

# Seed Testing

## INTERNATIONAL

ISTA News Bulletin No.134 October 2007



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Seed Testing International

No. 134, October 2007

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Dear Reader,

the 28th ISTA Congress 2007, in conjunction with the XV Congresso Brasileiro de Sementes in Iguaçu Falls, Brazil, was an amazing event. During the first day of the Seed Symposium on Monday, 7 May 2007, around 1000 people attended the ISTA Congress to follow the important and interesting discussions during that day. It underlines impressively on the one hand the importance of seed science, seed technology and seed testing in South America, and on the other the interest in international development and ISTA. Please find attached in this issue a short report on this fascinating Congress.

Next to decisions on a number of issues, and one of the routine highlights, the changes to the ISTA *International Rules for Seed Testing*, the voting Governments of ISTA approved the new ISTA Strategy, which will guide the Association over the next years. Therefore please find this Strategy as finally adopted in this issue of Seed Testing International.

It is obvious that ISTA and the seed industry have close links, and that developments in the seed industry therefore are also of major interest to seed testing laboratories. Therefore please find in this issue an article by the Secretary General of ISF, Bernard Le Buanec, about the developments within the seed industry, including interesting and important figures regarding the global seed industry.

Further, ISTA continues its series presenting individual Association Members. This series aims first of all to inform about conditions, situations and maybe challenges at individual member laboratories and in member countries, but also to be a starting point for fruitful and constructive discussion within the Association. It is therefore indeed my pleasure to present in this issue of STI a report on seed testing in Zambia. Zambia is a fascinating country in Southern Africa, which I had the pleasure of visiting this year for the first time.

ISTA has not only a future and an interesting presence, but also a past. And even while we focus our attention on current problems, challenges and planning for the future, we should not forget its significant history. It is indeed important to know where we came from and to be aware of ISTA's success story over the last 80 or more years. My thanks, therefore, go to Prof. Dr. Dr. Martin Steiner and Prof. Dr. Michael Kruse, who continuously provide us with very interesting articles about the history of ISTA and seed testing. This issue contains an interesting article about Nobbe's Statute, concerning the testing of agricultural seed, will be presented. This may be the fundamental document of all of our work today in seed testing.

Finally, I would already like to draw your attention to the future again, and the upcoming ISTA Annual Meeting from 16–19 June, 2008, in Bologna, Italy.

I hope you will enjoy reading this issue of Seed Testing International.

Yours sincerely,  
Michael Muschick



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## President's Report

By Dr. Katalin Ertsey



The 28th ISTA Congress was hosted by Brazilian ISTA members with colleagues from ABRATES successfully and in a very professional way. Besides the well-organized programme many ISTA members took the opportunity to visit the Iguazu Falls, one of the famous National Parks of the world.

On behalf of ISTA members I would like to thank the Brazilian Designated Authority and the Brazilian seed sector for their hospitality and excellent organization.

Before the Congress more workshops were organized on various topics:

- 25-27 April: ISTA Variety Workshop, in Pelotas, Brazil;
- 30 April-3 May: ISTA Tetrazolium and Germination Workshop on Tropical and Subtropical Seed, in Curitiba, Brazil;
- 1-3 May: ISTA Workshop on Statistics Aspects of GMO Detection, in Iguazu, Brazil.

The Congress programme started on Saturday, 5 May, with two days of Technical Committee Meetings. The Technical Committees used this event not only to present their activities and results, but also, as the guardians of continuity, to describe their terms of references and future

direction. This was followed on Sunday evening with the Opening Ceremony before a large audience with participation of the Minister for Agriculture of the State of Paraná, other Brazilian officials, the President of ABRATES, and representatives of international organizations and associations.

The seed symposium was attended by more than 500 participants from all parts of the world. The Symposium Convenor, Dr. Alison Powell, did everything to ensure success, and deserves praise for the results. The theme "Diversity in Seed Technology" was a good topic for the over 380 papers from 40 countries submitted for the six sessions. The presentations covered diversity between species, within species and lots, in contaminating organisms, in germination and storage behaviour, and in technical methods. The high-quality Poster Session also aroused the participants' interest.

During the Seed Symposium, an exhibition was organized covering all fields of activity related to seed. This was the biggest and most frequented seed exhibition of the last congresses.

At the Ordinary Meeting we had a number of significant items to discuss, such as changes to the ISTA International Rules, including the deletion of the Green International Seed Testing Certificate. Important items were the acceptance of the Method Validation Report and the decision about the Uncertainty of Measurement combined with use of the ISTA tolerance tables. Until now ISTA has already received five validation studies.

A fruitful discussion was held for the future during the debate on the Draft ISTA Strategy.

After election, the newly elected members of the Executive Committee were installed. The new members represent the sixth continent as before: John Hampton (New Zealand), 1st Vice-President; Udo von Kröcher (Germany), 2nd Vice-President; Members-at-Large: Mary Chipili (Zambia), Jorge Rosales King

(Bolivia), Joël Léchappé (France), Susan Maxon (United States), Alison A. Powell (United Kingdom), Masatoshi Sato (Japan), Grethe Tarp (Denmark) and Rita Zecchinelli (Italy).

I would like to thank Joseph O. Ahenda, Jose M. Chavez Bravo, Steve Jones and Silmar T. Peske, former members of the Executive Committee, for the active work they have done in the past three years, and Pieter Oosterveld, our President from 2004 to 2007, for his excellent work, especially for the recognition of ISTA by international organizations and for the further development of our Association.

One of the most important events of the 28th ISTA Congress was the greeting to the NCVESC Seed Testing Laboratory in Vietnam, which became the 100th ISTA-accredited laboratory. This was the highlight of our accreditation activity since May 1996, when the first Accreditation Protocol was circulated. The first ISTA audit was carried out in the same year in December. From there the number of accredited laboratories has slowly but continuously increased, reaching 100 in 2007. Now, all over the world in seed testing, accreditation means ISTA Accreditation

A successful congress is not only a summary of the last period, but the beginning of a new one. The newly elected Executive Committee made their first decisions during their first meeting on May 12. They agreed to continue with the system of regional representatives as follows:

- Asia: Masatoshi Sato; Australia: John Hampton; Europe (Western): Joël Léchappé and Alison Powell; Europe (Eastern): Katalin Ertsey; Africa: Mary Chipili; North America: Susan Maxon; South America: Jorge Rosales King.

To evaluate and prepare the important items before presenting them to ISTA members, various ECOM Working Groups operate within the ECOM. We decided to continue the following Working Groups: Constitution, ISTA Meetings, Accreditation, Training and Education, and Tropical Seeds.

The office of the Chair of the Rules Committee is very special in relationship with the ECOM: he must be well informed in all questions related to the Rules. Therefore, the ECOM agreed that for the 2007–2010 triennium, the Chair of the Rules Committee be invited to ECOM Meetings as an observer.

We also decided to ask the TCOM Chairs to participate in a two-day ECOM/TCOM Meeting in order to discuss and finalize the Working Programme (terms of references) for 2007–2010. In support of the establishment of the Working Programme for the TCOMs, during the Congress all present chairs received the draft list defining the prospects of the Association from the viewpoint of the ECOM regarding the Working Programme 2007–2010. Furthermore, the TCOM chairs received the information from the membership questionnaire defining important areas where the Association should focus its work. I hope that the terms of references will assure the positive development of ISTA for the next three years. A new Technical Committee for Advanced Technologies was established this year. The ECOM/TCOM Meeting will be in Zurich on 29–31 October. At the Meeting, one important issue will be to discuss the publication policy of SST with our chief editor Anne Bülow-Olsen.

The ISTA strategy includes the development of a Seed Analyst Training Programme. The ECOM Working Group on Seed Analyst Training has been working for three years to achieve this goal. The Working Group's proposal to establish a

training programme has been accepted by the ECOM.

Another important action for the near future is the submission of rules proposals (for 2008) to the ISTA Rules Committee at the latest by 1 November 2007.

After the ISTA Congress the summer was not uneventful. On an international level, two seed events were organized: the ISF Congress in Christchurch, New Zealand, and the OECD Seed Scheme. I as ISTA president and Michael Muschick, our Secretary General, participated at these meetings. ISTA has a strategic partnership with both organizations.

Other seed sector meetings will be the APSA Congress in Manila on November 6–10, with participation of our Secretary General.

During the past months ISTA has not only been active on an international level: the programme of ISTA Workshops is also continuing.

- ISTA Flower Seed Testing Workshop: 5–8 June, ENSE Laboratory, Tavazzano (LO), Italy;
- ISTA Workshop on Seed Vigour, 4–6 September, Izmir/Turkey;
- ISTA Workshop on Seed Sampling of Agricultural Seeds, 1–14 September, NAK, Emmerold, The Netherlands;
- ISTA Workshop on Moisture, Purity & Germination, 8–12 October, GEVES-SNES, Beaucauzè, France.

Other events for 2008 are in preparation:

- 14–18 April: 6th ISTA Seed Health Symposium, South Africa;
- 16–19 June: ISTA Annual Meeting, Bologna, Italy.

In future, we will also be taking ISTA GM test activity into consideration. The ISTA GMO Task Force has an excellent staff of experts. The 9th round of GM proficiency tests is over, and despite challenges we are ready to continue. The establishment of reference material in the framework of our accreditation programme is under way. The number of ISTA Laboratories accredited for testing specified traits is increasing. Our Secretary General, Dr. Michael Muschick is a member of the Organizing Committee of the first Global Conference on GM Seed Analysis.

All these above-mentioned information and activities are evidence that we are experiencing a very progressive time in the life of our association. ISTA is now a vigorous association, thanks to the work of our members and our last two presidents, who together with the Secretariat followed a good strategic and technical line for the interest of the seed sector.

During my presidency, my task will be, with the help of all ISTA members, to consolidate our results, evaluate the ongoing projects, and establish the development for the future.

Finally, I would like to thank again everybody for their work and support for ISTA and I wish you success in your work and efforts for the next three years!

Katalin Ertsey  
President of ISTA

# ISTA Annual Meeting 2008: overview

Bologna, Italy June 16–19

By Angela Gangell ISTA Meeting Organizer

With another successful ISTA Congress and Ordinary Meeting behind us (May 2007, Brazil), it is time to begin contemplating the next ISTA Annual Meeting! Planning for the ISTA Annual Meeting 2008 in Bologna, Italy, is well underway, and once again holds the promise of an international meeting point for seed science and technology experts from around the world. ONLINE REGISTRATION is already available at [www.seedtest.org](http://www.seedtest.org) to assist you with your early planning!

The format of the Meeting will be a little different in 2008. The success of the Specified Trait Testing discussion in the Session of the GMO Task Force at the 2007 Meeting, reinforced the decision to dedicate a whole day at the 2008 Meeting to the exchange of ideas on this particular topic. The number of participants on this day is expected to be higher than in previous Meetings, as the day is also being offered as a separate Registration to allow other interested parties the opportunity of attending.

At this year's Annual Meeting there is a special focus on the testing of Specified Traits, including the testing of Adventitious Presence of GM Seeds in non-GM Seed Lots. All aspects of this important area will be covered in a one-day seminar. A highlight therein will be to draw

conclusions from data gathered in recent rounds of the ISTA Proficiency Test Programme.

This special session will have a different topic at the 2009 Annual Meeting, so make sure you can attend this year if this topic is of special interest for you or your organization.

The presentation of ISTA's technical work will take place over the next two days. An essential part of ISTA, the 16 Technical Committees develop and validate the seed-testing methods of the ISTA *International Rules for Seed Testing*. Their work provides for information dissemination on the latest international seed science methodology and technology. The Technical Committees will report their year's work, along with reports from other Committees such as Laboratory Accreditation, Proficiency Testing and the Audit Programme. The Rules Committee will also meet to discuss Proposed Rules Changes. A reminder regarding Proposed Rules Changes for consideration and adoption at the 2008 Annual Meeting are required to be with the ISTA Secretariat no later than 1 November 2007.

The Ordinary Meeting will, as normal, take place on the last day of the Meeting, and is the business side of the event. Reports by the Executive Committee and

Secretary General, Fixation of Annual Subscriptions, and General Business will form parts of the Agenda.

## Location information

Bologna is a city rich in cultural, educational, civic, and gastronomic heritage, and it promises to be an exciting venue! The Conference Centre of the Savoia Hotel Regency, where the Annual Meeting will be held, is a well-equipped and modern facility that will provide well for the Meeting requirements. The Savoia Regency staff are looking forward to welcoming delegates of the Annual Meeting.

Accommodation has been pre-reserved at three different locations, but all bookings and amendments will be handled by Reception at the Savoia Hotel Regency — see the Programme and Hotel Reservation Form enclosed for contact details and further information!

Other important events that have been planned for this Meeting include the Registration and Welcome Cocktail on Sunday evening the 15th June (make sure you allow for this when you book your accommodation), and the Official Dinner which is planned to be, of course, a traditional Italian, relaxed feast! The LaRas University in Bologna also celebrates its 100th Anniversary in 2008 and the University has invited all delegates to a Cocktail



The Piazza Maggiore with the church of San Petronio Notte (Sergio Buono)



Neptune fountain (Alessandro Salomoni)



The Pietà of Nicolò dell'Arca

Party on the Monday evening. See the preliminary programme on page 26 for more information regarding this event.

The LaRAS (Seed Research and Testing Laboratory of the University of Bologna), was established in the academic year 1907/08 by professor Francesco Todaro, with the purpose of protecting and promoting quality seed production, national and international seed trade, seed growers, and users. Besides testing and control activity, LaRAS supports teaching within the University and carries out an intensive research work in seed science and technology. Since the foundation of ISTA, it has

been an ISTA Designated Laboratory by the Italian Government and authorised to issue ISTA Certificates. The seed control activity of LaRAS concerns the whole national territory, but mainly the Emilia-Romagna region, one of the most important for seed production in Italy.

#### Tourist information

For accompanying persons, Bologna will take up all their time in sightseeing and activities. A particularly good website is the Bologna Tourism Office, [www.bolognaturismo.info](http://www.bolognaturismo.info), which has an English option and links to many important sites for transport and things-to-do. Beautiful shops, restaurants, and mini-tour opportunities through the tourist office and hotel, ensure that accompanying persons will not be bored!

#### Opportunities!

The Annual Meeting can also be an opportunity for interested organizations to exhibit, and/or provide sponsorship for events. If you think you or your organization may be interested, please contact the ISTA Meeting Organizer at [meetings@ista.ch](mailto:meetings@ista.ch). Exhibition spaces are available in the main hall outside the Seminar room, and sponsorship opportunities can be discussed for any event on the programme that may be of special interest to your group.

#### A few "Don't forgets"

1. VISA: most important! Check with your local embassy whether you will require a visa to enter Italy. Our information suggests that many EU countries only require the EU identity card, however, CHECK FIRST. The Italian Ministry of Foreign Affairs ([www.esteri.it](http://www.esteri.it)) will give you a lot of information in regard to entry requirements; it is an easy-to-use website with an English option.

2. REGISTRATION. Early registration is before 30 April 2008, so plan the cost into your budget early!

3. LETTERS OF INVITATION: If you require a Letter of Invitation, please make sure that you request this from the Secretariat as early as possible. Letters of Invitation will only be issued after full payment has been received and processed, and a written request has been received and approved by the Secretariat.

Finally, we are looking forward to making the ISTA Annual Meeting 2008 another successful event for the international seed-testing community. It is more than just dissemination of information; it is the exchange of ideas, the opportunity of meeting like-minded professionals in your area of expertise (or government representatives); and the chance to participate in some of the most important discussions and exchanges of experience in the field of seed science testing & technology. ■



The Savoia Hotel Regency

# Evolution of the seed industry during the past three decades

By Bernard Le Buanec International Seed Federation

During the past three decades the seed industry and its regulating environment have changed drastically. In this paper, we will briefly present the evolution of plant breeding and seed regulations and more in details the evolution of seed production, seed markets and seed companies.

## 1. Evolution of plant breeding

Three main aspects are worth considering regarding the evolution of plant breeding.

### 1.1 Development of F1 hybrids

In the 1960s, with the noticeable exception of maize, most of the varieties were populations or pure lines often called open-pollinated varieties, or OP. Today, there is a long list of commercialized hybrid crops such as sunflower, sorghum, oilseed rape, rye, barley, rice, and several vegetables. Very recently, alfalfa and cocksfoot have been added to the list. This evolution is shown by the terminology used in some countries, where OPs are named varieties and not the hybrids that are named hybrids. However, hybrids are varieties. The evolution from OP to hybrids has had several consequences in terms of production and turnover (see below).

### 1.2 Genetic engineering

The first stable genetic transformations in plants were reported in 1983, and the first transgenic crops, GMOs, were commercialized in 1995. Since that date the area planted to GMOs has steadily increased to reach, in 2006, 100 million hectares, mainly soybean, maize and oilseed rape (see Fig. 1).

### 1.3 Molecular assisted selection

In order to speed up the creation of new varieties, breeders have always looked for early selection markers, in particular for long development cycle crops. These markers were sometimes phenotypic,

sometimes biochemical. The development of DNA markers in plants in the mid-1980s initiated what is called today marker-assisted selection (MAS). MAS is used to track in the progeny of a cross the genes or traits of interest. First used to track qualitative traits linked to one single gene or a few genes, MAS starts to give interesting results for more complex quantitative traits by the use of quantitative trait loci (QTL). The development of MAS requires quite sophisticated and expensive laboratories, not without impact on the concentration of the seed industry.

## 2. Evolution of international regulations

As regards international regulations, three main areas deserve specific consideration: the protection of intellectual property, the regulation for certification, and the development of regulations in new sectors.

### 2.1 Protection of intellectual property

The protection of plant breeders' rights sometimes seems today to have been present since time immemorial. However, this is not the case, and, with the exception of the plant patent acts enacted in 1930 for vegetatively propagating plants (with the exception of tubers) and some attempts in some European countries, the protection of intellectual property in the plant domain is

Figure 1 Area planted to biotech crops

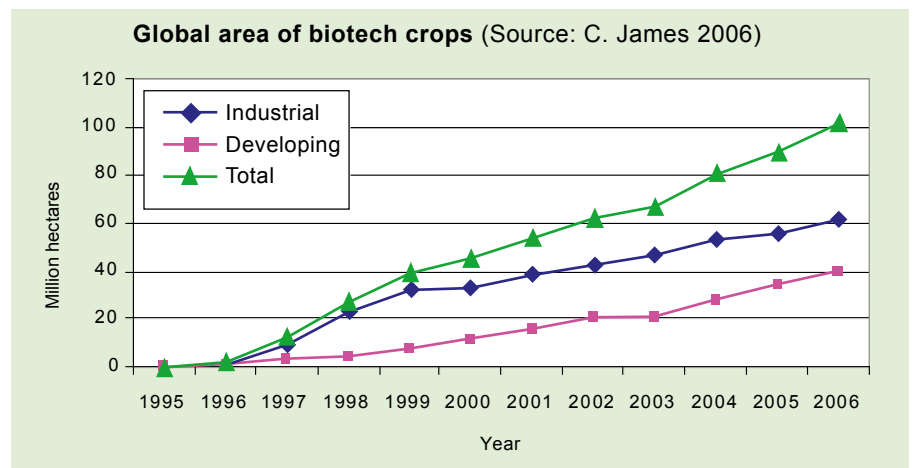
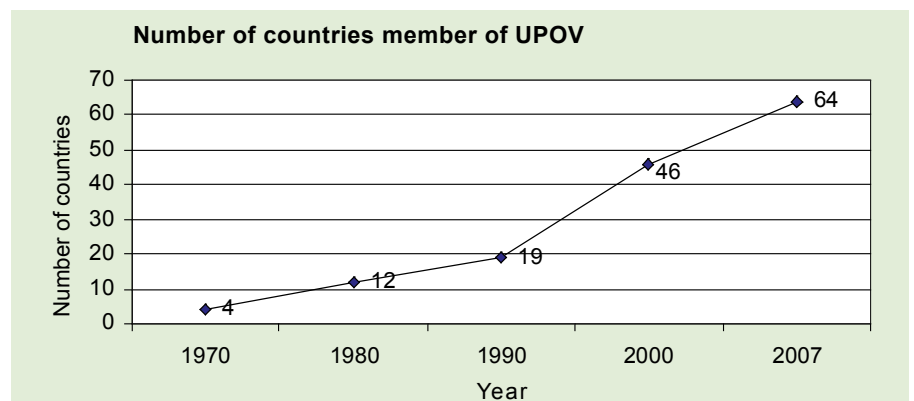


Figure 2 Countries member of UPOV





quite new. The milestones in protection of intellectual property in plants are:

- 1961: Adoption of the UPOV Convention;
- 1980: The US Supreme Court Chakrabarty Decision, allowing the patentability of living organisms;
- 1991: Adoption of a new Act of the UPOV Convention, granting extended rights to plant breeders and introducing the concept of essential derivation to prevent “easy breeding” and plagiarism;
- 1994: The TRIPS Agreement of the World Trade Organization (see Fig. 2).

