots for a number of quality attributes. Yet there is a growing concern about the availability of trained seed analysts. In a 2006 survey in the USA, 83 % of the respondents agreed that there was a shortage of seed analysts (see STI No. 131, April 2006, p. 48). While similar data are not as yet available from other parts of the world, anecdotal evidence suggests similar concerns.

So why is there a shortage of seed analysts? Again, the only data available come from the USA survey, which provided three reasons:

- a lack of training opportunities;
- the degree of training required to become a skilled seed analyst;
- low salaries that do not reflect the training/skills acquirement required.

Is the situation in the USA of concern to ISTA? The answer is obviously yes, because it is mirrored in other ISTA countries. The ISTA Secretariat has for many years received requests from members for seed analyst training. ISTA's member laboratories now range from public through to private ownership, from those established over 100 years ago to those very recently established, and from those which employ more than 20 seed analysts to those which employ only one or two. While some laboratories, particularly those in the EU, can continue to provide seed analyst training, laboratories in other parts of the world have difficulty in doing so.

ISTA's response

In 2004, the ISTA Executive Committee (ECOM) established a Seed Analyst Training Working Group, charged with developing an ISTA Seed Analyst Training Programme. This Group became the ISTA Seed Analyst Training Committee (SATC) in 2006.

In 2007, the ISTA membership approved the 2007–2010 ISTA Strategy, which includes the development of an ISTA seed analyst training system.

The SATC proposed that ISTA introduce a system of ISTA Contracted Seed Analyst Training Providers (see STI No. 133, April 2007, pp. 25–26), and this proposal was accepted by the ECOM.

At the ISTA Ordinary Meeting in Bologna in 2008, the proposal generated considerable debate amongst the membership, and it became clear that there were some very different opinions on the role of ISTA in seed analyst training and how it could be provided.

The ECOM asked the SATC to prepare and distribute a questionnaire on seed analyst training to ISTA Member Laboratories. The questionnaire was distributed in February 2009.

ISTA Seed Analyst Training Workshop

The Workshop which will be held on 14 June 2009, just prior to the ISTA Annual Meeting in Glattbrugg (Zurich), Switzerland, has three major goals:

- to provide a comprehensive overview of seed analyst training needs, problems and opportunities around the world;
- to gather ideas on the format/content of an ISTA Seed Analyst Training Programme;
- to provide recommendations as to how ISTA might deliver a Seed Analyst Training Programme.

The Workshop will begin with presentations from various regions on seed analyst training. The presenters (see below) will have had access to the questionnaire responses relevant to their region to assist them with the preparation of their presentations.

- Africa: Mary Chipili (Zambia)
- Asia: Masatoshi Sato (Japan)
- Australasia: John Hampton (New Zealand)
- Europe: Joël Léchappé (France)
- North America: Steve Jones (Canada)
- South America: Monica Moreno (Argentina)

Following these presentations, Workshop participants will form small groups, each led by a member of the SATC or a presenter. Using a brainstorming exercise, participants will discuss all aspects of ISTA Seed Analyst Training, working towards answering a set of questions common to all groups. Each group will elect a spokesperson, who will report the group's outcomes to all participants. The immediate past-president of ISTA, Pieter Oosterveld from the Netherlands, will then summarise the outcomes and present a conclusion to the day.

Seed analyst training is important to ISTA. The SATC and the ECOM intend that the Workshop outcomes will provide a way forward for the ISTA Seed Analyst Training Programme, and therefore welcome your active Workshop participation.

For more information, please see page 46, and visit www.seedtest.org/sat. ■

Proposed changes to the *International Rules for Seed Testing* 2010 Edition

Again this year, a number of proposals for changes and amendments to the *ISTA International Rules for Seed Testing* will be submitted for voting by the nominated ISTA Designated Members on behalf of their respective Governments, under Agenda point 9.

This year, Chapter 1: ISTA Certificates has been revised, in particular with regard to the Rules on reporting of results. These Rules are now synchronized with the corresponding Rules in other Chapters.

Since all tolerance tables have been moved to their respective chapters, Chapter 16: Tolerances will be deleted, and Appendixes A and B will be renumbered to Chapters 16 and 17.

Among the further changes are the following:

New species

Addition of *Brachiaria brizantha*

Chapters 2, 7 and 11

- Revised definition of seed treatment applicable to several Rules chapters

Chapter 1: ISTA Certificates

- Revision of 1.5 Reporting results, and synchronization with corresponding paragraphs in other Chapters
- Requirement for moisture-proof containers for moisture testing
- Clarification on how to state “Provisional” on “Original” and “Duplicate” ISTA Certificates
- Requirement for reporting the name of the sampling laboratory

Chapter 2: Sampling

- Reduction of submitted-sample size for *Nicotiana tabacum* to 5 g
- Addition of spiral-slot sampling stick without compartments and cargo sampler, for seed smaller than cereals, i.e. grasses and clovers

Chapter 3: The Purity Analysis

- Revision to 3.7 Reporting results

Chapter 4: Determination of Other Seeds by Number

- Revision of 4.7 Reporting results

Chapter 5: The Germination Test

- Top of paper covered with sand (TPS) method for *Glycine max*, *Helianthus annuus*, *Phaseolus vulgaris* and *Zea mays*
- Between paper (BP) method for *Brassica* spp. and *Sinapis alba*
- Organic growing media (O) method for *Vicia faba*

Chapter 7: Seed Health Testing

- Addition of new method 7-026: Detection of Squash Mosaic Virus, Cucumber Green Mottle Mosaic Virus and Melon Necrotic Spot Virus in Cucurbits

Chapter 9: Moisture Content

- Change to 9.1.6 Calculation and expression of results
- Change to 9.1.4.3 Containers: tight-fitting lids no longer necessary
- Addition to 9.1.5.1 General Directions and Precautions: retention of samples for re-testing, if required
- Clarification of 9.1.5.6 Predrying

Chapter 10: Weight Determination

- Revision of 10.7 Reporting method used for weight determination

Chapter 15: Seed Vigour Testing

- *Phaseolus vulgaris* validated for conductivity test
- Reporting results following a re-test
- New validated controlled deterioration (CD) test for *Brassica* spp.

Chapter 16: Tolerances

- Deleted, all tables having been moved to their respective Chapters

Appendix A

- Renumbered Chapter 16

Appendix B

- Renumbered Chapter 17

ISTA Seminar for Africa

Livingstone, Zambia, 13 February 2009

Mary M. Chipili¹ and Mable Simwanza²

¹ISTA Executive Committee Member-at-Large and ²ISTA Personal Member

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The ISTA Seminar for Africa was held at the Zambezi Sun Hotel, Livingstone, Zambia on 13 February 2009. There were 30 participants from 14 countries. The aim of the seminar was to bring representatives from the seed industry, seed testing laboratories and other related organizations together to exchange views and discuss the role and benefits of seed testing, especially as it relates to Africa.

After the welcome to the participants and an introduction by the ISTA President, Dr. Katalin Ertsey, the Seminar was officially opened by the Minister of Agriculture of Zambia, the Hon. Brian Chituwo, MP, whose opening address is given on p. 22.

ISTA in Africa

Among the questions raised was a concern about the lack of financial support for individual participation in Technical Committees (TCOMs). ISTA's response was that members of TCOMs do not have to attend all meetings, meaning that resources cannot be a reason for lack of participation. Information was also provided on the requirements for joining a TCOM. There is no cost involved, and participation is open to both the private and public sectors. The requirements are knowledge and willingness to take part in the work of the committees. The procedure on how to join a TCOM was outlined, and it was also mentioned that TCOMs have Working Groups, which people can join even if they are not TCOM Members.

The lack of political will to facilitate African participation in ISTA was also brought up. The politicians need to be oriented about the seed certification process for them to appreciate the benefits and costs of ISTA accreditation.

With regard to funding participation, it was indicated that the Secretariat cannot provide financial support, since it has no capacity building programme. Interested institutions were advised to approach the FAO.

Differences in the levels of agriculture in African countries make it difficult for some countries to appreciate the importance of ISTA. The private sector was also called upon to support governments in recognizing the importance of ISTA membership.

Inclusion of tropical species

Background information was given about the questionnaire on 7 African tropical species. The participants were encouraged to submit names of seed species to be included in the testing procedures. A reminder was, however, given that the species must be under seed production in the countries of origin, so that there is enough seed to carry out validation tests for inclusion in the ISTA Rules.



ISTA President Dr. Katalin Ertsey welcoming delegates to the 2009 ISTA Seminar for Africa.

Seed health testing in Africa – needs and challenges

The challenges for seed health testing in Africa were reported as inadequate facilities, a lack of experienced analysts, a lack of knowledge where to find reference materials when submitting seed health testing methods, and little research in seed science and seed health testing. To acquire reference materials, participants were advised to contact the Secretariat, which can facilitate networking with the 26 laboratories accredited for seed health testing.

The issue of entomological aspects of seed health testing is a phytosanitary concern, and is covered by the International Plant Protection Convention.

ISTA accreditation

The procedures and benefits of ISTA accreditation were outlined, and advice was given on how to become members of audit teams.

Other issues raised were ISO standards. It was, however, stated that ISTA has its own accreditation standards, which are not ISO standards.

When there is a dispute between auditors and a Member Laboratory, the laboratory can argue the case with the auditors and has the right to bring the case to

the attention of the ISTA Secretariat for arbitration.

A question was posed as to the possibility of the stakeholders in the seed industry to obtain the audit results of public laboratories. It was reported that ISTA values confidentiality. However, it was stated that it is up to the discretion of the laboratory to release audit results to stakeholders so as to promote public private partnership.

Seed multiplication abroad – challenges between countries with different ISTA positions

It was observed that there are a number of challenges in seed certification among African countries and the use of international seed testing certificates. Some representatives of the private sector at the seminar also observed that some seed laws among countries are an impediment to seed trade.

Species and cultivars and GMO detection – methods and approaches

At present, the ISTA approach to GMO detection is to allow laboratories to use their own methods for detection. However, the methodologies used should be well outlined.

Although ISTA believes in uniformity in seed testing, in the case of GMO testing it has adopted the performance approach.

It was observed that GMO concerns cut across all nations, and are political in nature, since countries have different policies.

Provisional certificates

A point was raised that in some cases when seed samples are taken for testing, the seed companies require urgent release of the test results. Participants were informed that provisional certificates could be issued for seed lots still undergoing tests in order to facilitate movement before the testing is concluded.

Statistical packages

There were also requests for statistical packages. Participants were informed that these can be downloaded from the ISTA web site.

Conclusion

The seminar proved to be useful for Africa, allowing an opportunity to voice issues that have been affecting African Member States of ISTA. ■

Available now —

Règles Internationales pour les Essais de Semences

Édition 2009 (including Annexe to Chapter 7)

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French translation of the
International Rules for Seed Testing

CHF 393.00 (approx. USD 357.00/EUR 243.00) from the
ISTA Secretariat (for contact details, see back cover)



ISTA Seminar for Africa 2009: Opening speech by the Hon. Brig. Gen. Dr. Brian Chituwo, MP, Zambian Minister of Agriculture and Co-operatives



“Madam President of ISTA, distinguished members of the Executive Committee of ISTA, participants of the ISTA Seminar for Africa, ladies and gentlemen:

Let me take this opportunity to warmly welcome you to the International Seed Testing Association Seminar for Africa, and to Livingstone in particular, the tourist capital of Zambia and the home of the mighty Victoria Falls (Mosi-o-Tunya). I further wish to extend a special welcome to our visitors who have come all the way from various countries worldwide. I suggest that you take full advantage of your visit to Zambia, and enjoy the abundant and exciting tourism facilities in Livingstone and other parts of the country. I thank the ISTA President and indeed the ISTA Executive Committee for accepting Zambia’s invitation to host the ISTA Seminar. It is indeed an honour for Zambia to host the 2009 ISTA Seminar for Africa, and I feel privileged to officially open this important seminar.

“I must mention here that Zambia has been an active member of the Association

for over two decades, and has realised immense benefits from her membership. Among the several benefits is that Zambia is able to export seed to neighbouring countries and beyond.

“May I also inform the delegates that as a country, Zambia has put in place the Plant Breeders’ Rights Act, and is in the process of instituting the Plant Breeders’ Office. This, I believe, will further enhance the seed industry as well as seed exports.

“I am proud to say that the Zambian government has long realised the importance of a strong involvement in the development of the seed industry. The strong feature of our seed industry is that it is fully liberalised. Though much of seed testing work is in the hands of the government, a considerable responsibility in the seed certification system and seed testing has been delegated to the private sector under a licensing scheme monitored by the seed control and certification institute.

“The African delegates present here will agree with me that agriculture is the key to the development of our economics. However, food production is low, and much of the people of the continent are food-insecure. The challenge therefore facing the African continent today is to increase food production in the light of ever increasing populations and the current increase in food prices.

“I am aware that the current information on high-quality seed availability in African nations indicates a mixed pattern. We have some countries with high-quality seed surpluses as well as others with deficits each year. This situation is worrisome and requires special attention by all nations. I believe that African nations can share high-quality seeds through movements of seed from surplus to deficit countries. This, ladies and gentlemen, requires a spirit of co-operation and understanding between countries in Africa and beyond.

“The role that ISTA plays in ensuring the availability of quality seed cannot be over-emphasised. This includes strong participation by our scientists in different working groups of the Association. I am informed that the Technical Committees of ISTA are a platform for sharing knowledge and ideas. It is in this regard that I highly commend ISTA for taking the initiative of involving and encouraging more membership from our continent. This will ensure the provision of quality seed to our farmers.

“I further wish to point out that there is very little seed trade among countries within Africa. There may be a number of factors responsible for this unfortunate situation. Prominent among these is the existence of different seed policies, seed laws, regulations and seed testing methods. This should be looked at critically with a view to harmonising seed policies across boundaries. I am glad to mention that initiatives in the southern and eastern regions have reached advanced stages in harmonising the process of seed laws and regulations. Harmonised seed testing methods in line with ISTA should also be encouraged across Africa. This will go a long way in facilitating seed trade on the continent and beyond.

“It is my hope and belief that this seminar will make participants understand the role ISTA plays and bring out challenges that African nations face regarding seed testing and provision of high-quality seed. You will agree with me that Africa needs more investment in seed testing in order to provide high-quality seeds of superior high-yielding crop varieties.

“I urge the delegates to participate actively in the deliberations of the seminar. I would appreciate receiving the output of the seminar.

