

# Seed Testing

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Dear Reader,

After a successful and highly interesting ISTA Annual Meeting 2012 in the Netherlands (please find a report on page 10) time is marching on, and already the registration for the 30th ISTA Congress 2013 in Antalya has opened. In this issue you will find all key information in regards to the programme, the meeting venue and the hosting country, aimed at keeping you completely informed about this outstanding, triennial event (page 29 and following).

Time is moving on and also ISTA has to adjust and find its way in the future. With reference to changes and the future: please take your time to read the report of the ISTA President (page 2) highlighting recent developments and future tasks of ISTA; examine the newly adopted ISTA Constitution, now called the *The Articles of the International Seed Testing Association (ISTA)* (page 19) and get an insight in “New developments and technologies in Seed Testing” from the report of the Seminar held in conjunction with the Annual Meeting (page 16).

As more and more members from all over the world are joining the Association, one particular region of current growth is Asia. We are pleased to present an article from this area in this issue, on the future growth drivers for the Indian seed industry (page 4).

Talking about the future, one should not forget to take a look back once in a while, as there is much we can learn from the past. I would like to thank Prof. Dr. Dr. h.c. Steiner and his colleagues for providing us once more with an article about the history of seed testing, more specifically about the Exhibition of the Machines and Equipment for seed cleaning in Graz in 1875.

In closing I wish you a lot of fun in reading this issue of Seed Testing International and please do not forget to register for the upcoming 30th ISTA Congress to be held in Antalya, Turkey, truly a place with a very rich history indeed.

Yours sincerely,

Michael Muschick



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# President's Report

Joël Léchappé



The ISTA Annual Meeting was held in Venlo, the Netherlands, from 11 to 14 June 2012. This meeting attracted 272 participants representing 46 countries. The Floriade exhibition centre provided an exceptional flowering environment propitious to a very successful meeting in a studious and relaxed atmosphere.

On behalf of ISTA, I would like to thank the Dutch Designated Authorities for their support, and the National Organisation Committee, chaired by Joost van der Burg, Marien Valstar, Reini Verboom, Marcel Toonen and Harry Nijënstein.

Although it may be redundant for those who participated in the Annual Meeting, I wish to highlight several important themes for our Association, which were voted on or deeply discussed.

First of all, I have the pleasure to announce that a new constitution, from now on called "The Articles of the Association" was voted on unanimously. It gives ISTA an official status of Association under Swiss law, with its official headquarters in Zurich. This new status strengthens the

Association and gives a legal status to fit with its mission. It is a major event, exceptional in the life of an international association such as ISTA.

With the signature of a Memorandum of Collaboration with the Royal Botanical Gardens, Kew, ISTA confirmed its willingness to support and collaborate with other scientific organizations for the development of research on seed quality. It will encourage greater communication, exchange of information and collaboration between RBG Kew and its international partners with ISTA Member Laboratories.

This is the second memorandum for ISTA, after the Memorandum of Collaboration signed in 2006 with the FAO, on cooperation in capacity building, transfer of technology and exchange of information in all aspects of seed quality assurance.

These collaborations, the close partnership with other organizations such as the OECD, UPOV and the ISF, and the involvement of the Designated Authorities as voting members in ISTA, strengthen the technical contribution of ISTA to the interface between scientific research, regulations and the seed trade.

## Audit process

During the Ordinary Meeting, the membership decided by a consensus vote that "ECOM undertakes a rigorous review of the audit process to improve its cost-effectiveness, and consider the overall cost to laboratories without reducing standards. Without in any way limiting the scope of the review, it should consider topics such as comparison with other systems, competitiveness, ensuring that the system is fit for purpose for Members and stakeholders". This motion has been discussed between the Executive Committee and the representatives from Australia and New Zealand. All agreed to present together the above proposal.

It may be surprising to make a deep review of the accreditation system when

the number of accredited laboratories is regularly increasing. In response to a motion passed at the 2010 Ordinary Meeting, requesting that "ECOM undertakes a rigorous review of the audit process to improve its cost-effectiveness..." the ECOM has put into place a financial tool to better understand the costs. This financial tool was presented and approved at the Ordinary Meeting.

Nevertheless, our review of the costs appears insufficient in regard to the current environment. Nowadays, ISTA is not the only accreditation body for seed testing laboratories. The number of bodies offering accreditation in seed testing has increased over the last 5–10 years. The proposed recognition and quality of the accreditation systems is varied. In some countries, it is recommended or compulsory for laboratories to comply with two or more accreditations. The laboratories must then face double costs and effort to fit the requests from the regulations, the competition or the needs for the international trade. As examples of other accreditation systems in seed testing, the following can be listed: ISO 9001 (certification of process), ISO 17025 (accreditation of laboratories), AOSA/SCST (qualification of analysts), NAL (accreditation of laboratories), regulations for licensing laboratories (e.g. EU 2004/117), or new accreditations under implementation. Each of these accreditation bodies requests to use its own standard, test report and/or logo. As a result there can be as many kinds of tests reports as possible accreditations to report the quality of a seed lot. Some standards do not require that the method used or the sample size is reported, and the link to the seed lot is not guaranteed. This creates heterogeneity and the risk of confusion and litigation.

One of the main goals of the review of the ISTA accreditation system is to consider topics such as a comparison with other systems and competitiveness, ensuring that

the system is fit for purpose for Members and stakeholders. This is an ambitious project, which is very important to contribute to the guarantee of uniformity in seed testing. It involves the Executive Committee, the Secretariat and partners from Designated Authorities and the seed industry. A progress report will be presented at the next ISTA Congress in 2013.

### More flexibility

Over the past few years, ISTA has been regularly asked to introduce more flexibility into the Rules. Recent examples are:

- to allow the issuing of original Orange International Seed Lot Certificates (OICs) for partial seed lots;
- approval for submission of large herbage seed lots;
- ending a germination test at a predetermined germination level;
- in-house germination methods? Flexibility versus heterogeneity?

The first three items were voted on at the Ordinary Meeting in Venlo, June 2012.

The in-house methods were deeply discussed on the basis of presentations prepared by the Rules Committee Chair, the Germination and Statistics Committees, and the Accreditation and Technical department. The main goal of the in-house methods is to limit the number of methods into the Rules to reference methods. Another advantage would be to allow laboratories to use their own method, with the equipment and consumables available at even low cost. However, one risk highlighted would be the creation of heterogeneity in the results, which is contradictory to the spirit of the Rules.

Failure to develop the current system could lead some laboratories to leave the ISTA accreditation and apply to other accreditation systems.

This debate is in this respect linked to the broader question of an ISTA accreditation to fit the needs of the members and stakeholders. The issue will be important for the future of ISTA. More work is necessary to come to a decision in the near future.

### Seminar

The seminar, organized and chaired by Bert van Duijn, on “New developments and technologies in seed testing” opened an important debate on the biological and agronomical pertinence of new methods and new tools. The main questions, raised by Alison Powell and Craig McGill during their presentation, were: “*How can ISTA respond to these developments? Does ISTA have a role in their validation? What are the needs and implementation barriers to introduce new methods into the Rules?*”

The discussion started in June is a first step; more discussion will be organized to help develop an ISTA position.

The above items all converge towards flexibility, competitiveness or new technologies. These are important items for the future of ISTA. The contribution of all members to the debates is essential.

### ISTA Congress 2013

Our next meeting will be at the 30th ISTA Congress in Antalya, Turkey. The Congress will open with the Seed Symposium on “Evaluation of seed quality: a key step in exploiting the benefits of plant breeding and genetic conservation”.

One of our statutory obligations during the congress is the election of a Vice-President and a new Executive Committee. The Technical Committees are also renewed. I invite all the current members to continue to participate in ISTA. I also invite everybody who wishes to be more involved to candidate as member of the Executive Committee or Technical Committees. You are welcome to read the very informative article from Steve Jones (on behalf of the Executive Committee) in this STI issue on page 42.

### Workshops

The Technical Committees, together with hosting member countries, regularly organize workshops. These workshops of a very high technical and scientific level offer the exceptional possibility to share knowledge, improve the competencies or to train new analysts. Whether you are a member of ISTA or not, you are welcome to participate.

To conclude, I would like to mention some additional ongoing topics within the ECOM and the Secretariat, such as the finalization of the financial tool, the feasibility of electronic publication, studies for a new website, the elaboration of a policy on international relations and the preparation of the proposed strategy together with the chairs of the Technical Committees for approval in Antalya, in June 2013.

Your ideas and proposals are welcome. ■

# Future growth drivers for the Indian seed industry

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Before 1960, the seed industry in India was primarily an unorganized sector, and whatever seed was sold was non-branded. Farmers were using their own saved seed for planting, and most of the cultivars were non-hybrid. The business was primarily family owned. The only company which was selling flower and vegetable seeds in its own brand in paper bags was Sutton, established in 1912.

In the late 1950s, on request by the Government of India, the Rockefeller Foundation and the United States Department of Agriculture provided technical support for plant breeding research. Consequently, in 1961 the first 4 maize hybrids were released, which altered the Indian seed industry in India. In 1963, the National Seeds Corporation Ltd. (NSC) was established, primarily to produce the foundation seed of released hybrids of maize, pearl millet and sorghum. This can be said to be the beginning of the development of the organized seed industry in India.

Plant breeding research for improvement of varieties was conducted primarily by public sector organizations, i.e. agricultural universities and institutes of the Indian Council of Agricultural Research (ICAR). The germplasm was stored and preserved by these organizations and was freely available on demand.

In 1988, a questionnaire was sent to 42 private seed companies to review the status of plant breeding research. Only 12 responded. According to the survey, no private company had been active in plant breeding before 1947. Between 1948 and 1970, only three companies began plant breeding research, while six began between 1971 and 1985 (P. K. Agrawal, 1988, Plant Breeding and Breeder Seed Production: A case Study, Division of Seed Science and Technology, IARI, New Delhi, pages 21).

However, the scene changed dramatically, and private sector companies are now active players in plant breeding research. These companies spend about 8–10 % of their turnover on research, and are concentrating primarily on the development of hybrid varieties (it makes business sense), but in some cases also on open pollinated research varieties of paddy (i.e. unmilled rice in the husk), wheat and soybean. In contrast, the public sector NSC concentrated on high-volume, low-value seeds of self-pollinated crops. The contribution of the private sector in the overall turnover of seed began to increase rapidly.

It was realized that quality seed is a vital input for increasing food production. It was also realized that there is large potential for the use of quality seed, and that the infrastructure for seed production, certification, quality assurance and marketing is very limited. So was the investment for the development of the seed sector. Therefore, the Government of India took some bold decisions.

First, breeder seed of publicly-bred varieties/hybrids was allotted to the private sector for the production of foundation and commercial seed.

Second, a new seed policy was announced in 1988, after a visit to Turkey by Prime Minister Mr. Rajiv Gandhi. Under this new policy, the import of germplasm was allowed. Also, from July 1991 foreign investors were allowed to establish equity participation up to 51% in priority sectors, including the seed sector. This resulted in the entry of multinational corporations into the Indian seed business.

The Government of India requested a loan from the World Bank to strengthen the infrastructure for seed production. It resulted in establishing 33 breeder-seed production units, which provided adequate facilities to produce breeder seed for the production of foundation and certified labelled seed. The private sector expanded rapidly. Seed corporations and seed certification agencies of the Indian states were also established by this loan. All this

development, no doubt, changed the seed sector considerably. It was estimated in 1988 that the turnover of sorghum, pearl millet, maize and cotton seed was 1 billion rupees (P. K. Agrawal, 1988, Seed Tech News, Vol. 18, No. 1) which in 2011 increased to about 50 billion rupees, a 50 times increase (1 US dollar = 45 rupees).

In 2002, the scenario changed with the introduction into India of Bt cotton. The increased usage of hybrid Bt cotton seeds throughout the country resulted in a productivity increase of 39 %, from 308 kg/ha (2001–2002) to 568 kg/ha (2009–2010, ISAAA, 2009, brief # 41). This established India as the second largest producer of cotton in the world.

More than 30 companies have licensing agreements with Mahyco Monsanto Biotech India Ltd. (MMB) to use the Bt gene. This brought about a change in the attitude of Indian farmers, who now view seed as an investment rather than a cost factor. The seed cost is low compared to the total cost of cultivation, and is estimated to be not more than 8 %. This change in attitude has opened up a host of opportunities for Indian seed companies which now aim to extend the success story of cotton to other crops by introducing researched and improved varieties of seeds.

The adoption in India of Bt cotton was very rapid, and the success story is unparalleled. As of 2010 there are 780 types of Bt cotton approved for cultivation (779 hybrids and 1 variety). Six cotton events are involved (Table 1).

Of the events listed in Table 1, the most popular are MON 531 and MON 15985 (gene source: MMB). Most of the cotton hybrids on the market are modified using these two events.

It is estimated that 86 % of total cotton cultivated on 11 million hectares is Bt cotton (B. Choudhary & K. Gaur, 2010, ISAAA). It is believed that 36 million packets of 450 grams of Bt cotton seed was sold during the 2011 planting season.

The fact that Bt cotton has saturated almost 90 % of India's cotton area also

arouses serious concern regarding the scope of expansion of this technology in the country. However, an innovative agronomic approach holds great promise in further yield enhancement. Multilocation trials conducted in three different states of India (Maharashtra, Andhra Pradesh and Karnataka) for two years revealed that even at varied between-row and between-plant spacing, whereby the number of plants per acre was almost doubled, there was no significant reduction in productivity per plant. Rather, yield benefits of 200–400 kg per acre were recorded, owing to more plants per unit area. Hence, it is obvious that there is provision for increasing the crop seed rate from the recommended 450 grams per acre to as high as 700–800 grams per acre, with the benefit of a much higher yield. Hence, the key to ensure progressive returns from such advanced technologies lies in the development of innovative agronomic practices and using intelligently seed technological tools at the user end. However, there has been an increased incidence of attacks by sucking pests, due to the dense plant canopy. It is therefore suggested to design appropriate plant architecture with sympodial branches.