In fact, in the early 1970s only very few countries allowed the protection of plant varieties and biological inventions. Today, a possible protection exists in most of the countries with large seed markets, even if enforcement of the rights is often still difficult. This protection of intellectual property has encouraged large investment in research.

## 2.2 Regulations for seed certification

Seed certification is a process by which a certain level of quality of the seed is guaranteed. Three main domains are concerned: the varietal identity and purity, the phytosanitary status and, in some countries, an official level of physical purity based on compulsory standards. In the past this certification was done by government officials or specialized accredited agencies. The recent evolution in the regulatory domain is characterized by a new sharing of tasks between the public and private sectors with a key word: “accreditation” of private entities, seed companies, for doing some regulatory tasks under the supervision of governments.

### 2.2.1 Certification of varietal identity and purity

With the exception of some regional schemes such as AOSCA or E.U., certification is regulated at international level by the OECD Seed Schemes for Varietal Certification of Seed Moving in International Trade. Whilst accreditation of seed companies was accepted in some European countries since the 1950s, this was not recognized at international level. In the mid-1990s, at the request of the International Seed Federation (ISF), a derogating experiment was put in place

within the OECD Seed Schemes to check the quality of results obtained by private seed companies in the certification process. This experiment started with field inspection (1995) and was extended to seed sampling, testing and labelling (2000). After ten years of intense debate and given the good results obtained by seed companies, not different from those obtained by government officials, the accreditation of seed companies for field inspection, seed sampling, testing and labelling was introduced in 2005 in the OECD Schemes.

### 2.2.2 Phytosanitary certification

The phytosanitary certification of seed moving in international trade is regulated by the International Plant Protection Convention, IPPC. This Convention allows accreditation of seed company employees for field inspection. The main change in the new text of the Convention that entered into force in December 2005 is the possibility to replace field inspection by laboratory’s checks. This opens a new era for global acceptance of seed health testing methods. It is certainly a new field of activity where ISTA and ISF should be very active in collaboration with IPPC.

### 2.2.3 Physical quality of the seed

Official standards of seed physical quality exist in some countries. Commercial contracts between seed companies also often require a given level of physical quality. It was important to have at international level an agreed system of seed testing to avoid disputes. Today the most recognized document is the ISTA orange certificate that was established in the early 1930s at the request of ISF. Until recently only governmental laboratories had the right to become ISTA member and to issue the orange certificate. The situation changed in 1995 when private laboratories were allowed to join ISTA but still without the authorization to issue orange certificates. Here again, as for OECD certification, after intense debate an experiment was put in place in 1999. Given the quality of their results, the private laboratory members of ISTA were allowed to issue orange certificates in 2005. The consequence is that an increasing number of private laboratories are becoming members of ISTA (Table 1).

**Table 1 Laboratory members of ISTA**

	1997	2002	2007
Public labs	132	121	121
Private labs	13	32	47

## 2.3 Establishment of new sectors of regulations

### 2.3.1 Organic seed

During the past 20 years, if we exclude free range grazing in Australia and Argentina, the area grown to organic agriculture, field crops and vegetable has increased regularly to reach in 2006, according to the International Federation of Organic Agriculture Movements, a total of about 20 million hectares. This has had an impact on the seed industry. In the first step seed not treated with synthetic chemical compounds were allowed. More recently, in most of the countries, organic farmers have, subject to exceptions, to use seed produced organically, also named organic seed. This has an impact on international trade, as the standards for organic agriculture differ from country to country, leading to technical trade barriers. A next step could be the compulsory use of “organic varieties” that will make even more difficult both the development of new varieties and the seed trade.

### 2.3.2 GM varieties

We have seen that the development of organic varieties has been significant during the past 10 years. This has led to the adoption in 2000 of a new binding international instrument, the Cartagena Protocol on Biosafety to the Convention on Biological Diversity. This Protocol, now ratified by 141 countries, impacts the seed industry mainly in two domains:

- the registration of new GM varieties as regards their possible impact on the environment
- the transboundary movement of GM seed

The environmental safety assessment, in addition to the food and feed safety assessment is very cumbersome and costly. The main consequence is that today only large multinational companies can afford to put on the market new transgenic traits, with a *de facto* exclusion of small and medium companies and public research institutions.

The transboundary movement is subject to prior informed consent of the receiving party and handling, transport, packaging and identification are regulated.

### 3. Evolution of seed production

In this paper seed production is understood in a broad meaning from sowing the basic seed to the final preparation of the commercial seed sold to the farmer. During the past 30 years some practices have stayed stable, such as the isolation distances for seed production, some have followed the general evolution of mechanisation and globalization but some have been specific to the seed industry.

Four areas deserve attention in the evolution of seed production: understanding the development of quality during the field seed production, seed testing, specialization of geographical zones of production, seed treatments.

#### 3.1 Field seed production

It is not possible in this paper to give details on the complex matter of development of seed quality during the field seed production.

- The process to maintain seed identity and seed purity, as said above, has remained stable based on the OECD Seed Schemes at international level.

- Progress have been made in management of physical purity, in particular in controlling the presence of other seeds thanks to a better use of herbicides and the simulation of the effect of cropping systems on the development of weeds.

- A better understanding of the mechanisms involved in the determinism of the germination potential, such as the impact of climatical conditions on dormancy, the maturing process, water stress, place of the seed on the seed bearer, time of harvesting, allows better advice to seed producers.

- Significant progress in diagnostic methods, epidemiology and pest management has improved seed health. That progress, mainly on fungi in the 1960s, were extended to bacteria, viruses and nematodes in the 1980s and 1990s.

#### 3.2 Seed testing

This is an area that would deserve several pages, in particular in Seed Testing International. A range of physiological tests has been perfected for the routine determination of germination and seed vigour. More recently, image analysis has been used to provide size classification in seed lots and to determine the kinetics of germination. There are now sensitive tests to

detect pathogens in seed lots using immuno-fluorescence and PCR techniques.

#### 3.3 Specialization of geographical zones of production

International seed trade is not new and it must be noted that the International Seed Trade Federation was established in 1924. However, the percentage of import/export was low compared to domestic markets and each country, with few exceptions, was able to produce its own seeds.

This has changed during the past three decades for several reasons:

- The development of cheap and fast transportation allowing to take advantage of favourable climatic zones such as East African high plains and Idaho for beans, high plains of Central America for flowers, ...
- A more recent cause of specialization of regions of production is the development of hybrids. Production of hybrid seeds need specific conditions both in terms of skilled labour and agro-climatic conditions. For example, the flowering time difference between male and female maize hybrids require specific climatic conditions, the production of hybrid vegetables requires skilled labour at reasonable price. Thus the production of hybrid maize in Europe is mainly lo-

Figure 3 Evolution of international seed trade



cated in France, Hungary and Austria, hybrid vegetables in South-East Asia, monogerm sugar beet in France, Italy and Oregon, ...

- The third reason is the speeding of all breeding and commercial processes leading to the development of counter-season cropping by companies of the Northern hemisphere in the Southern hemisphere. A good example of this evolution is the evolution of seed export from Chile (Table 2).

The evolution is illustrated by the development of international seed trade (see Fig 3).

In 1985 the international seed trade represented around 7% of the total seed market, in 2006 around 15%.

**3.4 Seed Treatment**

Seed treatment comprises different aspects:

- Physiological treatment or “priming”
- Coating and pelleting
- Phytosanitary treatment
- Microbial inoculation

**Table 2 Seed Export from Chile (million US\$)**

1985	1995	2004	2006
10	70	153	195

Today almost all commercialized seed are treated, 95% according to an ISF survey. This evolution is well illustrated by the lettuce case (see Fig 4).

In addition to the genetic, the seed is now a concentrate of technology, with a significant impact on the seed price (see Fig 5 next page).

This evolution is also illustrated by the global seed treatment sales

**Table 3 Evolution of Global Seed Treatment Sales (million US\$)**

1997	2002	2007*
700	920	1,550

\*estimation

**4. Seed markets and seed companies**

**4.1 Seed markets**

The global seed market has almost tripled during the past three decades from US\$ 12 billion in 1975 to US\$ 34 billion in 2006. If we include non-commercial seed, the total value of seed used at global level may be evaluated around US\$ 50 billion.

**Table 4 Global Seed Markets (billion US\$)**

1975	1985	1996	2006
12	18	30	34

This increase is due to several factors:

- Development of hybrids
- Increase of seed treatment
- Development of transgenic varieties

**Table 5 GM Seed markets (million US\$)**

1996	2000	2004	2006
115	2,703	4,663	6,150

- Development of new markets, in particular in developing countries

**Table 6 Main Domestic Seed Markets (million US\$)**

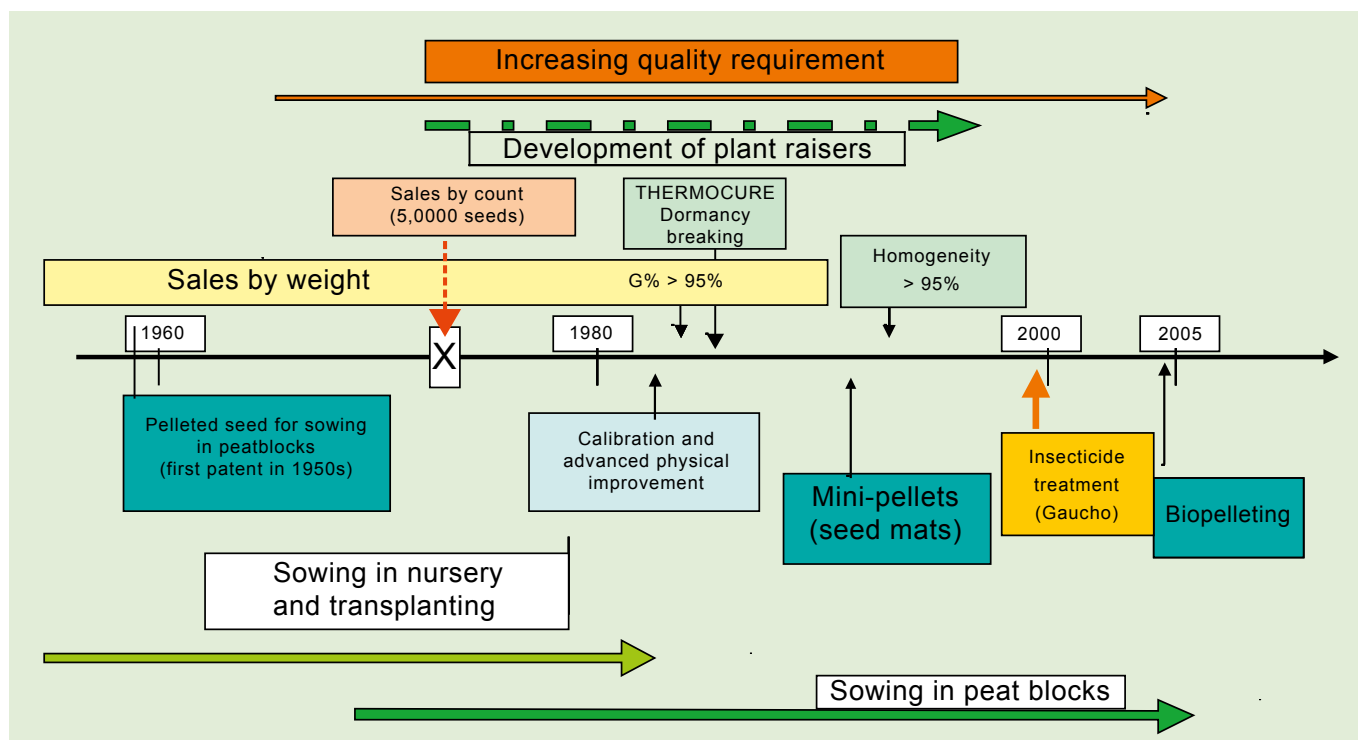
USA	7,080	Italy	670
China	4,000	Canada	550
France	1,915	Russia	500
Japan	1,500	Korea	400
Brazil	1,500	Australia	400
India	1,300	Mexico	350
Germany	1,000	Taiwan	300
Argentina	850	Spain	300

**4.2 Seed companies**

The key word illustrating the evolution of seed companies certainly is “concentration”. That concentration started in the 1970s with the arrival of pharmaceutical and oil companies.

A new wave of acquisitions took place in the 1980s and the process is still continuing actively with new deals every month. This evolution may be illustrated by the

**Figure 4 Sophistication of seed – lettuce example (Source: Pierre Ferraton)**



**Table 7 The first wave of concentration**

Year	Purchase of
1968	Asgrow by Upjohn
1970	Nickerson by Shell
1974	Funk by Ciba-Geigy
1974	Rogers Brothers by Sandoz
1976	Northrup King by Sandoz
1976	Zaadunie by Sandoz

turnover of major seed companies from 1985 to 2006 (see Table 8).

Today the top five companies represent 31.3% of the total seed market compared to 8% in 1985.

**Table 9 Level of concentration (%)**

	1985	1996	2006
C5	8.0	12.9	31.3
C10	11.9	14.2	37.7
C15	14.7	20.2	41.3

C5 represents the percentage of the top 5 companies in the global seed market, C10 of the top 10 and C15 of the top 15 companies

The concentration trend is clear. However, it must be noted that the seed industry is still relatively fragmented, if we compare to some other agriculture input providers, such as the crop protection industry where the top five companies represent more than 90% of the market.

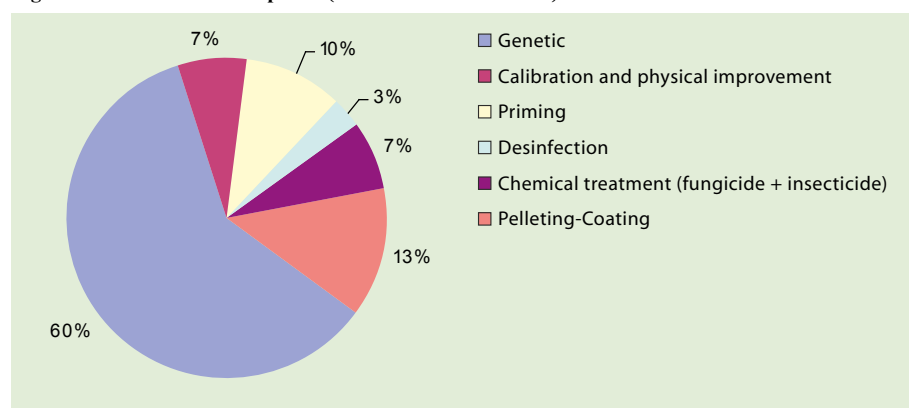
That concentration has several causes:

- The evolution of technologies increasingly sophisticated requiring high investments in research/development and production (see Fig 6).
- An increasing need of speediness in all the sectors of the business causing the lost of specificity of some activities and a vertical integration
- Multiple pressures linked to an increasing competition facilitated by globalization.

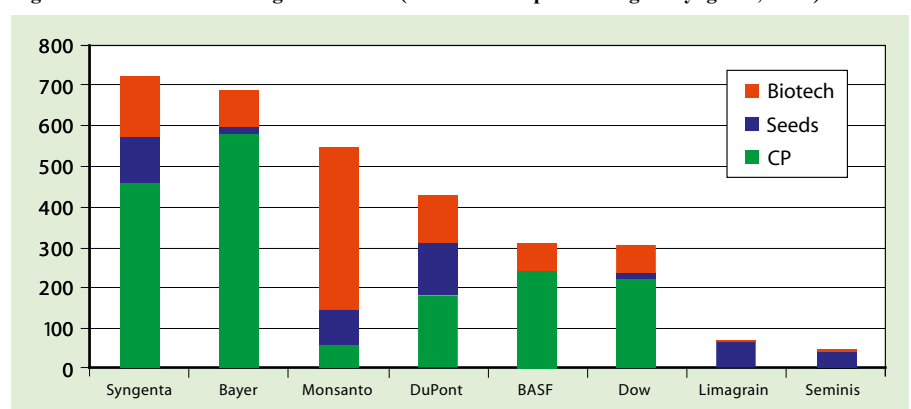
**Conclusions**

During the past three decades the seed industry has been faced with tremendous changes in terms of technology, markets and regulations. Thirty years ago seed companies, mainly of small and medium size, were selling graded seed mainly of lines, synthetics and populations. Today an increasing number of multinational companies are selling mainly seed of hybrids that are not only genetics but also the vector of many technologies depending on various and increasingly stringent

**Figure 5 Elements of seed prices (Source: Pierre Ferraton)**



**Figure 6 Investment Strategies for R&D (Source: Phillips McDougall/Syngenta, 2003)**



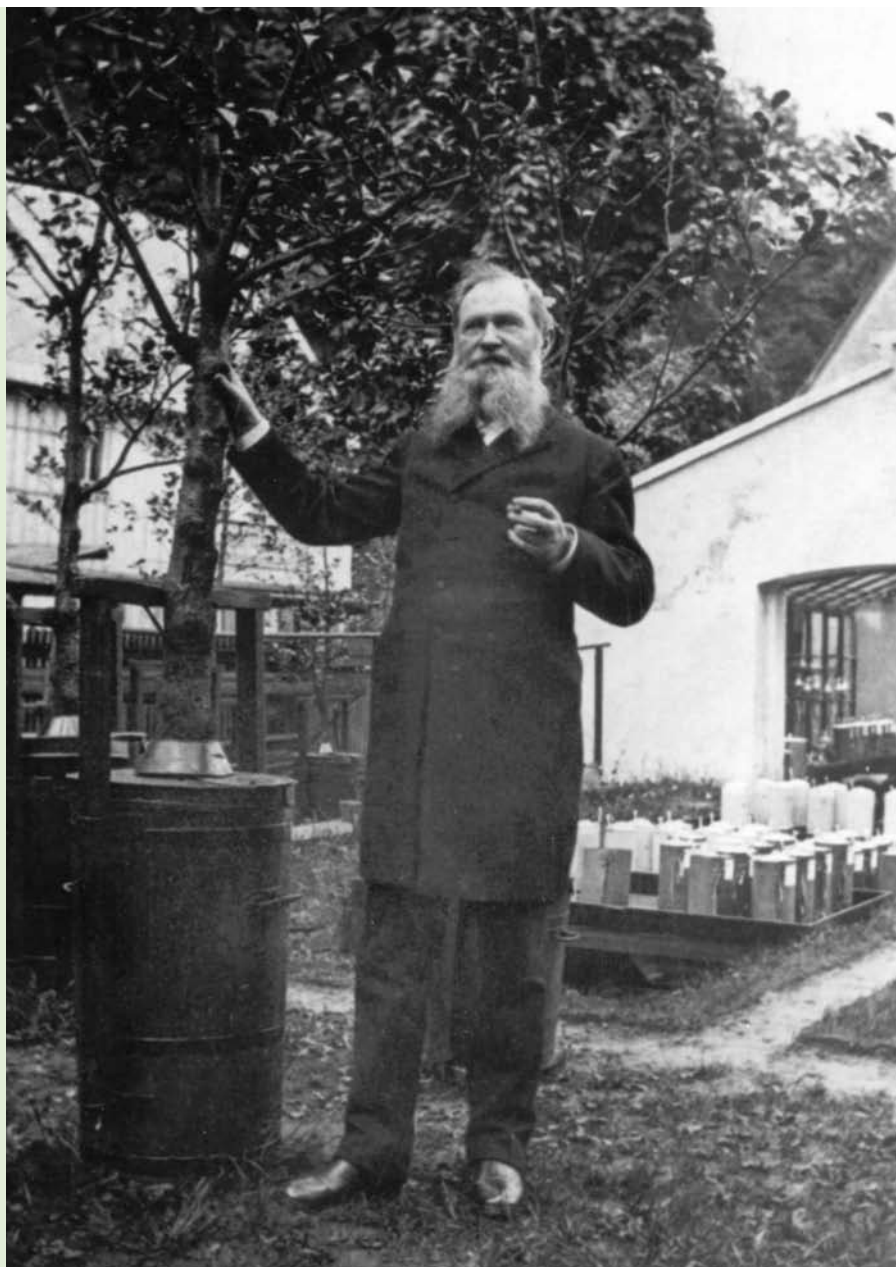
**Table 8 Company Turnover (million US\$)**

1985		1996		2006	
Pioneer	735	Pioneer	1500	Monsanto	4028
Sandoz	290	Novartis	900	DuPont-Pioneer	2781
Dekalb	201	Limagrain	650	Syngenta	1743
Upjohn-Asgrow	200	Advanta	460	Limagrain	1475
Limagrain	180	Seminis	375	KWS Saat	615
Shell Nickerson	175	Takii	320	Land O'Lakes	550
Takii	175	Sakata	300	Bayer BioScience	465
Ciba Geigy	152	KWS	255	Delta PineLand	417
VanderHave	150	Dekalb	250	Sakata	410
CACBA	130	Cargill	250	DLF Trifolium	365
Sakata	120	Pau Euralis	175	Takii	342
Orsan	115	Monsanto	170	Dow Mycogen	302
Cargill	115	Sigma	160	Barenbrug	197
Lubrizol	110	Saaten Union	155	Saaten Union	187
Volvo	97	RAGT	140	Desprez	186
ICT	90	Svalöf Weibull	140	RAGT	149
Royal Sluis	80	Cebeco	140	Svalöf Weibull	137
Cebeco	80	DLF	135	InVivo	116
KWS	75	Barenbrug	133		

regulations. The international seed trade is increasing and is at the moment around US\$ 5 billion and the global seed market is close to US\$ 35 billion. ■

## Nobbe's "Statute concerning the Testing of Agricultural Seeds" of August 1869

By A. M. Steiner and M. Kruse, ISTA Alumnus and ISTA Member, University of Hohenheim, Germany  
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Nobbe demonstrating an alder tree grown over the years in a container which received nitrogen purely from rhizobia symbiosis. The background shows in part a small greenhouse with a broad open door. The carriage in front of the door runs on rails and transporting containers can be pulled in and out according to the weather conditions, daybreak and nightfall. This construction was also an invention of Nobbe and until today is still in use. Notice the cigar in Nobbe's left hand. In order to optimize satisfaction of a precious cigar, Nobbe fixed its cheroot on a preparation needle to be able to fully smoke it up.