“It is now my pleasure and honour to declare the ISTA Seminar for Africa officially opened.” ■

World Seed Conference

Rome, Italy, 8–10 September 2009



A changing world carries many challenges for agriculture. At the global level, increasing population, climate change, parallel demands for food and energy production and evolving human needs require a response in agricultural production, often at the same time as land and inputs become increasingly scarce and expensive. Agriculture needs to provide food security and economic development in the context of these global challenges by responding at the local, national and regional level. Success in responding to these challenges relies on dynamic and sustainable agriculture. This conference is intended to raise awareness of the importance of new plant varieties and high quality seed in this context and considers how governments can develop an enabling environment to encourage plant breeding and the production and distribution of high quality seed.

The conference will comprise a two-day “Expert Forum”, followed by a one-day “Policy Forum”.

8–9 September: Expert Forum

The aim of the Expert Forum is to provide information and facilitate discussion on means of encouraging the development of new plant varieties and the production and distribution of high quality seed in order to meet the demands of a changing world. In particular, the Expert Forum will explore the:

- importance of new plant varieties in responding to evolving needs;
- role of multilateral cooperation in facilitating access to plant genetic resources for food and agriculture and ensuring fair and equitable benefit sharing;

- role of new technologies and methodologies in plant breeding;
- need for intellectual property protection to encourage the development of new plant varieties;
- scope for public/private partnerships;
- role of international certification in facilitating trade and market development;
- importance of high quality seed and seed treatment;
- benefits of effective systems of seed production and distribution;
- need for standardisation of methodologies in seed testing; and
- mechanisms for reducing technical barriers to trade and facilitating trade in seed.

These aspects will be considered in relation to a changing world, including a changing environment, market developments and evolving human needs, and

their role in achieving future food security and economic development, especially in developing countries.

10 September: Policy Forum

The Policy Forum will review the conclusions of the Expert Forum on means to provide an enabling environment that encourages the development of new varieties and facilitates the production and distribution of high quality seed.

Audience

This event is aimed at policy makers, government officials, plant breeders, seed specialists, researchers, farmers’ organizations and consumer organizations.



FAO headquarters, Rome (©FAO/Giuseppe Bizzarri)

Programme: 'Responding to the challenges of a changing world: The role of new plant varieties and high quality seed in agriculture'

Expert Forum

Tuesday, September 8, 2009

08:00–17:00 Registration

09:00 **Welcome by the Food and Agriculture Organization of the United Nations (FAO)**

09:10 **Opening address by Mr. Bernard Le Buanec, Chairman of the Organizing Committee**

Session 1. The role of plant breeding in meeting the multiple challenges of a fast-changing world

Chairperson:

Mr. Orlando de Ponti, President of the International Seed Federation (ISF)

09:30 **The evolution and contribution of plant breeding to global agriculture**

Mr. Marcel Bruins, Secretary General, ISF

09:55 **Anticipated demands and challenges to plant breeding and related technologies into the future**

Mr. Marcel Busuma Kanungwe, Director, Pannar Seed Ltd. (Zambia)

10:20 **Effective use of modern biotechnology and molecular breeding and associated methods as breeding tools**

Mrs. Usha Barwale Zehr, Director of Research, Mahyco (India)

10:45 **The opportunities presented by modern biotechnology to enhance plant breeding – what's in the pipeline?**

Mr. William S. Niebur, DuPont Vice President, Crop Genetics Research & Development, Pioneer Hi Bred International, Inc., A DuPont Company (United States of America)

11:10 **Building capacity for plant breeding in developing countries**

Mr. Elcio Guimaraes, Senior Officer (Cereals and Crop Breeding), Crop and Grassland Service (AGPC), FAO

11:35 **Discussion**

11:50 **Summary by Chairperson**

12:00 Lunch

Session 2. The importance of plant genetic resources for plant breeding; access and benefit sharing

Chairperson:

High-level representative from Contracting Parties of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) (tbc)

13:00 **The use of plant genetic resources in plant breeding**

Ms. Anke van den Hurk, Senior adviser biotechnology, biodiversity and organic seeds, Plantum NL (Netherlands)

13:25 **Facilitating access and ensuring benefit sharing globally: the Multilateral System of the International Treaty on PGRFA**

Chair of the Governing Body of the ITPGRFA

13:50 **Exchanging material in the daily business: the operations of the Multilateral System and the Standard Material Transfer Agreement (SMTA)**

Mr. Shakeel Bhatti, Secretary of the ITPGRFA

14:15 **Working with the Multilateral System – experiences of a seed company**

Ms. Franziska Zimmermann, Public Affairs Manager, Syngenta Switzerland

14:40 **Implementing the International Treaty at the national level: what is the impact on the seed sector?**

Representative of the public sector from Contracting Parties of the ITPGRFA (tbc)

15:05 **Discussion**

15:20 **Summary by Chairperson**

15:30 Coffee break

Wednesday, September 9, 2009

Session 3. Plant variety protection

Chairperson:

Mr. Doug Waterhouse (Australia)), President of the Council of the International Union for the Protection of New Varieties of Plants (UPOV)

- 16:00 **Benefits of plant variety protection**
Mr. Rolf Jördens, Vice Secretary General, UPOV
- 16:25 **Key requirements for an effective system of plant variety protection**
Mr. Peter Button, Technical Director, UPOV
- 16:50 **Experiences in Kenya**
Mr. Evans Sikinyi, Head, Seed Certification and Plant Variety Protection, Kenya Plant Health Inspectorate Service (KEPHIS)
- 17:15 **Experiences in the Republic of Korea**
Mr. Chang Hyun Kim, Director General, Korea Seed & Variety Service (KSVS)
- 17:40 **Discussion**
- 17:55 **Summary by Chairperson**

Session 4. The importance of quality seed in agriculture

Chairperson:

Mrs. Katalin Ertsey, President of the International Seed Testing Association (ISTA) and Director plant production and horticulture, National Institute for Agricultural Quality Control (OMMI) (Hungary)

- 09:00 **What is seed quality and how to measure it?**
Mrs. Alison Powell, Honorary Senior Lecturer, University of Aberdeen (United Kingdom)
- 09:25 **The influence of seed quality on crop productivity**
Mrs. Rita Zecchinelli, Head of ENSE Seed Testing Laboratory, Tavazzano (Italy)
- 09:50 **The evolution of seed testing**
Mr. Michael Muschick, Secretary General, ISTA
- 10:15 **Building capacity in seed quality assurance in developing countries**
Mr. Michael Larinde, Senior Agricultural Officer (Seed Production), Plant Production and Protection Division (AGP), Agriculture and Consumer Protection Department, FAO
- 10:40 **Raising seed quality: what is in the pipeline?**
Mr. Joost van der Burg, Seed scientist, Agrosystems Research, Plant Research International (Netherlands)
- 11:05 **Maintaining capacity in seed technology and seed testing**
Mr. John Hampton, Director Bio Protection and Ecology Division, Professor of Seed Technology, Lincoln University (New Zealand)
- 11:30 **Discussion**
- 11:45 **Summary by Chairperson**
- 12:00 Lunch



Session 5. Facilitation of trade and market development

Chairperson:

Mr. John C. Kedera, Managing Director, Kenya Plant Health Inspectorate Service (KEPHIS) (Kenya)

- 13:00 **Overview of the regulatory framework in seed trade**
Mr. Joseph Cortes, Seed Science Center, Iowa State University (United States of America)
- 13:25 **The role of international certification in facilitating trade and market developments**
Mr. Michael Ryan, Head, OECD Codes and Schemes, Directorate for Trade and Agriculture, OECD
- 13:50 **Phytosanitary measures and the international seed trade**
Mr. Jeffery Jones, Senior Officer (Phytosanitary Capacity Building), International Plant Protection Convention (IPPC), Plant Production and Protection Division (AGP), Agriculture and Consumer Protection Department, FAO
- 14:15 **Harmonization of seed testing for the facilitation of trade**
Mr. Joël Léchappé, Director, National Seed Testing Station (SNES) (France)
- 14:40 **Harmonization of the seed regulatory framework at the regional level**
Mrs. Paivi Mannerkorpi, Acting Head of Section, Unit for Biotechnology and Plant Health, DG Health and Consumers, European Commission
- 15:05 **Discussion**
- 15:20 **Summary by Chairperson**
- 18:00 **Conference gala dinner**

Policy Forum

Thursday, September 10, 2009

- 09:00 **Welcome by Mr. Bernard Le Buanec, Chairman of the Organising Committee**
- 09:30 **Welcome by Mr. Jacques Diouf, Director-General of FAO (tbc)**
- 10:00 **Welcome address by the Minister of Agriculture, Italy (tbc)**
- 10:30 **Key Note Speech by Mr. M. S. Swaminathan, UNESCO Chair in Ecotechnology, Member of Parliament of India and Father of the Indian Green Revolution**
- 11:00 **Conclusions of the Expert Forum**
- 11:30 **Providing an enabling environment (panel discussion)**
Panel moderator: Mr. Bernard Le Buanec
Panel members:
Mr. Ken Ash, Director, Trade and Agriculture Directorate, OECD
Mr. Francis Gurry, Director General, World Intellectual Property Organization (WIPO) and Secretary General, UPOV (tbc)
Mr. John C. Kedera, Managing Director, KEPHIS
Mr. Michael Muschick, Secretary General, ISTA
Mr. Shivaji Pandey, Director of Plant Production and Protection Division (AGP), FAO
Ms. Esther Penunia, Secretary General, Asian Farmers' Association for Rural Development (AFA)
Mr. Orlando de Ponti, President, ISF
Mr. Doug Waterhouse (Australia), President of the Council, UPOV
Representative of the International Federation of Agricultural Producers (IFAP) (tbc)
Chairperson of Session 2 (tbc)
- 12:00 Lunch
- 13:30 **Providing an enabling environment (continued)**
- 15:00 Coffee break
- 15:30 **Concluding remarks**
- 16:00 **Closing of the Conference**

Structure

The Expert Forum will be in English only.

The Policy Forum will have simultaneous interpretation in Arabic, Chinese, English, French, and Spanish.

Registration

Registration is required (cost € 125). In order to participate, please register on-line at worldseedconference.org.

Registration will be open from 30 March 2009.

Conference presentations and proceedings

Copies of all presentations will be published on the Conference website. The proceedings will be published after the Conference. ■

29th ISTA Congress 2010 Cologne, Germany, 16–22 June 2010

Udo von Kröcher

ISTA 2nd Vice-President and Chair of the National Organizing Committee, President of the Federal Plant Variety Office

On behalf of the German Ministry of Food, Agriculture and Consumer Protection, the Ministry of the Environment and Conservation, Agriculture and Consumer Protection of the State of North Rhine-Westphalia and the Secretary General of ISTA, we are pleased to announce the upcoming 29th ISTA Congress 2010 in Cologne, Germany. You are cordially invited to attend this International Seed Testing Congress, which will take place in the impressive historical venue ‘Gürzenich’ in the heart of Cologne.

The 29th ISTA Congress will include many interesting and informative sessions. In comparison with previous ISTA Congresses there will be some changes to the Congress structure.

Preliminary programme

Pre-Congress workshops

Two pre-Congress workshops for seed analyst training are scheduled in conjunction with the 29th ISTA Congress 2010. They will take place during the week prior to the beginning of the Congress.

Table 1. 29th ISTA Congress 2010: preliminary programme in brief

Wednesday, 16 to Friday, 18 June 2010
Seed Symposium: “Application and improvement of established and advanced technologies in seed testing”

Saturday, 19 & Sunday, 20 June 2010
Meetings of the 18 ISTA Technical Committees

Monday, 21 June 2010
Event: “Harmonized seed testing and global seed trade”

Tuesday, 22 June 2010
ISTA Ordinary Meeting

It is planned to hold a three-day workshop entitled “Species and variety testing with protein electrophoresis” at the Bundesortenamt (Federal Plant Variety Office) in Hanover.

A five-day workshop on “Viability and germination testing” is scheduled at the LTZ (Agricultural Technology Park) Augustenberg, Karlsruhe.

ISTA Seed Symposium

The ISTA Seed Symposium with the title “Application and improvement of established and advanced technologies in seed testing” will take place from 16–18 June. Reports on latest developments and results of seed science research will be given in oral presentations and poster sessions.

Meetings of the 18 ISTA Technical Committees

Meetings of all 18 ISTA Technical Committees, reporting on latest developments, validations and standardization of seed testing methods, are scheduled for 19 and 20 June.

Event

On 21 June an event with the draft title “Harmonized seed testing and global seed trade” will be held by the German Ministry of Food, Agriculture and Consumer Protection. The aim of the event is to discuss the question “Does the global seed trade need more harmonization?”

ISTA Ordinary Meeting

The ISTA Ordinary Meeting will take place on 22 June. This business meeting of government representatives will deal with internationally validated seed testing methods in the ISTA Rules, and with all other ISTA affairs.

Post-Congress tours

Three post-Congress tours are scheduled for 23–25 June 2010, directly after the ISTA Congress. All tours will depart from Cologne, and are planned to go to Baden-Württemberg, Thuringia and Bavaria. The itinerary includes interesting visits to seed laboratories, meetings with breeders,



The ‘Gürzenich’, venue of the ISTA Congress 2010 (©koelnkongress.de).



The entrance hall of the 'Gürzenich' (@koelnkongress.de)

growers and multipliers, and visits to famous sights and cities.

The workshops and tours have not been finalised; further information will follow after the ISTA Annual Meeting 2009 in Zurich.

The venue: Cologne

The 29th ISTA Congress will take place in Cologne. Cologne is located at the crossroads of main international traffic routes and is a multi-cultural city that looks back on a 2000-year history. This cathedral city on the Rhine is an important business centre in the west of Germany and in the heart of Europe. The 'Gürzenich', a historical events and congress centre, is located in the centre of Cologne, near the main railway station, and surrounded by hotels of

all categories. There are two international airports nearby – Cologne-Bonn and Düsseldorf. Further information about accommodation, travel, passports, visas, invitation letters etc. will be provided after the ISTA Annual Meeting 2009 in Zurich, Switzerland.

Registration fees

Different registration fees will be offered for three different periods: 16-22 June, 16-20 June or 19-22 June. Provision is made for ISTA Members and non-members. Table 2 gives an overview of the different fees.

There are reduced fees for EARLY registration up to and including 28 February 2010.

Registration fees include all sessions, coffee breaks and lunches, and the welcome cocktail and official dinner for the registered period.

The accompanying-persons fee includes all coffee breaks and lunches, and the welcome cocktail and official dinner. The fee does not include sessions.

The deadline for registration is 15 May 2010.

Trade exhibition

We would like to invite all exhibitors interested in reaching a target group of up to 600 seed science professionals from laboratories and organizations worldwide. The trade exhibition will be located in the foyers of the Congress Centre.

Organization

The 29th ISTA Congress will be hosted by the Federal Ministry of Food, Agriculture and Consumer Protection, in cooperation with the Federal State of North Rhine-Westphalia.

A National Organizing Committee, chaired by the President of the Federal Plant Variety Office (Bundessortenamt), has been established to prepare the Congress.