**Table 1.** Events approved for use for commercial Bt cotton seed production. Source: ISAAA, 2009

Event/Gene	Source	Date of approval
MON 531(BG), cry1Ac gene)	Mahyco/Monsanto	2002
MON 15985 (BG II), cry1Ac & cry 2Ab genes)	Mahyco/Monsanto	2006
Event 1 (cry 1Ac gene) sourced from IIT, Kharagpur	J K Agri-Genetics	2006
GFM Event(cry1Ab & cry 1Ac genes)	Nath Seeds (sourced from China)	2006
BNLA-601 (cry 1Ac gene)	CICR (ICAR) & UAS, Dharwad	2008
MLS-9124 (synthetic cry 1Ac gene)	Metahelix Life Sciences	2009

CICR = Central Institute for Cotton Research; ICAR = Indian Council of Agriculture Research; UAS = University of Agricultural Sciences

## The Indian seed industry

The Indian seed industry is a vibrant industry, consisting of players from the public and private sectors. Public-sector companies sell mostly varieties of high-volume, low-value seeds, while private-sector companies deal in low-volume, high-value hybrid seeds. There are about 500 seed companies in India; some of them have very good facilities for research, and spend about 8–10 % of their turnover on research.

Seed industry turnover in 2011 is estimated to be 150 billion rupees (Table 2), of which 130 billion is for crop seeds and

20 billion for vegetable seeds (Figs. 1, 2), which is almost double what was previously reported. There have been various reports that estimate the turnover of the Indian seed industry at 65 to 80 billion rupees (P. S. Dravid: 65 billion; Monish Jain: 80 billion; Indian Seed Congress 2011, Souvenir, Page 27, 113); it is highly undervalued. The International Federation of Seedsmen estimates Indian seed industry turnover to be 1.50 billion US dollars, and places it at 6th position worldwide (IFS, 2010). However, with a turnover of 150 billion rupees, the Indian seed industry ranks at 3rd position worldwide after China.

**Table 2.** Turnover of Indian seed market (estimate of Dr Pramod Agrawal, 2011)

Crop	Area, million ha	Area under improved seed, %	Area under improved seed, million ha	Seed rate, kg/ha	Total seed sold, million kg	Average sales	
						Rupees/kg	Million rupees
Wheat	27.33	25	6.83	100	683	30	20497
Paddy	43.77						
Hybrid		3/5	1.53	15	23	150	3430
Research		30	13.13	30	394	50	19700
Cer/Truth		30	13.131	30	394	22	8668
Maize hybrids	7.84	60	4.7	20	94	100	9400
Sorghum hybrids	8.31	90	7.5	10	75	100	7500
Pearl millet hybrids	9.33	100	9.33	5	47	100	4700
Castor hybrids	0.86	100	0.86	5	4.3	175	752
Gram pulses	7.31	5	0.3655	75	27.4125	80	2193
Lentils	1.38	10	0.138	30	4.14	80	331
Pigeon peas	3.55	10	0.355	10	3.55	80	284
Mung beans	2.84	20	0.568	12	6.816	100	681
Urd beans	2.67	20	0.534	12	6.408	100	640
Groundnuts	6.29	3	0.1887	150	28.305	52	1472
Mustard	6.7	25	1.675	5	8.375	100	837
Sunflower hybrids	2.08	80	1.664	5	8.32	150	1248
Soybeans	8.4	70	5.88	75	441	40	17640
Jute	0.91	30	0.273	10	2.73	70	191
Cotton	9.09	36 million packets sold				800 per packet	28800
						Total crop seed	128964
						Vegetable	20000
					Grand total		148964

The turnover of 150 billion rupees is achieved when only about 25 % of the required seed is supplied by the organized sector. If it is increased to 40–50 %, we may be number one in the World by turnover. India has the potential to be number one, provided massive extension work is done and seed companies try to reach “unreachable” areas of the country.

The turnover comes from hybrids and self-pollinated varieties including pulses. About one fifth comes from hybrid Bt cotton.

### Verification of turnover

Turnover was verified with the turnover of the seed companies, the state seed corporations (SSC), the NSC and the State Farms Corporation (SFC).

There are about 500 seed companies in India, of which 243 are members of the National Seed Association of India (NSAI; SSC are excluded). There is a lack of accurate information on their turnover; however, it was estimated to be 108.3 billion rupees.

There are 15 SSCs, one NSC and one SFC. Their combined turnover is 30.34 billion rupees.

These amounts combined come to 138.64 billion rupees, which is close to the original estimate of 150 billion.

### Growth drivers

Future growth drivers could be any crops if hybrids with a yield advantage are used. However, taking the interest of consumers and seed companies into consideration, I would view paddy as the most important, followed by maize. The following types of hybrids would add to the top and bottom lines of seed companies in the coming decade:

- good paddy hybrids with a yield advantage and not based on the 25A male sterile system;
- hybrids with a good seed yield (more than 1.5 tons/ha), so that the cost of seed production is reasonable.
- good paddy research varieties with excellent genetic purity and yield;
- good maize hybrids suitable for wider geographical areas;
- hybrids with a wider appeal;

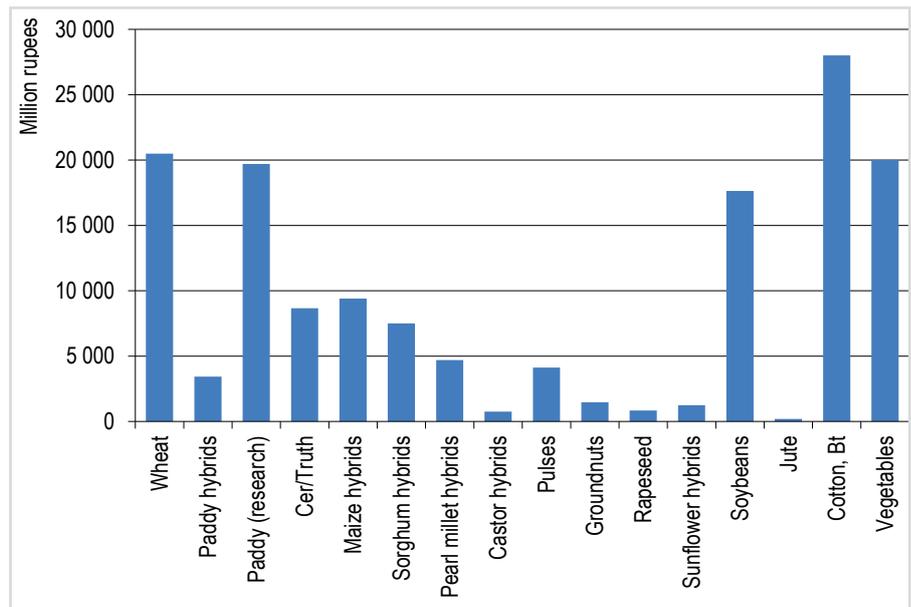


Figure 1. Estimated turnover of Indian seed industry in 2011 by seed crop segment (million rupees)(Pramod Agrawal, 2011).

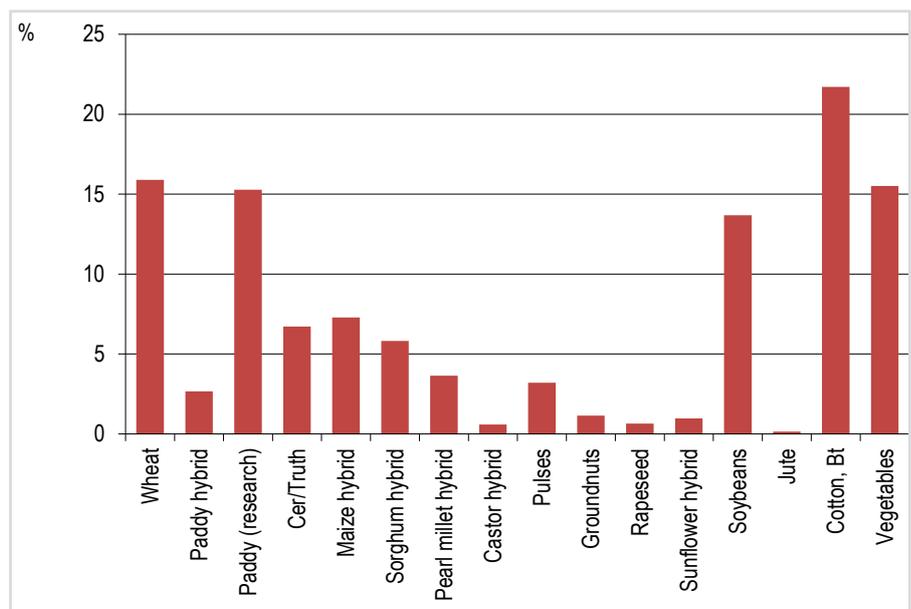


Figure 2. Estimated turnover of Indian seed industry in 2011 by seed crop segment (percent)(Pramod Agrawal, 2011).

- hybrids resistant to biotic and abiotic stress;
  - hybrids with trait integration to add value.
  - the support price or commercial price is competitive for farmers to grow more cotton.
- Cotton may also add to future seed industry growth, provided that:
- the plant type is changed to accommodate higher plant population;
  - hybrids resistant to sucking pests are available;

Government policies have always influenced farmers’ choices of crops for cultivation. Therefore it should be conducive to grow cotton (a non-food crop).

Considering the above I would like to justify the statements by giving some facts and figures about paddy and maize.

## Paddy

Paddy is the most important staple food crop for more than half of the world's population. In fact, paddy is an important part of the staple diet in the six most populous countries — China, India, Indonesia, Bangladesh, Pakistan & Nigeria — which together account for more than half of the annual global population growth (1.1 %) of 77 million people. It is believed that worldwide paddy production could catch up with the increasing demand by increasing usage of hybrid paddy seeds. Hybrid paddy yields about 15–20% more than the commercial varieties, and could hold the answer to food security, despite constraints such as decreasing land, water and labour availability.

China was the first to achieve success in hybrid rice when it released the three-line rice hybrid for commercial cultivation in 1976. In fact, this technology has enabled China to retain its position as the world leader in rice production, even with a significant reduction in the total rice-growing acreage in China since 1978. Now, it is reaping the benefits of the two-line hybrid rice technology, which has been successfully commercialized since 1995.

India started concentrated efforts on hybrid rice development in 1989. Several hybrids from the public and private sectors are available for cultivation, with the private sector being the dominant player. In spite of the availability of several hybrids, a very limited area is under hybrid cultivation, about 1.8 million hectares out of about 44.0 million hectares (4.1 %). One major reason for this low adoption is the unattractive yield advantage that this technology offers. It is a mere 1.0–1.5 t/ha over varieties. Hence, currently the cultivation is restricted to a few areas of Eastern Uttar Pradesh, Bihar, Jharkhand, Chhattisgarh, Punjab and Haryana. There is a general lack of acceptance in southern parts of the country, due to a lack of sufficient yield advantage, and to region-specific requirements for grain quality: the grains of our current rice hybrids are sticky in nature (with consumer preference being for free-flowing rice grains), and the rice has an aroma which is not preferred in many parts of the country.

It is expected that better hybrids will be developed to give a yield advantage over the research varieties of at least 3–4 t/ha, with an enhanced ability to fight drought and diseases. Most of our hybrid rice is developed by using CMS or the 3-line system. CMS is 25A, which provides stickiness. There is hence a need to find a good alternative to 25A. If this is achieved, the area under hybrid rice may reach 10–20 % of the total area under rice in India in the next five years.

In the past five decades, the paddy acreage has grown from 30.0 million ha in 1950 to about 44.0 million ha in 2000, and has remained there since the past five years. The acreages of some of the states are given in Table 3.

India is a major player in the global paddy market. With about 44.0 million ha under paddy cultivation (highest in the world), India is the 2nd largest producer after China. Interestingly, China has 33 % less acreage but enjoys a 35 % higher production compared to India, because of the introduction of hybrid varieties in a large area. The productivity for paddy in India has been stagnant at 3.3 t/ha, less than half that of China. Therefore, there is a need to conduct research on:

- developing better plant types;
- CMS line development;
- seed production technology to obtain higher seed yields;
- resistance to disease;
- agronomic research to enhance paddy production.

**Table 3.** Paddy acreage in selected states (Ministry of Agriculture, Government of India)

State	Area (million ha)	Area (%)
Uttar Pradesh	5.92	13.51
West Bengal	5.69	12.99
Orissa	4.45	10.16
Andhra Pradesh	3.98	9.08
Chhattisgarh	3.72	8.49
Bihar	3.36	7.67
Punjab	2.62	5.98
Assam	2.19	5.00
Tamil Nadu	1.93	4.41
Madhya Pradesh	1.66	3.79
Jharkhand	1.62	3.70
Maharashtra	1.53	3.49
Karnataka	1.40	3.20
Haryana	1.04	2.37
Gujarat	0.73	1.67
Kerala	0.26	0.59
Others	1.71	3.90
All India	43.81	100.00

Paddy seed turnover is calculated to be 21.8 billion rupees in 2011. It could be increased to 42 billion over the next four years (Table 4), if 50 % of the cultivated acreage is covered by research varieties and 10 % by hybrid varieties. The seed requirement is given in Table 4.

The market for paddy seed is therefore huge. The turnover of paddy is given in Table 5.

In order to achieve a turnover of 42 billion rupees from paddy seed, attention should be given to those areas where there is less penetration of quality paddy seed, or there is a big scope for selling paddy seed (Table 2).