### On Nobbe and the events preceding the founding of seed testing

**P**rof. Dr. Johann Christian Friedrich Nobbe was born in Bremen in 1830. After having been a teacher and the principal of a private school in 1848 - 1850, he studied natural sciences majoring in agricultural botany at the Universities of Jena and Berlin. In 1858, he took his Ph. D. in agricultural chemistry at Jena. Thereafter, Nobbe continued his teaching career at the Junior High School and obtained in 1861 a double appointment as teacher at the Higher Vocational School and as a physiologist at the Agricultural Experiment-Station, all in Chemnitz, Saxony. In 1866 he was awarded professorship. Two years later, in 1868 he was appointed lecturer for botany and zoology at the Royal Academy for Foresters and Agronomists at Tharandt, Saxony. In the following year 1869 in addition he was appointed Head of the Physiological Experiment-Station at Tharandt and held since that time both positions. This Station, later on re-named Physiological Experiment- and Seed Testing Station, was supported by the Dresden Agricultural Regional Association. Nobbe's fields of research were: mineral nutrition of plants, seed science and technology and physiology and technology of rhizobia inoculation in plants and seeds. Nobbe also held various high positions in the German agricultural organisational structure. He retired in 1904 at an age of 75 and was bestowed many public and scientific high ranking medals and honorary memberships from both national and international communities. Nobbe remained physically and mentally fit, until in 1922 after an evening walk, he unexpectedly passed away in Tharandt at the age of 93.

In April 1869 a progressive Saxonian agronomist, Count of Lippe-Weißenfeld, also Professor for Crop Science at the University of Rostock, submitted several grass seed samples to Nobbe for "botanical recognition". Surprisingly, one sample tagged Tall Fescue turned out to contain only 30 % true seeds. Other seed samples that were sent to the Experiment-Station for growing trials and immediately examined by Nobbe showed similar traits and other deficiencies. Nobbe was well aware of the sometimes criminal situation in

seed trade in those days, when the British Parliament passed the Adulteration of Seeds Bill. Consequently, this resulted in his publication in May entitled "On the necessity for control of the agricultural seed market" presenting seed testing results, discussing the actual situation in seed trade and proposing a seed testing scheme on a voluntary basis. Thereafter, he formulated his famous Statute published in August 1869 which is regarded to be the starting point of seed testing. The Statute is not extensive, but well considered. The following is a literal translation as close as possible to the past mid 19th Century phrasing:

#### Statute concerning the Testing of Agricultural Seeds

1. The purpose of seed testing to be executed by the Physiological Experiment-Station at Tharandt is to enable the farmer when buying seeds to protect him doable effectively of being at a disadvantage by supply of counterfeit or non-germinating seeds.
2. By procuration of the local Agricultural Groups of the Regional Association, each farmer in the domain of the Dresden Agricultural Regional Association is entitled to submit samples of purchased seeds, concomitantly stating the source and price, for testing purity, germination etc. to the Physiological Experiment-Station at Tharandt without having to pay any fee.
3. Sampling shall be done in front of witnesses and in such a manner that the sample to be tested and to be submitted in a sealed state to the Experiment-Station represents the true average of the afore thoroughly mixed seed lot and that it cannot be effectively challenged by the salesman. From smaller seeds as: rape, clover, and cabbage species, meadow grasses etc. at least 1 Loth [annotation: in the Kingdom of Saxony in 1869 = 15,6 g], from larger seeds as : peas, beans, cereals, maize etc.  $\frac{1}{4}$  to  $\frac{1}{2}$  Pfund [annotation: do. = 125 - 250 g] shall be submitted.
4. The results of the tests are published by the Experiment-Station in the "Official Journal for the Agricultural Associations in the Kingdom of Saxony".
5. Seed traders or producers, which wish to have seeds tested in their own commercial interest by the Experiment-Station as also farmers outside of the domain of

the Dresden Association and co-ops etc. have to pay to the cash-office of the Experiment-Station for each purity and germination test of larger seeds (peas, beans, vetches, lupines, cereals etc.) 1 Thaler, for smaller seeds (meadow grasses, trefoil, alfalfa, beta etc.) 2 Thalers. If there is a wish for a special quality determination, then the testing fee is 3 or 4 Thalers, respectively (annotation: calculated by comparison of the wages of craftsmen at the time of Nobbe and of today, 1 Thaler is equivalent to approximately 50 Euro = approximately 65 US \$).

6. For agricultural groups not belonging to the Regional Association as well as for seed producers or traders special agreements are provided by the Experiment Station [end of literal translation].

This was the Statute. In a following brief commentary explanations are made mainly concerning three points. The Experiment Station offers the opportunity for self-protection. In order to enable a customer making a purchase, if justified, to lodge a claim for compensation the following procedure is recommended: The seed company guarantees specified purity and germination percentages before selling. Purity and germination percentages are again determined after selling. The condition precedent for compensation is a re-test, not field emergence. Hence it is recommended to keep a sealed retain-sample. The explanation for this provision as presented by Nobbe is highly notable: "That field emergence cannot substantiate a claim for compensation, is obvious. A multitude of factors influence interactively field emergence (humidity etc. of the soil, the atmospheric conditions, the depth of sowing, etc.). Solely the germination test using appropriate equipment which allows to favourably adjust and to constantly regulate the germination conditions: humidity, temperature and access of air, can provide for a reliable determination of the maximum germination potential of seeds." In addition, organisational and financial matters are dealt with. Furthermore, the publication in the Official Journal (s. a.) of the contracts between the Experiment-Station and the customers as well as of the testing results of the seeds offered for sale is strengthened.

In a closing chapter the unsatisfactory test results of a sample of Golden Oat and

of two samples of Meadow Fox-Tail are shown and likely causes for the deficiencies discussed in order to demonstrate the necessity for seed testing. The paper ends with Nobbe's meanwhile famous dictum: "For sowings, however, the best is not too good!", and an invitation to make broad use of seed testing.

#### Forward-looking points of impact

Some basic points of lasting effect raised by Nobbe shall be accentuated. First, Nobbe prescribes that sampling has to be done objectively. The prerequisite is that the lot is afore thoroughly mixed so that the drawn sample is representative. To avoid problems the drawn sample shall be sealed. Submitted sample size has to be chosen to account for seed mass and with it for the number of seeds in the sample. In comparison to Nobbe's instructions, of course, the present-day ISTA-Rules prescriptions for lot uniformity, sampling and sealing as well as sample size are very refined. However, the basics had been well identified and named by Nobbe.

Second, Nobbe asks for preparing a retain-sample for a possible re-test. He clearly explains why field emergence cannot be a reliable measure for seed quality and in case justify a complaint. He points out precisely that only the germination percentage determined under favourable and standardised laboratory conditions is reliable and reproducible. It is indeed fascinating to compare Nobbe's description of 1869 (s. a.) with 5. The Germination Test, 5.1. Object, of the present-day ISTA Rules: "Testing under field conditions is normally unsatisfactory, as the results cannot be repeated with reliability. Laboratory methods have, therefore, been evolved in which the external conditions are controlled to give the most regular, rapid and complete germination ...". Considering the relationship between field emergence and maximum laboratory germination, Nobbe implicitly already adopted that in turn maximum laboratory germination is the best estimate for the field planting value of a seed lot (cf. ISTA Rules 5.1. Object).

Third, Nobbe was convinced that official publication of the testing results including the full references of the lots and their owners, producer or trader, is a powerful means. It supports good performance and it reveals weaknesses pro-

viding strong incentive for improvement. Present-day in some countries or regions of countries official publication is still practiced, however, in many it is not so due to an obligation to observe confidentiality in official seed testing. Without any doubt, publication adds transparency to the seed market. The tendency of going-private in seed certification may stimulate publication of results as advertising and sales promotion.

Fourth, the Physiological Experiment- and Seed Testing Station at Tharandt was supported by the Dresden Agricultural Regional Association. This fact is of importance with a view to the organisational and financial procurements always to be considered by Nobbe when making agreements and charging fees for seed testing from others outside the membership of this Association. Nobbe was aware that when it comes to disseminating seed testing and founding of other stations organisational matters and revenues become increasingly important. And from the beginning he aimed at uniformity in seed testing.

Fifth, up to Nobbe penal legislation was considered as being appropriate to handle fraud in the seed market as shown by the respective laws of the City and Republic of Bern 1816 (CH), the Swiss Canton Lucerne 1833, the Netherlands 1829, Belgium 1856 and the British Adulteration of Seeds Bill 1869. By contrast, Nobbe was convinced that criminal procedures *ex post* can never make seed business safe. His approach was a protective control: testing seed quality before sale, keeping retain-samples, and re-testing in case of doubt. Looking at seed certification, eventually Nobbe's approach turned out to be superior and to hit the spot. Even privatising seed testing, likewise as in certification, standards of seed quality have to be observed and guaranteed. Nobbe's Statute was the starting point of an awesome development. Nobbe himself added to this by convening the first Meeting of Chiefs of Seed Testing Stations and Interested Persons at Graz, Austria, in 1875. Thereafter, he published the first comprehensive methods for sampling and testing of seed samples in his Handbook of Seed Science in 1876. These methods proposed by him had been discussed and resolved at the Meeting in Graz. Nobbe remained leading in the field for more than 30 years.

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# The development of the Zambian seed industry

By Mary Chipili, ISTA Executive Committee Member

## 1. Introduction

Zambia is a landlocked country occupying a near central position on the southern African subcontinent, between latitudes 8-18° S and longitudes 22-33° E and covering an area of 752,621 km<sup>2</sup>, which approximately 2.5% of African continent. The Agricultural sector in Zambia has been identified to be the key component for the economic development of the country.

Agriculture generates between 18-20% of the gross domestic product (GDP) and provides livelihood for more than 50% of the population. In addition, the sector employs about 67% of the labour force.

The Zambian agriculture in general and the seed industry in particular, has undergone remarkable transformations since pre-independence. These changes have also significantly influenced the thinking and current direction of the seed industry. This paper highlights the seed industry development in Zambia focusing on the transformations particularly the participation of the public and private seed sectors. It shows that the roles of the private and public sectors are complimentary in enhancing seed provision. The seed testing activities in relation to International Seed Testing Association (ISTA) are also highlighted.

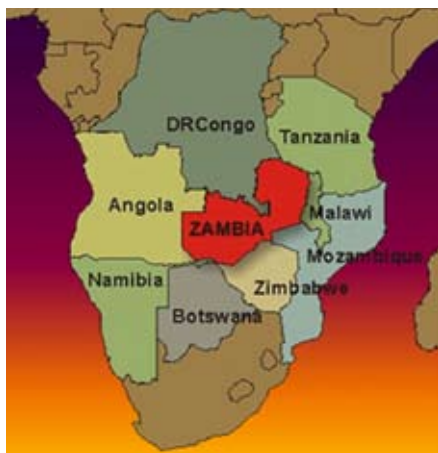


Figure 1. Zambia and neighbouring countries

## 2. The Zambian seed industry

Seed is a very important input in crop production as it sets the limit for production. It is therefore, imperative that a farmer plants good quality seeds. In this context quality refers to fit for use to meet preferences and expectations of farmers. A farmer prefers that good quality seed is offered and expects high return. In order to ensure farmer's access to good seeds the government took the lead in the provision of seeds.

### 2.1 Seed provision

Soon after independence in 1964, the government recognized the urgent need to enhance the provision of quality seeds to farmers. A program was initiated within the research branch of the Ministry of Agriculture and Cooperatives (MACO) to primarily develop new varieties of the country's staple food crop, maize and to ensure maintenance and increase of parent lines of a regional maize variety SR52 (developed in Southern Rhodesia, now Zimbabwe) in order to start hybrid seed production in the country. In the early 1970's the first local maize composites were developed and released for commercial production. The program expanded rapidly and included other important crops in the 1980s and 1990s. More superior varieties of maize, sorghum, pearl millet, sweet potato and cassava were bred and released by public breeders. There was no private involvement in breeding other than the University of Zambia, School of Agricultural Sciences, which offered some partnership in varietal development.

Seed production was organized by seed services, a section within the Research Branch at the time and now Seed Control and Certification Institute (SCCI). The production was by contract growing farmers. The same section was also responsible for maintenance breeding of varieties that were in circulation. Inherent in this organizational set up and operation were the following problems:

a) Seed Services could not cope with the demands of maintenance breeding which resulted in loss of genetic purity of parent materials. There was also a lack of regular supplies of breeder's seed which resulted in re-circulation of seed more than was desirable;

b) the principle of self-control of seed quality by Seed Services rendered field work ineffective;

c) the government controlled seed prices to low levels and failed to attract a sufficient number of farmers to grow seeds.

As a result of the above constraints, the delivery system became weak. The only superior maize hybrid SR52 produced in Zambia became contaminated and was yielding 20% lower than the same variety in Zimbabwe. It was, however, realized that in order to improve performance in the seed industry, there was need to separate the functions of production and marketing from those of quality control and plant variety development and improvement.

In that respect therefore, seed services was separated from the Research Branch in 1984 and became SCCI, a department under MACO, to continue with quality control and certification. A national seed company, Zambia Seed Company Limited (Zamseed), was formed in 1981 to be wholly responsible for production and marketing of seeds in the country. Zamseed produced and marketed all types of seed with the exception of cotton and tobacco which were handled by Lint Company of Zambia (Litco) and Tobacco Association of Zambia (TAZ)/Tobacco Board of Zambia (TBZ) respectively.

The National Variety Release Committee (NVRC) was formed in 1984 to scrutinize the release of varieties for commercial production in Zambia. Plant breeding and maintenance breeding were done by government and all the varieties from the breeding institutions were given to Zamseed for the purpose of seed production and marketing.



In 1991 the Zambian economy was liberalized and the seed industry was transformed from being wholly state funded to one in which both public and private sectors had a role to play. The development changed the seed business environment in Zambia. Seed production, processing, marketing and distribution that was dominated by Zamseed were open to all and saw to entry of other seed companies such as sempro (Z) Ltd (Pannar Seed), Maize Research Institute Ltd (MRI), SeedCo (Z) International Ltd.

The private sector involvement in seed provision increased the demand for seed services. SCCI lacked the capacity to effectively enforce the regulations under the seed law due to limited capacity in terms of human, financial and physical resources. In order to broaden the provision of quality control the Plant Variety and Seeds Act was amended to provide for increased private sector participation in seed quality control by way of licensing. The SCCI is also responsible for variety testing, policy formulation and implementation, and facilitating the development of the informal seed sector.

Most of the seed companies are concentrating on the provision of hybrid maize leaving most of the traditional crops e.g. sorghum, finger millet, pearl millet, cowpeas, groundnuts, beans, cassava and sweet potato unattended to, resulting in shortage of seed/planting materials for such crops. Non-governmental organizations (NGOs) have been critical in filling in the gaps left by the seed companies particularly in outlying areas. A number of government/donor/NGO seed programs are participating in developing seed provision system in rural areas. Their work has been complimentary to that of seed companies.

## 2.2 Private sector participation in the seed industry

The private sector participates in the development and introduction of new varieties on the Zambian market. Each seed company has introduced a basket of germplasm that has given the farming community a broader choice for desired seed varieties. The varietal development by the private sector will soon be strengthened further when the Plant Breeder's Rights Act is enacted.

Zambia has a formal system for variety release. Candidate varieties are tested by an independent institution for Distinctness, Uniformity and Stability (DUS) as well as for Value for Cultivation and Use (VCU). Results of the assessment are presented to a broad based Variety Release Committee (VRC) that considers candidate varieties for release. The VRC includes representatives from both the private and public sectors. This arrangement ensures a précised scrutiny of candidate varieties prior to their release and cultivates public confidence in varieties released.

The production and marketing of seed is almost entirely carried out by the private sector. However, the provision of foundation seeds for public bred varieties involves participation by the public sector. Even in such circumstances, public-private sector partnership exists to ensure the provision of demanded seed crop varieties.

The private sector has been active in seed promotions through field days, field schools, demonstration plots, seed fairs, agriculture shows, posters, adverts in both print and electronic media to mention but a few.

The private sector participates in seed quality control. Personnel from the private sector are licensed to carry out seed inspections, seed sampling and seed testing in accordance with set conditions. This has broadened the coverage of seed quality control. The service has speeded up seed inspections, sampling and testing.

Similarly private seed testing laboratories are licensed to test and certify seeds for the local market. Two private laboratories (Zamseed and Dunavant seed testing laboratories) have since been licensed. The laboratories conduct seed testing in accordance with guidelines from the Official Seed Testing Station (OSTS) laboratory of the government. The OSTs monitors the operation of private laboratories. The laboratories have broadened and speeded up seed testing and certification in Zambia.

## 2.3 Positive trends due to private sector participation in the seed industry

The number of seed companies has grown from one (1) in 1991 to seven (7) to date. During the same period, cotton seed com-



Figure 2. Participants of the VRC Meeting



Figure 3. Seed fair poster



Figure 4. At a seed company's field day

panies also increased from 1 to 6. This has brought about competition in seed delivery to the satisfaction of farmers.

There is no doubt that the market has experienced an improvement in seed quality due to competition and this has in turn reduced the cost of quality control by government as each company trade mark is a measure of quality.

There has been an improvement in product presentation to the market. More information flows from seed companies to beneficiaries. Seed package sizes are more demand driven. The industry has experienced some presentation in a 'kit' which not only includes seed but inputs

such as fertilizers, pesticides, herbicides and tools.

Seed companies have embarked on vigorous market strategies that have increased efficiency in seed distribution. This includes packaging and reduction in wastage. Financial discipline has introduced value consciousness among both distributors and end users.

The industry is promoting cost recovery in seed research. People/institutions are beginning to pay for research services hence government makes some savings.

The liberalization of the Zambian economy opened up for more participants in the seed industry and has brought about a healthy competition. Participants have also recognized the need to work together hence the formation of the Zambia Seed Trade Association (ZASTA). Membership to the association includes those involved in seed trade seed companies and seed grower associations. The association promotes interest in the provision of quality seeds to the local market and beyond.

The majority of farmers in Zambia are small-scale and located in rural areas where they are separated by poor road infrastructure. Seed provision by seed companies in rural areas is poor. In realizing the importance of improving productivity of the farmers, the government, through various co-operating partners (donors and NGOs) initiated the production of improved seeds in rural areas to increase their availability. Small-scale farmers produce certified seed which is distributed within the community and surplus sold to other communities.

### 3. Seed quality control in Zambia

Seed quality control in Zambia started in 1965 soon after independence. The SCCI, founded in 1965, is the official seed certifying agency in Zambia. The activities of SCCI were at that time guided by the Federal Seeds Act which was later transformed into Agriculture (Seeds) Act Chapter 352 of the laws of Zambia in 1967. The Act was amended in 1995, and it is today called Plant Variety and Seeds Act, Chapter 236 of the Laws of Zambia.