The Federal Agency for Agriculture and Food will be responsible for coordinating the congress on the ground.

Please visit the ISTA Congress 2010 web site (www.ista-cologne2010.de) for further information. ■

Table 2. Registration fees

Periods	Events	EARLY registration (up to 28 Feb 2010)	LATE registration (1 March 2010 and after)
ISTA Members			
16–22 June 2010	FULL Congress	550 €	750 €
16–20 June 2010	Seed Symposium & TCOM	500 €	700 €
19–22 June 2010	TCOM, Education, OM	450 €	650 €
Non-members			
16–22 June 2010	FULL Congress	825 €	1125 €
16–20 June 2010	Seed Symposium & TCOM	750 €	1050 €
19–22 June 2010	TCOM, Education, OM	675 €	975 €
Students			
16–20 June 2010	Seed Symposium & TCOM	150 €	150 €
Accompanying persons			
16–22 June 2010	FULL Congress	350 €	350 €
16–20 June 2010	Seed Symposium & TCOM	250 €	250 €
19–22 June 2010	TCOM, Education, OM	200 €	200 €

ISTA Seed Symposium 16–18 June 2010: “Application and improvement of established and advanced technologies in seed testing”

2nd call for papers

This is an invitation to people interested in presenting a paper during the Seed Symposium of the 29th ISTA Congress.

The 29th ISTA Seed Symposium will be made up of five oral sessions, detailed below, and two poster sessions, each of 2 hours, covering the same topics. Each oral session will be chaired by a lead speaker who is well known in the field of seed science and technology.

Intending participants are encouraged to present oral and poster papers dealing with a range of topics under the above theme. The research reported in offered papers can cover both the scientific basis of aspects of seed quality and its technological application in seed testing. In all sessions, we welcome papers based on both established seed testing methods and those using new or advanced technologies such as automated and computer-based methods and non-destructive techniques. Papers may be on crop species, flowers, trees and shrubs and new and potential cultivated species. We encourage papers on both tropical and temperate species.

Offers of papers should be submitted online only (www.seedtest.org/en/seed-symposium2010.html) in the form of an abstract in English of 1600 characters (maximum). Papers will be presented orally and in poster form, both forms having equal status. As the number of oral presentations will be 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. The selection of papers for oral presentation will be by the Scientific Programme Advisory Committee.

Deadlines

The timetable for submission and acceptance of papers is as follows:

- October 2008: First call for papers
- 15 July 2009: Deadline for submission of papers. Papers reviewed by the Scientific Programme Advisory Committee.
- 17 September 2009: Authors of papers considered for oral presentation contacted for further information on experimental results, additional to the abstract.
- 1 November 2009: Authors informed whether papers have been accepted for oral or poster presentation.
- 1 March 2010: Deadline for payment of registration fee for authors of accepted oral papers. If the presenter of an oral paper has not registered, the paper will be replaced in the programme.
- 1 March 2010: Deadline for acceptance of an invitation to present an offered oral paper as a poster.
- 2 April 2010: Deadline for payment of registration fee for authors of accepted poster papers. If none of the poster authors has registered by this time, it will not be possible to present the poster and the abstract will not be published.

Funding

Authors of proposed papers are encouraged to explore possible sources of funding for their attendance at the symposium as early as possible. ISTA cannot offer any financial support to authors of papers. However, a letter of acceptance of a paper for presentation (subject to funding) can be provided to assist in funding applications after 1 November 2009.

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Programme

Session 1: Technologies for improved seed supply

- Aspects of seed production related to seed quality during conventional and organic production
- Genetic conservation for breeding and diversity
- Participatory plant breeding
- Seed supply and development of seed testing in developing countries
- Seed health issues during production
- Physical and chemical seed treatments
- Seed moisture testing

Chair and lead speaker: P.K. Agrawal Prasha Agri Consultants Pvt. Ltd., New Delhi, India

Presentation title: Seed-led technology for better crop yield

The millennium challenge of producing more food from less land envisages high technological intervention. Seed is the delivery system through which most of genetic and biotechnological advancements get transferred for crop production. Combination of better genetic potential with biotech-enabled traits like insect protection and weed management, better agronomic techniques and tools has improved crop yield. In India Bt cotton can be cited as an example for this success. Five cotton events encompass 80 % of the total cotton cultivated area in India. Improved seed supply coupled with better agronomy facilitated a phenomenal increase in cotton production and India has become the 2nd largest cotton producer in the world. Technology has moved further. Seeds are now engineered to withstand a range of biotic stresses, enhance water and nitrogen use efficiency and to improve nutritive content. Biopharming and bioengineered 'albedo' plants are other emerging technologies whereby the scope of seed is widening beyond that of a mere agricultural commodity. [The co-author of this paper is Sherry R Jacob, ICAR Directorate of Seed Research, Kushmaur, Mau 275101, (UP), India].

Session 2: Aspects of purity: genetic, technical and physical

- Varietal identification
- Seed lot heterogeneity and sampling
- Automated and computer-based methods for seed identification and assessment
- Seed processing
- GM testing, the co-existence of GM and conventional seed production
- Contamination with fungal fruiting bodies, weeds and parasitic plants

Chair and lead speaker: E. Noli Laboratory for Seed Research and Testing, Department of Agroenvironmental Sciences and Technologies, University of Bologna, Bologna, Italy

Presentation title: New tools for measuring genetic quality in seed

Plant breeding is widely recognized as the major single contributor to the dramatic increases in agricultural yields observed over the last century. The seed is the delivery system for the scientific advances and technological innovations that have been achieved through plant breeding. In this context, genetic quality, both in terms of identity and purity, is an important component of the overall seed value, and its maintenance is the objective of certification schemes. Identity preservation extends further down in the production chain to separate specialized products from generic commodities.

Biochemical markers were the first efficient tool for variety identity and purity testing, and they are currently applied both in variety registration and protection as well as in seed quality control. However, in the last two decades molecular marker technology has become widely utilized in all stages from basic research to quality control of agricultural products, through the intermediate steps of variety development and seed production. In fact DNA-based technologies are highly efficient for genetic characterization and allow both the tagging of specific traits and the detection and quantification of minute amounts of contaminants.

Session 3: Basic approaches to physiological processes in seeds (in collaboration with the International Society for Seed Science)

- Seed development and maturation
- Desiccation tolerance and its acquisition
- Water activity in seeds
- Regulation, induction and breaking of dormancy
- Genomics
- Genetic regulation and initiation of germination
- Stress tolerance
- Physiology of priming

Chair and lead speaker: G. Leubner Molecular Plant Sciences, University of Freiburg, Germany

Presentation title: Comparative seed biology will lead the way: Evolutionary conservation and biodiversity of physiological mechanisms that control germination

Two opposing forces provide the basic physiological mechanism for the control of seed germination timing and synchrony: The growth potential increase of the embryo leading to cell-wall extension growth, and the restraint weakening of the various covering layers (envelopes). The latter include natural envelopes like endosperm, testa (seed coat), pericarp (fruit coat), as well as artificial envelopes applied by seed technologists. Research with seed model systems/species has started to provide an understanding of the molecular mechanisms underlying embryo growth, restraint weakening, dormancy, and the seed responses to environmental cues and abiotic stresses. Through adaptation, germination is timed to avoid unfavourable weather for subsequent plant establishment and reproductive growth. This adaptation seems to have taken place on a theme rather than via fundamentally different paths and similarities underlying the extensive diversity in the seed responses to the environment become evident. Interdisciplinary research approaches have combined molecular genetics, physiology, biochemistry, ecology, biomechanics, engineering and technology with post-genomic, bioinformatic and modelling techniques. These are on the way to providing an integrated, systems biology understanding of seed dormancy, after-ripening and germination. Comparative seed biology, with model, horticultural

and crop species representing important phylogenetic clades and seed types, will lead the way to the identification of evolutionary conserved and species-specific mechanisms that control germination.

Session 4: Approaches to the evaluation and improvement of germination

- Germination testing methods
- Dormancy in seed testing
- Viability testing
- Influence of storage and storage conditions on germination
- Seed collection and handling effects on germination and longevity
- Effects of insect pests and seed-borne pathogens

Chair and lead speaker: J. Léchappé
GEVES Station Nationale d'Essais de Semences, Beaucauzé, France

Presentation title: Seed germination tests: ubiquitous and up-to-date tests over the years? Influence of external factors such as quality assurance and progress in research on the stability and the evolution of the tests.

Since the creation of the first seed testing laboratories at the end of the 19th century, germination tests have remained the reference tests for the seed trade, the seed

industry in their aim to produce seeds of high quality, and for national and international regulations. Two aspects will be developed and discussed:

- The classical and standard germination tests, in the framework of quality assurance facilitate the equivalence of evaluation of the seed germination quality over the world regions, whatever the technological facilities of the laboratories may be.
- The input of research to the evolution of the classical tests (germination, tetrazolium, viability etc.). Nowadays, more and more tests are available for tropical and subtropical species. Many applied research programmes aim to improve the performance of the tests, for example by shortening the duration, breaking the dormancy (GA_3 , KNO_3). New tests are being added to the existing ones. Some are in the process of being adopted as routine tests (SBP-ELISA, image analysis), whilst others are more prospective (e.g. molecular markers).

The interactions between the seeds presented for testing and accompanying additional elements, such as seed microflora (saprophytes or pathogens) and seed treatments, including chemicals with the possibility of phytotoxicity, and their influence on the way that test methods evolve, will also be discussed.

Session 5: Assessment and improvement of seed performance in practice

- Causes of vigour differences (production, processing, physiological)
- Vigour testing
- Impact of seed vigour on crop and transplant establishment
- Priming and other invigoration treatments
- Vision systems for seedling selection

Chair and lead speaker: S. Matthews
School of Biological Sciences, University of Aberdeen, Aberdeen, United Kingdom

Presentation title: Seed vigour: from one hypothesis to many predictions and uses.

Almost all vigour tests that are in use or proposed can be explained in terms of seed ageing and its consequences. Experimental evidence will be presented to support this hypothesis in a range of crops, including major field crops (e.g. maize and soyabean) and vegetables (e.g. legumes, brassics, cucurbits, pepper). The consequences of ageing, including electrolyte leakage into seed soak water and slower physiological germination, form the basis of many vigour tests. These tests differentiate the field and greenhouse emergence as well as the storage potential of seed lots that have similar and acceptable high levels of standard germination. The ageing hypothesis can be extended by interpreting differences in rate of germination as differences in the mean lag period between imbibition and radicle protrusion, during which the damaging effects of ageing undergo metabolic repair. This proposition will be used to explain stress tests (e.g. cold test for maize) and seedling growth tests (e.g. cool germination test for cotton) of seed vigour and some of the effects of seed priming. The implications for the rational search for rapid biochemical/molecular tests of seed vigour and for the selection of vigorous genotypes will be highlighted. This will provide a science-based theme for the oral and poster papers that follow in Session 5. ■



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Status 15 March 2009

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Creped cellulose paper covered with sand for *Glycine max*, *Helianthus annuus*, *Phaseolus vulgaris* and *Zea mays*

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Summary

The germination medium top of creped cellulose paper without a blotter and covered with a ½–¾-inch (1.27–1.91 cm) layer of sand (TCS) is currently utilized in AOSA Rules as a growing medium for six species: *Glycine max*, *Gossypium* spp., *Helianthus annuus*, *Phaseolus vulgaris*, *Pisum sativum* and *Zea mays*.

A peer validation study showed no significant differences between currently used ISTA media and top of crepe paper with sand (TPS) medium for *Glycine max* and *Zea mays*. However, for *Phaseolus vulgaris*, the TPS medium produced significantly different but higher results than the between-paper (BP) method. For *Helianthus annuus*, TPS produced significantly higher results than BP, but no significant difference to sand and organic growing media. These results support the inclusion of TPS as a new testing medium option for ISTA laboratories.

Introduction

A significant germination media disparity exists between the International Seed Testing Association (ISTA) *International Rules for Seed Testing* and the Association of Official Seed Analysts (AOSA) *Rules for Testing Seeds*. The difference is the AOSA option of conducting germination tests on creped cellulose paper (TC) and on top of creped cellulose paper without a blotter and covered with ½–¾-inch (1.27–1.91 cm) layer of sand (TCS) on the following species: *Glycine max*, *Gossypium* spp., *Helianthus annuus*, *Phaseolus vulgaris* and *Zea mays*. A number of laboratories utilizing AOSA methods have adopted the TCS medium because it allows precise calibration of moisture levels through the use of

calibrated water-spraying tables and dry sand.

Typically, TCS tests are conducted by moistening a sheet of creped paper, planting seed on the moistened medium and covering the seed and paper with 2 cm of dry sand. Initial discussions with the ISTA Germination Committee chairperson, Ronald Don, suggested that the TC medium was already covered as an ISTA medium as top of paper (TP); however, the TCS medium (combination of paper and sand) would require comparative testing before consideration for inclusion in the *International Rules for Seed Testing*.

In response, a multi-laboratory comparative test was completed on the use of TCS as a germination media for *Pisum sativum*. After the completion of this study, the ISTA Germination Committee approved a proposal for the inclusion of top of crepe paper with sand (TPS), the equivalent to the AOSA TCS method, as a germination medium for *Pisum sativum*. This Rule proposal was voted on in June 2008 at the ISTA Ordinary Meeting and passed. However, the AOSA Rules contain five additional species (*Glycine max*, *Gossypium* spp., *Helianthus annuus*, *Phaseolus vulgaris* and *Zea mays*) that allow use of the TCS medium. Allowing the use of the TPS medium within the ISTA Rules for these additional species was the next logical topic of interest after TPS was adopted for *Pisum sativum*.

Materials and methods

A peer validation study was designed to compare the germination rates of *Glycine max*, *Phaseolus vulgaris* and *Zea mays* on the three media between paper (BP), sand (S) and TPS, and the germination rates of *Helianthus annuus* on the four media BP, S, TPS and organic growing medium (O). *Gossypium* spp. was considered for the study, but was not included, since the TCS method on *Gossypium* spp. is not widely utilized. Four seed lots per species were tested. The average germination

rates for the four seed lots each of *Glycine max*, *Phaseolus vulgaris*, *Zea mays* and *Helianthus annuus* were 88.9, 89.6, 93.3 and 88.8 %, respectively. The germination regimes followed ISTA Table 5A Part 1. Four hundred seeds were used for each medium, with four observations of 100 seeds each. Two ISTA-accredited laboratories participated: Kari Fiedler, SGS Mid-West Seed Services, Inc., Brookings, SD, USA (AOSA/ISTA), and Victor Vankus, National Tree Seed Laboratory, Dry Branch, GA, USA (AOSA/ISTA).