**Table 4.** Paddy seed requirements (total area under cultivation: 44 million ha). Note: It is assumed that about 50% area of paddy will be in research variety and 10% area will be in hybrid by 2016

Paddy type	Area under branded seed, %	Seed requirement for 50 % of area, million ha	Seed rate, kg/ha	Total seed requirement, tonnes
Research variety	50	22	30	660 000
Hybrid	10	4.4	15	66 000

**Table 5.** Expected value of the paddy seed market by 2016. Note: turnover will surpass Bt cotton

Paddy type	Expected requirement, tonnes	Selling rate, rupees/tonne	Value of the market, billion rupees
Research paddy	660 000	50 000	33.0
Paddy hybrid	66 000	150 000	9.9
		Total	42.9

## Maize

Maize (corn) is the most cultivated grain in the world, with the USA and China accounting for more than 60% of global production. Over the past several years, world supply has been unable to meet demand, and this has been compounded by the ever-increasing alternative uses of corn for production of motor fuel, particularly in the USA.

Global corn production has almost doubled over the past two decades from 400 million tonnes (1990) to 817 million tonnes (FAOSTAT, 2009), and average yields have gone up from 1.95 t/ha (1960) to 5.12 t/ha. (FAOSTAT, 2009). This increase in productivity has been largely due to the introduction of single-cross hybrids.

Globally, India has the 4th largest acreage and is the 5th largest corn producer. Its yield is low, almost half that of Argentina or China. The corn yield of the USA is highest in the world, and about five times that of India (Table 6). Therefore, maize offers a great opportunity to further enhance yields through hybrid varieties, particularly with single-cross hybrids. Corn is grown in many states in India.

In 2010–11, corn was planted over 8.1 million hectares (Reuters) with a production of 16 million tonnes (Bloomberg).

The concept of hybrid vigour was first commercially exploited in corn in the USA. The first commercial hybrid seed corn was sold in 1924 by Henry Wallace. Seed companies did massive extension work in convincing farmers in the USA to plant hybrids for better yield. It was not easy. The substantially higher yield and mechanization-friendly plant characteristics led to extensive adoption of these cultivars in the USA. The introduction of still higher yielding and more uniform single-cross maize hybrids, compared to the initially developed double-cross hybrids, led to the successful establishment of hybrid technology in agriculture, which was soon adopted in almost all other crops.

Almost 40 years later, the first hybrid maize seed was produced in 1961 and sold in India. Growing conditions for maize are very different in India to the USA. The area and production of maize in India is given in Table 7. In this table, the States have been arranged in order of yield per hectare. With almost 8 million hectares under maize cultivation there is a great opportunity to enhance its production by innovative technology, including agronomic and seed technology tools.

In India, corn is used as for the following purposes (Sai Kumar, Chikkappa and

Manivannam, 2010, NSAI Magazine Oct. Dec, 2010):

- poultry feed (bulk users, about 49 % of production);
- human Consumption (25 %);
- animal feed (12 %);
- starch industry (white corn; 12 %);
- brewing (1 %);
- seed (1 %).

One question which is frequently asked is whether Indian companies will be able to compete with the multinational seed companies operating in India with respect to maize research, seed production and sales. My thinking is that Indian and multinational seed companies may co-exist in this vast market. Selling price of maize seed varies from 50 to 250 rupees per kilogram (Table 8).

Of course, the multinational corporations have a wide collection of germ plasm and a very massive research network. This gives them an edge, but they are operating in the premium price segment, whereas the low-, medium- and high-price segments are still available for Indian companies, for which there is a vast acreage available. It is hoped that demand for corn seed is expected to be more than 30 million tonnes by 2015 (Rath and Joshi, NSAI Magazine Oct.–Dec. 2010, p. 24–25).

**Table 6.** Maize area and production of few selected countries (FAOSTAT, 2009)

Country	Maize area, ha	Production, million tonnes	Yield, t/ha
World	159531007	817110509	5.12
USA	32209277	333010910	10.34
Argentina	2337175	13121380	5.61
China	30478998	163118097	5.35
Brazil	13791219	51232447	3.71
Mexico	7200000	20202600	2.81
India	8400000	17300000	2.06

**Table 8.** Approximate selling prices of maize in India

Price segment	Price, rupees/kg
Low price: composite, varieties etc.	40–70
Medium price: hybrids, double cross, 3-way cross etc.	80–100
High price, double cross, 3-way cross and single cross	100–150
Premium price: single cross	150–250

**Table 7.** Area, production and yield of maize in selected states of India (2008–09) (Source: Directorate of Economics and Statistics, Department of Agriculture and Cooperation)

State	Area, million ha	Proportion of total area, %	Production, million tonnes	Proportion of total production, %	Yield, kg/ha
Andhra Pradesh	0.85	10.42	4.15	21.04	4873
Tamil Nadu	0.29	3.51	1.26	6.37	4389
West Bengal	0.09	1.11	0.34	1.74	3782
Punjab	0.15	1.85	0.51	2.60	3404
Karnataka	1.07	13.08	3.03	15.35	2833
Bihar	0.64	7.84	1.71	8.69	2676
Himachal Pradesh	0.30	3.64	0.68	3.43	2273
Jammu & Kashmir	0.32	3.86	0.63	3.21	2005
Rajasthan	1.05	12.88	1.83	9.27	1736
Uttar Pradesh	0.80	9.78	1.20	6.07	1499
Gujarat	0.50	6.10	0.74	3.75	1481
Jharkhand	0.22	2.64	0.30	1.54	1407
Madhya Pradesh	0.84	10.29	1.14	5.80	1361
Others	0.41	4.98	0.64	3.23	1560
All India	8.17	100.00	19.73	100.00	2414

Incorporating tolerance against the main biotic and abiotic stresses, particularly drought, either by conventional breeding or biotechnological tools, offers particularly promise.

In future, global warming is likely to aggravate the environmental stress for wheat and rice (Ortiz *et al.*, 2008, *Climate change: can wheat beat the heat? Agriculture, Ecosystem and Environment*, 126 (1/2), 46–58). In this scenario, maize, a C4 plant (see box at right), may have an increased role in the future agricultural landscape.

### Executive summary

There are about 500 seed companies in India belonging to the public and private sectors. The combined turnover of seed industry is estimated to be 150 billion rupees in 2011 (3.333 billion US dollars; 1 dollar = 45 rupees). Of this, 130 billion rupees (USD 2.889 billion) comes from crop seed and 20 billion rupees (USD 444 million) from vegetable seeds. This places India at 3rd position in the world after China, whereas the International Federation of Seedsmen (2010) has put India at 6th position (USD 1.5 billion = 67.5 billion rupees). Various Indian authors have also estimated the Indian seed industry turnover to be 60 to 80 billion rupees. According

to the present estimate, we are at 3rd position in the world when only 25 % of the required seed is sold through the organized sector. If it is increased to 40–50 % we may be number one in the world. And we have the capability to be number one. The seed industry took a big leap forward after the commercialization of Bt cotton in 2002. Having seen the success of the Bt gene, many companies are looking to incorporating useful traits in their products for commercialization, but so far success has eluded them. It is hoped that the Round-up Ready flex gene may be commercialized in 2013. Technology for added value in products has become a central point for product development. However, the development of technology and its integration in products are expensive, a cost that small companies cannot afford. Paddy and maize are expected to drive the growth of the Indian seed industry further. In India, paddy is grown on 44 million hectares. In 2011, turnover from paddy was calculated to be about 20 billion rupees (USD 444 million), and it may reach about 40 billion rupees (USD 888 million) by 2016. Similarly, maize turnover is currently about 7 billion rupees (USD 156 million) which could be doubled in the next 4 years. The area under maize, a C4 crop (see box), may increase to mitigate the impact of climate change. ■

### C4 plants

C4 plants utilize the C4 carbon fixation pathway, in which the CO<sub>2</sub> is first bound to a phosphoenolpyruvate in the mesophyll cell, resulting in the formation of a 4-carbon compound, oxaloacetate, that is shuttled to the bundle sheath cell where it is decarboxylated to liberate the CO<sub>2</sub> to be utilized in the C3 pathway. A C4 plant is better adapted than a C3 plant in an environment with high daytime temperatures, intense sunlight, drought, or limitation of nitrogen or CO<sub>2</sub>. Most C4 plants have a special leaf anatomy, Kranz anatomy, in which the vascular bundles are surrounded by bundle sheath cells. Upon the fixation of CO<sub>2</sub> into a 4-carbon compound in the mesophyll cells, this compound is transported to the bundle sheath cells in which it is decarboxylated, and the CO<sub>2</sub> is re-fixed via the C3 pathway. The enzyme involved in this process is PEP carboxylase. In this mechanism, the tendency of rubisco (the first enzyme in the Calvin cycle) to photorespire, or waste energy by using oxygen to break down carbon compounds to CO<sub>2</sub>, is minimized. Examples of C4 plants include maize, sorghum, sugarcane, sunflower and broccoli.

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The Edition 2013 (effective 1 January 2013) includes the latest changes passed at the ISTA Ordinary Meeting 2012, held at Venlo, the Netherlands. Updates, in the form of additions or replacements of existing pages, are published as Amendments and can be inserted separately into the binder.

**Amendments Part A: effective 1 January 2013**

**Amendments Part B (changes regarding large herbage seed lots):  
dispatch April 2013, effective 1 July 2013**

Prices (incl. Annexe to Chapter 7):

**Complete Edition 2013: CHF 421.00 (approx. USD 450.00/EUR 348.00)**

**Amendments: CHF 115.00 (approx. USD 123.00/EUR 95.00)**

All purchasers will receive Amendments Part B free of charge in April 2013. Available from the ISTA Secretariat (for contact details, see back cover)



# Report from the ISTA Annual Meeting 2012

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The International Seed Testing Association (ISTA) was delighted to hold its Annual Meeting in collaboration with the National ISTA Designated Authority of the Netherlands from 11 to 14 June 2012. The conference venue chosen for this occasion was the Floriade 2012, a unique world horticultural expo situated in Venlo, a small city in the province of Limburg, close to the German border. The Floriade is staged only once every 10 years. It is very popular (2012: 2 million visitors), as it showcases the world's best flowers, plants, trees, fruits and vegetables.

This year, the Annual Meeting was preceded by a Variety workshop and a Flower Seed Testing workshop. Both workshops were organized together with the Dutch colleagues from Naktuinbouw and were held from 6 to 8 June in Roelofarendsveen, the Netherlands. More information on these workshops is available on page 63.

The participation at this meeting was the highest ever reached at an ISTA Annual Meeting. We are very proud to report that the meeting was attended by a record number of 272 participants from state and public sector. In fact, there were participants from universities, companies, seed industry and governments, representing in total 51 countries. However, the majority of participants were from seed companies and the remainder from research institutes.

Following the opening of registration, the meeting started with the Welcome Reception, held on Sunday evening, the 10th of June. The Welcome Reception took place at the reclusive Beach Club at the premises of the Floriade. The beautiful weather enabled everyone who came to the Welcome Reception to spend an amusing evening in sunshine outside the Beach Club and to enjoy the food and drinks offered by the courteous waiters.

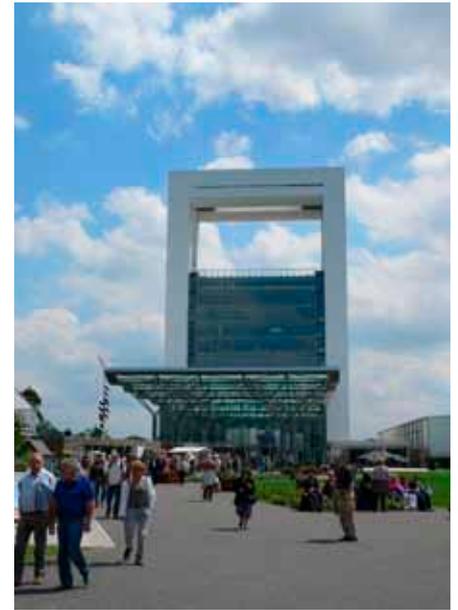


Attilio Lovato with Nico Koomen, President of the Dutch Horticultural Council (Nederlandse Tuinbouwraad), the organizers of the Floriade.



Head of the National Organizing Committee, Joost van der Burg.





The following day, on June 11, the ISTA President opened the meeting by welcoming everyone present for the ISTA meeting. After the opening of the meeting, the ISTA Seminar organized by the ISTA Advanced Technology Committee was held. The topic of this year's ISTA Seminar was about the future of technologies from the past, in fact, how we use these technologies and what happens to future technologies of today. The Seminar was led by the Technical Committee Chair Bert van Duijn and was attended by 248 people (see separate report on page 16).



On Tuesday and Wednesday, the technical committees presented their work. The schedule was filled by sessions on current issues such as Rules Proposals which were later to be discussed and voted on in the Ordinary Meeting. On both days, each committee was given the opportunity for side meetings either at the meeting venue or at one of the hotels. As usual, some of the meetings were held privately, others were open for public participation.

On Wednesday evening, the Official Dinner took place in the beautiful greenhouse Villa Flora at the Floriade. The marvellous location and the exotic music allowed everyone to spend an enjoyable and unforgettable evening with food and wine. Some of the participants even chose to dance on stage and since the dinner tables were round, it was easier for everyone to chat with people sitting on the same table.



On the last day of the meeting, the Ordinary Meeting was opened by a welcome of the ISTA President. The Ordinary Meeting

## ISTA Annual Meeting 2012



Bert van Duijn, Chair of the ISTA Seminar.



was attended by around 150 participants. The ISTA President expressed his appreciation for the invitation from the national Designated Authority and later remarked on the importance of the Netherlands as a seed-production country.