The broader mandate of SCCI is to contribute to increased agricultural production in general and crop production in particular through assurance of supply of the highest possible quality seed and planting materials to the farmers and agro-based industries.

The goal of SCCI to articulate formulate and monitor implementation of seed policies in order to harmonize approaches to seed multiplication, production and distribution to facilitate local international seed trade.

The SCCI is a service department and undertakes the following activities.

#### 3.1 Variety testing and registration

The SCCI conducts routine tests on new candidate varieties for Distinctness, Uniformity and Stability (DUS); and the Value for Cultivation and Use (VCU) in order to ascertain identity of different varieties and for farming community to make informed choices on the varieties they intend to use. The activity also assures the owners of varieties against piracy. The

candidate varieties are tested at sites in three agro – ecological zones of Zambia namely region I (with 800 mm rainfall per year or less), region II (800–100 mm rainfall) and region III (over 1000 mm rainfall). Over 60 new varieties of different crop species are tested each year.

#### 3.2 Seed inspections

This is done to ensure that released seed varieties are not contaminated or lose their genetic production potential during seed production. All seed growers are registered and their fields inspected and minimum standards enforced (Fig. 6). The seed imports and exports are also monitored. Over 35,000 hectares are registered and put under seed production of different seed crop varieties each year.

#### 3.3 Seed training and cottage (rural) seed industry development

Seed training is carried out to build capacity in the Zambian Seed Industry to ensure quality delivery of seed services. Training targets farmers, extension staff, NGOs and Community Based organization (CBOS). This increases understanding for quality seed provision in Zambia and beyond (Fig. 7).

The SCCI is promoting rural seed industry to make seeds more available and accessible to all farmers. Through this activity, all rural seed initiatives in the country are coordinated to harmonize approaches, broaden coverage and avoid duplication of these efforts.



Figure 5. Seed testing laboratory, Chilanga



Figure 6. Seed inspections



**Figure 8. Staff of the Official Seed Testing Station**



**Figure 7. Seed training**

### 3.4 Official Seed Testing Station (OSTS)

The Official Seed Testing Station (OSTS) is responsible for testing and certifying seeds lots. The main laboratory (ZMDL01; Fig. 8), based at SCCI headquarters, is accredited with the International Seed Testing Association (ISTA) and is authorized to issue ISTA Certificates. In addition to the ISTA-accredited laboratory, satellite laboratories were established to cater for the growing seed industry's testing demands, which have spread to all parts of the country. Currently there are four (4) satellite laboratories that are certifying seeds and issuing national certificates but not ISTA certificates.

ZMDL01 has a quality assurance system that is based on the ISTA Seed Testing Accreditation Standards, the National Agriculture Policy and the Plant Variety and Seeds Act CAP 236 of the Laws of Zambia), seed Regulations and the current version of the ISTA International Rules for Seed Testing

The OSTS operates an internal quality assurance system appropriate to type, range and volume of work it performs. The quality assurance system ensures that the required degree of accuracy and precision is achieved. The system also provides for



**Figure 9. Seed testing**

deficiencies detected and appropriate corrective action taken.

The seed-testing laboratory conducts seed tests to determine the following seed parameters:

- germination;
- moisture content;
- number of weed seeds;
- purity (presence of chaff and other unwanted material);
- presence of seeds of other crops;
- seed viability;
- seed health;
- variety purity for certain crops;
- laboratory proficiency (ISTA samples) testing.

Any seedlot that fails to meet the crop specific standards is not authorized for sale. Seed Certificates are issued for all the seeds that have undergone laboratory seed tests. The certificates will indicate whether seed has passed the tests and whether it is worth marketing or not.

Other activities performed by the OSTS include:

- a) Auditing of private laboratories. The OSTS is responsible for auditing and monitoring of private seed testing laboratories. Zambia has so far seen development to two private seed testing laboratories. Monitoring of these laboratories is done to ensure that the laboratories are proficient enough to undertake seed testing activities and that seed testing standards are strictly adhered to in order to avoid supplying farmers with inadequately tested seeds.

- b) ISTA referee testing. The SCCI receives samples from ISTA for the Proficiency (referee) Test Program. These programs are aimed at assessing the accuracy and efficiency of testing procedures of all ISTA member laboratories. Such tests are conducted every year on any sample received by the laboratory.

- c) Monitoring and licensing of satellite and private seed laboratories. The OSTS headquarters also monitors the seed testing and certification activities of the satellite seed testing laboratories in Zambia. The monitoring involves checking the performance of equipment and availability of resources necessary to run the laboratory efficiently.

- d) Providing a research facility for UNZA students. Students are availed with facilities to conduct their research on issues related to seed technology. ■

# Report from the 28th ISTA Congress 2007

## Iguaçu Falls, Brazil, 5–11 May

By Patricia Raubo, ISTA Secretariat

The official programme of the 28th ISTA Congress which was held at the Rafain Palace Hotel began with the Meetings of the Technical Committees on May 5. These meetings comprised 16 single sessions spread over the first two days of the congress. Interested delegates were invited to attend these sessions at which each committee discussed and planned their projects and future activities to be focussed on for the upcoming working period 2007-2010.

The two days were completed by an Opening Ceremony on the evening of May 6, presenting the addresses of the President of ISTA, Mr. Pieter Oosterveld, the Secretary General of ISTA, Dr. Michael Muschick, the President of ABRATES and 2nd Vice-President of ISTA as organiser of the Congress, Dr. Silmar Peske and the Honorable Minister of Agriculture of Paraná. For this occasion, Dr. Bernard Le Buanec, Secretary General of the International Seed Federation (ISF) had been invited to give a presentation on the global seed industry (see page 36) which was very well received by the audience. The President of ISTA then continued, honouring Dr. Le Buanec with a Certificate of Appreciation in approval for his collaborative work and support rendered to the Association. The President then asked Dr. Norbert Leist to come on stage in order to declare him the first Honorary Life



Member of ISTA, for which he has been elected in recognition of his outstanding contributions and services to ISTA. Both Dr. Le Buanec and Dr. Leist were the first to receive these recognitions from ISTA correspondingly.

To conclude the festivities of the evening, the delegates of the congress were invited to a Welcome Cocktail offered with a variety of Brazilian titbits.

In the morning of May 7, after welcome greetings of the President of ISTA, the ISTA Seed Symposium was formally opened by the Symposium Convenor of

ISTA, Dr. Alison Powell. The 6 oral presentation sessions and 2 poster sessions were spread out over three days, concluding the Seed Symposium before lunch time of the last day. Each session was chaired by a renowned scientist, every one presenting a key note ahead of the other 5-6 presenters for each session. 'Diversity within and among seed lots and species', 'Problems associated with the domestication and use of non-crop species', 'Diversity in contaminating organisms', 'Seed development, dormancy and germination: physiology and methods', 'Vigour



Bernard Le Buanec with ISTA President Pieter Oosterveld



Norbert Leist being made an Honorary Life Member by the President



The audience at the opening ceremony

and invigoration' and 'Seed storage and genetic conservation' were the themes under which 35 oral presentations and 245 posters were presented to over 1000 listeners in the audience.

The afternoon programme for May 7 continued with meetings of the Editorial Board (Seed Science and Technology) with interesting statistics about papers submitted to the journal, the steps involved in the publication of papers in SST, major achievements of the board during the past 3 years and future goals.

The Audit Programme session which followed gave highlights and useful examples on the newly introduced scope of accreditation, information and examples on the evaluation of reporting on ISTA Orange International Seed Lot Certificates,

in addition to some general figures related to accreditation of laboratories and proficiency testing.

The Ordinary Meeting Preparation session afterwards gave the opportunity to thoroughly discuss the Draft ISTA Strategy paper (published in the April 2007 issue of Seed Testing International) with the Members before it was going to be submitted for vote at the Ordinary Meeting two days later.

The same kind of opportunity for pre-discussion was given for the Proposed Rules Changes 2007 which were presented in the Rules Committee Session after that, giving the opportunity to people to ask questions or get more information to single proposals.

The finish of this very active day was the Official Dinner which started off with an inaugural ceremony where the winners of the Seed Symposium Awards for the best oral presentations and the best posters were announced and supplied with a certificate and cheerful applause.

The winners of the oral presentations 2007 were:

- William Finch-Savage for the presentation of: "A trait-led investigation of seed vigour using natural genetic variation in *Brassica oleracea*." (William Finch-Savage, Katharine Dent and Guy Barker, Warwick HRI, Warwick University, Wellesbourne, CV35 9EF Warwick, UK; bill.finch-savage@warwick.ac.uk);
- Jitka Kochanek for the presentation of: "The impact of maternal vegetative



The ISTA stand



The incoming and outgoing Presidents



**Jitka Kochanek receiving her certificate from Pieter Oosterveld and Silmar Peske**



**Guro Brodal with the President**

stress on seed longevity” and “The impact of provenance, season and seed differences on the seed longevity of nine Australian native species.” (both by: Jitka Kochanek, Kathryn J. Steadman, Robin J. Probert and Steve W. Adkins, The University of Queensland, School of Land and Food Sciences, The University of Queensland, St. Lucia QLD, 4072 Brisbane, Australia; j.kochanek@uq.edu.au);

– Isolde D. K. Ferraz for the presentation of: “Desiccation-sensitive seeds and possibilities for seed storage of a tropical tree species from the Amazon.” (Yêda M. B. C. Arruda and Isolde D. K. Ferraz. Instituto Nacional de Pesquisas da Amazônia, Av. André Araújo, 2936, 69060 000, Manaus, Brazil; iferraz@inpa.gov.br);

– Guro Brodal for the presentation of: “Inoculum thresholds for *Dreschlera* in organic barley and oat seed.” (Guro Brodal and Birgitte Henriksen, Norwegian Institute for Agricultural and Environmental Research, Hogskoleveien 7, N-1432 Aas, Norway; guro.brodal@bioforsk.no).

The three posters that were selected for the award for 2007 were:

– “Mean germination time provides a repeatable vigour test for maize.” (Stan Matthews, Mohammad Khajeh Hosseini and Anders Lomholt, University of Aberdeen, 23 St. Machar Drive, AB24

3UU Aberdeen, UK; agr791@abdn.ac.uk);

– “Image analysis technique to evaluate mechanical and chinch-bugs damages in beans seeds.” (Victor A. Forti, Silvio M. Cícero and Tais L. Pinto, Escola Superior de Agricultura Luiz de Queiroz, Av. Pádua Dias, 13418 900 Piracicaba, Brazil; smcicero@esalq.usp.br)

– “Soybean seed coat genes revealed by cDNA/AFLP fragments.” (Liliane M. Mertz, Fernando A. Henning, Helen L. da Cruz, Gaspar Malone and Paulo D. Zimmer, UFPel, Rua Anchieta, 3831/401, 96015420 Pelotas, Brazil; djzimmer@ufpel.edu.br).

After the participants had satisfied their appetite at the dinner buffet, there was no chance to sit still while the Brazilian life band started playing their rhythms until late.

The next day, Thursday May 10, continued with the presentations of the Technical Committees, reporting the impressive progresses and achievements they had achieved in their committee work during the last year. The Technical Committee presentations held during that day can be found on the ISTA Website (MEMBERSHIP/ISTA Meetings/28th ISTA Congress 2007/Meeting Presentations or [http://www.seedtest.org/en/meeting\\_presentations\\_content---1--1262.html](http://www.seedtest.org/en/meeting_presentations_content---1--1262.html)).

Traditionally on the last official day of the meeting, the actual Ordinary Meeting took place. This meeting follows the pro-

cedure and agenda presented in the ISTA Constitution, following which the delegates had received the agenda plus the 11 documents which needed a vote from the Designated Members entitled to vote on behalf of their government two months prior to the meeting:

– Document 01/2007/OM: Agenda of the Ordinary Meeting 2007;

– Document 02/2007/OM: Draft Minutes of the Ordinary Meeting 2006;

– Document 03/2007/OM: Activity Report 2006 of all ISTA Bodies;

– Document 04/2007/OM: Proposal for the Membership Fees 2008;

– Document 05/2007/OM: Proposed Changes to the ISTA International Rules for Seed Testing;

– Document 05A/2007/OM: Proposed Changes to the ISTA List of Stabilized Plant Names;

– Document 06/2007/OM: Method Validation Reports on Proposed Changes to the ISTA International Rules for Seed Testing;

– Document 07/2007/OM: Proposed Changes to the ISTA Constitution;

– Document 08/2007/OM: Draft ISTA Strategy;

– Document 09/2007/OM: Draft ISTA Position Paper on Quantifying and Reporting Uncertainty of Measurement in Seed Testing;

– Document 10/2007/OM: Draft Rules of Order for the Ordinary Meeting;

- Document 11/2007/OM: Discussion Paper on the price of the ISTA Certificates.

(See also April 2007 issue of Seed Testing International or visit the ISTA Website for the detailed documents.)

Throughout the day, these documents were discussed with the members and thereafter approved by vote by the voting delegates entitled to vote on behalf of their government, either by applause or formally using the voting cards where so required by the ISTA Constitution.

In a nutshell, the major outcomes were:

- acceptance of the Minutes of the last Ordinary Meeting, held in Switzerland 2006
- acceptance of the Activity Report 2006 of all ISTA Bodies, including financial report presented;
- acceptance of the new membership fees 2008, increased by 1% inflation rate compared to 2007
- adoption of all proposed changes to the ISTA Rules with the exception of item ‘C.3.3 Create PSD 64’ and item ‘C.3.6. Modify Rule 3.7’ as a consequence, both withdrawn upon recommendation of the Purity Committee for further elaboration. The changes adopted come into force on 1 January, 2008, and are available from the Secretariat as Update 2008 of the ISTA Rules. The most significant items adopted were the introduction of three new Seed Health Methods, a major revision of Chapter 9 Moisture Content including a new basic reference



The new President, Katalin Ertsey, with the new Executive Committee

method, and a major revision of Chapter 17 Certificates, including the deletion of the ISTA Green International Seed Lot Certificate;

- adoption of the proposed changes to the *ISTA List of Stabilized Plant Names*, resulting in the 5th Edition of this publication which is available for download from the ISTA website;
- adoption of the proposed changes to the ISTA Constitution by including the previously agreed definition of the word ‘government’ as Article IV (a), and alignment of the membership categories in line with the earlier introduction of new membership categories. Changes

adopted to the ISTA Constitution come into force with immediate effect and have been incorporated in the ISTA Constitution 2007 available on the ISTA website;

- adoption of the proposed ISTA Strategy (see page 23);
- adoption of the proposed ISTA Position Paper on Quantifying and Reporting Uncertainty of Measurement in Seed Testing (see page 24, also available on the ISTA website);
- adoption of the proposed Rules of Order for Ordinary Meetings, already implemented by the President during the meeting;
- positive discussion on the suggestion of increasing the price of the ISTA Certificates in order to allow for increase of personnel of the Association, which resulted in a positive decision by the Executive Committee to execute the proposal in increasing the price from Swiss Francs CHF 2.00 to 3.00 as per 1 January, 2008.



Voting for the new Executive Committee

During the days previous to the Ordinary Meeting day, the Designated Members present were nominating persons which they favoured for the position of 1st Vice-President of ISTA and as Members-at-Large serving in the ISTA Executive Committee for the upcoming triennium (2007–2010). A verified list of nominations received from the Designated Members



was then presented to the delegates well before the election of the new Executive Committee was to take place under the corresponding agenda point of the Ordinary Meeting day.

While the Secretary General, vote counters and witnesses were occupied with the evaluation of the elections, the participants enjoyed the exciting presentations, announcing the places of the next ISTA meetings to be Bologna, Italy in 2008 (ISTA Annual Meeting, 16–19 June more information on page 4 or on the ISTA website), Zurich, Switzerland in 2009 (ISTA Annual Meeting, 15–18 June) and Cologne, Germany in 2010 (ISTA Congress, 16–22 June).

As it happened, this eventful day was also the 75th birthday of Prof. Dr. Attilio Lovato, long time ISTA family member, having served in many different positions

in ISTA, from Technical Committee member to Executive Committee member-at-large, Vice-President, President, Honorary Secretary Treasurer and currently Honorary President of the Association. As well known by everyone, he received a happy-birthday-song from the whole Ordinary Meeting!

Upon return of the counting team from the evaluation of the ballot vote, the successful candidates elected to serve on the Executive Committee of ISTA until the next ISTA Congress in 2010 were announced.

**ISTA Executive Committee 2007-2010**

- President: Katalin Ertsey, Hungary
- 1st Vice-President: John Hampton, New Zealand
- 2nd Vice-President: Udo von Kröcher, Germany

Honorary President: Attilio Lovato, Italy (permanent member with observer status)

Members-at-Large: Mary Chipili, Zambia; Jorge Rosales King, Bolivia; Joël Léchappé, France; Susan Maxon, USA; Alison Powell; UK; Masatoshi Sato, Japan; Grethe Tarp; Denmark; Rita Zecchinelli, Italy.

The out-going Executive Committee members were asked to come on stage, to receive their discharge by the voting delegates. This was done and the President personally thanked the Executive Committee members for their collaboration and work under his presidency, thanked his wife and four sons in absence, the Dutch seed sector and the staff at his institute and the ISTA Secretariat for all the support he had received during the last three years.

There followed the installation of the new Executive Committee members for the upcoming triennium, including the installation of the new President.

As her first point of action, the newly installed President of the Association, Katalin Ertsey, gave the President's closing address for the meeting. She used this opportunity to express the pride she felt in being a part of this Association, and thanked Pieter Oosterveld as out-going President for an excellent leadership during the last three years.

In closing, much appreciation was tendered to Silmar Peske and his team as the organiser of this great 28th ISTA Congress that was now coming to an end. ■



The Congress organizer, Silmar Peske, receiving a commemorative award for his work



# ISTA Strategy

This document was prepared by the ISTA Executive Committee and submitted as proposal to the ISTA Ordinary Meeting 2007 for voting by the nominated ISTA Designated Members voting on behalf of their respective Governments.

The document was discussed and approved as herein reflected by vote of the nominated ISTA Designated Members present at the Ordinary Meeting 2007, held on Friday, May 11, 2007 at the Rafain Hotel, Iguacu Falls, Parana, Brazil under the Agenda point 14.

## ISTA IS THE INTERNATIONAL SEED TESTING ASSOCIATION.

**Vision: Uniformity in Seed Testing world wide**

**Mission: ISTA achieves its vision by producing internationally agreed rules for seed sampling and testing, accrediting laboratories, promoting research, and providing international seed analysis certificates, training and dissemination of knowledge in seed science and technology to facilitate seed trading nationally and internationally.**

Some headlines in the development of ISTA over the past ten years:

- ISTA continued its role as the international association for seed science and technology and seed testing;
- ISTA membership increased from 64 countries (April 1994) to 76 countries and from 136 laboratories to 171 laboratories;
- ISTA opened its membership for seed company and private seed testing laboratories;
- ISTA has added method validation as an important part of method development;
- ISTA reviewed the referee tests system and transformed it into a proficiency test system, including clear and transparent standards for the required performance;
- ISTA introduced an accreditation standard for seed testing laboratories that meets the standards of internationally accepted accreditation, including an audit procedure that guarantees a worldwide uniform application of the standard;

- ISTA decided to open the accreditation system for seed company laboratories, including the issuance of the ISTA international certificates;
- ISTA has enhanced the decision-making process by introducing annual meetings;
- ISTA professionalised its internal organisation, including the introduction of modern office tools and techniques for communication;
- ISTA strengthened the relation and collaboration with international operating organisations and associations;
- ISTA and FAO concluded upon a Memorandum of Understanding for future co-operation.

### Considerations

The increasing interest in ISTA and its activities indicates the importance of ISTA as a service provider for governments, international organisations, and the national and international seed trade. In a time of globalisation, seed industries in many countries have entered into the international market. Governments want to facilitate the seed industry and seek for co-operation with internationally operating associations such as ISTA. The ISTA Rules and the accreditation standard, are of increasing value for the goal of uniformity in seed testing. Seed companies are doing business on the basis of bilateral agreements, including reference to the ISTA Rules and methods.

### In conclusion

The work of ISTA is very much appreciated and valuable for governments, international organisations and the seed industry. ISTA should continue its work and the development of the association.

ISTA will help its members to make substantial and lasting improvements in their performance and to build an association that can attract, excite and retain excellent people and laboratories. To achieve this, the following Strategy has been developed:

### 1. Method development

Method development is an important activity for ISTA. The respective technical committees play a leading role in these activities. ISTA will make a study of the process of method development in order to examine whether the current structure needs changes. Important issues for the study are: the adjustment of the work to market demands, the availability of experts, financial aspects, etc.