The effects of the various factors (laboratory, seed lot, medium and their interactions) were assessed by analysis of variance (ANOVA), and least significant differences (LSDs) were computed for comparing means. The computations were performed using MSUSTAT (1991).

Results

Mean germination percentages for *Glycine max* and *Zea mays* showed no significant differences by media type (Table 1). Mean germination percentages for *Phaseolus vulgaris* using S and TPS were 92.1 and 91.2 %, respectively, and significantly higher than BP (85.7 %). Mean germination for *Helianthus annuus* on TPS was 94.4 %, significantly higher than BP (91.0 %), and not significantly different from S and O (94.3 and 92.9 %, respectively; Table 2).

Discussion

Since results obtained in the previous validation study (Evaluation of Crepe Cellulose Paper Covered with Sand as an ISTA Medium) supported the inclusion of TPS as a medium option in the ISTA Rules for *Pisum sativum*, the ISTA Germination Committee determined that a peer validation study was necessary to include TPS as a medium option also for *Glycine max*, *Helianthus annuus*, *Phaseolus vulgaris* and *Zea mays*.

The data generated in the current validation study supports the inclusion of TPS as

Creped cellulose paper covered with sand for *Glycine max*, *Helianthus annuus*, *Phaseolus vulgaris* and *Zea mays*

Table 1. Mean germination percentages averaged across two laboratories and four seed lots for three media types for various species.

Medium	Mean germination (%)		
	<i>Glycine max</i>	<i>Phaseolus vulgaris</i>	<i>Zea mays</i>
BP	88.6	85.7	94.8
S	88.2	92.1	94.1
TPS	88.1	91.2	93.9
LSD ($p = 0.05$)	NS	2.2	NS

Table 2. *Helianthus annuus* mean germination percentages averaged across two laboratories and four seed lots for four media methods.

Medium	Mean germination (%)
BP	91.0
S	94.3
O	92.9
TPS	94.4
LSD ($p = 0.05$)	1.5

a new medium for ISTA laboratories for these species. The TPS medium utilizes a “lean manufacturing” approach to seed testing through sprayer tables, food service trays and carts. The TPS medium has the potential to save time and increase uniformity of results among seed testing laboratories. A key advantage of this medium is the uniformity in sand-based tests allowed by the use of dry sand and calibrated moisture application through sprayer tables.

Acknowledgments

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New method for germination of *Brassica* spp. and *Sinapis alba* seeds

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Using the top-of paper (TP) substrate prescribed in the ISTA Rules (ISTA 2008) is inefficient when testing large numbers of samples, in terms of the space required in the germination facilities. For this reason, trials have been carried out in Hungary with the between-paper (BP) substrate, which requires much less space

and is a prescribed substrate for *Raphanus sativus* (another *Brassicaceae* species). The results obtained over several years indicate that there are no significant differences between the results of tests using BP compared to TP.

Testing *Sinapis alba* using the BP method

To test whether BP could be included in the ISTA Rules as a prescribed substrate for *Brassica* spp. and *Sinapis alba*

germinations, a peer validation study was carried out. This study involved the comparative testing of three seed samples of varying germination capacity of both *Brassica* spp. and *Sinapis alba* by three different ISTA-accredited laboratories. The laboratories tested the samples using both the BP and TP methods at the two alternative temperatures prescribed in the ISTA Rules, i.e. constant 20 °C, and alternating 20 and 30 °C. For each test, 4 replicates of 100 seeds were sown on the BP substrate (Fig. 1), and the participating labs used



Figure 1. Testing *Sinapis alba* using the between-paper method

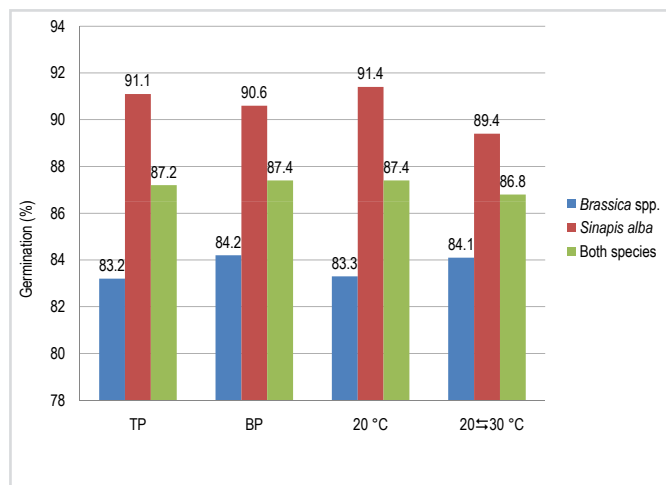


Figure 2. Plot of mean germination results obtained using TP and BP media and a constant 20 °C and alternating 20-30 °C

their own usual procedures for the TP substrate. Dormancy was not a problem with any of the seed lots, and the laboratories were instructed not to apply KNO₃ or prechilling. The germination period (days of counting) and the evaluation of the seedlings were in accordance with the ISTA Rules.

Data exploration

The number of normal seedlings of *Brassica* spp. and *Sinapis alba* were first explored using box plots, which showed that there appeared to be little difference in germination between the BP and TP methods,

or between germinations at 20 °C and 20 and 30 °C. Calculation of the mean results for the BP (87.4 %) and TP (87.2 %) methods, and tests conducted at 20 °C (87.4 %) and 20 and 30 °C (86.8 %) confirmed this (Fig. 2).

However, there appeared to be interactions between methods and laboratories, particularly for the *Brassica* spp. samples. For the *Sinapis alba* samples, differences between methods and laboratories were not as obvious (Fig. 3).

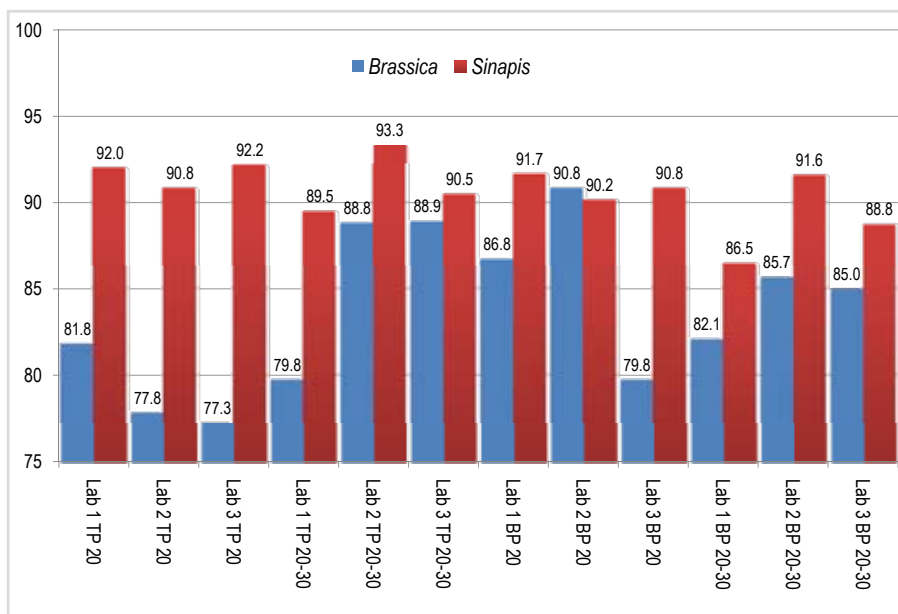


Figure 3. Detailed results of the three labs and the four test methods for the *Brassica* spp. and *Sinapis alba* samples.

Analysis of variance

In order to investigate the interactions further, the data was subject to analysis of variance (ANOVA). A fixed-effect model was used, with the objective to describe the data and not to make inferences based on the possible population of laboratories. For the *Brassica* spp. there were significant interactions for Lab x Method, Temperature x Method, Lab x Seed Sample, Lab x Temperature x Method and Laboratory x Seed Sample x Temperature. For *Sinapis alba* the only significant interaction was with Seed Sample x Method. The ANOVA tables also show that there was no significant difference between the TP and BP methods for either species.

Estimate repeatability and reproducibility of the test results

For *Brassica* spp. and *Sinapis alba* a mixed-effect model was fitted to the data. An estimate of the repeatability was then given by the residual variance component estimate and an estimate of the reproducibility by the repeatability estimate plus the sum of the variance component estimates associated with random terms.

The repeatability estimates were found to be comparable for both species: 14.23 for *Brassica* spp. and 12.12 for *Sinapis alba*. If we compute the binomial variance associated to a germination of 85 % and 100 seeds, we find: $(85 \times 15)/100 = 12.75$. We can say, therefore, that for the *Brassica* spp. and *Sinapis alba* comparative test, the repeatability (intra-laboratory

variability) is associated purely with sampling variation.

The reproducibility estimates are very different: 50.5 for *Brassica* spp. and 13.84 for *Sinapis alba*. However, it should be noted that the interaction with the Method variance components was relatively small for *Brassica* spp., indicating that the two methods of TP and BP will provide similar results.

Conclusion

The statistical evaluation of the germination test results of this peer validation study shows that, for both *Brassica* spp. and *Sinapis alba*, there is no significant difference between the TP and BP germination methods. In addition, the repeatability of the test method is associated purely

with sampling variation, and the interaction with method variance components is relatively small, even for *Brassica* spp., indicating that the two methods of TP and BP will provide similar results. It is therefore recommended that BP is added to the ISTA Rules as an alternative prescribed germination medium for *Brassica* spp. and *Sinapis alba*. ■

Use of organic growing media as a primary substrate for germination of *Vicia faba* seeds

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Following the introduction and definition of organic growing media in the ISTA Rules in 2007, the ISTA Germination Committee suggested to allow the use of organic growing media as a primary substrate for germination testing, when necessary.

The French seed testing station GEVES-SNES used to test a large number of *Vicia faba* L. seed samples, and demonstrated in a national study in 2000 that normal germination was lower with sand substrate than with organic growing media (3 % difference on average in 40 samples). This difference was explained by a larger number of abnormal fractured seedlings, caused by a more rapid imbibition in sand.

Based on these results, it was decided to organize a validation study, in order to see whether organic growing media can be used as another primary substrate for the germination of this species.

Material and methods

A comparative test was set up in order to compare the results obtained with organic growing media for the germination of *Vicia faba* with those of the other media permitted for this species (between paper, and sand).

Seed material

Three samples of *Vicia faba* seeds with various levels of germination quality (between 80 and 95 % germination) were selected for this study.

Participants

Samples were sent to 7 accredited laboratories in France, the Netherlands, Scotland, Germany, the USA, Norway and Israel.

Germination methods

Samples were tested using three different germination methods based on ISTA germination conditions:

- between paper (BP); 20 °C
- sand (S); 20 °C
- organic growing medium (O); 20 °C

Four hundred seeds from each of the 3 samples were tested using each of the three methods.

Statistical analysis

Repeatability and reproducibility were analysed with the statistical tool developed by S. Grégoire according to ISO 5725-2.

The effects of the various factors (laboratory, sample, growing media) were analysed by variance analysis using Statgraphics.

Results

Repeatability

Repeatability was calculated using the statistical tool developed by S. Grégoire based on ISO 5725-2. When the standard deviation is low, the repeatability of the method is high.

The overall mean results for the three types of growing media are presented in Figure 1.

Repeatability was higher with organic growing medium than with sand or between paper. The difference in repeatability was lower between organic growing medium and sand than between organic growing medium and between paper.

Reproducibility

Reproducibility is reported in the same way as repeatability.

Figure 2 shows that reproducibility was higher with organic growing medium than with sand or between paper. The difference in reproducibility was higher between organic growing medium and sand than between organic growing medium and between paper.

Effect of the test conditions

The results were analysed with the variance analysis module of Statgraphics in order to evaluate the influence of the various factors on germination.

Laboratory effect

The data reported in Figure 3 are the overall average results (over all samples and all germination conditions) obtained by each laboratory. Two laboratories, 4 and 7, reported significantly lower results than the other 5 laboratories.

Figure 4 presents the results obtained from the interaction between laboratories and growing media. Laboratories 4 and 7 obtained poor results with the between-paper method.

In consequence, the effect of the growing media was analysed with and without the results of the two laboratories 4 and 7.

Sample effect

Figure 5 shows the results obtained from the three samples when the results of laboratories 4 and 7 were not taken into account in the overall mean.

Growing media effect

Results presented in Figures 6 and 7 indicate that the percentage of normal germination was higher with organic growing media than with sand or between paper. The difference between the results when using sand and paper was significant when all the laboratories were taken into account (Fig. 6). The difference was not significant when the laboratories 4 and 7 were excluded (Fig. 7).

Conclusion

The results obtained in this comparative test indicate that organic growing media can be proposed as an additional primary substrate for the germination of *Vicia faba* seeds.

Results of normal germination are more repeatable and more reproducible with organic growing media than with the other media (sand and between paper). Normal germination also increased with the use of organic growing media compared to the two other substrates. ■

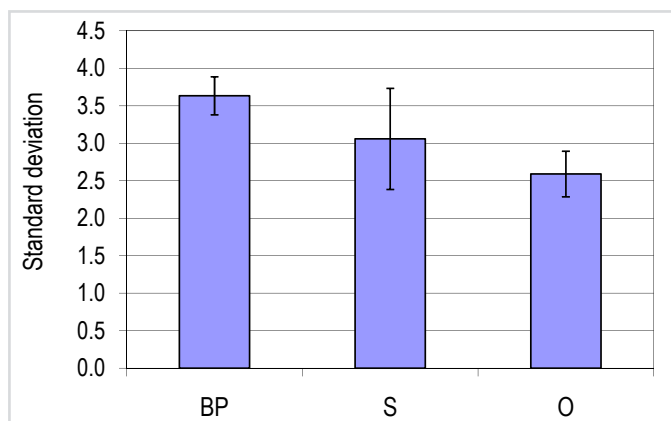


Figure 1. Overall mean results of repeatability (standard deviation) of normal seedlings expressed per growing media. All samples and laboratories are taken into account.

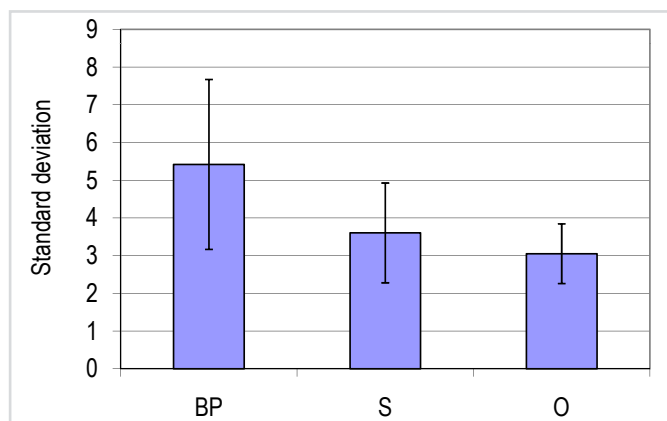


Figure 2. Overall mean results of reproducibility (standard deviation) for normal seedlings expressed per growing media. All samples and laboratories are taken into account.