After the President's address, the Roll Call of the Designated Members entitled to vote revealed that 35 voting delegates were present at the meeting. To reach a quorum, 29 voting delegates were required, therefore the meeting was declared quorate.

Before proceeding to the voting items of the day, the programme continued with the reports from the Executive Committee which consisted of several items presented: the annual report of the Executive Committee, a presentation on the legal status of the Association and a presentation on an internal finance tool. The annual report from the Secretary General followed as a separate agenda point.

Then a short introduction was given to explain why the vote on a modified Constitution was put for vote under agenda point 7., which is to ensure that ISTA is recognized as an association under the Swiss Civil Code 60 ff. A vote on the Constitution Changes 2012 was then proceeded with, and 'The Articles of the International Seed Testing Association' as they were to be called after a successful vote by the ISTA voting delegates then came into force as accepted by the voting delegates and officially signed by the ISTA Officers (see page 19).

The next item on the agenda was the fixation of annual fees. The proposal put forward by the Executive Committee was to



The ISTA Secretariat information stand.

raise the fees by 1% to help offset increased salary costs due to inflation or changes in responsibilities. After a lively debate, the majority of the voting delegates voted in favour of the proposed increase to come into force on January 1, 2013.

Thereafter, the proposed changes to the International Rules for Seed Testing 2013 were up for debate and voted on by the 35 voting delegates item by item. One of the main rules proposals up for vote were the proposed modifications to chapter 2.5.4.2 Large herbage seed lots, but there were also many other rules proposals: additions of new species; a proposal to allow the issuing of original Orange International Seed Lot Certificates for partial seed lots; taking the container-sample for heterogeneity testing; several PSD modifications; amendments to the description of seedling abnormalities; ending germination tests at a pre-determined germination level; a new seed health method on Detection of infectious tobamoviruses on *Lycopersicon esculentum* (Tomato) by the local lesion assay (indexing) on *Nicotiana tabacum* plants; addition of a PCR testing option to an existing seed

health method; proposals for sample sizes for seed health tests; amendment to the seed health method for Detection of Pea Early Browning Virus and Pea Seed-borne Mosaic Virus on *Pisum sativum*; removals of the low-temperature method for those species where it has not been individually validated from the Moisture Table; and also a clarification of purity testing for weighed replicates test.

The consideration and adoption of the reports of the Technical Committees was done by applause not at least to acknowledge all their work and support for the Association.

The venue of the Congress 2013 which in fact will be held in the beautiful city of Antalya in Turkey, from 12th to 18th of June 2013 (more information is available on [www.seedtest.org/Congress2013](http://www.seedtest.org/Congress2013)) was then presented under the agenda point 'Announcement of place and date of the next Ordinary Meeting', followed by a presentation on the Seed Symposium 2013 which is part of the Congress. Then everyone was invited to stunning Edinburgh for the ISTA Annual Meeting 2014.

After the closing address of the ISTA President, the organizers in the Netherlands were given a certificate of appreciation, expressing gratitude for all their work on behalf of the Association in organizing the meeting. The President also thanked everyone for the very intensive and productive meeting and invited everyone to the next Ordinary Meeting to be held in Turkey.

The high participation to this year's ISTA Annual Meeting was highly appreciated and special thanks goes all speakers, exhibitors, and active participants for the successful meeting. Thanks are also due to the staff for their tremendous amount of work and efforts in the preparation and organisation of the meeting. The ISTA Annual Meeting 2012 was an unforgettable experience and very fruitful in terms of lively discussions and decisions made. All the hard work ultimately contributed to the success of this year's meeting.

Further information about the Annual Meeting 2012, including minutes and presentations, is available on the ISTA web site at [www.seedtest.org/AM12](http://www.seedtest.org/AM12). ■

ISTA Annual Meeting 2012





The Executive Committee.



Discussion and panel session.



The National Organizing Committee: Harry Nijenstein, Marcel Toonen, Reini Verboom and Joost van der Burg (not present: Marien Valstar).



# ISTA Seminar “New developments and technologies in seed testing”

Bert van Duijn

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The ISTA Seminar entitled “New Developments and Technologies in Seed Testing” was, apart from the Welcome Reception the day before, the starting event of the 2012 Annual Meeting. Being a Committee with the aim to provide information on new technologies to the other ISTA Technical Committees, the Advanced Technologies Committee (ATC), as main organizer, involved all the ATC contact persons of the other TCOMs in the organization of the seminar programme. This included requesting and providing feedback, suggestions and support. This resulted in a multifaceted programme with 13 lectures.

The lectures involved speakers from eight different countries (USA, UK, France, Denmark, Sweden, New Zealand, Italy and the Netherlands), affiliated to universities, institutes and companies. Expecting a very high diversity in areas of interest, and in addition a scientific and practical level among the attendants, a main challenge for the organizers was to include enough topic diversity and scientific and practical level differentiation in the seminar; especially in order to satisfy the majority of this very special audience. Based on the feedback survey on the seminar, which showed over 75% of the attendants rating the seminar between good and excellent, the organizers can be satisfied with the result.

There were 248 seminar participants from 51 different countries, representing scientists and seed laboratory specialists from the private, state and public sectors, laboratories, institutes, and universities. After the opening of the seminar by ISTA President Joël Léchappé, the Chair of the Seminar and the ATC, Bert van Duijn, introduced the major session topics. The three sessions ranged from vision and

image analysis, via sensors, to molecular technologies. Each topic was illustrated shortly by looking into possible technologies that may become sooner or later part of seed testing assays.

## Vision and image analysis

In the vision and image analysis session various aspects of the application of vision and image analysis technologies and approaches in seed testing were covered. These technologies differ e.g. in the wavelength (type of light, radiation) used to capture the image and the test application.

On this topic, Birte Boelt from Aarhus University (Denmark) clearly explained the principle of multispectral cameras and imaging, and its power to identify seed quality differences at the level of individual seeds. Such systems can be used for quality testing of seed batches as well as in seed sorting. Similarly, working at a different wavelength and showing internal structures, X-ray images can also be used.

Henry Bruggink from Incotec (NL) has worked for over 15 years on the development of X-ray seed evaluation and sorting systems. He explained the restrictions of X-ray imaging in seed testing (connected with radiation physics and seed physiology) as well as the ins and outs of the image analysis software that is essential in the application of X-ray images in seed evaluation. Both multispectral imaging and X-ray imaging are technologies that currently are available and used in seed testing and sorting. Nonetheless, this is not (yet) the case with magnetic resonance imaging (MRI), a technology that is applied to almost every standard used in hospitals nowadays.

Fabio Gorian from the Forestry Research and Conservation Institute (Italy) showed impressive MRI images of tree seeds, and illustrated how these images uncovered defects in seeds. Future developments may lead to the availability of MRI as a standard technique in seed testing.

Stephen Harper from GTG/Germains (UK) and Étienne Belin from SNES/GEVES (France) presented examples of the current use of visual light seed imaging in a practical application involving imaging of the germinating seed. In the analysis of primed seeds, GTG uses a fully automated system based on the imaging of the seedlings.

Etienne Belin informed on the software issues involved in seed image analysis and the challenges in monitoring seedling elongation in seed testing.

The final lecture in the session, by John Bijl and Cees Visser from ViVi (Netherlands), illustrated emerging possibilities for the use of image analysis in systems. In fact, image analysis in systems allows the sale to growers of sorted seedlings in protected containers, as an alternative to seeds. This possibility supports the ISTA notion that seedling quality and testing is increasingly important.

## (New) Sensor applications in seed testing and developments in seed technology

The morning continued with a session on sensor applications in seed testing, including new developments in seed technology. Parameters discussed in seed testing were oxygen, ethanol, and water activity.

In a range of experiments and data analysis, Kent Bradford, from the University of California Davis (USA), showed approaches to the measurement of seed oxygen consumption during germination. Such approaches can be used as a valuable tool in the determination of seed quality aspects, at both the single-seed and seed batch levels.

This lecture was complemented by Steven Groot from Wageningen University and Research Centre (Netherlands), who spoke about the use of ethanol determinations in the headspace of seed containers to determine seed viability. Both (single-seed)



The speakers at the Seminar: (from left to right) Bert van Duijn (Seminar Chair), Steven Penfield, Frans Tetteroo, Kent Bradford, Cees Visser, John Bijl, Patrik Stolt, Birte Boelt, Steven Groot, Henry Bruggink, Stephen Harper, Étienne Belin, Beni Kaufman

oxygen consumption and ethanol measurements promise to become standard tools in seed research and seed testing laboratories.

Craig McGill from Massey University (New Zealand), and representing the ISTA Moisture Committee, explained very clearly in an impressive appearance the difference between moisture content and water activity and their measurements in seed testing. The advantages of water activity measurements were clearly illustrated and are subject of studies and evaluation of the Moisture Committee.

The session was completed by Frans Tetteroo from Incotec (Netherlands), who showed all the possibilities and functionalities available today in seed coating and seed pelleting technology. In his presentation, he also included an outlook into the future.

### Molecular technologies in seed testing

In the final session, molecular technologies in seed testing were discussed. Both Steven Penfield from Exeter University (UK) and Patrik Stolt from ScanBi

Diagnostics (Sweden) gave excellent overviews of different levels of detail, possibilities, technical challenges, and applications of molecular technologies as means of understanding seed quality aspects as well as seed testing assays.

Finally, Benjamin Kaufman from Pioneer HiBred (USA), representing the GMO committee, talked about DNA markers in purity testing. He explained to the audience the challenges and opportunities that the GMO Committee is facing in terms of the application of DNA marker technology to seed testing, and specially seed purity testing.

### New technologies and ISTA Rules, needs and implementation barriers

A final session was dedicated to the perspective of all these new developments and technologies in relationship to the ISTA International Rules for Seed Testing.

Alison Powell from Aberdeen University (UK) wrapped up the day by explaining the most important issues to be considered on

the route to implementation of new views, technologies, and scientific advances in the ISTA seed testing rules.

All presentations of the Seminar are available on the ISTA web site ([www.seedtest.org/Final\\_Programme](http://www.seedtest.org/Final_Programme)). They provide a valuable source of information for those who attended the seminar, but also for those who could not be present. The Seminar showed that new technologies and developments in seed testing emerge quickly, and should be monitored closely and continually by the seed testing community for applicability and robustness. The organizers thank the ATC members and ATC contact persons from the other Committees very much for their valuable input, suggestions, and critical questions, as well as the members of the ISTA Secretariat for coordination, logistics, and preparations. Last but not least, our committee is grateful that so many excellent speakers agreed to deliver a presentation and thus ensured a successful, really interesting, and enjoyable Seminar. ■

# ISTA signs a Memorandum of Collaboration with the Royal Botanic Gardens, Kew

Alison Powell

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At the ISTA Annual Meeting in Venlo in June 2012, the ISTA President, Joël Léchappé added his signature to a memorandum of Collaboration (MoC) with the Royal Botanic Gardens (RBG), Kew, UK. The MoC had previously been signed in London by Tim Entwistle, Kew's Director of Conservation, Living Collections and Estates. The MoC represents the outcome of work within the ECOM Working Group on Seed Science, which is made up of Alison Powell (Chair), Joël Léchappé, Françoise Corbineau (Université Pierre et Marie Curie, France), Alan Taylor (Cornell University (USA) and Robin Probert (RBG, Kew, UK). This working group was set up in 2007 and included within its objectives to increase collaboration with other organisations and to maintain and increase ISTA's involvement in science. Discussion within the working group led us to believe that collaboration with RBG, Kew (most specifically with the Conservation Department and the Millennium Seed Bank) would help us to achieve both these objectives. Close collaboration with Robin Probert (Head of Conservation and Technology, Seed Conservation Department, RBG, Kew), has helped us to achieve this collaboration, and we are particularly grateful to him for his support.

ISTA and RBG, Kew have much in common. Both are non-profit-making organisations committed to the maintenance and improvement of seed quality for agriculture, forestry and land restoration, as well as the introduction of species. The focus of RBG, Kew's Millennium Seed Bank Partnership (MSBP) and its global network of laboratories is the long-term conservation and use of seeds of wild plants, crop relatives and wild species. Within this framework, evaluation and maintenance of seed quality is essential. ISTA members are



ISTA President Joël Léchappé signing the Memorandum of Collaboration with the Royal Botanic Gardens, Kew.

committed to developing and establishing standard methods for sampling seeds and testing seed quality, accrediting seed testing laboratories and promoting research in all aspects of seed science and technology.

Close relationships between the two organisations have existed for a number of years. Conservationists from Kew's Millennium Seed Bank have contributed to ISTA's Technical Committees, for example Hugh Pritchard (Head of Research, Seed Conservation Department) as Chair of the Storage Committee and as a member of the Forest Tree and Shrub Committee, and Moctar Sacandé (International Programme Co-ordinator for Africa, Seed Conservation Department) as a member of the Storage Committee and as one of the Associate Editors of Seed Science and

Technology. A former member of staff at Kew, Fiona Hay, is now Chief Editor of Seed Science and Technology. In addition, representatives of Kew have given presentations at ISTA seed symposia, and ISTA members have contributed to, or are currently involved in, research programmes across Kew's Millennium Seed Bank Partnership.

The signing of this Memorandum of Collaboration will encourage greater communication, exchange of information and collaboration between ISTA Member Laboratories and RBG, Kew and its international partners. There will be particular interest in wild plant species not currently in the ISTA Rules, including crop relatives and forestry species which will contribute to the maintenance of food security and plant diversity in the future. ■

# A new legal basis for the International Seed Testing Association

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At this year's Ordinary Meeting, an important agenda point was the vote on changes to the ISTA Constitution, in order to establish ISTA as an association under Swiss law (see *Seed Testing International* 143, April 2012).