The association will continue to organise annual meetings in order to facilitate contacts between the experts. Contacts between experts, either as members of committees or as individuals, are important for the exchange of information and ideas.

The association will continue to give support to the activities of the committees by supplying assistance from the secretariat.

### 2. Method validation

Method validation is an important element of method development and recognition. ISTA is restructuring its method validation system to increase efficiency and better meet today's market needs. Methods developed by any person or laboratory can be submitted to ISTA for validation. A business plan will be elaborated.

### 3. Certificates

The ISTA certificate is a valuable document, providing a lot of information about quality of the seed involved. The association will examine how to increase the usefulness of ISTA certificates. Advantages and disadvantages of changing the wording from 'ISTA Certificates' to 'ISTA Seed Testing Reports' will be explored.

### 4. Accreditation

The accreditation programme of ISTA is very well accepted. Worldwide around 100 laboratories have been accredited. The performance of the laboratories has

improved. The ISTA audits are very well received by most of the laboratories. The association sees the accreditation standard as an important part of the ISTA work. The basic principles of the audit procedures will remain untouched. However as before, comments and advice of auditees will be continuously subject to discussion and consideration in order to remain as effective and efficient as possible. The audits on the recently agreed performance based approach for testing on specified traits will continuously be reviewed, in order to find the best way to assure the quality of the laboratory.

### 5. Training

ISTA will continue to organise workshops. ISTA wants to extend the collaboration with other organisations, especially for workshops in areas where seed testing is still in an early stage of development. ISTA realises that a professional approach to training programmes and workshops should be maintained.

In response to the expressed wish for ISTA training, the association is developing a seed analyst training system.

The association will explore the possibilities of distance learning programmes.

### 6. Publications and Products

ISTA's publications and products are of great value to members to improve their performance and are also sold to non-members. The association is investigating ways to increase sales and reduce costs. Electronic publishing and distribution will be investigated.

### 7. Seed Science

ISTA seed symposia have to compete with more specialised congresses and symposia. Nevertheless, part of the core business of ISTA is seed science. Therefore, the association will redefine the aim and structure of its symposia. The executive committee will seek cooperation with other associations that are active in the field of seed science. Furthermore the

executive committee is considering other avenues for expanding seed science.

### 8. International recognition

ISTA is a well-known international association. However, the association feels that not all governments, institutes, organisations and seed companies are aware of the benefits and possibilities ISTA can offer them. ISTA wants to show its value to all those who are working in the seed science and seed testing area. ISTA will start a campaign to enhance international recognition.

### 9. Sound management of ISTA affairs

The Executive Committee will ensure strong accountability to members through effective and cost-efficient management of ISTA affairs and by ensuring that ISTA focuses on essential functions. Decision-making processes will remain open and well managed, with effective linkages to members, governments and the seed sector. ■

## ISTA Position Paper on Quantifying and Reporting Uncertainty of Measurement in Seed Testing

This document was prepared by the ISTA Statistics Committee, endorsed by the ISTA Executive Committee and submitted as proposal to the ISTA Ordinary Meeting 2007 for voting by the nominated ISTA Designated Members voting on behalf of their respective Governments.

The document was discussed and approved as herein reflected by vote of the nominated ISTA Designated Members present at the ISTA Ordinary Meeting 2007, held on Friday, May 11, 2007 at the Rafain Hotel, Iguacu Falls, Parana, Brazil under Agenda point 14.

### ISTA Position Paper on Quantifying and Reporting Uncertainty of Measurement in Seed Testing

The ISTA Rules provide methods for sampling and testing seeds that allow the issue of seed sample certificates and seed lot certificates.

Uncertainty of measurement is a key aspect of ISTA's technical work in Rules establishment.

ISTA's long tradition in working on uncertainty started in 1931, as the very first edition of the ISTA Rules contained toler-

ance tables. S.R. Miles revised their statistical basis and published a "Handbook of tolerances and of measures of precision for seed testing" (Miles, S.R. (1963), Proc. ISTA, 28(3), 523-686). New tolerance tables continue to be introduced by ISTA as required.

Tolerance tables provide a mechanism for deciding whether the differences in results recorded among replicates for a quality test, or between tests, are acceptable or not acceptable.

The ISTA Accreditation Standard based on ISO Standard 17025 is the basis for ISTA laboratory accreditation. This standard requires under specific conditions a statement on uncertainty of measurement on the test report. For determining uncertainty, the ISO/Guide "Guide to the expression of uncertainty in measurement" is broadly accepted.

In this position paper, it is explained that ISTA is dealing with uncertainty in agreement with ISO requirements to the benefit of its clients by using the concept of tolerance tables for seed testing. Two aspects are specified, quantifying uncertainty of measurement, and reporting uncertainty.

### 1. Quantifying uncertainty of measurement

Uncertainty of measurement is defined as "A parameter associated with the result of a measurement, that characterises the dispersion of the values that could reasonably be attributed to the measurand." (International Vocabulary of basic and general terms in Metrology. ISO, Geneva, (1993).

The ISO-Guide and other literature describe two different approaches for quantifying uncertainty:

1. Individual “uncertainty sources” are identified and their contributions quantified. These so called “uncertainty components” are then combined mathematically to obtain a “combined standard uncertainty”, from which in a next step an “expanded uncertainty” is derived. Usually, quantifications are made on the standard deviation level.
2. The total variation of estimates is quantified directly in comparative tests, without a detailed analysis of identity and contribution of the various uncertainty sources. From these data, the “combined standard uncertainty” and the “expanded uncertainty” are computed.

ISTA is using a combination of both approaches.

In comparative tests, the total variation of test results is determined according to approach 2. In-house replicates and other factors are also included, allowing the estimation of effects which are considered as potentially being uncertainty components according to approach 1 (e.g. the absolute level of the test result). Statistical distributions, e.g. the binomial or Poisson distribution, are also used as the basis for the random sampling error. From this total variation and identified uncertainty sources tolerance tables are developed. They contain those uncertainty sources that are relevant to specific test situations.

As ISTA is working worldwide, these routine data sets represent variation reported by experienced laboratories at an international level.

Statistical evaluations of the data are carried out according to good statistical practice. Technical steps, (search for outliers for instance), are not described in this paper.

With more than 750 species and more than 40 different types of tests covered by the ISTA Rules, individual tables for each test x species combination would be unpractical, and are not necessary. ISTA Technical Committees are careful when selecting species for uncertainty evaluations, and check for differences between species, or groups of species. If

differences are not significant, uncertainty is seen as being not species specific, and one tolerance table can cover all species, or appropriate groups of species.

As the ISTA Rules ensure uniformity in seed testing, uncertainties are determined within ISTA, not within countries or for individual laboratories. Customers know that uncertainty of results is comparable from one ISTA laboratory to the other. To achieve and maintain this is a key element of ISTA's strategy and work, as mentioned in the ISTA logo “Uniformity in Seed Testing”.

## 2. Reporting uncertainty of measurement in ISTA

ISTA does not report uncertainty on its certificates. Instead, the tolerance tables are published in ISTA documents like the ISTA Rules and ISTA Handbooks. These tables are known and available to ISTA customers.

Tolerance tables address specific situations, which are of practical interest for the laboratories, sellers, buyers, and regulatory authorities (e.g. a comparison of two test results obtained in different laboratories on the same submitted sample). Thus, for a seed testing method there is a set of tolerance tables available to cover different test situations of interest. Among existing tolerance tables, none is defined as the standard to be reported on an ISTA Certificate.

Indication of a value for uncertainty along with the result in the test report would create confusion for the users of the certificate. ISTA users know the value of uncertainty depend on the question (e.g. check the compatibility of replicates within a laboratory; compare two results obtained by two different laboratories, etc).

Many test results in seed testing are reported as percentage values. Tolerance tables illustrate the dependency of uncertainty on the level of the test result.

In germination testing uncertainty is 66 % higher when the test result is 50 % compared to when the test result is 90 %. This example is given to illustrate uncertainty in seed testing and how tolerance tables give appropriate uncertainty measurements to the customers.

Tolerance tables are user-friendly and can easily be applied in practice, even by staff or customers who are not able

to compute. When comparing two test results there is no need to compute the maximum tolerable difference by means of the two expanded standard deviations. The answer is provided by the table from the two test values.

ISTA is committed to tolerance tables as the way to give information on uncertainty to its customers for seed testing. It is part of ISTA's service, has been well established for decades, and is recognized as appropriate by the seed sector worldwide. There is no contradiction between the ISTA system and ISO documents on uncertainty. ■

# ISTA Annual Meeting 2008

## Preliminary programme

The ISTA Annual Meeting 2008 will be held from 16–19 June in Bologna, Italy.

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.

At this year's Annual Meeting there is a special focus on the testing of Specified Traits, including the testing of Adventitious Presence of GM Seeds in non-GM

Seed Lots. All aspects regarding this important area in Seed Testing will be covered in a one-day seminar on 16 June. A highlight therein will be to draw conclusions from data gathered in recent rounds of the ISTA Proficiency Test Programme on GM Testing. We look forward to seeing you in Bologna!

SUNDAY, 15 June, 2008	16:00 - 20:00	Registration of participants and welcome cocktail at the Savoia Regency Hotel
MONDAY, 16 June, 2008	08:30 - 18:00	ISTA SEMINAR ON SPECIFIED TRAIT SEED TESTING
	19:00	Cocktail Party in celebration of the 100th Anniversary of the LaRAS, the Bologna Seed Research and Testing Laboratory at the Faculty of Agriculture
TUESDAY, 17 June, 2008	PRESENTATION OF ISTA's TECHNICAL WORK	
	08:30	Opening by the ISTA President
	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 - 15:30	Session III. a. Report from the Flower Seed Committee b. Report from the Forest Tree and Shrub Seed Committee c. Report from the Storage Committee d. Report from the Committee on Advanced Technologies
	15:30 - 16:00	Coffee break
	16:00 - 16:30	Session IV. a. Report from the Editorial Board
	16:30 - 19:00	Time allocated for Meetings of individual ISTA Committees
WEDNESDAY, 18 June, 2008	PRESENTATION OF ISTA's TECHNICAL WORK	
	08:30	Opening by the ISTA President
	08:30 - 10:30	Session V. Fundamentals of Seed Testing a. Report from the Bulking and Sampling Committee b. Report from the Statistics Committee c. Report from the Nomenclature Committee d. Report from the Method Validation Committee
	10:30 - 11:00	Coffee break

11:00 - 12:00	Session VI. Laboratory Accreditation a. Report from the Proficiency Test Committee b. Report from the Audit Programme
12:00 - 13:00	Lunch break
13:00 - 13:30	Session VII. Seed Analyst Education a. Report from the Seed Analyst Training Committee
13:30 - 14:30	Session VIII. Proposed Rules Changes a. Meeting of the Rules Committee
14:30 - 15:00	Coffee break
15:00 - 18:00	Session VIII. Proposed Rules Changes (continued) b. Meeting of the Rules Committee
19:30 - 22:00	OFFICIAL DINNER
THURSDAY, 19 June, 2008	ISTA ORDINARY MEETING
09:00 - 10:00	Welcome by the ISTA President Presentation
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 2008
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. Close

# EXHIBITION SPACES AVAILABLE

## ISTA Annual Meeting 2008

### Bologna, Italy

#### Limited availability — prime location

If you are interested in renting a space,  
please contact the Meetings Organizer: [meetings@ista.ch](mailto:meetings@ista.ch)

Cost: 1000 Euros per space

**BR – Brazil****BRAM0002**

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**New ISTA Members and Membership Mutations – Status – 12.12.2007**

## Advanced Technologies Committee

By Brigitte Hamman, ISTA Advanced Technologies Committee Member



An exciting new committee met for the first time at the recent ISTA congress held in Brazil. The Advanced Technologies Committee (ATC) aims to signal emergent technologies that could be of importance to ISTA members, and to evaluate a selected number of these technologies. This will include technologies from other scientific fields that could be designed so as to be applicable to seeds or the seed business, and of course, technologies designed specifically for the seed testing industry.

In order to avoid reservations stemming from the composition of the committee (many of the members are drawn from Industry, which is also where many of the new technologies are being developed), a set of internal rules that will guide the ATC are being compiled. This will ensure that the processes involved are satisfactorily neutral and transparent. A draft of these rules and guidelines will be presented to the executive committee in 2008, and only once these rules have been accepted and are in place will there be any evaluation of technologies.

Technologies will be selected based on the response to a questionnaire to be distributed among the seed testing com-

munity. The questionnaire will allow the committee to begin their duties with an overview of the range in seed technologies that are currently available, and this will be available as a web-based list, to be constantly updated. Those technologies on the List deemed the most promising will be selected and evaluated further. Confidentiality will not be required of the users of the list, and will mean therefore that the list will be in the public domain and the technology subject to public scrutiny. In order to appear on the list, the technology in question needs to a) be "new" in the sense that it is not already covered by ISTA Rules or Handbooks, b) represent an advanced approach or technology, c) not have already been rejected by ISTA, d) present a new testing method, e) be fully documented, and lastly, f) able to be tested at different locations. Most of all, the ATC will be looking for technologies that speed up, improve, add to or even replace current tests.

If a promising technology is not already being explored by one of the already existent technical committees, then some of the technologies on this list will be selected for further evaluation according to the following criteria: a) it must provide

information on the type of output that is desired by the seed testing stations' customers, b) it must provide a significant improvement of the work in terms of efficiency, accuracy, reliability, safety, or otherwise be interesting for seed testing stations to adopt, and finally, c) the owner of the technology should be prepared to co-operate so that the technology can be properly and independently tested.

Current member composition:

Johan van Asbrouck (Thailand) *Chair*  
 Bert van Duijn (Netherlands) *Vice Chair*  
 Brigitte Hamman (Switzerland)  
 Joost van der Burg (Netherlands)  
 Harry Nijënstein (Netherlands)  
 Zhujun Zhu (China)  
 Rukui Huang (China)  
 Kent Bradford (USA)  
 Pascale Jansen (Belgium)  
 SVR Rao (India)

An additional three candidates will be sourced so that the committee is as globally representative as possible. Naturally, anyone who has a keen interest is welcome to contribute by forming a working group which can include members of the committee. ■



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Newly accredited ISTA Member – Status – 12.12.2007

Termination of Accreditation – Status – 12.12.2007

# Purity PT evaluation using standard Tattersfield approach

By Kirk Remund and Martina Rösch

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Martina Rösch ISTA Accreditation Department, ISTA Secretariat, Zürichstrasse 50, CH-8303 Bassersdorf, Switzerland martina.roesch@ista.ch

The ISTA Statistics Committee and Secretariat conducted an evaluation to determine whether the standard Tattersfield evaluation is appropriate for Purity PT evaluation of laboratory performance. This evaluation showed that the Tattersfield approach was a reasonable approach when the following two conditions are met:

1. The purity of all samples included in a PT round must be below 99.5% at the present 2500 seed sample size. If this condition is satisfied then the distribution of lab results for each sample is approximated well by the Normal distribution which is a requirement of the Tattersfield approach.

2. The standard deviation across labs for each sample used in the Tattersfield statistic calculation must be no smaller than the theoretical sampling standard deviation from the Binomial distribution. We propose in practice that the observed standard deviation across labs be used in the Tattersfield statistic calculation as long as it is greater than the theoretical sampling standard deviation. If the observed standard deviation is smaller than the theoretical sampling standard deviation then the theoretical sampling standard deviation will be used in the Tattersfield statistic calculation.

A computer program was developed by the ISTA Statistics Committee for use by the ISTA Secretariat to calculate and summarize the results from different Purity PT rounds. The program is written using the publicly available and free program called "R" (available on the worldwide web at

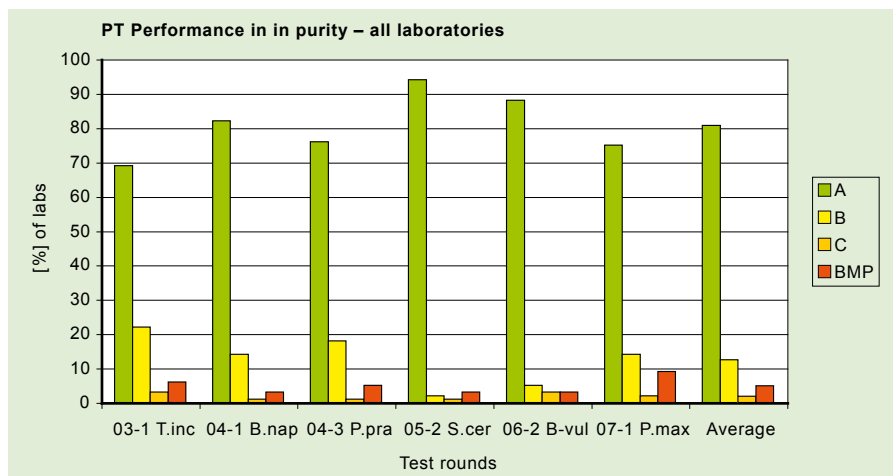


Figure 1. Performance of all labs

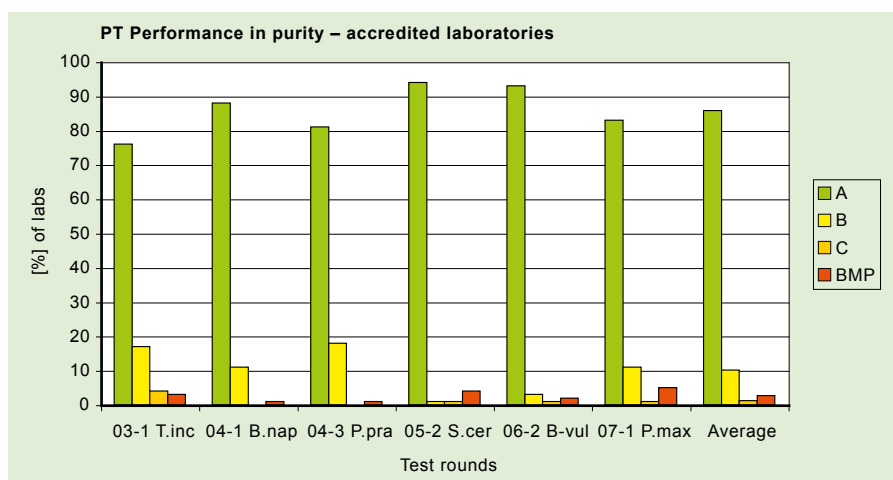


Figure 2. Performance of the accredited labs

www.r-project.org). The Tattersfield statistical calculations are included with the constraints enumerated above. We expect that there is much opportunity in the future to use the R program for many more ISTA applications in the future.

**PT Performance in Purity**

The ISTA Secretariat did an evaluation of the test round that have been performed so far. Two test rounds had to be excluded from evaluation as the purity level was above 99.5%. Results of six test rounds are available so far and results according to the different ratings are presented below.

As already observed in other tests, the performance of accredited laboratory is better than the one of non-accredited laboratories. Approximately, one fourth of the participants are non-accredited laboratories. Nonetheless, in general the performance in purity testing is very good. On average, more than 80 % of all laboratories achieved in-round A ratings.

Until test round 07-1 on Panicum maximum, 58 laboratories had completed six test rounds and were given an overall rating. More than 80 % of the laboratories have an overall A rating and it is encouraging to see that no laboratory scores an overall BMP rating.