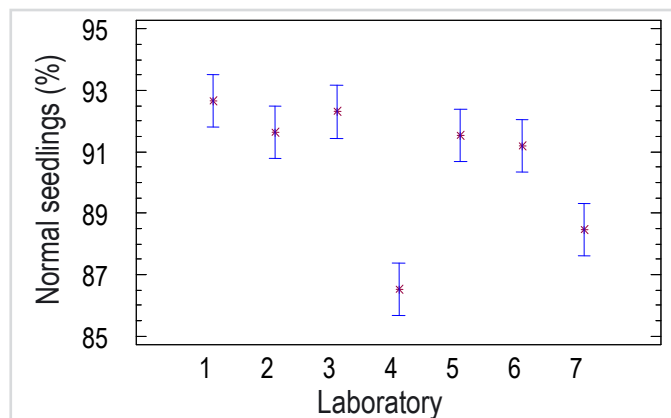


Figure 3. Percentages of normal germination for all samples and all growing media tested.

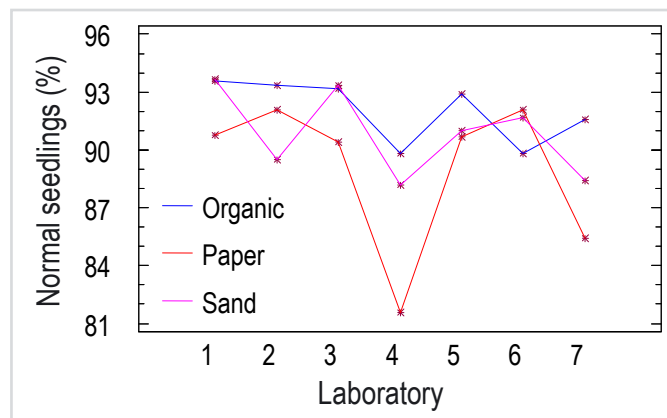


Figure 4. Percentages of normal germination for all samples and for each of the growing media tested.

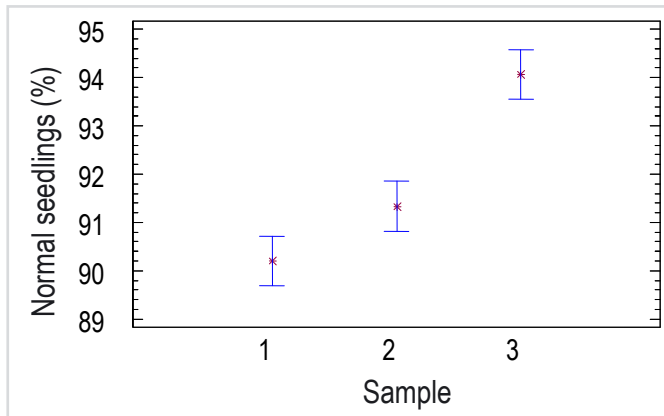


Figure 5. Percentages of normal germination for each sample tested, for all the substrates and all the laboratories except laboratories 4 and 7

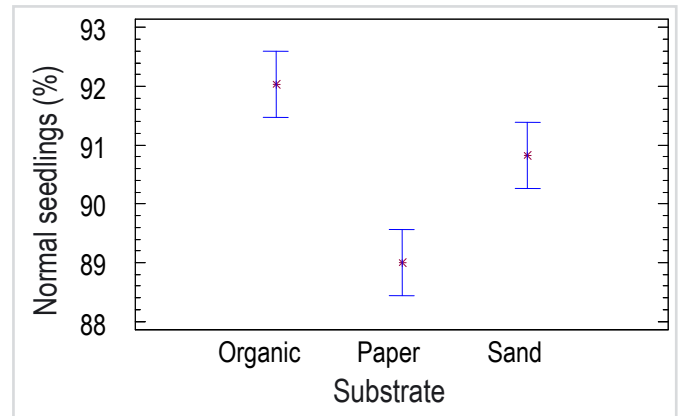


Figure 6. Percentages of normal germination for each type of growing media used, for all the laboratories and all the samples tested.

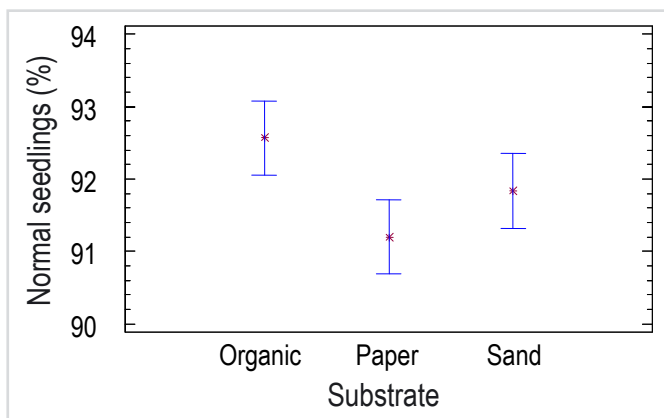


Figure 7. Percentages of normal germination for each type of growing media used, for all the laboratories except laboratories 4 and 7 and for all the samples tested.

ISTA GMO Proficiency Test PT12

This is to announce the 12th ISTA Proficiency Test on GMO Testing, on maize (*Zea mays*).

Each participating laboratory will receive 12 numbered maize seed samples. Each sample contains 2000 seeds based on the 1000-seed weight. Samples may be positive (i.e. contain GM seeds) or negative (i.e. contain no GM seeds). The positive samples are spiked with defined quantities of seeds with one or more of the following events:

- BT11 (devitalized);
- TC1507;
- T25.

Since GMO testing was included in the ISTA Accreditation Programme, participation in the ISTA Proficiency Tests on GMO Testing is compulsory for those laboratories with GMO testing methods in their scope of accreditation.

The ISTA Proficiency Test on GMO Testing is also open to any other laboratories involved in GM seed testing. Your laboratory can select the appropriate method for detecting the presence or absence of GM seeds and quantifying their presence in samples of conventional seeds.

Laboratories interested in participating should please send a completed registration form to the ISTA Secretariat by 1 May 2009 at the latest.

The registration form and a detailed announcement can be found on the ISTA web site under the following link:

<https://www.seedtest.org/gmopt12>

Results of ISTA GMO Proficiency Test PT10

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The aim of the 10th GMO proficiency test (PT10) was to check the ability of participating laboratories to detect and quantify the presence of GM seeds in samples of conventional cotton seeds. Samples were prepared as described in Table 1. In addition, this GMO PT included a stacked event (MON531 × MON1445) for the first time in the history of the GMO PT programme.

During the past few years, there has been an increase in GM crops containing stacked traits. Stacked traits or stacked events can be defined as “plants containing two or more transgenes, usually as a result of the crossing of two (or more) transgenic plants with different transgenes”. These stacked events can offer desirable multiple agronomic traits which may improve the overall performance of the single seed, e.g. yield or resistance to abiotic and biotic stresses. The issue of stacked genes is very complex, particularly from a seed testing point of view (for more information see ‘ISTA and biotech/GM crops’, STI No. 136, pp. 3–5). The issue of discrimination

between stacked and non-stacked events will not be discussed, since it falls outside the scope of this PT round.

Experimental design

All samples contained the transgenic events MON531 and/or MON1445. Four samples contained the stacked event MON531 × MON1445 (Table 1). These samples were not taken into consideration for the quantification rating. When the samples were prepared, defined numbers of seeds were mixed with non-GM seeds. The genetic purity of the negative (based on 30000 seeds) and positive material (based on 400 single seeds) was pretested before preparation of the samples.

Each participating laboratory received a sample set consisting of twelve samples with four spiking levels of 0.6, 0.8, 1.2 or 1.4 % GM cotton seeds (by number of seeds). Each sample contained approximately 2500 seeds (290 g), based on the thousand-seed weight (Table 1).

Evaluation

A total of thirty laboratories participated in this round. Twenty-five participants submitted their results, and five provided

qualitative results only. The identity of the participating laboratories is confidential at all stages of the GMO PT. Each participant is given an A, B, and C or below minimum performance (BMP) for each GMO PT round, reflecting its testing performance.

Qualitative results: detection

The rating for the presence/absence (qualitative) results is based on a percentage of misclassified samples out of the total of twelve samples. Misclassification includes false positive and false negative results, and results that are missing for individual samples. More than 96 % of the participants successfully classified all the twelve samples correctly (including the stacked event) and therefore achieved an A rating. One laboratory had a total of four misclassifications, and was given a BMP (Table 2).

Quantitative results

The quantification of the GM seed level can be done by either a subsampling quantification method (also known as semi-quantitative) or a quantitative test. The quantitative rating is based on the quantification results for the eight samples (with

Table 1. Summary description of experimental design/ treatments applied in PT10

Lot No.	Spiking level	Event	Number of samples	Number of non-GM seeds per sample	Number of GM seeds per sample
1, 2	0.60 %	MON531	2	2485	15
3, 4	0.60 %	MON1445	2	2485	15
5, 6	0.60 %	MON531 × MON1445	2	2485	15
7, 8	0.80 %	MON531 + MON1445	2	2480	10+10
11, 12	1.20 %	MON1445 + MON531 × MON1445	2	2470	10+20
9, 10	1.40 %	MON531 + MON1445	2	2465	15+20

Table 2. Summary of PT10 qualitative rating results.

Rating	Misclassified samples	Number of laboratories
A	0–5 %	24
B	>5–10 %	0
C	>10–20 %	0
BMP	>20 %	1

non-stacked events) and their respective reference value. Participants are allowed to report their results using one of the three following units:

- percentage of DNA copies;
- percentage of seed mass;
- percentage of number of seeds (including subsampling).

Twenty laboratories performed the quantitative test, and reported the estimated value of the GM contents of the individual test samples: as percentage GM DNA copies (6 laboratories, Fig. 1), percentage mass of GM seeds (8 laboratories, Fig. 2) or the percentage of GM seeds in number (6 laboratories, Fig. 3).

The evaluation procedure involves comparison of reported values with reference values for that spiking level. Evaluation of quantitative results is identical irrespective of the chosen report unit, but the reference values differ to some extent. For percentage of seed mass and percentage of number of seeds, the reference value is the same as the true value for each sample and is recorded during the sample preparation. For the percentage of DNA copies, the reference value is calculated as the median value of all results reported in percent of DNA copies for each spiking level. It is assumed that the majority of the participants opting to use percentage of DNA copies as the reporting unit will report the results expressed on the basis of the haploid genome. The ploidy levels should be taken into account, in order to avoid ambiguity in the interpretation of the results. It is well known that the various types of seed tissue can have different ploidy levels, such as in maize. These issues can have a major impact when the quantifying results are reported in percentage of DNA copies (for more information see the clarification document “Unit”, available at the ISTA GM information platform http://www.seedtest.org/upload/cms/user/GMPTClarificationpaper-unitsandstandards_FinalMay2008_.pdf).

Eleven laboratories (55 %) obtained an A rating, three (15 %) a B rating and four (20 %) a C rating. Two laboratories (10 %) obtained a BMP rating (Table 3). The quantitative BMP rating is defined when more than 50 % of the samples are outside the accepted predefined range i.e. ($0.5 \times$ reference value; $2 \times$ reference value).

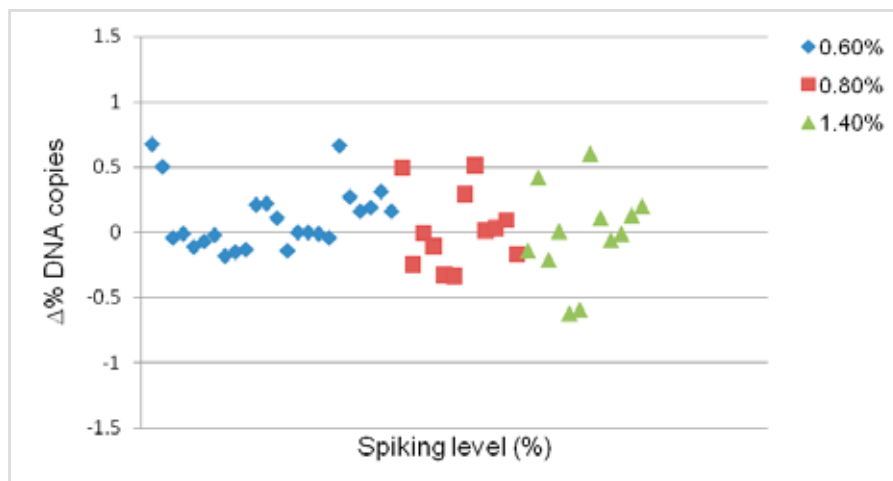


Figure 1. DNA percentage reported (reference value: percentage of DNA copies) in samples with 0.6, 0.8 and 1.4 % spiking levels. Each dot on the figure represents a single event combination: MON531, MON1445 or MON531 + MON1445.

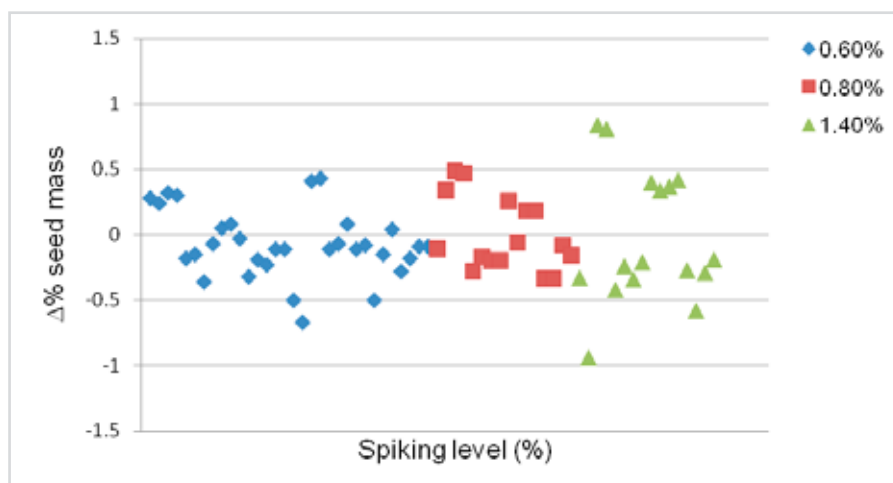


Figure 2. DNA percentage reported (reference value: percentage seed mass) in samples with 0.6, 0.8 and 1.4 % spiking levels. Each dot on the figure represents a single event combination: MON531, MON1445 or MON531 + MON1445.