The vote was preceded by a presentation by ECOM member Alison Powell (UK) on the legal status of the Association, outlining the many reasons for the various changes, such as allowing the Association to comply more easily with Swiss tax law, defining liabilities etc.

Another change was the name of the Constitution, which would in future be known as the "Articles of the International Seed Testing Association (ISTA)".

The vote itself, under Agenda point 7, was introduced by ECOM member Craig McGill (New Zealand), Chair of the ECOM Working Group on Constitution and Bylaws.

The motion to accept the new Articles was passed unanimously by the Voting Delegates.

The new Articles were then signed by ISTA President Joël Léchappé (France) and Officer Francisco Krzyzanowski (Brazil), and so immediately came into force as of 14 June 2012. This is an important milestone in ISTA's history.

The new Articles are presented on the following pages, with changes marked in blue. The Articles can also be downloaded from the ISTA web site, under "About ISTA".

## The Articles of The International Seed Testing Association (ISTA)

### I. Name and Seat

#### Article 1 Name

The Association shall be known according to the Swiss Civil Code articles 60 ff. as The International Seed Testing Association, hereinafter referred to as "the Association".

#### Article 2 Seat

The seat of the Association shall be at the office of the Secretary General in Switzerland.

### II. Objects

#### Article 3 Primary Purpose and Secondary Purposes

(a) The primary purpose of the Association is to develop, adopt and publish standard procedures for sampling and testing seeds, and to promote uniform application of these procedures for evaluation of seeds moving in international trade.

(b) The secondary purposes of the Association are actively to promote research in all areas of seed science and technology, including sampling, testing, storing, processing, and distributing seeds, to encourage variety (cultivar) certification, to participate in conferences and training courses aimed at furthering these objectives, and to establish and maintain liaison with other organisations having common or related interests in seed.



ISTA President Joël Léchappé and Officer Francisco Krzyzanowski signing the new ISTA Articles.

# ISTA Annual Meeting 2012

## III. Membership

### Article 4 Governments, Authorities and Members

#### (a) Government

The word Government shall mean member of the United Nations or its specialised agencies or Distinct Economies as recognised by international fora.

#### (b) Designated Authority

A Designated Authority is an authority designated by a Government to act on its behalf in designating Designated Members and in liaison with the Association.

#### (c) Designated Member

A Designated Member is a Personal Member designated by their Designated Authority and **entitled to vote**, subject to the provisions of Article 12.

#### (d) Member Laboratory

A Member Laboratory is a laboratory engaged in the testing of seed which supports the Association and its objectives and is admitted by the Association.

#### (e) Personal Member

A Personal Member is a person engaged in the science or practice of seed testing or in the technical control of such activities who supports the Association and its objectives and is admitted by the Association. A Personal Member may be nominated by a Member Laboratory to represent the Member Laboratory in the affairs of the Association.

#### (f) Associate Member

An Associate Member is a person who is not a Personal Member, but who supports the Association and its objectives, and is admitted by the Association.

#### (g) Corporate Member

A Corporate Member is any organisation which supports the Association and its objectives, pays an appropriate annual fee to the Association, and is admitted by the Association.

#### (h) Honorary Life Member

An Honorary Life Member is a person who in the opinion of the Association has made an outstanding contribution to the Association, and has been honoured by election to the status.

#### (i) Accredited Laboratory

An Accredited Laboratory is a member laboratory accredited by the Executive Committee according to the Accreditation Standards approved under Article 15(c) (15) of the Constitution.

### Article 5 Withdrawal

(a) Any Government may withdraw its Designated Members from the Association by giving notice of withdrawal at any time. Such notice shall be communicated to the Secretary General who shall inform all Members thereof.

(b) If a Government states, in its notice, that its withdrawal is because it cannot comply with an amendment adopted under Article 20, such withdrawal shall be effective on the date of the entry into force of such amendment, provided the Secretary General has received the notice not more than 30 days after the entry into force of the amendment. Withdrawal under any other circumstances shall become effective at the end of the calendar year in which the notice for that purpose is given.

(c) The financial obligation to the Association of a Government which has given notice of withdrawal shall include the entire calendar year in which the notice is given, except that, if the withdrawal is effective on the date of the entry into force of an amendment as provided above, the Government shall have no further liability for subscription after that date.

(d) Any Member may withdraw their Membership from the Association by giving notice of withdrawal at any time. Such notice shall be communicated to the Secretary General who shall inform all Members thereof.

(e) If a Member states, in their notice, that the withdrawal is because they cannot comply with an amendment adopted under Article 20, such withdrawal shall be effective on the date of the entry into force of such amendment, provided the Secretary General has received the notice not more than 30 days after the entry into force of the amendment. Withdrawal under any other circumstances shall become effective at the end of the calendar year in which the notice for that purpose is given.

(f) The financial obligation to the Association of a Member for which notice of withdrawal has been given shall include the entire calendar year in which the notice is given, except that, if the withdrawal is effective on the date of the entry into force of an amendment as provided above, the Member shall have no further liability for subscription after that date.

### Article 6 Protection of Members

Any Member who has not consented to a resolution which infringes the law or the Articles of the Association is entitled by law to challenge such resolution in court within one month of learning thereof.

### Article 7 Exclusion

Any exclusion of Members requires a resolution by the Members and good cause.

## IV. Bodies and Capacity to Act

### Article 8 Bodies

#### (a) General Meeting of Members

(b) Executive Committee (as the governing body of the Association)

#### (c) Financial Auditors

### Article 9 Capacity to Act

(a) Legal entities have capacity to act once the (governing) bodies required by law and their articles of Association have been appointed.

(b) The (governing) bodies express the will of the legal entity.

(c) They bind the legal entity by concluding transactions and by their other actions.

(d) The governing officers are also personally liable for their wrongful acts.

## A. The General Meeting of Members

### Article 10 Powers

(a) The General Meeting of Members appoints the Officers and the Executive Committee and decides all matters which are not reserved to other governing bodies of the Association.

(b) It supervises the activities of the Executive Committee and Financial Auditors and may at any time dismiss – whenever justified by good cause – the latter without prejudice to any contractual rights of those dismissed.

## Article 11 Meetings

(a) An Ordinary General Meeting of Members shall normally be held every year, but Extraordinary General Meetings may be held when considered necessary by the Executive Committee or by law when requested by one-fifth of the Members.

(b) Matters in dispute at General Meetings of the Association shall be referred to a vote.

(c) In the event of a tie in a vote, the President, or in his/her absence the Vice-President shall have a deciding vote at General Meetings of the Association and of the Executive Committee. In all other committees of the Association, in the event of a tie, the acting Chairman shall have a deciding vote.

(d) Designated Members designated by forty percent of the Designated Authorities shall constitute a quorum at General Meetings of the Association. In determining the percentage, fractions less than 0.50 shall be dropped and those 0.50 or greater shall be regarded as a whole number. If the Ordinary General Meeting is not quorate a 'by correspondence' vote will be held to allow the adoption of Ordinary General Meeting agenda items.

(e) The agenda for an Ordinary General Meeting shall include:

- (1) Call to order.
- (2) President's address.
- (3) Roll call of Designated Members entitled to vote.
- (4) Comments about the minutes of the previous General Meeting.
- (5) Report of the Executive Committee.
- (6) Report of the Secretary General.
- (7) Fixation of annual subscriptions.
- (8) Consideration and adoption of reports.
- (9) Announcement of the place and date for the next Ordinary General Meeting.
- (10) Any other business raised by a Member, of which notice in writing has been received by the Secretary General at least

two months prior to the date of the General Meeting.

(11) Any other business raised by consent of the Executive Committee.

(12) President's closing address.

(13) Adjournment.

(f) Additionally at the Ordinary General Meeting held in the third year after the Ordinary General Meeting at which officers and members-at-large of the Executive Committee were appointed:

(14) Discharge of the Executive Committee.

(15) Election of Officers and members-at-large of the Executive Committee.

(16) Installation of new Officers.

(g) The Executive Committee approved minutes of the Ordinary General Meeting will be published on the ISTA website within two months of the Ordinary General Meeting. If there are no comments requiring amendment to the minutes within the subsequent two month period, the minutes will be considered approved. If there are comments and the comments are accepted by the Executive Committee, then the minutes including the comments will be considered approved and published on the ISTA web site.

(h) Any comments about the minutes of the previous General Meeting will be considered at the next Ordinary General Meeting under agenda Article 11 (e) (4).

## Article 12 Voting

(a) Irrespective of the number of Designated Members designated by a single Government, only one vote may be cast on behalf of that Government.

(b) The following categories of motions require for adoption a two-thirds majority of those voting:

- (1) Motions to alter these Articles.
- (2) Motions to dissolve the Association.
- (3) Motions arising during General Meetings and relating to temporary adjournment, closing of debate, or postponement of action.

All other motions require a simple majority of those voting for adoption.

(c) On urgent matters as determined by the Executive Committee, and in which the Executive Committee is not authorised to act,

voting members may be requested by the President to vote by correspondence during the period between Ordinary General Meetings of the Association in accordance with letter (a) and (b) of this Article.

(d) Each Member is by law excluded from voting on any resolution concerning a transaction or dispute between him or her, his or her spouse or a lineal relative on the one hand and the Association on the other.

## Article 13 Officers

(a) The Officers of the Association shall be:

- (1) President.
- (2) Vice-President.

(b) The tenure of office of the President and Vice-President shall be from the adjournment of the Ordinary General Meeting at which they were appointed to the adjournment of the Ordinary General Meeting of Members held in the third year after the Ordinary General Meeting at which they were appointed. If the Ordinary General Meeting at which elections are held is not quorate the tenure of the existing Executive Committee will continue until a 'by correspondence' vote can be held to discharge the Executive Committee and to appoint a new Vice-President and new Executive Committee.

(c) On completion of the tenure of office the outgoing President shall not at any time in the future be eligible for reappointment as President or for appointment as Vice-President.

## Article 14 Functions of Officers

(a) The President shall call and preside at General Meetings of the Association and meetings of the Executive Committee. The President shall be an ex-officio member of all committees of the Association.

(b) The Vice-President shall assist the President and, in the event of the inability of the President to serve, shall carry out such duties as pertain to the office of the President. In the event that a President cannot continue in office for the remainder of his/her term, the Vice-President will be referred to as the President for the remaining period of that Presidency and will also



## ISTA Annual Meeting 2012

serve for the expected period of his/her own Presidency.

### Article 15 Executive Committee

(a) The Executive Committee shall consist of the President and Vice-President, together with nine members-at-large who shall be Designated Members.

(b) The tenure of office of the members-at-large shall be the same as that for Officers as provided in Article 13 (b).

(c) The functions of the Executive Committee shall be as follows:

(1) The Executive Committee shall manage and direct the affairs of the Association according to the provisions of this Constitution and to decisions arrived at by the Association at **Ordinary** or **Extraordinary General Meetings**.

(2) The Executive Committee shall appoint a Secretary General. The task of the Secretary General is to manage ISTA under the authority and the control of the Executive Committee. The relations between the Executive Committee and the Secretary General are laid down in the Management Regulations, established and approved by the Executive Committee.

(3) In the event of vacancies in the panel of Officers or members-at-large of the Executive Committee, the remaining members of the Committee are empowered to appoint substitutes to serve until the next **Ordinary General Meeting** of the Association at which the election of officers and members-at-large will be held.

(4) The Meetings of the Executive Committee shall be called in accordance with the provisions of Article 14 or on the written request of six or more of its members.

(5) The Executive Committee is empowered to form committees to study and report on problems appertaining to the affairs of the Association, to establish and maintain liaison with such other organisations as may be concerned with the objects of the Association, and plan and approve conferences and training courses aimed at furthering the objectives of the Association.

(6) Responsibility for the finances of the Association is vested in the Executive Committee.

(7) The Executive Committee shall appoint an Editor to "Seed Science and Technology".

(8) The Executive Committee shall approve interpretations of the International Rules for Seed Testing, when need therefore arises, after having consulted with the technical committees concerned

(9) The Executive Committee is empowered to appoint, at each **Ordinary General Meeting of Members**, an Auditor who shall not be an Officer or member-at-large of the Executive Committee and who need not be a Designated Member.

(10) The Executive Committee shall render to each **Ordinary General Meeting of Members** of the Association a full account of its proceedings and of the activities of the Association and shall present to said **General Meeting** an audited statement of accounts up to the end of the preceding calendar year.

(11) The Executive Committee is empowered to call and summon an International Seed Testing Congress in conjunction with an **Ordinary General Meeting of Members** of the Association. All such Congresses shall be devoted to the reading of scientific papers, discussions and demonstrations on seed investigations, and such related subjects as appertain to the objects of the Association.

(12) The Executive Committee is empowered to employ and pay for such clerical assistance as is deemed necessary.

(13) The Executive Committee is empowered to approve the admission of new Members of the Association.

(14) The Executive Committee is empowered to delegate the handling of special problems.

(15) The Executive Committee is empowered to approve and publish Accreditation Standards, to accredit member laboratories and to authorise such laboratories to issue International Seed Testing Association Certificates.

(16) The Executive Committee shall prior to an **Ordinary General Meeting of Members** decide the place of the next **Ordinary General Meeting of Members** of the Association.

(17) Six members of the Executive Committee shall constitute a quorum. Between meetings, business shall be transacted by correspondence in which at least 6 members must participate to effect a decision.

### Article 16 Nomination and Election

(a) At the **Ordinary General Meeting of Members** which completes the tenure of office of the President and Vice-President, the outgoing Vice-President, provided that person was duly elected to that office at the **Ordinary General Meeting of Members** three years previous, without further election shall be appointed President for the ensuing period. If at this **Ordinary General Meeting**, for whatever reason, the outgoing Vice-President is not available for appointment as President, the office of the President shall be filled by election by the procedure prescribed for officers in the letters (b) and (c) of this Article.