Only one non-accredited laboratories has in-round ratings for six test rounds. Its overall rating would be an A. ■

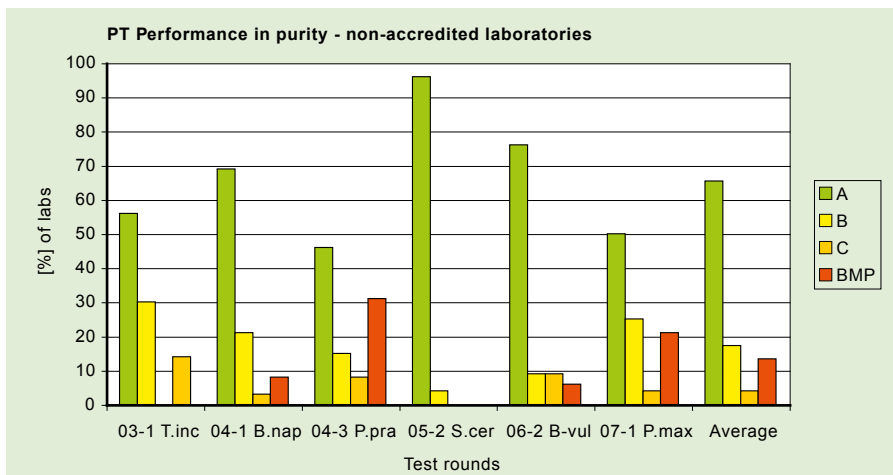


Figure 3 Performance of the non-accredited labs

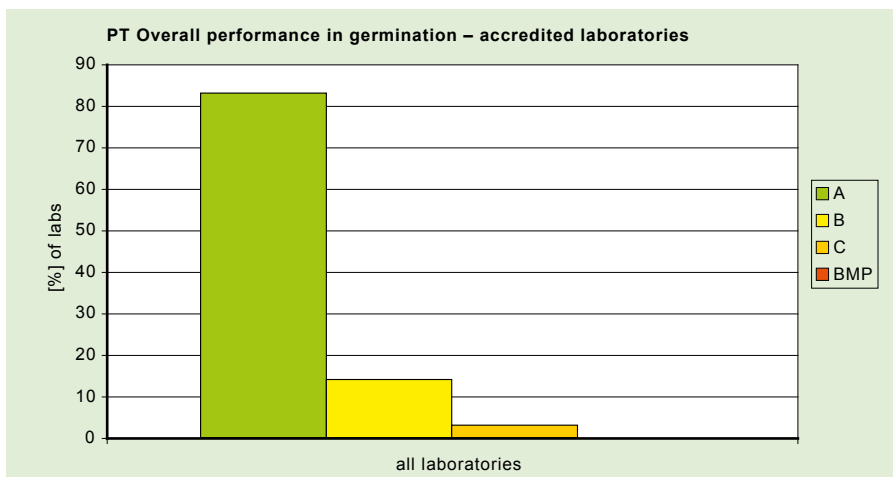


Figure 4 Overall performance of the accredited laboratories

# Accreditation documents – update

By **Martina Rösch** ISTA Accreditation Department, ISTA Secretariat  
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At its last meeting, the ISTA Executive Committee approved changes to the *ISTA Accreditation Standard*, the directives on *Termination, Suspension and Withdrawal of Accreditation* and the procedural documents on the Performance Based Approach. It also adopted a new accreditation document

## New Document – Scope of Accreditation Policy

The reason for creating a scope of accreditation policy document was that often the laboratories' scope of accreditation is ambiguously described in the laboratory's quality manual which would lead to non-conformities when observed during an on-site assessment. There was felt a need for describing what a scope of accreditation can be made up of and how the ISTA Accreditation Department will keep records on each laboratory's scope of accreditation in its data base.

Previously, a crop group matrix corresponding to the PT Programme matrix was used to describe and publish the laboratory's individual scope of accreditation. However, this approach was insufficient as in some cases it is not detailed enough because the methods in the ISTA Rules have a very specific field of application, e.g. a seed health method to be performed on a specific species/pathogen combination, or conductivity on *Pisum sativum* to determine the seeds' vigour.

Also the approach of defining a laboratory's scope of accreditation according to ISTA Rules Chapters seemed to be insufficient as the test object of some chapters is the same (e.g. estimation of viability is described in Chapter 6, Tetrazolium and Chapter 12, Embryo Excision) or procedures of other chapters are to be applied as part of the method (e.g. moisture content determination, described in Chapter

9 to conduct an Accelerated Ageing test, described in Chapter 15).

Therefore, a list of all ISTA Rules standard methods has been compiled. For some of the test objects, the crop group approach is still considered being the most appropriate in order to avoid the need for endless lists of species. This applies to tests such as germination, purity or weight determination. The crop group list for these tests also corresponds to the concept applied in the ISTA PT Programme.

The list of methods is compiled in such a way that there is always the test including its general object (e.g. Germination: determine the maximum germination potential), and the field of application which is the species or groups of species to be covered (e.g. *Zea mays* for the UTLIEF electrophoresis analysis).

In the future, the accredited laboratories will receive a detailed list of methods and covered species as appendix to their Accreditation Certificate. This list will also be published on the ISTA website.

## New version of the ISTA Accreditation Standard

As one of the core documents of the Accreditation Programme of ISTA, the Accreditation Standard is under continuous review and revision. In its latest update, some redundancies and inconsistencies in the use of terminology were removed. The new version of the Accreditation Standard reflects the decision of the Executive Committee to allow laboratories to subcontract part of their work to other laboratories only when the subcontractor holds a valid ISTA accreditation for the analysis in question. A revision of subcontracting requirements in the standard was

also due, since the newly adopted version of Chapter 17 of the ISTA Rules refers to subcontracting as a valid option in case a laboratory cannot perform a requested test itself. With the deletion of the Green Certificate, parts of laboratory work, including sampling, may be transferred to a subcontractor. The Accreditation Standard also states the duties of a subcontracting laboratory such as keeping a list of its approved subcontractors including evidence that the subcontractor holds the required accreditation and communication with the applicant.

## New version of the Termination, Suspension and Withdrawal of Accreditation document

The new version of this document now caters for possibilities to shorten the period of suspension following an overall 'below minimum performance' in the ISTA PT. If a laboratory gives evidence of appropriate corrective action, accreditation may be re-instated before the overall performance rating for the test in question is again a minimum C-rating.

## Principles and Conditions for Laboratory Accreditation under the Performance Based Approach

Following the first experiences with the accreditation of laboratories for methods under the Performance Based Approach, a revision of the related documents was necessary in order to enhance clarity. The documents now give more information on the participation in the PT on GM testing and the required extent to which Performance Data shall be provided.

All above mentioned documents are published on the ISTA website for free download under: <http://www.seedtest.org/en/content---1--1253.html>. ■

## An Overview of the Seed Symposium

Presented at the conclusion of the ISTA Seed Symposium (28th ISTA Congress and 15th Brazilian Seed Congress), Iguazu Falls, Brazil, 9 May 2007

By Julio Marcos-Filho Dept. of Crop Science, University of São Paulo, Brazil

**B**razil is a tropical country whose different regions do not exhibit extreme climatic variations and allow excellent environmental conditions for the production of grain, vegetable, fruits, forage, and woody crops of tropical to temperate origin.

The strategic importance of the Brazilian agricultural sector has been documented over time. The contribution of the whole chain of agribusiness to the Brazilian gross domestic product (GDP) has been about 26% to 32% in the last few years, but it can be higher.

The country is one of the largest producers of the most important crops in the world and contributes a significant percentage of the world's total agricultural production. The average productivity of major crops is similar to or greater than the world average and has continued to increase in the last decade.

The Brazilian seed industry is well developed and until the middle 1990s, both national and international companies were active and competitive. Recently, there has been a significant increase in mergers of some national companies by international seed companies. Even so, in 2006, the Association of Brazilian Seed

Producers had 554 registered members, each representing a seed company. The Brazilian seed market is substantial and consists primarily of grain, vegetables and tropical forage grass crops. It represents 7.5% of the total world seed market in 2005/2006.

Although this brief presentation of Brazilian Agriculture and its seed industry permits a general view of the strength of these activities, it was not surprising that *Diversity in Seed Technology* was chosen as the central theme of the 2007 ISTA Symposium.

First, the relationships between the word *diversity* and many seed science and technology activities are large and dynamic. They suggest opportunities for differing research approaches such as, seed morphological and genetic variability among different plant genera and species; a broad manifestation of vital processes directly affected by genotype; alternatives for seed-borne disease and insect control; the adoption of different procedures during pre- and post-harvest seed production; factors associated with the production of high quality seeds; the variation of the technology levels in different regions

of the world, and many others that clearly illustrate this relationship.

In addition, one of the most important human priorities emphasized around the world is the preservation of biodiversity that is constantly being threatened by our disorganized exploration of natural resources. Biodiversity is not uniformly distributed in different parts of the world regions, being more ample in the tropics. Brazilian natural resources are vast and illustrated by this country's prominent position as a holder of 25% of the world biodiversity. As a consequence, the selection of the theme "diversity in seed technology" could not be more appropriate for this international seed meeting hosted by Brazil.

The Seed Symposium of the 28<sup>th</sup> ISTA Congress held in Fóz do Iguazu, in the Paraná State, from May 7 to 9, 2007 with 1092 registered participants representing more than 40 countries was held jointly with the 15<sup>th</sup> Brazilian Seed Congress. The theme of the Symposium was developed in six sessions, each with a keynote address presented by the respective Chair and six oral presentations. In addition there were 245 papers presented in two poster sessions under the same headings as the oral sessions. Considering the country of origin of the main author of each paper at these meetings, the same trend as displayed in the Symposium held in Budapest/2004, continued to illustrate the significant contributions of Brazilian papers (56.8% of the total), followed by India (10.4%), Argentina (6.8%) and France (4.3%), with others contributing 21.8%. This clearly documents where the volume of active seed research is occurring.

The percentage of papers submitted under different topics can be compared with those at the three preceding symposia held in Pretoria, Angers and Budapest (Table 1). In each case the data is based on the total number of abstracts submitted for possible presentation. These data permit comparisons and the identification of important shifts in seed research



since 1998. The number of papers has steadily increased, but seed physiology papers have continued to be prominent. Research in seed testing remains popular with a major emphasis on seed vigor assessment and studies of alternatives to the standard germination test which are closely tied to the seed physiology approach. These trends have not changed since the 23<sup>rd</sup> ISTA Congress in Buenos Aires, Argentina in 1992. This table also shows variation in the intensity of research in seed production, pathology and drying/storage.

In the 2007 Symposium, the following sessions were supported by oral presentations and poster papers, the abstracts of which were published in the abstract booklet. Only the abstracts of authors who attended the symposium were published in 2007.

**1. Diversity within and among seed lots and species.** (Chair and lead speaker: Michael Kruse, Germany).

This session included 38 papers (oral and poster), representing 13.6% of the total papers submitted. The majority of the studies focused on procedures for seed identification using morphological characteristics, molecular markers and computer imaging analysis. Of particular note was the increase in number of papers involving assessment of the seed quality of native plants.

**2. Problems associated with the domestication of non-crop species.** (Chair and lead speaker: Mirian Eira, Brazil)

This area comprised 24 papers (8.6% of total) that primarily examined the requirements for germination of different species, procedures for overcoming seed dormancy and mechanisms of desiccation tolerance. These topics are fundamental to the domestication of native species. The session also included a significant number of papers concerning medicinal and native forests seeds and maintenance of genetic diversity.

**3. Diversity in contaminating organisms.** (Chair and lead speaker: Gary Harman, USA)

Among the 30 (10.7% of total) presented papers, this session focused almost exclusively on seed-borne diseases. It also considered papers that were quite diverse with respect to species studied. Interestingly, there was a relative decline of papers describing chemical seed treatments and increases in biological control and the use of alternative procedures such as physical (thermotherapy), areas that were relatively well emphasized at the Budapest symposium. Several papers dealt with methods for detection of microorganisms associated with seeds of different species, including the use of molecular markers and studies of seed health in organic production systems.

**4. Seed development, dormancy and germination: physiology and methods.** (Chair and lead speaker: Roberto Benech Arnold: Argentina)

This session included 73 communications (26.1% of total) dealing primarily with studies of maturation, germination, relationship between proteins and seed

vigor, procedures to overcome dormancy as well as molecular markers to obtain basic information. Some papers focused on the effects of growth regulators on physiological processes in seeds. The increase in the number of papers on medicinal plants and forestry seeds was also found in this session, particularly on desiccation tolerance.

**5. Vigor and invigoration.** (Chair and lead speaker: Kent Bradford, USA)

The greatest number of papers (76, 26.7% of total) was presented in this session. Approximately 50% were directed at different aspects of seed vigor (assessment, relationship with seed performance in the field and during storage, association with deterioration, etc). This concentration of papers confirms the need for a continuing search for assessment procedures to provide standardized information on seed performance ability and emphasizes that stand establishment remains a crucial component of crop production. The same is true for studies on seed storability.

Papers on seed vigor focused on refinements of validated and recognized tests to assess the physiological potential of less studied seeds instead of the development of new proposed vigor tests. In general, papers on seed priming emphasized methodology, the identification of causes and effects of treatment, and the use of efficient procedures to avoid possible reversal effects following drying and storage of conditioned seeds.

**6. Seed storage and conservation.** (Chair and lead speaker: Hugh Pritchard, UK)

**Table 1** Percentage distribution of abstracts of papers submitted for possible presentation at ISTA symposia from 1998 to 2007, based on the main research topics.

THEMES	25 <sup>th</sup> Congress Pretoria, 1998	26 <sup>th</sup> Congress Angers, 2001	27 <sup>th</sup> Congress Budapest, 2004	28 <sup>th</sup> Congress Foz do Iguaçu, 2007
Seed Production	12,0% (‡)	11,9% ≈	15,4% ↑	7,2% ↓
Seed Physiology	29,0%	30,6% ↑	33,6% ↑	30,0% ↓
Seed Quality Assessment	27,5%	26,0% ↓	28,7% ↓	25,0% ↓
Seed Pathology	15,5%	17,4% ↑	12,6% ↓	14,2% ↑
Drying and storage	9,0%	6,4% ↓	3,8% ↓	15,9% ↑
Others	7,0%	7,7% ≈	5,9% ↓	7,7% ↑
Total number of papers	182 <sup>1</sup>	219 <sup>1</sup>	286 <sup>1</sup>	391 <sup>2</sup>

(‡) Comparisons within each line: symbols indicate increases (↑), decreases (↓) or non-significant variation (≈) between subsequent paper percentages, within each theme, in comparison to the previous symposium.

- All submitted abstracts were published in the abstract booklet,
- Only the abstracts of authors who attended the symposium were published

This area comprised 39 papers (13.9% of total) that addressed drying methods, factors affecting storability of orthodox and recalcitrant seeds, procedures for the assessment of seed moisture content, seed desiccation tolerance and conservation of genetic resources. There was a significant decrease in the number of papers on fruit and forestry tree seed storage in comparison to previous symposia.

The word *diversity* can be used again to emphasize the wide range of seed topics covered in this 28th ISTA Congress presented as oral and poster papers. The papers provided an interesting combination of basic and technological approaches in cultivated and native plant seed production. The authors broached differing aspects of seed behavior and provided an overview of issues and problems associated with seed quality components thus offering informative and thought provoking ideas and concepts. New approaches and possibilities to solve important problems found in different regions and countries of the world were also featured.

Our deeper knowledge of the germination process and mechanisms of metabolic block that characterize seed dormancy represent critical information guiding the rational use and preservation of natural resources. This fundamental understanding has paved the way for improved uses of native and medicinal plants as a world

priority as discussed in the different sessions of this Symposium.

There was significant interest in areas such as cultivar identification and preservation of genetic purity reflect dynamics in plant breeding programs. At the same time, it was possible to discern current and future priorities in seed science and technology research such as:

- post-harvest seed technology;
- seed pathogen biological control;
- use of molecular markers in differing aspects of seed technology;
- problems associated with organic seed production;
- studies on the mechanisms of gene expression in relation to seed germination and vigor;
- relationship of proteins and physiological processes in seeds;
- computer imaging seed analysis as a tool for studies of different aspects of seed technology.

The improvement of testing procedures to assess the physiological component of seed quality and the estimation of seed performance potential in the field and storage are continuing priorities. Other papers focusing on a wide range of less studied species in different regions of the world provide guidance in rational decisions to preserve our natural resources.

The analysis of the papers in this Symposium reveals a broad and consistent

body of information. This evaluation has shown that the papers presented from different regions in the world are conducted by highly qualified scientists capable of maintaining undeniable energy and the desire to present high quality seed research. The fundamental importance of maintaining active seed research programs persists as a result of continuing developments in plant breeding programs and the unquestionable evolution of crop production technology as a guarantee of providing interesting and useful genes to mankind in a competitive environment.

Therefore, under the *biological approach*, seeds represent the continuation of life. Under the *technological approach*, seed is the most efficient way to transfer advances in plant genetics and breeding to farmers. From the perspective of these two view points, the dynamics of seed research is irreversible and will continue to represent significant short and medium term progress as outstanding symbols of diversity.

#### Acknowledgement

Dr. Miller McDonald from The Ohio State University, USA is acknowledged for his helpfulness in reviewing the manuscript. ■

## PRELIMINARY ANNOUNCEMENT

### ISTA GMO DETECTION WORKSHOP

**When: JUNE 2008** (around the time of the ISTA Annual Meeting)

**Where: Bologna, Italy**

The workshop will address the technical and scientific challenges in testing for the adventitious presence of GM seed and will provide hands-on training in current methodologies.

This workshop is still in the planning phase and we would appreciate your preliminary registration of interest to assist us in this process.

Please email the ISTA Meetings Organizer to register your interest: [meetings@ista.ch](mailto:meetings@ista.ch)





## ISTA Seed Vigour Workshop Bologna, April 15–18 2008

The ISTA Vigour Committee and the Seed Research and Testing Laboratory (LaRAS) of the Department of Agro-Environmental Sciences and Technologies, the University of Bologna invite you to their workshop on Seed Vigour, to be held in Bologna, Italy from 15–19 April 2008. The workshop will be made up of lectures and practical experience in vigour testing. It will also offer the opportunity for general discussion of seed vigour and time for discussion of specific questions from participants regarding seed vigour testing procedures.

### Date

April 15–18 2008

### 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. The University of Bologna is over 900 years old and in 2008 LaRAS will celebrate 100 years of seed testing. The city itself has one of the most beautifully preserved city centres in Italy and some of its finest food. It is well located for visits to other centres in the region of Emilia Romagna.

### Local organiser

Dr. Enrico Noli  
LaRAS – Laboratory of Research and Analysis of Seeds  
Department of Agro-Environmental Sciences  
and Technologies (DiSTA), University of Bologna

### Workshop content

#### Lectures

- Background to seed vigour
- Importance of seed vigour in crop production
- Two ISTA validated vigour tests:
  - Accelerated ageing test for *Glycine max*
  - Conductivity test for *Pisum sativum*
  - Controlled deterioration test for small seeded vegetables
- Cold test for maize
- Rate of germination test
- Precision in vigour testing
- Where a knowledge of seed vigour is useful
- Tolerances

#### Practical work

All participants will:

- Complete the conductivity and controlled deterioration tests and evaluate their results;
- Carry out stages in the accelerated ageing test;
- Evaluate results from accelerated ageing, cold and rate of germination tests.

### Question and answer session

These will consider questions on all aspects of seed vigour and any vigour test.

### Group participatory work

Participants will work in groups to discuss / comment on defined topics and report to the whole group for further discussion

### Presenters of the workshop

The workshop will be presented by Dr Alison Powell (Chair of the Vigour Committee, University of Aberdeen), Dr Stan Matthews (University of Aberdeen) and Dr Emanuela Casarini (University of Bologna).

### Further details

Further details about this workshop, including costs, accommodation and registration details can be found on the ISTA website

### Registration

There will be a minimum number of participants required for this workshop to take place, with a maximum number of 20.

Registration fee: EUR 350 (ISTA Members)  
EUR 535 (non-members)

**Deadline for registration is 18 December 2007.**

Registration form and full details are available on <http://www.seedtest.org>

### Contact

For queries and registrations of accommodation and workshop:

Dr. Enrico Noli  
LaRAS – Laboratory of Research and Analysis of Seeds  
Department of Agro-Environmental Sciences  
and Technologies (DiSTA),  
University of Bologna  
Via Fanin, 40  
40127 Bologna  
Italy

Telephone: +39-051-209 62 53  
Fax: +39-051-209 62 52  
E-mail: [enoli@agrsci.unibo.it](mailto:enoli@agrsci.unibo.it)

# ISTA Workshop on Species and Variety Testing/Verification

Freising-Munich, Germany April 21–25, 2008



**Date**

April 21–25, 2008

**Location**

Bavarian State Research Center for Agriculture  
 Institute for Plant Breeding and Crop Science  
 Lange Point 6, Labor 2  
 D-85354 Freising  
 Germany

**Local organiser**

Dr. Berta Killermann, ISTA Variety Committee Chair  
 Benno Voit, Senior Analyst and Quality Manager

**Workshop content**

Lectures on general principles and details of

- conventional methods (morphological-, chemical-, fluorescental-, ...),
- biochemical methods (A-PAGE, SDS-PAGE, starch) and
- field methods, ...

Practical application of the different above-mentioned methods with different varieties/species (*Lupinus*, *Triticum*, *Poa*, *Lolium*, *Avena*, *Pisum*, *Glycine max*, *Festuca*, *Brassica*, *Sinapis*, *Hordeum*, *xTriticosecale*, ...)

Half day excursion

Presentation and discussion of the VARCOM work (ideas, helpful suggestions, looking for further active co-workers in the different VARCOM working groups, ...)