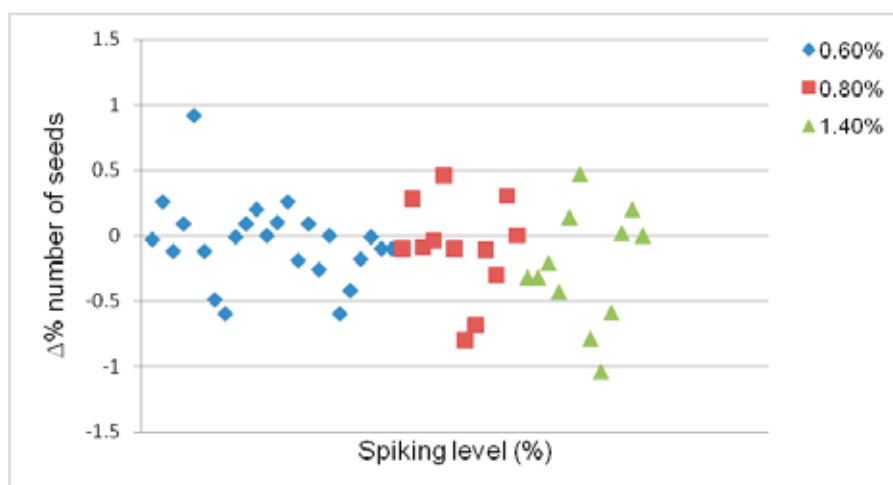


Figure 3. DNA percentage reported (reference value: percentage number of seeds) in samples with 0.6, 0.8 and 1.4 % spiking levels. Each dot on the figure represents a single event combination: MON531, MON1445 or MON531 + MON1445.

The two laboratories rated as BMP had more than 70 % of their samples outside this range. The details of the rating system for quantitative results can be found in STI No. 130, October 2005, pp. 11–14.

The number of deviating results for the samples was consistent across the spiking

levels (three levels) and across the reporting unit/reference value (three levels), as seen in Figures 1–3. These trends are similar to the ones reported in previous GMO PT rounds.

Conclusions

The participating laboratories were able to demonstrate their ability to detect adventitious presence and quantify the GM content at various levels. The percentage of laboratories reporting correct qualitative and quantitative results was 90–95 %.

The whole GMO area is a fast-growing field and still contains many challenges. In particular, the identification and

quantification of stacked genes is still in its early stages and more research and development is therefore needed. This will be a very challenging topic for future GMO PT programmes, and is one that ISTA is at the forefront of (see 'ISTA and biotech/GM crops', STI 136, October 2008, pp. 3–5).

Acknowledgements

Thanks are due to Christoph Halde-mann (Chair of the GMO Task Force) and Cheryl Dollard (Proficiency Test WG Leader) for editing the draft, and also to Jean Louis Laffont for the indispensable work that he and the STAT Committee do for the GMO Task Force. ■

Table 3. Summary of PT10 quantitative rating results

Rating	Number of laboratories
A	11
B	3
C	4
BMP	2

New electronic form for non-conformity reports

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The ISTA accreditation program has now been running for more than 10 years. A substantial number of changes and improvement in reporting audits have taken place in that period. However, the non-conformities found during audits have always been handwritten. The auditors then had to type the non-conformities into the database at the ISTA Secretariat, and this very often included a lot of work redrafting the handwritten non-conformities in an attempt to improve the wording. From the database the non-conformities were then transformed into a checklist (Word document) which was then sent to the laboratories as part of the audit report.

The laboratories then had to write a report describing the reasons or root causes for the non-conformities, corrective actions taken to remove the non-conformities and implementation of these corrective actions. Each laboratory did this in its own way, and very often the references to

individual non-conformities were not reported precisely. This resulted in auditors having to re-write the follow-up corrective actions in a corrective action report and send this back to the laboratory for further action or clarification. This was laborious and time consuming, and very often both the laboratory and the auditors lost track of the process.

In Autumn 2008, we decided that the time had come to eliminate the last handwritten parts in the ISTA accreditation procedure and to improve our reporting process by making it more effective and clearer. We introduced therefore a new pro forma into which non-conformities are directly entered using a laptop during the audit. The auditors bring a laptop with them and the laboratory being audited provides the auditors with printer access. This allows the printing of non-conformity reports at the audit which are then signed by the laboratory and the auditors.

The laboratory will also receive the non-conformity reports electronically as a Word file together with the audit report. The laboratory is then asked to use this Word file when reporting its follow-up

corrective actions. In the Word file a space is assigned/made available for the laboratory to report its corrective actions and for reference to documents demonstrating the implementation of the corrective actions. The laboratory is asked to return the Word file with its additions electronically.

The auditors will then again use the Word file for commenting on the laboratory's corrective actions and approve these or otherwise.

We have now had our first experiences of using this new electronic non-conformity report form at the ISTA Secretariat and it has already shown its value. It makes it much easier for us to read corrective actions and write corrective action reports back to the laboratory. We hope that laboratories who have experience of the new electronic non-conformity report forms find that it makes their responding to audits much easier. We would appreciate any comments on this aspect from the laboratories as well as additional suggestions for improvements.

The next development in this area will be an on-line/web-based system which will reduce the amount of paper used. ■

Laboratory accreditation changes

Status 19 March 2009

Re-accreditations

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Termination of accreditation

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ISTA Workshop on Molecular Markers for Variety Identity and Purity

Bologna, Italy, 10–13 June 2009



The ISTA Variety Committee (VAR) and the Seed Research and Testing Laboratory (LaRAS) of the Department of Agro-environmental Sciences and Technologies of the University of Bologna invite you to their workshop on Molecular Markers for Variety Identity and Purity, to be held in Bologna, Italy from 10 to 13 June 2009. The workshop will be made up of lectures and practical experience in the use of molecular markers (MM). It will also offer the opportunity for discussion both on general as well as on specific questions from participants regarding variety testing procedures.

Content

- Overview of morphological, biochemical and DNA-based markers (MM)
- DNA extraction procedures and quantification methods
- The polymerase chain reaction – Basic concepts
- PCR-based markers
- Separation, visualization and genotyping methods
- Random/anonymous markers: RAPDs and AFLPs
- Specific markers: SSRs, SCARs, SNPs
- Assay design/optimization
- Introduction to programs for data analysis
- Statistics for purity testing
- MM and ISTA Overview on the work carried out by the Variety Committee

Practical work

- All participants will work hands-on for:
- DNA extraction and quantification
 - PCR preparation
 - Agarose and acrylamide gel casting and electrophoresis
 - Gel loading and fragment visualization (ethidium bromide, silver staining and fluorescent labelling)
 - Data collection, interpretation and analysis

Question and answer sessions

These will consider questions on all aspects of variety identity and purity testing by MM.

Lecturers

- Dr. Ana Vicario (Vice-Chair of the Variety Committee, INASE, Argentina)
- Dr. Daniel Perry (Leader of the VAR Wheat Group, Canadian Grain Commission, Winnipeg, Canada)
- Dr. Emanuela Casarini (Leader of the VAR DNA WG)
- Dr. Enrico Noli (LaRAS, University of Bologna)
- Dr. Elena Battistini (LaRAS, University of Bologna)
- Dr. Silvia Scacchi (LaRAS, University of Bologna)
- Dr. Maria Teriaca (LaRAS, University of Bologna).

Location

The workshop will be held at the Seed Research and Testing Laboratory (LaRAS) of the Department of Agro-Environmental Sciences and Technologies, the University of Bologna. This is based about 6 km from central Bologna and is linked to the city by a frequent bus service. Bologna itself is well served by an international airport, road and rail transport.

Further details

Further details about this workshop, including costs, accommodation and registration details can be found on the ISTA website <http://www.seedtest.org/en/workshop.html>

Registration

There will be a minimum number of participants required for this workshop to take place, with a maximum number of 20. If you wish to participate, please contact Enrico Noli (enoli@agrsci.unibo.it; fax +39 051 2096253). The deadline for final registration (with payment of fee) is 5 May 2009.

Registration form

The registration form can be downloaded from the workshop detail page at: <https://www.seedtest.org/workshops>

ISTA Quality Assurance Workshop

Bassersdorf, Switzerland, 11–13 June 2009

In conjunction with the ISTA Annual Meeting, 15–18 June 2009.

We are pleased to invite you to the ISTA Secretariat for participation in the ISTA Quality Assurance Workshop, with an optional excursion to Zurich city on 13 June.

The aim of this workshop is to give experienced laboratories the opportunity to discuss and obtain inspiration on how to improve their Quality Assurance system and benefit from it.

Venue and local organizer

ISTA Secretariat, Zürichstrasse 50, 8303 Bassersdorf, Switzerland. E-mail: ista.office@ista.ch

Provisional programme

The workshop will consist of oral presentations, group work and exercises. The workshop's lecturers will try to involve the participants as much as possible.

- Internal quality control
- Check testing, blind tests etc.
- Statistical analysis
- Trends
- Monitoring of staff
- Seed samplers
- Seed analysts
- Non-conforming work:
 - What is non-conforming work?
 - What are preventive actions
 - Effectiveness of corrective actions
 - Internal audit
- Technical issues:
 - Dealing with the calibration of equipment etc.
 - How to read uncertainty on calibration certificates?
 - How to use uncertainty in the calibration work?
 - How to calibrate sieves internally?

General matters:

We will focus on the different paragraphs in the accreditation standard, for example, on ones that are difficult to deal with and how the participants have solved specific problems etc.

Lecturers

Lecturers will be from the ISTA Accreditation Department and Technical Auditor/s.

Participants

There will be a minimum number of participants required for this workshop to take place.

The maximum number of participants is 30 persons.

Accommodation

Novotel

Single room: CHF 226 (including breakfast)

Double room: CHF 252 (including breakfast)

Address: Lindbergh-Platz 1, 8152 Glattpark-Opfikon-Zurich, Switzerland

Ibis Hotel

Single or double room: CHF 130; Breakfast: CHF 15

Address: Heidi Abel-Weg 5, 8050 Zurich, Switzerland

Workshop fee

ISTA Members: EUR 200

Non-members: EUR 300

The workshop fee includes participation in the workshop, all associated literature, coffee breaks, lunches and local transportation.

Excursion fee (optional): EUR 60

Fee includes a guided city tour, lunch and local transportation.

Registration

For workshop registration and hotel reservations please register online or fill in the registration form and return it to the local organiser. The ISTA Secretariat will make the hotel reservation for you.

Registration deadline

29 April 2009

Payment deadline

29 May 2009

Payment instructions will be provided with the invoice.

Registration form

The registration form can be downloaded from the workshop detail page at:

<https://www.seedtest.org/workshops>

ISTA Seed Analyst Training Workshop/Seminar

Zurich, Switzerland, 14 June 2009

The Seed Analyst Training Committee (SATC) of the International Seed Testing Association (ISTA) takes pleasure in inviting you to participate in the workshop/seminar on Seed Analyst Training to be held on 14 June 2009 in Glattbrugg (Zurich), Switzerland. The workshop/seminar will take place one day before the ISTA Annual Meeting in Zurich from 15-18 June 2009.

Workshop content

The workshop/seminar will include presentations on seed analyst training in different regions of the world. Participants will also consider different aspects of the Seed Analyst Training Programme and their expectations and needs will be discussed. It is hoped that information gathered at the workshop/seminar will help ISTA build a system of seed analyst training that meets needs and which is acceptable for everybody.

Workshop organizer

ISTA Seed Analyst Training Committee (SATC)
E-mail: ista.office@ista.ch

Local organizer

ISTA Secretariat, Zurichstrasse 50, 8303 Bassersdorf, Switzerland. E-mail: ista.office@ista.ch

Provisional programme:

1. Presentations from various regions:
 - Africa: Mary Chipili
 - Australasia: John Hampton
 - Europe: Joël Léchappé
 - North America: Steve Jones/Susan Maxon
 - South America: Monica Moreno, Silmar Peske
 - Asia: Masatoshi Sato
2. Brainstorming exercise in groups, each led by a member of the Seed Analyst Training Committee, to consider various aspects of the Seed Analyst Training Programme. Views and expectations would be gathered.
3. Presentation by each group of their findings
4. Conclusion/summary of overall findings

Venue

The workshop will be held at the venue of the ISTA Annual Meeting 2009 (15-18 June; see p. 12):

NOVOTEL, Lindbergh-Platz 1, 8152 Glattpark-Opfikon-Zurich, Switzerland

Lecturers

- Mary Chipili, Zambia (ISTA ECOM Member-at-Large)
- John Hampton, New Zealand (ISTA 1st Vice-President and Chair of ISTA Seed Analyst Training Committee)
- Steve Jones, Canada (ISTA Rules Committee Chair and Member of ISTA Seed Analyst Training Committee)
- Joël Léchappé, France (ISTA ECOM Member-at-Large and ISTA Technical Auditor)
- Susan Maxon, United States (ISTA ECOM Member-at-Large)
- Monica Moreno, Argentina (Head of ISTA Accredited Laboratory and ISTA Technical Auditor)
- Silmar Peske, Brazil (Member of Seed Analyst Training Committee)
- Masatoshi Sato, Japan (ISTA ECOM Member-at-Large)

Accommodation

Novotel

Single room: CHF 226 (including breakfast)
Double room: CHF 252 (including breakfast)
Address: Lindbergh-Platz 1, 8152 Glattpark-Opfikon-Zurich, Switzerland
For reservations, please fax the reservation form (www.seed-test.org/am2009) to +41 44 829 99 99 before 15 May 2009.

Ibis Hotel

Single or double room: CHF 130; breakfast: CHF 15
Address: Heidi Abel-Weg 5, 8050 Zurich, Switzerland
For reservations, please fax the reservation form (www.seed-test.org/am2009) to +41 44 838 60 01 before 15 April 2009.

Prices are per room per night and only valid for the dates of the Seed Analyst Training (14 June 2009) and ISTA Annual Meeting (15-18 June 2009) inclusive.

Registration

Deadline: 15 May 2009
There is no registration fee. The cost of registration will be met by the budget for the ISTA Annual Meeting 2009.

Participants

Maximum 150

Registration form

The registration form can be downloaded from the workshop detail page at:
<https://www.seedtest.org/workshops>

ISTA Seminar on Purity Testing

Zurich, Switzerland, 15 June 2009

The Seed Purity Committee of ISTA is pleased to invite you to their seminar on Seed Purity in Glattbrugg (Zurich), Switzerland.

Seminar content

Presentations on various aspects of seed purity by experts in the field. The work of the Purity Committee and topical issues currently being addressed by the Committee will be presented.

Participants will also be able to put questions to a panel of experts and discuss issues related to the purity test. It is hoped that this Seminar will be invaluable both to those involved in the technical aspects of the work and to stakeholders who make use of the results of purity analyses.