(b) Subject to the provisions of the letter (a) of this Article, the election of Officers and members-at-large of the Executive Committee shall be by ballot at an **Ordinary General Meeting** of the Association.

(c) Subject to the provisions of the letter (a) of this Article, nominations for the election of Officers and of members-at-large of the Executive Committee may be submitted only by Designated Members. Such nominations shall be in writing supported by a mover and a seconder (both being Designated Members) and must be received by the Secretary General at the latest on the day prior to the **Ordinary General Meeting** at which the elections are to take place.

### C. Auditors

#### Article 17 Figures

(a) The Association must submit its accounts to a full audit by external auditors if two of the following figures are exceeded in two successive business years:

- (1) Total assets of CHF 10 million.
- (2) Turnover of CHF 20 million.
- (3) Average annual total of 50 full-time staff.

(b) The Association must submit its accounts to a limited audit by external auditors if a Member with personal liability or an obligation to provide further capital so requests.

(c) The provisions of the Code of Obligations on external auditors for companies apply *mutatis mutandis*.

(d) In all other cases the Articles of the Association and the General Meeting are free to make such auditing arrangements as they deem fit.

(e) The Association must be registered if it is subject to an audit requirement or if it conducts a commercial operation in pursuit of its objects.

## V. Assets of the Association and Liability

### Article 18 Assets of the Association

(a) Payment of monies belonging to the Association may be made only in connection with matters directly related to the objects of the Association as provided for in this Constitution.

The income of the Association shall be derived from annual membership subscriptions, and from payments and donations received from persons, organisations, or governments for specified or general purposes.

(c) The financial year of the Association shall be from January 1st to December 31st, and subscriptions for each financial year shall be payable on January 1st of that year.

(d) The amount of the annual subscription for Members and the additional fee for Accredited Laboratories shall be determined annually at an Ordinary General Meeting of the Association, due consideration being given to statements submitted in accordance with Article 15 (c) (9) and letter (g) of this Article. Notification of proposals to change the rate of annual subscriptions shall be sent to the Designated Authorities and Members of the Association at least two months prior to an Ordinary General Meeting.

(e) (1) The representation by any Designated Member, the subscription of or for whom/which is still in arrears by the end of the current financial year, shall lapse, provided that due notice of arrears in subscription has been given by the Secretary General.

(2) The membership of any Member, the subscription of or for whom/which is still in arrears by the end of the current financial

year, shall lapse, provided that due notice of arrears in subscription has been given by the Secretary General.

(f) Accounts of all monies received and expended by the Association shall be kept by the Secretary General.

(g) A statement showing the financial position of the Association, examined and certified by the Auditor, shall be circulated annually to the Members of the Association and published in the "Activity Report of the ISTA Committees".

### Article 19 Liability

The Association is liable for its obligations with its assets. This liability is limited to the assets. The Members are not personally liable.

## VI. Amendments and Dissolution

### Article 20 Amendments

The provisions of this Constitution may be amended as follows:

(a) Any proposal to alter the provisions of this Constitution must be received in writing by the Secretary General at least three months prior to the date of the **General Meeting** of the Association at which it is to be considered.

(b) The Secretary General shall communicate any such proposal to each Member of the Association at least two months prior to the date of such **General Meeting** of the Association and shall maintain records showing evidence of such communications.

(c) Amendments of this Constitution shall come into force only if they receive the support of at least two-thirds of the Designated Members voting at a **General Meeting** of the Association, provided a quorum is present.

### Article 21 Dissolution of the Association

(a) Dissolution of the Association can take place when a **General Meeting** called for this purpose shall have voted for the dissolution of the Association by a two-thirds majority of the Designated

Members voting, provided a quorum is present. The funds remaining after dissolution of the Association shall be given to (an) institution(s) granted exemption from taxes with the same or similar objects. Remaining funds cannot be allocated to the Membership.

(b) The Association is dissolved by operation of law if it is insolvent or if the Executive Committee may no longer be appointed in accordance with the Articles of the Association.

(c) Where the objects of the Association are unlawful or immoral, the competent authority or an interested party may apply for a court order of dissolution.

## VII. Final Provisions: Coming into Effect and Interpretation

### Article 22 Coming into Effect

Once the Articles, or changes to the Articles, have been adopted by the voting members at a General Meeting and they are signed on behalf of the Association they come into effect.

The Articles adopted as Constitution in previous meetings of the Association are therefore annulled once the Articles are signed.

### Article 23 Interpretation

In any case where the interpretation of this Constitution is in doubt, the English text thereof shall govern.

The Articles adopted as Constitution in the Zurich 2011 meeting are now annulled. These revised Articles come into immediate effect on:

Date:

Signed on behalf of the Association

ISTA President

ISTA Vice-President/Officer

# Auditors' Meeting 2012

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The ISTA auditors met on 12 June 2012 in Venlo, the Netherlands, during the Annual Meeting of the Association. Eight technical auditors participated besides the three ISTA system auditors.

## General information regarding ISTA audits

The technical auditors were presented with the audit plan for 2012 and 2013. They were also informed about the time periods necessary to produce the audit reports in 2011. The auditors committed themselves to try to provide the audit reports within 14 days of the audit date.

## GMO Workshop/Training for ISTA auditors

The GMO workshop for technical auditors has been scheduled for October 2012. The seed testing laboratory of the University of Bologna (LaRAS) volunteered to host this training session and invited the ISTA auditors. The workshop will cover critical steps of GMO testing, followed by practical demonstrations in the laboratory. The second major topic of the training will be statistical and quality assurance aspects.

## Monitoring of samplers

As already mentioned in the April 2012 issue of STI (No. 143), "Monitoring ISTA samplers: results of questionnaire", the ISTA Executive Committee has confirmed the compulsory requirements for a monitoring system for samplers as stated in the current ISTA Accreditation Standard. The Executive Committee has stated that check sampling is strongly recommended, and that monitoring must include audits. The

ISTA Bulking and Sampling Committee (BSC) was provided with a list of questions and was asked to support in clarifying the minimum requirements that a laboratory must fulfil to meet the ISTA Accreditation Standard. The list included questions such as:

- If check sampling is performed, what is the minimum check sampling rate?
- Can check sampling be omitted if the laboratory has an annual internal audit for sampling that covers every sampler? Is this a physical audit or can it be a video audit, since some laboratories have many samplers located far away from the laboratory.
- The ISTA Accreditation Standard states that the laboratory should be able to detect trends. If there is no check sampling, how would it be possible to detect trends?

The BSC addressed some of the questions, and is working on the remaining ones.

## Technical requirements

The Accreditation and Technical Department often receives queries about the calibration requirements for specific equipment. The technical auditors were asked whether they were willing to participate in a survey. A questionnaire will list various types of equipment and ask specific questions regarding the expected calibration (e.g. frequency of internal or external calibrations or checks). The technical auditors agreed to participate and to provide information regarding the frequency and type of calibration that they would expect when auditing a laboratory. The results will be used to produce a summary the various expectations for equipment. The outcome of the questionnaire might initiate further discussion within the technical auditors' group or discussion with the Technical Committees.

## Selected documents for translation

- Many documents are usually requested to be translated for an ISTA audit. The ISTA auditors discussed whether it would be possible to reduce the number of quality documents.
- The auditors stated that under specific circumstances the complete quality documentation must be translated and provided. This is the case for laboratories applying for their first accreditation audit. When a laboratory requests tests to be included in the scope of accreditation, quality documentation related to these tests must also be submitted for a document review prior to the audit.
- The auditors discussed the possibility to not select such quality documents for tests where the laboratory performed very well in the proficiency test programme. The laboratories will also be asked to provide the number of pages and the type of the documents before requesting the translation.
- The auditors agreed that it is essential to review some of the laboratory's quality documentation prior to the audit. The auditors will still try to reduce the number of documents requested for translation without reducing the quality of the audit.

## Questions and answers to ISTA Technical Committees

During ISTA audits we face questions from the laboratories that are later on sent to the ISTA Technical Committees. This is a selection of answers provided by the Committees which are relevant to the audit process.

- Automatic sampling: Is it allowed that the settings of the automatic sampling device can be changed at all times? Answer of ISTA Bulking and Sampling Committee: the authorised seed sampler takes the responsibility for the

adjustments, and signs the documentation, while allowing the other person to change the settings. This other person will need some training, and records shall be available. The ISTA-accredited laboratories should be able to train and authorise somebody to carry out the duties of adjusting the automatic sampler. The other possibility is to increase the number of ISTA-authorized seed samplers.

- Reporting the moisture determination result on an ISTA Certificate: Is the laboratory required to state the temperature range, e.g. 130–133 °C? Answer of ISTA

Moisture Committee: the laboratory can also just report the temperature used, e.g. 130 °C.

- Reporting of other seeds found during the purity analysis: The laboratory reported a species not listed in the list of stabilized names. However, the species was listed in GRIN. Answer of ISTA Purity Committee: if the species is listed in GRIN but missing on the Stabilized List, the laboratory can report the species. However, if the species is listed in the Stabilized List and a new name is given in GRIN, the Stabilized List name is to be used.

### Other information

- Norbert Leist informed the ISTA auditors that he will retire as technical auditor as of January 2013. Norbert was thanked for his good work as ISTA technical auditor.
- The ISTA auditors were informed that Mary Jane Kelly will leave her position as ISTA system auditor as of the end of June 2012. Mary Jane was thanked for her good work. ■

## Evaluation of participant survey

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Following the ISTA Annual Meeting 2012, the Secretariat sent out an online evaluation survey to the 272 participants. This was completed by 80 participants, or about one third. The Secretariat would like to thank everyone who took the time to answer the questions and give their views on the various issues. This will help the Secretariat a lot when assisting future hosts in the organization of ISTA events.

A synopsis of some of the questions and answers is presented below.

### ISTA Seminar “New developments and technologies in seed testing”

Overall, the presentations at the ISTA Seminar were seen as good or even very good (Fig. 1). For some participants the presentations were too commercial with not enough scientific background, and too focused on the Dutch seed industry.

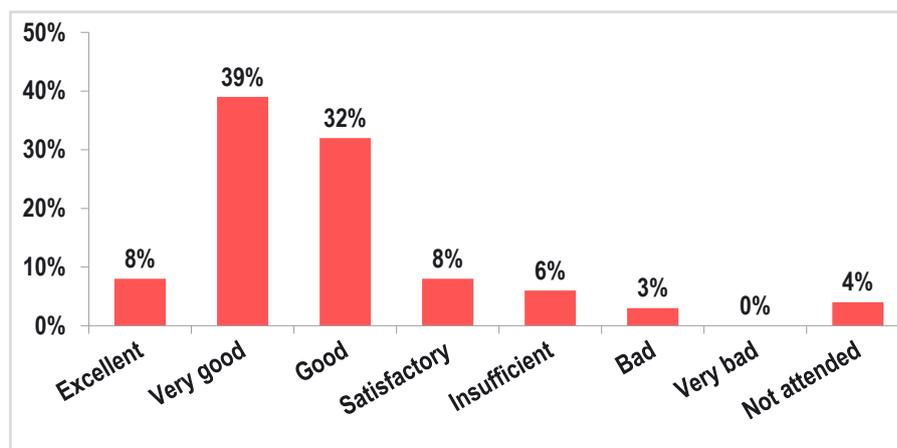


Figure 1. Ratings given to the ISTA Seminar “New developments and technologies in seed testing”.

### ISTA Technical Committees

The presentations of the Technical Committees were rated as good and mostly even very good (Fig. 2). There were also statements received that both quality and scientific and technical depth varied between the different Committees.

### Ordinary Meeting

The Ordinary Meeting was rated as good or even very good (Fig. 3). The participants especially appreciated the good preparation and adherence to the schedule.

### Exhibition

According to the comments given by the participants, the exhibitors mostly covered the areas of interest. However, some felt that exhibitors with a focus on different types of seed equipment would have been an asset, and some also expected the exhibition to be bigger. With regards to the ISTA information booth, most of the answers received were either good or very good.

# ISTA Annual Meeting 2012

## Floriade

Most of the participants rated the Floriade 2012 as good or even very good (Fig. 4). Some found it a shame that because of the full meeting schedule (and unsuitable weather conditions), they didn't have much time to visit the Floriade.

## Conclusion

The overall impression of the participants to the ISTA Annual Meeting 2012 was good. However, many found that the location was not very suitable for an ISTA meeting, because of the long travel distances from the hotels to the meeting venue and between the hotels. On the other hand, the Floriade was seen as a pleasant 'plus' to the Meeting. The general impression of the Meeting programme was very good.

The most important reason for attending the Meeting is clearly the networking aspect, in being able to meet and exchange knowledge with other seed experts. Another important expectation that was mentioned is to get updates on new seed testing solutions available. Some of the participants were more interested in practical solutions, whereas others have higher preferences for theoretical information. The feeling was that the meeting presented an appropriate blend of information.

Most of the participant's expectations were met. If not, the reasons were mostly due to the lack of interaction possibilities with other participants after the meetings.

We are happy to see that most of the participants plan to attend the ISTA Congress 2013 in Antalya, Turkey. Those who indicated that they did not plan to attend the Congress stated the reasons as being mainly due to insecurity of obtaining travel approvals from their superiors/employers.