**Registration**

- Maximum number of participants: 14
- Registration fee:
  - EUR 250 Euro (ISTA Members)
  - EUR 375 Euro (non-members)

For the further planning of the workshop we need your Preliminary registration, and, if you like, your title of an oral or poster contribution to the workshop. Special tasks and questions from participants are welcome.

After receiving the preliminary registration, we will send you further information, including the programme, travel information, and a list of hotels nearby.

**Contact**

Please contact Dr. Berta Killermann for further information.

e-mail: [berta.killermann@LfL.bayern.de](mailto:berta.killermann@LfL.bayern.de)

# ISTA Moisture, Forest Tree & Shrub Seed and Tetrazolium Workshop

Peri, Verona, Italy 12–14 June 2008

<b>Date</b>
12–14 June 2008
<b>Location</b>
Centro Nazionale per lo Studio e la Conservazione della Biodiversità Forestale
<b>Local organiser</b>
Fabio Gorian Centro Nazionale per lo Studio e la Conservazione della Biodiversità Forestale Via del Ponte 256 37020 Peri (VR) ITALY email: f.gorian@corpoforestale.it phone: +39 045 6284071 fax: +39 045 6284089
<b>Objectives</b>
The workshop will deal with practical problems related to seed testing of forest and shrub species. The goal of the meeting is to intensify an exchange of information in this area. The topics to be discussed are Sampling, Moisture and Tetrazolium Testing.
<b>Preliminary programme</b>
Thursday, 12 June: Tetrazolium testing: theory and sample preparation Friday, 13 June: Sampling: theory and practice Tetrazolium testing: sample evaluation Official dinner Saturday, 14 June: Moisture testing: theory and practice  If required, transfer to Verona main railway station for trains to Bologna, the venue of the ISTA Annual Meeting (16–19 June 2008).
<b>Participants</b>
Maximum 20 participants
<b>Registration</b>
Participation fee: ISTA Members: EUR 150 Non-ISTA members: EUR 225  This includes workshop documentation and other material, coffee breaks and lunches, official dinner and transfer to the railway station on Saturday afternoon.

Accompanying persons: EUR 60  
This includes official dinner and transfer to the railway station.

Payment must be made to:  
RAMBLER VIAGGI srl  
BANCO POPOLARE DI VERONA E NOVARA  
AGENZIA DI PARONA-  
c/c n° 3191  
CHECK DIGIT IT 63 B05188 11714 000000003191  
-(CIN B ABI 5188 CAB 11714)

For the further planning of the workshop we need your preliminary registration, and, if you like, your title of an oral or poster contribution to the workshop. Special tasks and questions from participants are welcome.

After receiving the preliminary registration, we will send you further information, including the programme, travel information, and a list of hotels nearby.

**Accommodation**

Accommodation will be available at Agriturismo al Castello (single: EUR 30 and double: EUR 50 per night), which is at a distance of 4 km, and at Albergo Olivo (single: EUR 40 and double: EUR € per night) which is just a short walking distance from the Workshop venue. All prices include breakfast. Please indicate the dates for which you require accommodation on the registration form and/or to the local organizer.

**Travel information**

Regular scheduled flights from every continent, most countries, and major cities of the world land at “Valerio Catullo” international airport, Verona (www.aeroporto-verona.it). Also, Verona can be reached by train and bus from most European countries. Details for transportations to the hotels will follow later.

For workshop registration and hotel reservation please fill in the registration form and return it to the local organizer:

# ISTA Purity, Germination and Tetrazolium Test Workshop on Tropical and Subtropical Seeds

The ISTA Purity Committee and the National Seed Institute (INASE-Argentina) invite you to their Workshop on Tropical and Subtropical Seeds, to be held in Córdoba (Argentina) from 28–31 July 2008.

## Date

July 28–31, 2008

## Location

Córdoba Catholic University  
Córdoba, Argentina

## Local organiser

INASE  
attn. Monica Ines Moreno  
Paseo Colón 922, 4° Piso  
Buenos Aires, 1063  
Argentina  
Tel. +54 11 4349 2035  
Fax +54 11 4349 2496  
E-mail: mimoreno@inase.gov.ar

## Registration

- Number of participants: 20
- Registration deadline: April 28, 2008
- Registration fee:
  - USD 250 (ISTA Members)
  - USD 375 (non-members)

The registration fee includes participation, supporting material and literature, lunches and refreshments, daily travel hotel/laboratory, and official dinner.

## Acommodation

Further information about hotels and other activities, will be announced soon.

## Workshop content

- Physiology of tropical species
- Morphology of tropical grasses
- Purity Test
- Germination Test
- Tetrazolium Test

## Preliminary Registration

I am interested in the ISTA Purity, Germination and Tetrazolium Test Workshop on Tropical and Subtropical Seeds.

Name  First Name

Company/Institution

Address  Phone #

Fax #

E-mail

Position at work

ISTA Membership status: (Please tick boxes)

ISTA Laboratory Member  Technical Committee Member  Non-Member

# 8<sup>th</sup> ISTA Seminar on Statistics in Seed Testing

Roelofarendsveen, The Netherlands, 22–26 September 2008

### Date

September 22–26, 2008

### Location

Naktuinbouw  
Sotaweg 22  
2371 GD Roelofarendsveen  
The Netherlands

### Preliminary programme

The planning of the program for this seminar is currently underway. We envisage alternating theoretical presentations with practical presentations around statistical aspects of seed testing. Concerning the theoretical aspects, we envisage readings on the Linear Model, on the Generalized Linear Model and on Bayesian statistics. For the more practical orientated presentations, there will be readings on the analysis of proficiency tests, statistical aspects of GMO detection, repeatability/reproducibility computations, detection of outliers and tools for visualizing data. Also, participants are welcome to suggest any topics for consideration or for a presentation by themselves.

### Registration

- Number of participants: 20–25 at maximum
- Registration fee:
  - EUR 410 (ISTA Members)
  - EUR 615 (non-members)

The registration fee includes the costs for the official programme of the seminar, all supporting literature, lunches, coffee breaks, seminar dinner, and an excursion.

### Contact

Are you interested in participating?  
Please contact Petra Remeeus for further information.  
email: [p.remeeus@naktuinbouw.nl](mailto:p.remeeus@naktuinbouw.nl)  
Fax: +31 713 32 63 69

## Preliminary Registration

I am interested in the 8<sup>th</sup> ISTA Seminar on Statistics in Seed Testing.

Name  First Name

Company/Institution

Address  Phone #

Fax #

E-mail

Position at work

ISTA Membership status: (Please tick boxes)

ISTA Laboratory Member  Technical Committee Member  Non-Member

# ISTA Flower seed testing workshop

Tavazzano (LO), Italy, 5–8 June, 2007

By Rita Zecchinelli ENSE – Laboratorio Analisi Sementi, Tavazzano (LO), Italy

The ISTA Flower Seed Testing Workshop was hosted by ENSE Laboratory, in Tavazzano, Italy, by the staff of ENSE Seed Testing Laboratory, Fabio Ferrari and Rita Zecchinelli, Head of the hosting laboratory and Flower Seed Testing Committee (FSC) Vice-Chair.

Zita Ripka, FSC Chair, Stefanie Kraemer, Tetrazolium Committee Chair, Maria Rosaria Mannino, Purity Committee Chair and Sylvie Ducournau Germination Committee Vice-Chair participated as lecturers, giving their important contribution to the success of the workshop.

The workshop was organised in the framework of the FSC activities with the aim of training participants in different kinds of tests relevant for flower species. The workshop was a mix of lectures and practical works, and consisted of purity, germination, tetrazolium test, and quality assurance sessions. Due to the presence of participants from non-ISTA laboratories, the activities of ISTA, and in particular the Flower Seed Committee, were also presented. 17 participants from France, Hungary, Italy, Japan, Norway, Serbia, Slovenia, Sudan and Turkey, coming from seed companies and public seed testing laboratories, attended the workshop.

A preliminary ring test between the participants, on a voluntary basis, had been organized prior to the workshop. Two *Callistephus chinensis* samples of about 5 grams had been distributed to 13 participants. Purity, other seed determination (OSD), and germination, were required tests. Results were presented by the test organiser. In general the results were very good. In the purity test, only two participants did not retrieve some added seeds belonging to the same species, while two other participants misidentified the seeds of *Chrysanthemum segetum*, as *Anthemis arvensis*. In the germination test, presentation of the results gave an opportunity to refresh the rounding procedure knowledge, as just in a single case it was not correctly applied. Germination results have been analysed by ISO 5725-2

software available on the ISTA web site. The analysis showed for two participants, a tendency to give over or under estimations (“h” values were greater than the critical values). None of the participating laboratories had shown “k” values (variability of the repeats) greater than the 1% and 5% “k” critical values.

After a presentation on the FSC activities by Zita Ripka, the first day was dedicated to purity testing. Maria Rosaria Mannino gave a lecture on pure seed definitions for *Viola*, *Dahlia* and *Centaurea*, species on which the practical exercises were organized. Participants were also asked to analyse two mixtures of flower species, one sample of large seeded species, and one sample of smaller seeds, with the aim to separate and identify the components.

The second and the third days’ agenda included lectures and practical exercises on germination and tetrazolium testing. Stefanie Kraemer presented the theory and history of seed biochemical viability determination by the topographical tetrazolium test. Species considered during the tetrazolium session were *Callistephus chinensis*, *Dahlia pinnata* and *Helianthus debilis*. Samples were prepared one day and evaluated the day after.

Species considered in the germination part were *Dahlia pinnata*, *Centaurea* spp., *Helianthus debilis* and *Campanula* spp. A presentation held by Sylvie Ducournau focused on the germination methods prescribed by the ISTA Rules. Photos of normal seedlings and different types of abnormality, illustrated the seedling evaluation.

During the practical sessions, magnification of seed and seedlings were displayed on screen to show practical examples of how to prepare the sample for tetrazolium test, how to evaluate a seedling etc., and to analyse comments of participants.

During the last day, time was reserved for the quality assurance system to be applied in different steps of laboratory work; such as preparation of working samples (Zita Ripka), purity test (Maria Rosaria Mannino), germination (Sylvie Ducournau), and reporting results on ISTA certificates (Rita Zecchinelli). Maria Rosaria Mannino also presented the ISTA Universal List of Species, whilst Rita Zecchinelli gave a presentation on ISTA and its activities.

The workshop dinner was organised in Lodi, a small town whose old central square is famous for the ancient buildings and the cathedral. ■



Participants of the ISTA Flower Seed Testing Workshop, Tavazzano, Italy 5-8 June 2007

# ISTA/APSA/FAO Training Course in Seed Health Testing

BPI-NSQCS, Quezon City, Philippines, 19–23 February 2007

By Steven J Roberts Plant Health Solutions, Warwick, UK



Following a previous successful training course in the Asia-Pacific region in Bangkok in July 2006, this was the second ISTA/APSA seed health training course to be held in South East Asia. This time there was additional sponsorship from FAO, which meant that participants only had to pay for their travel expenses. The course aimed to provide participants with the skills and knowledge to improve the standardisation and reliability of seed health testing in the Asia-Pacific Region; participants got hands-on experience of performing seed tests for fungi, bacteria and viruses, with an emphasis on methods in the ISTA rules. Representing ISTA, the training was led by Dr Steve Roberts of Plant Health Solutions, UK ([www.planthealth.co.uk](http://www.planthealth.co.uk)), with excellent support from Dr Rick Mumford of CSL, UK ([www.csl.gov.uk](http://www.csl.gov.uk)), and local organiser Ms Jane Bartolini. The course was hosted by the Philippine National Seed Quality Control Services (NSQCS) at their central laboratories in Quezon City, Manila. NSQCS is part of the Bureau of Plant Industry (BPI) and Quezon City, as the former capital, also houses the buildings of many other

Philippine government departments.

Participants were invited from both government laboratories and private seed companies in the Asian-Pacific region, with preference given to APSA and ISTA members. Eighteen participants attended, representing ten countries: Afghanistan, Bangladesh, Egypt, China (Hong Kong), Korea, Malaysia, Sri Lanka, Taiwan, Thailand and of course the host country the Philippines. There was considerable variation in the backgrounds and level of experience amongst the trainees, who ranged from young laboratory technicians to (older) company directors.

Following a formal welcome from BPI Director Mr. Joel S. Rudinas and messages from ISTA (Dr Steve Roberts) and APSA (Dr Frisco Malabanan), the intensive program began. As it was a practical training course, the majority of the five days was spent in the lab., performing seed tests on brassicas, carrots, rice and tomatoes for fungal, bacterial and viral pathogens. Tests included: blotter and direct agar plating for fungi; dilution plating and identification by pathogenicity or PCR for bacteria; and ELISA

for viruses. Each day started with one or two lectures on different aspects of seed health testing, seed borne pathogens, and related issues; the rest of the day was then spent in the lab. Lectures included: an introduction to ISTA and seed health testing; sampling and statistics; introductions to testing for bacteria, fungi, viruses; method validation; quality assurance and laboratory accreditation. There was also an additional lecture on regional issues and harmonisation of quarantine regulations given by Mrs Merle Palacpac, Chief of the Post-entry Quarantine Service in the Philippines. In the lab, working in groups of two, and regardless of their backgrounds, all trainees showed a keen interest and were actively engaged in the practical work. Emphasis was given not only to the methods themselves, but also to implementing appropriate quality assurance procedures to comply with the ISTA accreditation standards. Given the demanding schedule and intensity of the course, there were some tired people at the end of each day.

A cultural evening on the second day provided an opportunity for the staff of

the NSQCS to demonstrate their abilities in both traditional and modern dancing, and the director and assistant director of the BPI to demonstrate their singing prowess. Participants were also encouraged to show off their musical and dancing talents, and despite initial shyness, most took to the task with the same enthusiasm they showed in the lab.

On the Wednesday afternoon there was a visit to the seed health testing lab. at the International Rice Research Institute (IRRI) at Los Baños, some 40 miles (64 km) to the South East of Manila. This allowed participants to experience the almost continuous traffic jams through Manila, testing the stamina of instructors and trainees alike. Mrs Patria Gonzales, Head of the Seed Health Unit, provided participants with valuable insight into the operation and workings of a well-designed and equipped, high throughput seed testing lab, together with examples of many of the pathogens found of rice seeds. Following a brief visit to the Museum of Rice, the return journey was made more bearable for most by the consumption of large quantities of the local buko pie, and a detour to Magnetic Hill where the bus apparently rolled up hill in neutral.

In addition to the support from the sponsoring organisations (ISTA, APSA, FAO), this course could not have taken place without the considerable time and effort which was put into the advance preparations by all the staff of the NSC-QS under the direction of Mr Henry Carpiso and especially the efforts of local organiser Mrs. Jane Bartolini; and the priority, importance and support given to the course by the Philippines government through the BPI. Participants and trainers particularly appreciated the hospitality and friendliness shown by all members of the BPI-NSQCS team.



Based on their comments and feedback, all participants gained something useful from the course whether it was new knowledge, a gain in confidence to carry out tests or set up a lab., a greater understanding of and enthusiasm for standards and accreditation, or just a better idea of what is involved in seed health testing. There was a general consensus amongst participants that the course was too short: they would have liked more time to get to grips with some of the more difficult methods/topics such as testing for bacteria, PCR and statistics, and to extend it to cover more crops. It is also to be hoped that through the face-to-face contact made during the course participants will be encouraged to maintain contact and develop collaborations to ensure the continuing development of seed health testing and standards throughout the Asia-Pacific region. To this end participants were also in agreement on the benefits of, and continuing need for, this and similar courses in the region in future.

**Abbreviations**

- ISTA – International Seed Testing Association ([www.seedtest.org](http://www.seedtest.org))
- APSA – Asia & Pacific Seed Association ([www.apsaseed.com](http://www.apsaseed.com))
- FAO – Food and Agriculture Organisation of the United Nations ([www.fao.org](http://www.fao.org))
- PCR – polymerase chain reaction, a method for amplifying specific DNA sequences
- ELISA – enzyme linked immunosorbent assay, a method for determining specific antigen-antibody reactions ■



# ISTA GMO Workshop on Methods for Detection and Statistical Aspects

Izmir, Turkey 27-30 March 2007

By Hulya Ilbi, Ege University, Bornova, Izmir

From 27th to 30th of March, 2007, Ege University in Izmir, Turkey was pleased to host the "GMO Workshop on Methods for Detection and Statistical Aspects" organized by ISTA. The Horticulture Department of Agricultural Faculty and Seed Technology Center, as the local organizers, arranged the workshop by providing their laboratory facilities and computer room. The Turkish Research and Scientific Council (TUBITAK) also supported the workshop by contributing to the accommodations and travel expenses for lecturers.

The aim of the Workshop was to improve and exchange knowledge on methods for quantitative and qualitative GM seed detection and statistical aspects that are important for analyzing seed lots and to develop links between seed analysts and researchers with different experiences.

More than 30 nominations from different countries applied to participate in this workshop. There were a total of 19 participants from 12 different countries including Turkey, China, Ukraine, Bulgaria, Serbia, Belgium, Slovenia, Latvia, Israel, Tunisia, Germany and India who attended the Workshop in Izmir. Participants with different experiences on GM testing, molecular biology and biotechnology included researchers, directors and seed technicians from research organizations, universities and seed companies.

The Workshop which gathered different cultures as well as providing knowledge exchange consisted of two parts: In the first part, practical and theoretical lectures on PCR based methods for qualitative and quantitative GM detection in seed lots took place. This part was led by Dr. Christoph Haldemann from the Swiss Federal Department of Economic Affairs, Agroscope Liebefeld-Posieux Research Station, ALP. He outlined what transgenic plants are and how they are developed, which methods can be used for detection, identification and quantification for GMO, the objective of the GMO detection as well as giving some general

information about GM crop species and their production areas and quantities.

The PCR based methods for GMO detection were introduced following the general information on DNA properties. Dr. Haldemann stressed on the quality control in GMO analysis by using validated methods and assay controls. The quantitative PCR approaches, competitive- and real-time-PCR techniques, were introduced and the factors affecting quantification were pointed out. Also, other methods than PCR used in GMO analysis, especially protein based methods for GMO detection were introduced. He presented a very demonstrative movie on how lateral flow strips for GMO detection work. In the practical part, participants isolated DNA from seeds of soybean and maize samples and from CRM materials with a subsequent DNA quantification by spectrophotometer. The PCR of 35S promoter as screening method, nested-PCR for RR- Soybean, Bt 11 and Bt 176 as gene specific methods were practiced to detect and identify GMO's. The participants were highly interested in the immunostrip technology too, which was provided from the US company Agdia Inc. ([www.agdia.com](http://www.agdia.com)). Dr. Haldemann also showed the databases to reach the information about GM crops and their gene structures.

In the second part of the workshop, statistical aspects on GM seed quantification were focused theoretically and practically by using computers. This part was led by two lecturers from France, Sylvain Gregoire and Jean-Louis Laffont. Mr. Gregoire, the chairman of the ISTA Statistical Committee as well as a member of the GMO Task Force, is from GEVES.

Mr. Laffont from Pioneer seed Company is a member of ISTA Statistical Committee and the GMO Task Force. They first reviewed the basic statistical tests, and demonstrated how sampling is important and affects the results statistically, by using two colored beads of 100. They pointed out the determination of appropriate testing plans and robustness of these plans for

estimate of % GM in seed sample. In this part the SeedCalc program for GM seed analysis was introduced and each participant did exercises individually by using this program in the computers with instructors help. ISTA GMO proficiency test rating was explained as well as giving information about ISTA performance data evaluation and accreditation.

At the end of the first day of the workshop, small city tour was organized to Karsiyaka which is located in the north part of the Izmir bay. The participants and lecturers had some time to visit Izmir and walk by the seaside, enjoying the sunny weather. We all enjoyed having the delicious Turkish cuisine and nice music and Turkish dancing in the Thermal Restaurant which is located in the spring hot water area of Izmir.

At the closing session all participants received ISTA certificates of attendance and a CD with lectures notes, laboratory protocols, publications etc. Opportunity to evaluate the workshop was offered too. The participants were all satisfied with the workshop in terms of knowledge given and initiation of a collaboration which would be helpful in their future work.