Seminar organizer

ISTA Purity Committee; e-mail: maria-rosaria.mannino@geves.fr or jane.taylor@niab.com

Local organizer

ISTA Secretariat, Zürichstrasse 50, 8303 Bassersdorf, Switzerland. E-mail: ista.office(at)ista.ch

Programme

For further details see p. 12.

Part 1: Pure Seed Definitions

- Review of Pure Seed Definitions in ISTA Rules
- Botanical criteria for Pure Seed Definitions
- Purities of tropical/subtropical species such as *Panicum*, *Bra-chiaria* and *Chloris*
- Testing forest tree and shrub seed species

Part 2: Seed identification

- Identification of seeds to the genus or species level
- Tools for seed identification
- The Universal List of Species: role and impact
- Species classification and nomenclature

Part 3: Seed blowing

- Innovation in standard blowing procedures for *Poa pratensis* and *Dactylis glomerata*
- Demonstrations on the value of equivalent air velocity to calibrate a blower
- Methodology for developing a uniform blowing procedure for grass species

Part 4: Discussion forum

- Possible topics: the future of purity testing, the role of machine vision, the reporting of purity results, calculations and the use of statistics and tolerances

Part 5: Conclusion/summary

Lecturers

Adriel Garay, USA (Oregon State University)
 Norbert Leist, Germany (ISTA Past President)
 Maria Rosaria Mannino, France (Purity Committee Chair)
 Deborah Meyer, USA (Purity Committee Member)
 Monica Moreno, Argentina (Head of ISTA-Accredited Laboratory, ISTA Technical Auditor and Purity Committee Member)
 Zdenka Prochazková, Czech Republic (Forest Tree and Shrub Seed Committee Chair)
 Jane Taylor, UK (Purity Committee Vice-Chair)
 Joost van der Burg, Netherlands (Advanced Technologies Committee Member)

Venue

The workshop will be held at the venue of the ISTA Annual Meeting 2009 (15–18 June; see p. 12):

NOVOTEL, Lindbergh-Platz 1, 8152 Glattpark-Opfikon-Zurich, Switzerland

Accommodation

Novotel

Single room: CHF 226 (including breakfast)
 Double room: CHF 252 (including breakfast)
 Address: Lindbergh-Platz 1, 8152 Glattpark-Opfikon-Zurich, Switzerland

For reservations, please fax the reservation form (www.seed-test.org/am2009) to +41 44 829 99 99 before 15 May 2009.

Ibis Hotel

Single or double room: CHF 130; breakfast: CHF 15
 Address: Heidi Abel-Weg 5, 8050 Zurich, Switzerland

For reservations, please fax the reservation form (www.seed-test.org/am2009) to +41 44 838 60 01 before 15 April 2009.

Prices are per room per night and only valid for the dates of the Seed Analyst Training (14 June 2009) and ISTA Annual Meeting (15–18 June 2009) inclusive.

Registration

Deadline: 15 May 2009

This seminar is part of the ISTA Annual Meeting, 15–18 June, 2009. There is the option to register for the Annual Meeting including the Purity Seminar or to register for the seminar only. To register for the whole Annual Meeting please see page 16.

Registration fee

For Purity Seminar, Monday, 15 June ONLY

ISTA Members: EUR 180

Non-members: EUR 230

Student (current student identification required): EUR 99

Fee includes Seminar, lunch and coffee breaks.

ISTA Workshop on Quality Assurance in Seed Testing Palmerston North, New Zealand, 19–23 October 2009

The ISTA Accreditation Department and the Institute of Natural Resources, College of Sciences, Massey University invite you to their workshop on quality assurance in seed testing to be held in Palmerston North, New Zealand from 19 to 23 October 2009. The workshop will cover quality assurance in the seed laboratory. This workshop will appeal to seed analysts working in laboratories that have a quality assurance system implemented or are looking to establish a quality system within their laboratory.

If you have ever wondered the following about quality assurance in the seed laboratory:

- Why do we have a quality assurance system operating in our laboratory?
- Isn't quality assurance a waste of time?
- I know a little about quality assurance, but, there must be more to it?
- Quality assurance in my laboratory takes a lot of time – is there a smarter way of doing it?

Then this workshop is for you. We look forward to seeing you on it!

Location

Institute of Natural Resources, College of Sciences, Massey University, Palmerston North, New Zealand.

Local organizer

Craig McGill
Institute of Natural Resources (PN433),
Massey University, Private Bag 11-222

Palmerston North 4442
New Zealand

Phone: +64 6 356 9099 extension 7841

Fax: +64 6 350 5679

Email: c.r.mcgill@massey.ac.nz

Aim of the Workshop

This workshop aims at presenting and discussing the basic principles of quality management focusing on the needs of seed testing laboratories.

Successful participants should be able to:

- understand how to ensure traceability and make an audit trail
- perform a root cause analysis
- develop their own check list for internal audits
- deal with non-conformities, corrective and preventive actions
- work out training requirements.

Workshop content

- Basic principles of quality management
- Non-conforming work
- Internal audits
- Training programme in seed testing
- Internal quality control procedures
- Quality management in general

Participants of this workshop will be actively involved through group work, exercises, discussions, presentations and practical work on quality assurance in moisture determination. Theoretical background will be given through lectures. The workshop language is English.

Preliminary programme

Monday: Welcome — Introduction to quality assurance — The development of quality assurance in ISTA — Document control — Traceability, recording, calculation with exercises and case studies — Calibration and uncertainty with exercises.

Tuesday: Training — requirements to the training — monitoring of staff — Group work — Quality assurance in the moisture laboratory — practical work.

Wednesday: Non-conformities — corrective actions — preventive actions — How to do a root cause analysis — exercise — Internal audits, group work — Workshop official dinner

Thursday (all day): Workshop excursion

Friday morning: — Internal quality control procedures, trend analysis with examples and exercises — What is objective evidence? Role play — General matters, quality policy, quality goal — evaluation of the workshop by participants — Closing ceremony.

Lecturers

Jette Nydam (System auditor, ISTA Secretariat)
Craig McGill, Massey University (Chair, ISTA Moisture Committee)
Don Scott (past-President of ISTA)

Accommodation

The following motels are close to each other and on the main route from the city centre to Massey University:

Colonial Court Motel & Conference Centre
305-307 Fitzherbert Avenue, Palmerston North, New Zealand

Phone: +64 6 359 3888 • Fax: +64 6 359 3189

E-mail: colonial@manawatu.gen.nz

Web site: www.colonialcourtmotel.co.nz/

Accommodation (cont.)

Harringtons Motor Lodge
 301 Fitzherbert Avenue, Palmerston North, New Zealand
 Phone: +64 6 354 7259 • Fax: +64 6 354 8493
 E-mail: harringtons@clear.net.nz
 Web site: www.harringtonsmotel.co.nz/

Participants should contact the motels directly for booking accommodation. Indicative prices for accommodation are available on the website for each motel in NZD. When making a booking, participants should mention they are with the ISTA Quality Assurance in Seed Testing Workshop being held at Massey University. For other motel options please contact the local organizer.

Registration

Number of participants: maximum 30
 There will be a minimum number of participants required for this Workshop to take place.
 Registration deadline: 28 August, 2009

Registration fee

- New Zealand Dollars (NZD) 580.00 (approx. USD 300.00) for ISTA Members
- NZD 870.00 (approx. USD 450.00) for non-members

The USD amounts are based on the NZD:USD exchange rate on 27 February 2009. Participants wishing to pay in USD must pay the USD equivalent to NZD 580.00 (ISTA Member) or NZD 870.00 (non-member) at the NZD:USD exchange rate at the time of payment.

The registration fee includes all literature and supporting material for the workshop, lunches (except for the day of the field trip) and coffee breaks, workshop dinner and transfer between the workshop venue and hotels. Details for payment will be provided on receipt of your registration.

A field trip to the Wairarapa, a major food and wine producing area in New Zealand will be organised. A lunch stop will be made in a small country town where participants can purchase lunch at one of the numerous eateries there.

Additional information

Palmerston North Airport is 15–20 minutes drive from the motels above. Shuttle buses and taxis are available at the airport. A taxi from the airport to either of the motel above is approximately NZD 25.00.

Registration form

The registration form can be downloaded from the workshop detail page at:
<https://www.seedtest.org/workshops>



ISTA Workshop on Sampling, Moisture, Germination, Purity and Quality Management

Taichung, 8–12 September 2008

Anny van Pijlen

Member, ISTA Tetrazolium and Germination Committees

General Netherlands Inspection Service (NAK)
8300 BC Emmeloord, Netherlands
apijlen@nak.nl

The ISTA Workshop on Seed Sampling, Moisture, Germination, Purity and Quality Management course was held from 8–12 September 2008 in Taichung, Separate Customs Territory of Taiwan, Penghu, Kinmen and Matsu. The workshop was kindly hosted by the Department of Horticulture, National Chung-Hsing University, and sponsored by the ISTA-accredited seed-testing laboratory in Taichung. The workshop was attended by 18 participants from six different Asian countries. The lecturers of the workshop were Dr. Chung-Li Chen, Professor of the Department of Agronomy, NCHU, Dr. Yu Sung, Professor of the Department of Horticulture, NCHU, and Anny van Pijlen, Department of International Co-operation and Training, NAK, Emmeloord, the Netherlands.

The main objective of the workshop was to provide information, based on the ISTA Rules and Handbooks, on temperate grass species. Besides the temperate grasses, a number of vegetable species were prepared for germination and tetrazolium testing. Basic principles of quality management were discussed, aimed at training laboratory staff to introduce and maintain a quality management system which complies with the requirements of the ISTA Accreditation Standard and the



ISTA Rules and Handbooks. The workshop was also to provide experience for the future for Asian laboratories to participate in the ISTA Proficiency Test Programme, especially when temperate grasses are part of the programme.

After the workshop the participants had learned the following:

- basic knowledge of temperate grass species and weed seeds;
- how to use the ISTA handbooks and Rules in day-to-day work;
- details about the ISTA Accreditation Programme and ISTA audit procedure;
- how to document staff competence;

- how to introduce quality controls, e.g. entrance control of media or monitoring of seed samplers.

The workshop was divided into theory lectures and practical sessions. Subjects for the workshop were:

- seed sampling;
- moisture;
- purity;
- germination;
- tetrazolium testing;
- calibration equipment;
- ISTA Accreditation Programme;
- ISTA Audit Programme.





Course participants in front of the National Chung-Hsing University

Seeds of temperate grass species were sent on beforehand, planted by the students of the Department of Horticulture of the University, and evaluated during the workshop. The presentations were supplemented by practical group work where the participants could discuss the work and exchange their views and experience of seed testing.

On the third day, an excursion was arranged to the Plant Germplasm Division and Biotechnology in the Agricultural Research Institute. A slide show was presented, followed by a tour through the Institute to give us a closer view of the its work. After the visit the group went to the Tea Museum in Lugu Township, Nantow County, where we were entertained with a real traditional tea ceremony. After lunch we needed some exercise, and went to the Chi-Toe Forest, where we climbed up to the highest point of the forest. It goes without saying that the views were spectacular. The last part of the trip was a visit to the ISTA Member Laboratory TWDL0100 in Taichung, to see how a quality system is implemented in daily work. The participants could thus see what kind of activities and documents are associated with quality management.



Group picture at the Chi-Toe Forest

The workshop ended on the Friday afternoon after the evaluation of the workshop and the presentation of the certificates of attendance. Dr. Yu Sung had arranged an extra excursion for the participants. After the closing session and acknowledgements to the organisers and the sponsors of the workshop, the participants were invited to visit the Sun Moon Lake. The lake is located south of Taichung, and is known for the beauty of the surrounding area.

The majority of the foreign participants were leaving on Saturday, but some of them, like myself, were caught up in a typhoon. On Saturday, 13 September, Typhoon Sinlaku hammered the island at peak strength, and Taipei airport was closed for several hours. For me it was my first experience with this phenomenon. The next day the weather was back to normal, the airport was open and the flights were on schedule again. ■

ISTA Workshop on Purity, Germination and Tetrazolium Testing on Tropical and Subtropical Seeds

Córdoba, Argentina, 15–18 September 2008

Sylvie Ducournau¹ Maria Rosaria Mannino², Monica Moreno³ and Norbert Leist⁴

¹Vice-Chair, ISTA Germination Committee, ²Chair and ³Member, ISTA Purity Committee, ⁴Past-President of ISTA

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Beaucouzé, France

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1063 Buenos Aires, Argentina

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One of ISTA's priorities is the improvement of the Rules and the increase of activities with regard to tropical and subtropical species. Following this principle, a workshop was held in 2008 which included sessions on purity, germination and tetrazolium methods for seed analysis, mainly concentrating on tropical and subtropical species.

The four-day workshop was organized by Monica Moreno of the Instituto Nacional de Semillas of Buenos Aires (INASE), and took place in Córdoba (Argentina) in September 2008, hosted by the Córdoba Catholic University. Twenty-four participants attended this Workshop, with the majority coming from South America (Argentina, Equator, Brazil, Bolivia and Chile) and two from India and Australia. Most of those attending had experience in testing tropical and subtropical seeds, but some trainees did not. Participants came either

from seed companies or from national seed testing stations or institutions.

To start the programme, Norbert Leist, Maria Rosaria Mannino and Sylvie Ducournau presented general aspects of ISTA work and procedures.

Practical sessions were introduced and organized by Monica Moreno and Maria Rosaria Mannino for purity, and by Augusto Martinelli and Norbert Leist for germination and tetrazolium.

Rosalba Peman, Professor at the Córdoba Catholic University, gave interesting presentations on the physiology of tropical and subtropical grass seeds.

There was a lot of interesting exchange and discussion throughout the workshop between the participants and the lecturers.

Concerning purity, the discussion showed that participants do not have difficulties in understanding the Pure Seed Definition (PSD) 36 used for analysis of *Panicum maximum*. Nevertheless, the experience of the analyst seems very important to ensure its correct use in the practice. As underlined by a participant, workshops could include specific practical sessions on the use of the Pure Seed Definitions. A suggestion of improvement of the Pure Seed Definition 36 was also raised by participants. They proposed to simplify the

analysis by giving the possibility to not detach the pedicel from the spikelet when present. No problems were detected in the analysis of *Brachiaria* sp., following the current Pure Seed Definition 36.

Chloris gayana was the species that showed the most important problems in purity analysis, and a clarification on how to carry out the test would be necessary. This species is included in Chapter 13 (germination test by replicates without purity), but the very high percentages of weeds often present in seed lots could require a purity analysis. Following current Rules, both methods, with purity analysis and without purity analysis, but with germination by weight replicates, can be chosen by laboratories, which could lead to a lack of uniformity in seed testing.