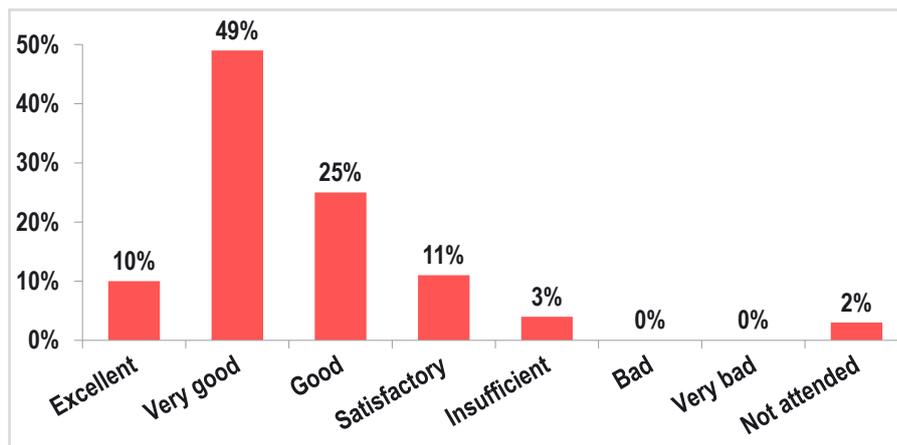


Figure 2. Ratings given to the presentations of the ISTA Technical Committees.

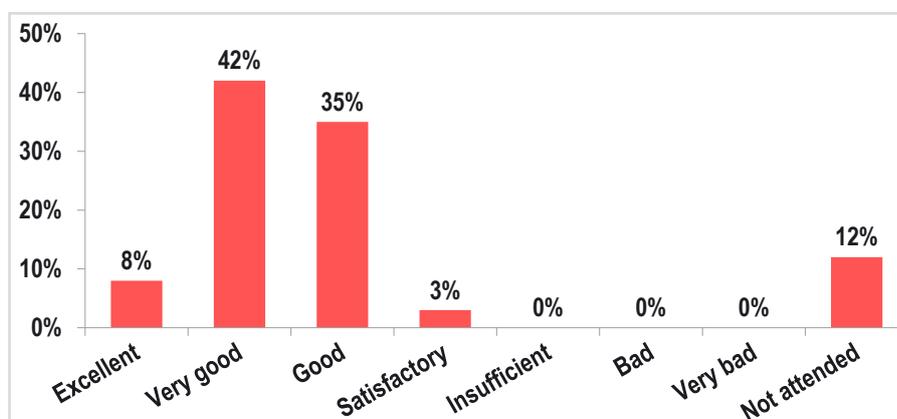


Figure 3. Ratings given to the Ordinary Meeting.

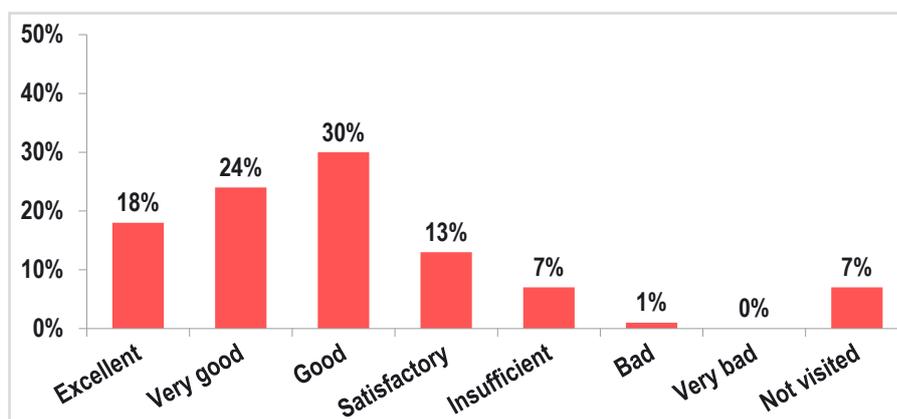


Figure 4. Ratings given to the Floriade.

## Draft Minutes of the ISTA Ordinary Meeting 2012

The draft minutes of the ISTA Ordinary Meeting 2012, held in Venlo, the Netherlands, on June 14, are available on the ISTA web site at [www.seedtest.org/OM12\\_Minutes](http://www.seedtest.org/OM12_Minutes)

# Changes to the *International Rules for Seed Testing* 2013 Edition

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Again this year, a number of changes and amendments to the *ISTA International Rules for Seed Testing* were proposed at the Ordinary Meeting under Agenda point 9. These included final modifications to the Rules Proposals which were discussed and agreed on at the meeting of the Rules Committee the previous day.

Major amendments are that as from 2013, Orange Certificates may be issued for partial seed lots without further testing, and that a germination test may be terminated at a predetermined level. There is a new seed health method for tobamoviruses on tomatoes, and a PCR testing option for *Xanthomonas campestris* on brassicas.

A further major amendment is the increase in the size of herbage seed lots for approved seed production plants.

With regard to the date of coming into effect, the Rules Amendments are split into two parts, A and B.

Part A includes all changes *except* those relating to herbage seed lot size. It will come into effect on 1 January 2013.

Part B includes the changes relating to herbage seed lot size. It will be dispatched in April 2013, and will come into effect on 1 July 2013.

The Rules Proposal document listing all approved Rules changes for 2013, with the final modifications marked in green, can be downloaded from the ISTA web site at [https://www.seedtest.org/Rules\\_ch2013](https://www.seedtest.org/Rules_ch2013).

## Chapter 1: Certificates

- Issuing of original Orange International Seed Lot Certificates for partial seed lots

## Chapter 2: Sampling

- Addition of *Solanum nigrum*
- Addition of *Prunus* spp., for species that are difficult to distinguish
- Submission of large herbage seed lots
- Clarification of taking the container-sample for heterogeneity testing

## Chapter 3: The Purity Analysis

- Transferring *Arachis* to PSD 21
- PSDs 11 and 20–24: broken seed or separated cotyledons contained within testa must be considered to be pure seed
- PSD 36: removal of pedicel no longer compulsory

## Chapter 5: The Germination Test

- Amendment of seedling abnormalities 11/05 and 11/06
- Ending a germination test at a pre-determined germination level

## Annex to Chapter 7: Seed Health Testing Methods

- New method 7-028: Detection of infectious tobamoviruses on *Lycopersicon esculentum* by the local lesion assay on *Nicotiana tabacum* plants
- Modification to method 7-019 by adding a PCR testing option
- Minimum recommended seed sample sizes for seed health methods (Amendments to methods 7-001a, 7-001b, 7-002a, 7-002b, 7-016, 7-017 and 7-018)
- Updates to text of method 7-024

## Chapter 9: Moisture Content

- Removal from Table 9A Part 1 of the low-temperature method for those species where it has not been individually validated

## Chapter 13: Testing Seeds by Weighed Replicates

- Clarification of purity testing for weighed replicates test

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[www.seedtest.org/sst](http://www.seedtest.org/sst)



## New face at the ISTA Secretariat

### Florina Palada

#### System Auditor



Florina Palada was born in Cucuruzu, Romania, and shortly afterwards moved to Bucharest with her parents. The fact that she lived in Bucharest did not stop her from choosing a career in agriculture. She graduated from the agricultural high school in Călugăreni and the Agriculture University, and gained a Master's degree in Sustainable Agriculture at the University of Agricultural Sciences and Veterinary

Medicine, Bucharest. In her PhD thesis she studied the behaviour of some varieties of *Lolium perenne* in various storage conditions over time. The thesis was elaborated at the University of Craiova, Romania. From 2001, she participated in a large number of classes to deepen her knowledge about the establishment and deployment of the quality management system in an organization and carrying out audits in accordance with ISO 9001 and EN ISO /IEC 17025 standards. She successively worked in two laboratories for seed quality control in Romania, starting as a purity analyst and sampler. After nearly 20 years she became the coordinator of sampling and testing of seed lots for International ISTA Certificates and also the Quality Manager. In the same time, she has been an official inspector for field control and also an

auditor. In the past six years she has been Quality Manager of a multinational seed production company, coordinating the activity of the Quality Assurance Department with responsibilities in the QA of every step of the sowing seed production (field, processing, testing and sales), and deployment and maintenance of the quality management system according to ISO 9001. In the same time, she managed client complaints, sampling activity according to the ISTA Rules and the relationships with Romanian official authorities in the seed industry. She also coordinated the process of ISTA accreditation of the company laboratory for sampling and testing. Florina Palada started work in the ISTA Secretariat as ISTA System Auditor in August 2012. ■

## My European sojourn comes to a close

Mary Jane Kelly

Greetings from Canada to all my former colleagues and ISTA friends from around the world! After a whirlwind four years of traveling to audit seed laboratories in more than forty different countries, I am now back in Ottawa with family and friends close-by.

With over 6000 photographs on my laptop, I hope to put together a wonderful memoir of all the people and places I was fortunate enough to travel to and perform accreditation and re-accreditation audits for since August, 2008.

Meeting people from so many diverse backgrounds has enriched my life in ways I would never have thought possible. The cultures and customs, as well as the kindness and thoughtfulness of audit participants I was exposed to, will never be forgotten. I will keep all of you in my thoughts and hope for a re-union one day.

I will definitely miss the excitement of traveling to exotic destinations, but I hope to be able to see more of Canada as an auditor here in the near future.

I also intend to consult for any laboratories interested in ISTA accreditation.

I am very honoured to have worked for the International Seed Testing Association whose goals are so important to the seed industry worldwide. I wish the Secretariat all the best for a healthy, secure future with many more laboratories wishing to become accredited!

All the best,  
MJ Kelly (former ISTA System Auditor) ■

## Call for registration: 17th ISTA GMO Proficiency Test on soya (see p. 58)



# 30th ISTA Congress Antalya, Turkey, 12–18 June 2013

## Overview

Tue–Thur 4–6 June	ISTA Vigour Workshop, İzmir (see page 59)	Friday 14 June	Official Dinner
Thur–Sun 6–9 June	ISTA Workshop on Purity and Germination, Ankara (see page 60)	Sat–Mon 15–17 June	Presentation of ISTA's technical work (see page 32)
Tuesday 11 June	Welcome reception	Monday 17 June	Discussion on ISTA strategy 2013–2016 Discussion Forums
Wednesday 12 June	Opening ceremony	Tuesday 18 June	ISTA Ordinary General Meeting with election of Executive Committee (see page 32)
Wed–Fri 12–14 June	ISTA Seed Symposium (see page 38)	Wed–Fri 19–21 June	Post-Congress tours to İstanbul, İzmir, Kapadokya and Antalya (see page 37)



## Invitation by Mr. M. Mehdi Eker Minister for Food, Agriculture and Livestock of the Republic of Turkey



We, as Turkey and the Ministry are pleased to host the 30th ISTA Congress to be held in 2013. The organization in Antalya of this international seed

congress, which is held once every three years, has importance in terms of history, culture, tourism, agriculture sector and seeding industry.

This land covers the earth where seed was sowed for plant culture for the first time ten thousand years ago.

Our country is like a bridge between East and West in the fields of cultural cooperation, trade and agriculture. It has a strategic significance for ensuring cooperation in those fields. Therefore, it is an active business area for seed manufacturing companies today.

Furthermore, Turkey allows for growing a number of agricultural products, because of its geographical location, and since it is located on the subtropical (temperate) zone containing various climate regions, and it has a Mediterranean climate with hot and dry summers and relatively mild-cool and rainy winters.

Turkey, being a genetic centre for endemic plants with a variety of agriculture and plant patterns, puts forward plant breeding, seed production and trade. Conservation of genetic sources and their use in plant breeding, which are some of the main themes of the Congress, are of vital importance within this context. I would like to invite the seed world family, seed scientists, seed specialists, officials and researchers from all over the world to the 30th ISTA International Seed Congress to be held between 12 and 18 June, 2013 in Antalya, Turkey as the host country.

I would like to express my gratitude to ISTA for organizing this Congress in our country.

Mehdi Eker  
Minister of Food, Agriculture and  
Livestock of the Republic of Turkey

## Invitation by Dr. Joël Léchappé President of the International Seed Testing Association



Dear colleagues and friends,  
It is a great pleasure and honour for me to invite you all to attend the 30th ISTA Congress in Antalya, Turkey. ISTA Congresses are a major worldwide event with regards to seed quality determination and the most important regular event in the life of our Association.

Also for the 30th ISTA Congress, the Executive Committee and the Turkish National Organisation Committee have taken care to offer participants a full and interesting programme. This programme includes technical workshops for the training of seed analysts, a scientific symposium discussing the latest results in applied seed science, a detailed insight into the work of

all 18 ISTA Committees, including their achievements and future plans, and two discussion sessions with focus on topics related to future developments in the area of seed quality determination. The Ordinary General Meeting to handle the affairs of the Association will end the Congress.

I'm convinced that the 30th ISTA Congress will become a milestone for our Association, and I'm looking forward to personally welcoming you at this important and outstanding event in Turkey.