## Acknowledgements

I would like to thank:

- Dr. Christoph Haldemann, Sylvain Gregoire, and Jean-Louis Laffont, for participation in this Workshop and sharing their knowledge and experiences with us.
- Ms. Branislava Opra from ISTA, for her assistance in the organization of this event.
- The US company, Agdia Incorporated ([www.agdia.com](http://www.agdia.com)) providing the workshop with ImmunoStrips/lateral flow strips:
- TUBITAK for their financial support.
- All participants for their full attendance to the lectures and practical works, as well as for their friendship gained during the time that we spent together. ■

# ISTA Variety Testing Workshop

25–27 April 2007, Pelotas, Brazil

By Trevor Mazutinec BioVision Seed Labs and Norbert Leist LTZ Augustenberg

The 2007 ISTA Variety Testing Workshop was held from 25–27 April at the Universidade Federal de Pelotas (UFPEL) in Pelotas, in the South of Brazil. Attendants included graduate students from UFPEL in the Seed Science and Technology Department, technicians from the Brazilian Ministry of Agriculture, representatives of FUNDACEP and a variety of technicians from BioVision Seed Labs in Edmonton, Alberta, Canada. The practical aspects of the workshop were performed in the laboratory of Professor Paulo Dejalma Zimmer. Professor Dr. Norbert Leist, ISTA GMO Chairman, presented the theory portions of the workshop. Senior Analyst Rainer Knoblauch, ISTA Variety Chairman, instructed the practical portions, which included chemical and physical methods (*Lupinus*, *Brassica*) as well as electrophoretic work with storage proteins of *Zea mays*, *Triticum aestivum*, *Oryza sativa*, *Helianthus annuus* and *Lycopersicon esculentum*.

The first day began with welcome speeches by Professor Dr. Silmar Peske, 2. Vice President of ISTA and Dejalma Zimmer, and an outline of the topics to be covered during the workshop. Since the majority of the attendees were learning about ISTA for the first time, Norbert Leist started the workshop with a presentation on the history and formation of

the International Seed Testing Association. This was followed by presentation and discussion of the various methods for determining the variety of a sample, from morphological to biochemical.

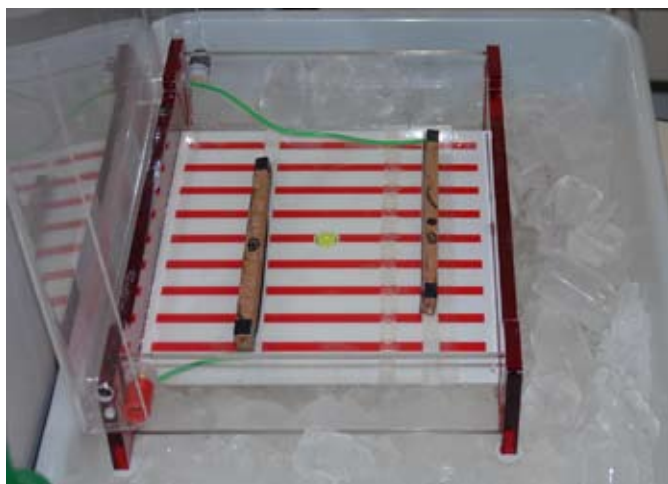
The first practical session included a demonstration of the Fluorescence test for *Lolium spp.* and *Avena spp.*, the Lupine alkaloid test for *Lupinus spp.* and the Formic acid test for *Sinapsis arvensis* in *Brassica*. Especially germinated *Lolium perenne* and *multiflorum* seeds were placed under ultra-violet light to observe the fluorescence of the root traces of *multiflorum* and no fluorescence of *perenne*. Also seeds of a white and a yellow *Avena* variety were tested under ultra-violet light and we could see that the white variety produces bluewhite fluorescence, while the yellow variety showed no fluorescence. The next was a Lupine alkaloid test, using Lugol's solution, for determining sweet lupines (low alkaloid content) and bitter lupines (high alkaloid content). When Lugol's solution was applied to the water that the *Lupinus* seeds were soaked in, the sweet lupines showed a clear solution but the bitter lupines a reddish-brown outfall within the solution. The final non-biochemical test was with formic acid to determine *Sinapsis arvensis* in *Brassica* samples. When a solution of 98% Formic acid was applied

to the seeds, rapidly the *Sinapsis arvensis* seed solutions stained red.

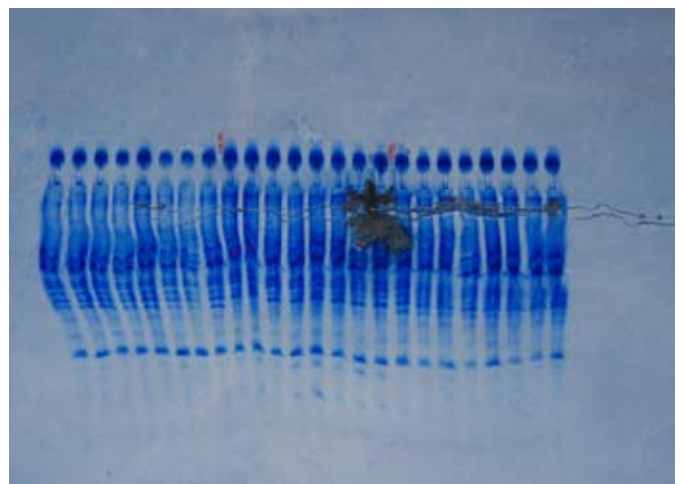
There was one problem for the workshop; it was not possible to get the chemicals needed (supported by the Sinus company) through Customs. The lecturers – aware of the problem – took some chemicals and some ready gels with them, to allow the workshop to become a success also in practical work. It was also not possible to receive the electrophoresis chambers (supported by the Sarsted company) which were waiting at the customs at the next airport.

The lecturers could manage these deficiencies by a sophisticated arrangement of lectures and practical work, so that Rainer Knoblauch could build a very special chamber for electrophoresis by hand. He succeeded to set up a “Pelotas chamber” which was improved day by day and at the end delivered perfect results. Besides this, the participants learned how to prepare home made equipment!

Still on the first day, following lunch, lectures on the theory associated with Ultrathin Layer Isoelectric Focusing (UTLIEF) of seed storage proteins were started. We also discussed how to evaluate the IEF gels after the separation of the proteins. This was followed by another practical session in which the preparation of samples of *Oryza sativa* and *Triticum*



The “pelotas chamber”



IEF results

*aestivum* were presented. Also during this session, a sample of *Zea mays* was run by IEF. The workshop participants were asked to prepare and load the gel in order to understand how to use the procedure. After the IEF run was finished, the *Zea mays* gel was fixed, stained, destained and dried. We were then able to see the bands of the male, female and hybrid seeds that were loaded onto the gel.

Day two started with a short review of the previous day by the workshop participants and then went right into the practical aspects starting an IEF run for *Oryza sativa*. After that the theory of other electrophoresis methods was presented and how to develop a test for an unknown species using IEF. At this time, the IEF run was complete and we were able to go through the steps for fixing, staining, destaining and drying the IEF gel which was then ready for interpretation. We could observe the protein bands for the *Oryza sativa* well defined. After lunch, the practical session started with an IEF run for *Triticum aestivum*, followed by lecture how to troubleshoot an IEF run, and how to report the results. The latter depends on what type of test is performed: Hybrid

determination is the look for presence of hybrid seed after comparison with male and female standards. Varietal confirmation is a test to confirm the variety of the sample by comparing to the known standard. Varietal identification is a test to identify the unknown sample by comparison to a library of known varieties. Day Two ended with a practical session, in which the *Triticum* IEF gel was fixed, stained and destained, so it was possible to observe the bands for the *Triticum* samples.

The final day of the workshop started again with a short review of the day before followed by practical IEF run of *Helianthus annuus*. While the gel was running, we had a theoretical session discussing the IEF method. Dr. Norbert Leist also gave a presentation on the ISTA GMO Task Force and their activities. Having finished the *Helianthus* gel we could evaluate the protein bands of the samples. After lunch, the workshop participants started an IEF run of *Lycopersicon esculentum* followed by a final discussion regarding variety identification. When the gel for the *Lycopersicon* sample was ready, we brought all of the gels back to the lecture room and

did one final evaluation of all of the gels. Looking at the gels, we noticed that the best gel produced was the last one. Rainer Knoblauch attributed this to the ease of use of the IEF system and the quick learning ability of the workshop participants.

The workshop was closed with a small ceremony where Norbert Leist, Rainer Knoblauch, Paulo Dejalma Zimmer and Silmar Peske handed out certificates to all of the workshop participants. Silmar Peske also had some kind words to say to the group. He stated how proud he was of the students and their ability to understand and participate in the workshop, as it was presented in English. He also praised Desalma Zimmer for his excellent work in organizing the workshop. That night, the workshop participants and organizers ended the week with a typical nice Brazilian dinner at one of the famous local barbecue restaurants. ■

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## ISTA Workshop on Statistical Aspects of GMO Detection

1–3 May 2007, Iguaçu, Brazil

By Dr Maria Laene Moreira de Carvalho Federal University of Lavras-UFLA

The ISTA Workshop on Statistical Aspects of GMO Detection was held in Foz do Iguaçu-Paraná, on May 1-3, 2007, with the presence of lecturers from the ISTA Statistics Committee and GMO Task Force: Dr Sylvain Grégoire and Jean-Louis Laffont (France), Kirk Remund (USA) and Dr Enrico Noli (Italy). The event, was coordinated in Brazil by Dr Maria Laene Moreira de Carvalho of the Federal University of Lavras - UFLA, it was organized jointly by ISTA and ABRATES. Laboratory methods were approached for testing of GMO that had included generalities of PCR, quantification methods and good laboratory practice. The statistical topics included the

use of the program Seedcalc to design appropriate testing plans for assessing the percentage of GMOs in samples of seeds or in lots, using quantitative or qualitative tests.

Other topics considered were robustness of the testing plans, repeatability and reproducibility, as well as a refresher on theoretical distributions and statistical tests.

The participants came from different countries including Brazil, Argentina, Japan, Canada, Belgium and Holland. They enjoyed the opportunity to debate problems, to share experiences and to learn practical examples of statistical applications in the OGM analyses. Every

effort was made to ensure a pleasant atmosphere, while sharing knowledge and solving all problems.

The participants and lecturers had the chance to celebrate the success of the course with a lot of pasta, wine, and the famous Brazilian Caipirinha. ■

# 3<sup>rd</sup> ISTA Workshop on Seed Vigour Testing

## COODETEC, Cascavel, Brazil, May 1–3, 2007

By **Lea Mazor**, Head of the Official Seed Testing Laboratory, ARO- Volcani Center, Israel

The 3<sup>rd</sup> ISTA Workshop on Seed Vigour Testing was held in Cascavel, Brazil between May 1–3, 2007, hosted by the Cooperativa Central de Pesquisa Agrícola (COODETEC). The local organizer was Dr. Leopoldo Baudet (University of Pelotas, Brazil) and the presenters of the workshop were Dr. Alison A Powell (Chair of ISTA Vigour Committee), Dr. Stan Matthews (University of Aberdeen, UK) and Dr. Roberval Vieira (Sao Paulo State University, Jaboticabal, Brazil). Fifteen participants attended the 3 day workshop. The majority came from different regions of Brazil, with others from USA, Paraguay and Israel. They were from seed testing labs and seed companies, and also included a number of PhD and MSc university students.

The central laboratory of COODETEC hosted the workshop in their new facilities near Cascavel. The workshops, which had only been opened one month before our visit, were very impressive, and gave us plenty of room for our practical work. The staff of the seed testing lab had prepared samples of tests in advance and provided all our needs. Their assistance, support and availability, made a significant contribution to the success of the workshop.

The workshop began with a video “What is Seed Vigour?” prepared by Dennis TeKrony (previous Chair of the Vigour Committee), followed by a lecture from Alison “Introduction to Seed Vigour”. Her diction and clear language as well as her profound knowledge in seed vigour was remarkable. The programme continued with a mix of lectures and practical work. The lectures (9 in total) comprised theoretical basis of vigour, practical aspects, as well as critical aspects of the tests. The lecturers Alison, Stan and Roberval were interesting, didactic and knowledgeable. Their talent, experience and personalities were highly appreciated by the participants.

During the practical work the participants compared several relevant vigour methods and studied the advantages



and limitations of each one. Among the many methods of vigour testing, the most important ones were presented and demonstrated, namely: the accelerated ageing test, conductivity test, controlled deterioration test, cold test and rate of germination. A new way of approaching rate of germination in vigour testing, using physiological germination, was introduced to us by Stan, with his unique sense of humor and terminology (MGT and MJGT). This made us think that maybe, after all, a universal, quick and uncomplicated method for vigour testing will be possible, when the Vigour Committee has completed further studies on this test.

On our second day, Dr. Ivo Cararo Executive Director of COODETEC welcomed us with an interesting lecture about the background and role of COODETEC for the farm co-operatives. This was followed by a visit to the COODETEC laboratories and trials, which allowed the participants to get acquainted with the research carried out there.

The Brazilian spirit in organizing the official dinner as well as an informal dinner at a brewery with “paying by weight food” and their friendly hospitality made these unique events. Our official dinner took place at a ‘colonial style’ restaurant.

This is how the Brazilians describe farms and restaurants owned by immigrants who continue to maintain their traditional production and cuisine. We enjoyed quail, presented in many different styles, as well as other delicacies, and good company.

One unexpected event in the workshops was the appearance of a TV film crew who filmed both in a lecture and practical session and interviewed some of us. The participants will not forget seeing themselves on the local Brazilian TV on the 7 o'clock news!

We are very grateful to COODETEC for providing us with such a good setting for our workshop, for their hospitality, and for sponsoring our lunches. We are also grateful to Syngenta for their financial support at the workshop dinner. Last but not least, many thanks to our local organizer, Leopoldo for his professional attitude, kindness and generosity in organizing the workshop and for the superb accommodation in the Bourbon Cascavel Express Hotel. Leopoldo drove to Iguassu Falls airport (140 km –one way) to pick us up and ensure that we would not get lost. We appreciated this very much! “Muito Obrigada” to all of you. ■

# ISTA Tetrazolium and Germination Workshop on Tropical and Subtropical Seed

Curitiba, Brazil, April 30<sup>th</sup> to May 3<sup>rd</sup> 2007

By Jose Franca-Neto Ph.D., Research Scientist from Embrapa Soybean, Londrina, Parana, Brazil.  
jbranca@cnpso.embrapa.br

**I**STA and ABRATES-Brazilian Association of Seed Technologists organized and promoted the Tetrazolium and Germination Workshop on Tropical and Subtropical Seed. The Workshop was held in one of the most beautiful cities of Brazil, Curitiba, the state capital of Parana, from April 30<sup>th</sup> to May 3<sup>rd</sup>, 2007. This was one of several Workshops offered in Iguassa Falls, Brazil before the 28<sup>th</sup> ISTA Congress.

The Workshop was organized and instructed by; Stefanie Kraemer (ISTA Tetrazolium Committee Chair), Ronald Don (ISTA Germination Committee Chair), Norbert Leist (former ISTA President), Osvaldo Ohlson (head of the regulatory Seed Laboratory of the State of Parana – CLASPAR), Maria Cristina Dias (IAPAR-Agronomical Research Institute of Parana), Branka Opra (ISTA), and Jose Franca-Neto (Embrapa Soybean). The organizing committee included the support of Antonio Medeiros (Embrapa Forest), and Jorge Szczypior (Ministry of Agriculture).

Seventeen participants from five countries took part in the workshop, involving public and private sectors related to seed production, analysis and regulation; eight from Brazil, five from Argentina, two from Bolivia, one from Panama, and one from Israel.

The program of the Workshop covered topics such as principles and history of tetrazolium testing, procedures of tetrazolium preparation and evaluation for de-



Participants of the Tetrazolium and Germination Workshop on Tropical and Subtropical Seed, Curitiba, Brazil, April 30<sup>th</sup> to May 3<sup>rd</sup>, 2007.

termining seed viability and vigour, germination testing, seedling evaluation for mono- and di-cotyledons, using the ISTA Seedling Evaluation Handbook, and use of tolerance tables. All these topics were covered in detail for seed of five tropical genus: *Brachiaria*, *Coffea*, *Glycine*, *Gossypium*, *Phaseolus* and *Zea*.

Additional to the technical program, the Workshop offered participants the possibility of a city tour to Curitiba, including detailed visits to the Botanical Gardens, the Oscar Niemeyer Museum, the Wire Opera House, and to the Paulo

Leminski Park. Two official dinners were offered to the participants: one in a traditional Brazilian “Churrascaria” and the other at Italian Restaurant Madalosso, the second largest in the World, hosting nearly 5,000 customers at once.

The final evaluation by the participants of the Workshop was very successful, since it combined an excellent technical program with leisure activities, which resulted in great integration amongst participants, organisers and instructors from several countries. ■



General view of the training room during the workshop.



Practice on tetrazolium testing.



Stefanie and some of the workshop participants enjoying a nice Brazilian “churrasco.”

# FOCUS ON...

A magnifying glass with a grey handle is positioned over the 2008 meeting details. The lens is centered on the text, and the handle extends towards the bottom right. The background of the entire page is a light green color with a pattern of various types of seeds and grains scattered across it.

**2008**

June 16-19

ISTA Annual Meeting

Bologna, Italy

See page 4

A magnifying glass with a grey handle is positioned over the 2009 meeting details. The lens is centered on the text, and the handle extends towards the bottom left. The background of the entire page is a light green color with a pattern of various types of seeds and grains scattered across it.

**2009**

June 15-18

ISTA Annual Meeting

Zurich, Switzerland

A magnifying glass with a grey handle is positioned over the 2010 meeting details. The lens is centered on the text, and the handle extends towards the bottom right. The background of the entire page is a light green color with a pattern of various types of seeds and grains scattered across it.

**2010**

June 16-22

29th ISTA Congress

Cologne, Germany

# CALENDAR CALENDAR CALENDAR



Jan 22-25	IPSA - Independent Professional Seedsmen Association Annual Meeting, Clearwater, Florida <a href="http://www.ipsaweb.com">www.ipsaweb.com</a>	<h1>2008</h1>
Feb 26-29	8th Annual Congress of the African Seed Trade Association (AFSTA) Casablanca, Morocco <a href="http://www.afsta.org">www.afsta.org</a>	
Mar 12-14	World Biofuels Markets Congress, Brussels, Belgium <a href="http://www.worldbiofuelsmarkets.com">www.worldbiofuelsmarkets.com</a>	
March	8th World Soybean Research Congress (WSRC)	
<b>Apr 7-11</b>	<b>ISTA Seed Health Workshop, Pretoria, South Africa</b> <a href="http://www.seedtest.org">www.seedtest.org</a>	
Apr 13-18	5th International Crop Science Congress 2008, ICC Jeju, Korea <a href="http://www.cropscience2008.com">www.cropscience2008.com</a>	
<b>Apr 14-18</b>	<b>6th ISTA Seed Health Symposium, Kruger National Park, South Africa</b> <a href="http://www.up.ac.za/conferences/ielc/">www.up.ac.za/conferences/ielc/</a>	
<b>Apr 15-18</b>	<b>ISTA Seed Vigour Workshop, Bologna, Italy</b> <a href="http://www.seedtest.org">www.seedtest.org</a>	
<b>Apr 21-25</b>	<b>ISTA Workshop on Species &amp; Variety Testing, Freising-Munich, Germany</b> <a href="http://www.seedtest.org">www.seedtest.org</a>	
May 26-28	ISF Congress, Prague, Czech Republic <a href="http://www.worldseed.org">www.worldseed.org</a>	
<b>June 12-14</b>	<b>ISTA Moisture, Forest Tree &amp; Shrub Seed and Tetrazolium Workshop, Peri, Verona, Italy</b> <a href="http://www.seedtest.org">www.seedtest.org</a>	
June	ISTA GMO Workshop, Bologna, Italy <a href="http://www.seedtest.org">www.seedtest.org</a>	
<b>June 16-19</b>	<b>ISTA Annual Meeting 2008, Bologna, Italy</b> <a href="http://www.seedtest.org">www.seedtest.org</a>	
Jun 24-27	1st Global Conference on GMO Analysis, Como, Italy <a href="http://gmoglobalconference.jrc.it/">http://gmoglobalconference.jrc.it/</a>	
<b>June 30-July 4</b>	<b>ISTA Moisture, Germination and Vigour Workshop, Nakuru, Kenya</b> <a href="http://www.seedtest.org">www.seedtest.org</a>	
<b>July 28-31</b>	<b>ISTA Purity, Germination, and Tetrazolium Test on Tropical &amp; Subtropical Seeds, Córdoba, Argentina</b> <a href="http://www.seedtest.org">www.seedtest.org</a>	
<b>Sep 22-26</b>	<b>8th ISTA Seminar on Statistics in Seed Testing, Roelofarendsveen, The Netherlands</b> <a href="http://www.seedtest.org">www.seedtest.org</a>	

**June 15-18** ISTA Annual Meeting, Switzerland

# 2009

# Seed Testing

INTERNATIONAL

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