Concerning the germination session, interesting work has been carried out by and was presented by Rosalba Peman on treatments for breaking the dormancy of tropical and sub-tropical grass species. She obtained results showing that gibberellic acid is much better than treatments prescribed in current ISTA Rules for breaking the dormancy of *Panicum maximum* seeds. The possibility to introduce this treatment into the table 5A after a validation study was discussed.



Workshop participants at the Catholic University of Córdoba



Discrepancies in the root system evaluation of soybean were identified by the participants. All germinate soybean seeds in sand, but when the primary root is deficient, some laboratories accept 2, 3 or 4 secondary roots to consider the seedling as normal, leading to differences in results.

The difference between ISTA and AOSA Rules concerning the evaluation of the root system of sunflowers was also discussed. It seems that this causes difficulty for South American countries exchanging seeds and results with United States or other countries.

It may be necessary to summarize some principles on seedling evaluation, for example concerning the root system evaluation of soybean and sunflower, in order to harmonize results between laboratories.

It was a really fruitful workshop with a lot of discussion on a lot of subjects. All these participants had wide experience on these species and it will be beneficial and

interesting for ISTA to take advantage of their knowledge, for example of the dormancy-breaking treatments for tropical grass seeds.

The tetrazolium session, chaired by Augusto Martinelli and Norbert Leist, dealt with theory and practical work with *Brachiaria*, *Panicum*, *Helianthus* and *Glycine*. Whereas methods for the first three species are described in the ISTA Rules, *Glycine* is surprisingly missing there, and the method is presented in the ISTA Tetrazolium Handbook and the ISTA Working Sheets only. As much knowledge has been accumulated in Argentina (e.g. by Roque Mario Cravio, Miriam Arango Perearnau, Carina Gallo: Prueba Topografica por Tetrazolio en Soja, 2008) and Brasil (Jose Franca Neto, Francisco Carlos Kryzyzanowski, Nilton Pereira da Costa: The Tetrazolium Test for Soybean Seeds, Embrapa, 1998) it was concluded to strengthen the efforts to define the most appropriate method to

bring *Glycine* into the ISTA Rules. Augusto volunteered to set up a Rules Proposal, present it to the Chair of the TEZ Committee and organize the validation. In the discussion about the staining procedure it was clarified that the three parameters percentage of the tetrazolium solution, staining time and staining temperature are interdependent. Therefore, when the TEZ solution is lowered to 0.1 %, time and temperature have to be adapted accordingly (see ISTA Rules and Working sheets). Clarification is also needed regarding the evaluation of the inner part of the cotyledons in *Glycine* and *Helianthus*, whether this check and the evaluation of the plumula are obligatory or not.

Finally, it can be said, that the intensive open discussion and the contribution from experienced participants supported the ongoing process of optimizing the methodology. The presentation by Steffi Krämer, Chair of the TEZ Committee, beside others, gave insight in the validation study of *Allium*, *Cucumis*, *Lactuca*, *Lycopersicon* (which are now accepted in the ISTA Rules), showed the current work with *Brachiaria*, *Larix*, *Picea*, and also the enlargement of the ISTA Working Sheets I with 52 and Working Sheets II with 16 species. The training plans foresee in 2009 a workshop on tropical tree seeds in Brazil, and in 2010 a combined germination and tetrazolium workshop on agricultural species in Germany just before the ISTA Congress.

Finally, special thanks to the organizations that supported this workshop together with ISTA: INASE, the Cámara de Semilleras de la Bolsa de Cereales, the Cámara de Cereales y Afines de Córdoba, and the Universidad Católica de Córdoba.



ISTA Moisture, Germination and Vigour Workshop Nakuru, Kenya, 3–7 November 2008

Dr. Chagema Kedera, Mr. Simeon Kibet and Mr. Zakayo Kinyanjui
KEPHIS Nakuru Regional Office, Quality Assurance

Kenya Plant Health Inspectorate Service (KEPHIS)
Nakuru Regional Office
P.O. Box 1679, Nakuru, Kenya
skibet@kephis.org

The ISTA Moisture, Germination and Vigour Workshop was held at the Kenya Plant Health Inspectorate Service (KEPHIS), Nakuru, Kenya from 3–7 November 2008. It was attended by 21 participants from Kenya, Sudan, Zambia, Madagascar, Zimbabwe and India.

The workshop registration opened at 8.30, followed by a welcome address by the local organizer, Dr. Joseph Ahenda. Then the opening speech was given by Dr Vassey Mwaja, a Director of the Board of KEPHIS. After this there was a photo session of all the participants.

The workshop presentations started with the registration of expectations of participants, led by Anny van Pijlen, after which Craig McGill gave his presentation on ISTA Rules Chapter 9: Moisture. A participant asked the importance of determining seed moisture and Craig put the question to the participants. The reasons for testing for seed moisture were stated to be storage, viability, knowing optimal harvest time, drying and processing, seed treatment, vigour testing and seed trade.

Another question was asked on the temperature for predrying, which was given as 25 °C.

In the afternoon of that day there was practical moisture testing and calculation of moisture results. Then Anny van Pijlen gave a general introduction to seed sampling and purity.

The morning of 4 November started with a presentation on germination testing by Anny van Pijlen. She covered the theory of germination and a discussion on the work of the Germination Committee. This was followed by a presentation on the evaluation of germination of *Desmodium* by Simon K. Kibet. Later, after the



From left to right, first row: Gillian McLaren, Craig McGill, Dr. Vassey N. Mwaja, P.L.O Nyambuya, Anny van Pijlen, Dr. Joseph Ahenda, Stephen Ithili. Second row: Andriamainty Marius, James Wathiru, Amina Abdalla, Evaline Shitabule, Carolin Kavuu, Jane Kingori, Timothy Osoro, Z. Kinyanjui. Third row: J. Cheptaiwa, Simeon Kibet, Miruka George, F. Nganga, R. Okayo, Mary Kamau, Kefa Oganda. Fourth row: J. Muchiri, W. Sitienci, Cham Puro, Ephraim Wachira, M. Kiptoo

coffee break, Gillian McLaren took the participants through the *ISTA Handbook on Seedling Evaluation* and a practical session on seedling evaluation, covering *Allium cepa*, *Daucus carota* and *Helianthus annuus*.

On Wednesday the 5th, the day started with the group visiting the Nakuru branch of the Kenya Seed Company, one of the largest seed companies in Kenya. They were shown how seeds are received, dried, processed, sampled and marketed. Later, the participants visited the Menengai crater and Lake Nakuru National Park, a lake famous for its flamingoes.

The morning of 6th November began with a presentation on equipment calibration, led by Gillian, and after the coffee break there was practical work on germination evaluation covering *Desmodium* spp, *Arachis hypogaea* and *Phaseolus vulgaris*.

In the afternoon, Gillian gave a presentation on seed vigour testing. She defined “vigour”, and explained how it relates to

germination, what vigour differences mean and types and use of vigour tests. Then there was practical work on the electroconductivity test using *Pisum sativum*.

This was followed by a lecture on ISTA accreditation by Anny van Pijlen. She introduced the meaning of quality assurance and the different international standards such as ISO 9001 and ISO 17025. She discussed quality management principles and the elements of the quality management system. After this she took the participants through the ISTA accreditation standards covering management requirements, staff, environment, equipment, lot identification, sampling, test reports and certificates, records, quality assurance system, methods and procedures.

She also covered audits, proficiency testing and the benefits of being ISTA accredited.

The objectives of the workshop were achieved as expressed by the participants. ■

ISTA/FAO Training of Trainers Course on Seed Quality Testing

Bishkek, Kyrgyzstan, 1–5 December 2008

Dr. Andrea Jonitz¹ and Prof. Dr. Norbert Leist²

²Past-President of ISTA

¹Landwirtschaftl. Technologiezentrum Augustenberg
76227 Karlsruhe, Germany
andrea.jonitz@ltz.bwl.de
²76669 Bad Schönborn, Germany

This training course for trainers from the Central Asian and Caucasus regions was held at the Republican Seed Inspection (RSI) Central Seed Laboratory in Bishkek, Kyrgyzstan, and was attended by twelve participants from six countries: Armenia, Kasachstan, Kyrgyzstan, Moldavia, Tadschikistan and Usbekistan. The organization in Bishkek was managed by Mr. Rudenko, Director of the Central Seed Laboratory, together with Mr. Abdulhakim Islamov from the Swedish International Development Cooperation Agency (SIDA). The capital support from the FAO allowed the laboratory to be equipped with the necessary tools such as sampling equipment and sample dividers, and in addition to provide for each participant copies of the ISTA Rules, the ISTA Handbooks on Sampling and Seedling Evaluation, the Tetrazolium Working Sheets and the NIAB Seed Identification Handbook.

The major challenge for the local organizers was not to order this material but to get it through customs. But finally this literature, together with hardcopies of all the lectures, allowed highly effective practical work in a suitably well-equipped location. All participants were updated with the newest books for their mission in training. Due to the fact that all participants spoke Russian, the English lectures and the discussions were translated perfectly throughout the week by Mr. Ilias Chelokenov. The lecturers were Dr. Andrea Jonitz (Head of the Seed Testing Laboratory Augustenberg, Karlsruhe, Germany) and Prof. Dr. Norbert Leist (Honorary Life Member of ISTA, Bad Schönborn, Germany).

All workshop participants found accommodation in the Hotel Sayakat, Bishkek,

in comfortable walking distance from the Institute, where also lunch and dinner were served.

The workshop was opened by a presentation on ISTA, followed by an introduction to the ISTA Rules, the ISTA Quality Management System, and lectures on the trade and the role of seed quality control and laboratory accreditation. There was then practical work on sampling, purity, germination and tetrazolium testing, followed by demonstrations of selected methods of variety testing.

After a theoretical introduction to the principles and procedures of sampling the seed lot, there were practical exercises in a seed plant outside Bishkek. For this purpose, two lots of barley were provided for the sampling, allowing all participants to work out the whole procedure by themselves, beginning with the determination of the number of bags to be sampled, taking the primary samples and sample division to preparation of the submitted sample to send it to the seed testing lab. Back in the laboratory, after two hours' work in the cold warehouse, sample dividing for purity analysis was shown. To demonstrate the importance of correct sampling, each participant was given one sample of 1 kg barley spiked with exactly 20 red-coloured barley seeds for a sampling division exercise. Finally, the number of red seeds in each working sample of 150 g were compared and statistically evaluated.

The second day started with seed identification. After a general introduction, there was practical work with the genera *Avena*, *Rumex*, *Vicia*, *Lathyrus* and *Silene*. Each participant received several seeds from each genus to practise seed determination. All participants learned to identify the different species, with the help of reference material such as a training seed collection, the very well-arranged and large laboratory collection of Russian seeds, and literature including the famous Digital Seed Atlas from the Netherlands. The day was completed with information on how to set



Sampling exercise in the seed plant.

up a seed collection, nomenclature, and the GRIN System with the *ISTA List of Stabilized Plant Names*, and current literature.

Wednesday started with purity testing, using samples of *Triticum*, *Hordeum*, *Pisum*, *Medicago* and *Brassica* which were spiked with other seeds and broken seeds. At the end of each session the other seeds were counted, identified and named according to the *ISTA List of Stabilized Plant Names*. Finally all the other seeds were shown as pictures first without and then with their names. Thus the attendees become more and more familiar with the seed characteristics.

The next object of the training was germination testing. The species dealt with were *Avena*, *Hordeum*, *Glycine*, *Pisum*, *Phaseolus*, *Cucumis* and *Lactuca*. All aspects from how to plant the seeds up to the evaluation of normal and abnormal seedlings were presented and discussed. Special attention was paid to the aspect of dormancy, its origin and physiology, ways to detect it



Sample spiking for purity testing and seed determination.



Concentration and technical precision during tetrazolium testing.

and how to break it. The laboratory staff had prepared 4×100 seeds of each species for each participant, so that the evaluation could be taught intensively by using the *ISTA Handbook on Seedling Evaluation*. With a video camera it was possible to discuss all the interesting abnormal seedlings or questionable cases in detail together in the group. Each evaluation was finished using the tolerance tables and with a statistical evaluation of the overall results of all attendees.

Tetrazolium testing, dealing with *Pisum*, *Helianthus*, *Triticum* and *Lactuca*, was the next training unit, with lectures on viability determination using the topographical tetrazolium test and the chemistry of tetrazolium, including practical preparation and staining of seeds by tetrazolium solution. According to the time schedule, the major activities of evaluation were on Friday, so during the staining time lectures and presentations on variety testing were given, dealing especially with chemical, physical and biological methods and electrophoresis. The evaluation of the tetrazolium test followed the ISTA Rules and the ISTA Working Sheets. It was taught that appropriate equipment is essential and special training is necessary, but that under these conditions very clear results can be achieved.

A comparison of viability, germination and vigour testing closed the practical part of the training. In the final discussions diverse aspects of quality assurance, the ISTA accreditation standard and the

management of seed-testing laboratories were covered.

It can be said that this was a highly interesting but demanding training course, rich in experience and in exchange. The five days were so busy and intensive that only little time was available for a social event and a visit to Bishkek. Nevertheless, Mr. Rudenko, together with Mr. Islamov, organized a short tour and visit to the capital of Kyrgyzstan, followed by a typical Kyrgyz dinner with speeches, vodka, music and dancing.

The great achievement of this training course would not have been possible without generous financial support from the FAO, the high personal engagement of Ms. Nadine Ettel from the ISTA Secretariat, the competent management of Mr. Rudenko and his very enthusiastic staff and the strong support of Mr. Islamov in organizational and practical matters.

At the end of the training, each participant received an ISTA certificate of attendance, and from the lecturers a CD with all the presentations of the week, additional information about statistics and quality management, and photos of the workshop.



The workshop participants in front of the seed testing station at Bishkek.

CALENDAR

2009

- 10–13 June** ISTA Workshop on Molecular Markers for Variety Identity and Purity, Bologna, Italy
www.seedtest.org/workshops
- 11–13 June** ISTA Quality Assurance Workshop, Bassersdorf, Switzerland
www.seedtest.org/qa
- 14 June** ISTA Seed Analyst Training Workshop/Seminar, Zurich, Switzerland
www.seedtest.org/workshops
- 15 June** ISTA Seminar on Purity Testing, Zurich, Switzerland
www.seedtest.org/pur09
- 15–18 June** ISTA Annual Meeting, Zurich, Switzerland
www.seedtest.org/am2009
- 8–10 September** 2nd World Seed Conference, Rome
www.worldseedconference.org/
- 19–23 October** ISTA Workshop on Quality Assurance in Seed Testing,
Palmerston North, New Zealand
www.seedtest.org/workshops

2010

- 16–22 June** 29th ISTA Congress, Cologne, Germany
www.seedtest.org/congress2010

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