Joël Léchappé  
President of the International Seed  
Testing Association

# Draft programme

Venue: Kervansaray Hotel Lara, Antalya

## Tuesday, 11 June 2013

12:00–19:00 Registration desk open

18:30–21:00 **Welcome reception**

## Wednesday, 12 June 2013

08:00–17:00 Registration desk open

08:30–09:30 **Opening ceremony**

09:30–10:00 **Presentation: The seed industry in Turkey**

10:00–10:30 Coffee break

10:30–11:00 **ISTA Seed Symposium 2013: Evaluation of seed quality: a key step in exploiting the benefits of plant breeding and genetic conservation (see page 38)**

Symposium Convenor: Dr. Alison Powell, University of Aberdeen, UK

11:00–12:30 **Session 1: Role of quality evaluation in seed production**

Chair and Lead Speaker: Francisco Krzyzanowski, EMBRAPA Soja, Brazil

Presentation title: The role of quality evaluation in seed production as exemplified by soybean seed production

12:30–13:30 Lunch break

13:30–14:30 **Session 1 (continued)**

14:30–15:00 **Poster session 1**

Chair: Hülya İlbi, Ege University, İzmir, Turkey

15:00–15:30 Coffee break

15:30–17:00 **Poster session 1 (continued)**

## Thursday, 13 June 2013

08:00–16:30 Registration desk open

08:30–10:00 **Session 2: Seed storage for commercial use and genetic conservation**

Chair and Lead Speaker: Robin Probert, Millennium Seed Bank, RBG Kew, UK

Presentation title: Pre-storage factors critically affect the quality of seeds for storage and use: a review of the underlying biology and practical implications

10:00–10:30 Coffee break

10:30–11:30 **Session 2 (continued)**

11:30–12:30 **Poster session 2**

Chair: Hülya İlbi, Ege University, İzmir, Turkey

12:30–13:30 Lunch break

13:30–14:30 **Poster session 2 (continued)**

14:30–15:00 **Session 3 (ISSS collaborative session): Physiological, biochemical and molecular markers of seed quality**

Chair and Lead Speaker: Françoise Corbineau, Université Pierre et Marie Curie-Paris 6, Paris, France

Presentation title: Markers of seed quality: from a physiological to a molecular approach

15:00–15:30 Coffee break

15:30–16:30 **Session 3 (continued)**

## Friday, 14 June 2013

08:00–17:00 Registration desk open

08:30–09:30 **Session 3 (continued)**

09:30–10:00 **Session 4: Advanced methods in seed quality evaluation**

Chair and Lead Speaker: Beni Kaufman, Pioneer, USA

Presentation title: Next generation seed quality testing

10:00–10:30 Coffee break

10:30–12:30 **Session 4 (continued)**

12:30–13:30 Lunch break

13:30–15:00 **Session 5: Evaluation and improvement of physiological quality**

Chair and Lead Speaker: Alison Powell, University of Aberdeen, UK

Presentation title: Electrical conductivity measurements of solute leakage: past and current use and their future application for rapid assessment of germination and vigour

15:00–15:30 Coffee break

15:30–16:30 **Session 5 (continued)**

16:30–17:00 **Conclusion of Symposium**

19:00–23:00 **Official Dinner**



### Saturday, 15 June 2013

- 08:00–18:30 Registration desk open
- 08:00–18:30 Presentations of ISTA's technical work and meetings of ISTA Technical Committees**
- 08:00 Opening by the ISTA President, Joël Léchappé, France
- 08:00–09:00 Bulking & Sampling Committee
- 09:00–10:00 Flower Seed Committee
- 10:00–10:30 Coffee break
- 10:30–11:30 Forest Tree & Shrub Seed Committee
- 11:30–12:30 Germination Committee
- 12:30–13:30 Lunch break
- 13:30–14:30 Moisture Committee
- 14:30–15:30 Statistics Committee
- 15:30–16:00 Coffee break
- 16:00–17:00 Variety Committee
- 17:00–18:00 GMO Committee

### Sunday, 16 June 2013

- 08:00–18:30 Presentations of ISTA's technical work and meetings of ISTA Technical Committees (continued)**
- 08:00–09:00 Purity Committee
- 09:00–10:00 Seed Health Committee
- 10:00–10:30 Coffee break
- 10:30–11:30 Seed Storage Committee
- 11:30–12:30 Tetrazolium Committee
- 12:30–13:30 Lunch break
- 13:30–14:30 Seed Vigour Committee
- 14:30–15:00 Nomenclature Committee
- 15:00–15:30 Editorial Board of Seed Science and Technology
- 15:30–16:00 Coffee break
- 16:00–18:30 Rules Committee

### Monday, 17 June 2013

- 08:00–10:00 Presentations of ISTA's technical work and meetings of ISTA Technical Committees (continued)**
- 08:00–08:30 Advanced Technologies Committee
- 08:30–10:00 Proficiency Testing, Laboratory Accreditation and Quality Assurance Programme

- 10:00–10:30 Coffee break
- 10:30–13:00 Preparation for the Ordinary General Meeting: discussion on the Draft ISTA Strategy 2013–2016**
- 13:00–14:00 Lunch break
- 14:00–17:30 Discussion forums**
- 14:00–15:30 Do the current principles and requirements for the ISTA Rules meet the future needs for developments in seed technology?**
- 15:30–16:00 Coffee break
- 16:00–17:30 Discussion on the use and international standardization of DNA technologies in the area of seeds**

### Tuesday, 18 June 2013

- 08:30–17:30 ISTA Ordinary General Meeting**
- 08:30–08:45 Welcome by the ISTA President, Joël Léchappé**
- 08:45–10:00
1. Call to order
  2. President's address
  3. Roll call of Designated Members entitled to vote
  4. Comments about the minutes of the previous General Meeting
  5. Report of the Executive Committee
  6. Report of the Secretary General
- 10:00–10:30 Coffee break
- 10:30–12:30
7. ISTA Strategy 2013–2016
  8. Election of Officers and members-at-large of the Executive Committee
  9. Fixation of annual subscriptions
- 12:30–13:30 Lunch break
- 13:30–15:30
10. Consideration and adoption of the proposed Rules changes
  11. Consideration and adoption of reports
  12. Announcement of the place and date of the next Ordinary General Meeting
  13. Any other business raised by a Member, of which notice in writing has been received by the Secretary General at least two months prior to the date of the General Meeting
  14. Any other business raised by consent of the Executive Committee
- 15:30–16:00 Coffee break
- 16:00–17:30
15. President's closing address
  16. Discharge of the Executive Committee
  17. Installation of new Officers
  18. Adjournment

**30th ISTA Congress, Antalya, Turkey, 12–18 June 2013**  
**Online registration now open: [www.seedtest.org/2013](http://www.seedtest.org/2013)**

# General information on Turkey and Antalya

Turkey, exotic, colourful, many-faceted, romantic, ever old and ever new, is the gateway to the fabled east. Turkey is a country located at a point where the three continents of the old world, Asia, Africa and Europe, are closest to each other, and where Asia and Europe meet. Because of its geographical location, Anatolia has always been important throughout history and is the birthplace of many great civilizations. Turkey is not only a corridor through which the ancient Asian Turkish culture is transmitted to Europe, but is also regarded as a window of Western culture opening to meet Eastern culture.

## Climate

The Mediterranean and Aegean shores of Turkey experience long, hot summers and mild, rainy winters. Istanbul averages 0 °C (32 °F) in January and 23 °C (73 °F) in July. Average annual precipitation totals 697 mm (27.4 in.), most of which falls in December and January. Along the central Anatolian plateau, a continental climate prevails, with hot summers and colder winters. The plateau receives only about half as much precipitation, but it is more evenly distributed throughout the year. The eastern highlands experience even longer and colder winters. Along the Black Sea, the



Map of Turkey, showing Congress and workshop venues.

climate is mild and rainy. Southeast Anatolia records the country's highest summer temperatures, averaging more than 30 °C (86 °F) in July and August.

## About Antalya

Antalya is also known as “the paradise on earth”, “the pearl of the Mediterranean”, and “the Turkish Riviera”.

It is the location of the most magnificent and best preserved ancient theatre in Asia and Africa, the Aspendos Theatre.

In addition to numerous archaeological cities and historic buildings, Antalya offers lots of waterfalls, caves and an endless beach.

According to a worldwide survey of customer satisfaction, conducted among 35 million people, 15 of the world's top 100 hotels are in Antalya.

The world-class golf clubs of Antalya are among the favourites of internationally famous golfers.

The city was visited by Attalos, and subsequently by queens and emperors such as Cleopatra and Hadrian.

Thanks to the ancient statues on display, Antalya Museum is one of the world's most important museums.



The Antalya clock tower.

## Registration fees (online registration at [www.seedtest.org/2013](http://www.seedtest.org/2013))

Periods	Events	EARLY registration (up to 15 March 2013)	LATE registration (16 March–15 May 2013)
<b>ISTA Members</b>			
12–18 June	Congress incl. Symposium	540 €	590 €
12–17 June	Symposium & TCOM meetings only	490 €	540 €
<b>Non-members</b>			
12–18 June	Congress incl. Symposium	810 €	970 €
12–17 June	Symposium & TCOM meetings only	735 €	880 €
<b>Students</b>			
12–17 June	Symposium & TCOM meetings only	175 €	175 €
<b>Accompanying persons</b>			
12–18 June	Social events, lunches etc. only	300 €	300 €
<b>Exhibitors (incl. 1 person)</b>			
12–18 June	Exhibition booth	3000 €	3000 €



The harbour of Antalya.

The turquoise shores of Antalya combine ancient cities whispering tales of history, myth and legend, met on either side by tranquil, emerald-green forests and the sparkling waters of the Mediterranean. This is the perfect choice for a vacation surrounded by sea, sun, sand and more. Along with a cultural heritage deeply rooted in history, Antalya's coves and highlands of unique beauty, pristine beaches, comfortable hotels and marinas, colourful entertainment venues, and art-filled festivals all make it a tourist destination that offers its guests endless possibilities. These include the pleasure of sunbathing from sunrise to sunset; the natural thrill of outdoor sports in the grip of mother nature; the excitement of discovering national parks

with their rich flora and fauna, ancient cities, and museums; the mystery of the mountains and the peaceful Mediterranean coves drawing you away; the romance of watching an opera outdoors under the stars at night; sampling the unique delicacies of Turkish cuisine and enjoying the party scene. Meeting the hospitable people of Antalya is just another part of the pleasant holiday experience.

In June, average air temperatures in Antalya are 30–35 °C, and average sea temperatures 25–30 °C.

### Flight information

Flight time from Istanbul to Antalya is 1 hour, with direct flights offered by Turkish

Airlines and other domestic carriers. In June, many direct charter flights are available from most major European cities. Turkish Airlines also offers easy connections to all passengers arriving in Istanbul from its other direct flight locations with Turkish Airlines or other Star Alliance Members. From the airport to the ISTA Congress venue, the Kervansaray Hotel Lara, the taxi fare is approximately 20 €/40 Turkish lira.

There are direct flights to and from Aalborg, Amsterdam, Astana, Baghdad, Basel/Mulhouse, Berlin, Bournemouth, Bremen, Brussels, Chelyabinsk, Cologne, Copenhagen, Donetsk, Dortmund, Dresden, Düsseldorf, Eindhoven, Ekaterinburg, Frankfurt, Glasgow, Göteborg, Hamburg, Hanover, Helsinki, Karaganda, Kemerovo, Kiev, Liege, L'viv, Malmö, Manchester, Minsk, Munich, Newcastle, Nuremburg, Orenburg, Oslo, St Petersburg, Sarajevo, Stuttgart, Tel Aviv, Vienna, Warsaw and Zurich.

### Visas

All participants are advised to check with the Turkish Consular Missions (where available) for visa requirements. Please check the Ministry of Foreign Affairs web site about details of visa requirements ([www.mfa.gov.tr/visa-information-for-foreigners.en.mfa](http://www.mfa.gov.tr/visa-information-for-foreigners.en.mfa)). A letter of invitation can be issued by the ISTA Secretariat to registered participants requiring a visa.



The Düden waterfalls.

## Medical facilities

In addition to the special precautions taken by the host authorities, medical facilities available at the Hotel Kervansaray Lara will be at the disposal of the participants. In case of need, please contact the relevant information desks.

## Local time

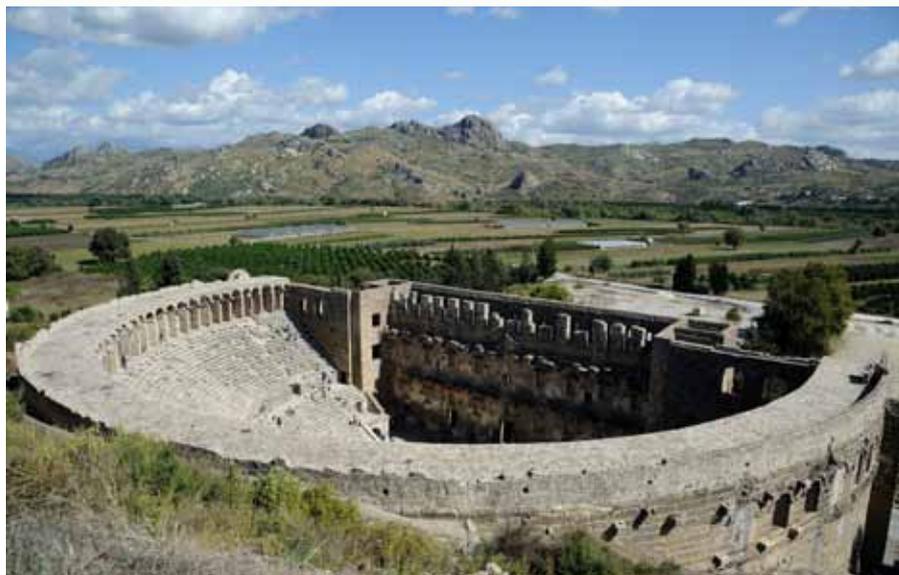
Local time in Istanbul is UTC/GMT + 2 hours.

## Working hours

Banks are open Monday to Friday from 08:30 until 12:00 or 12.30, depending on the bank, and from 13:30 until 17:00. However, some banks continue to serve during lunch breaks.

Museums are generally open from Tuesday to Sunday from 9:30 until 17:00 or 17.30, and closed on Monday. Shops and bazaars are normally open from Monday to Saturday from 9:30 to 22:00, and closed all day on Sundays. However, shopping malls and stores on main streets are open all day, seven days a week. You can find restaurants or cafes open at virtually any time of the day or night.

Official institutions and banks are closed on Saturday and Sunday.



The theatre of Aspendos.

## Currency and foreign exchange

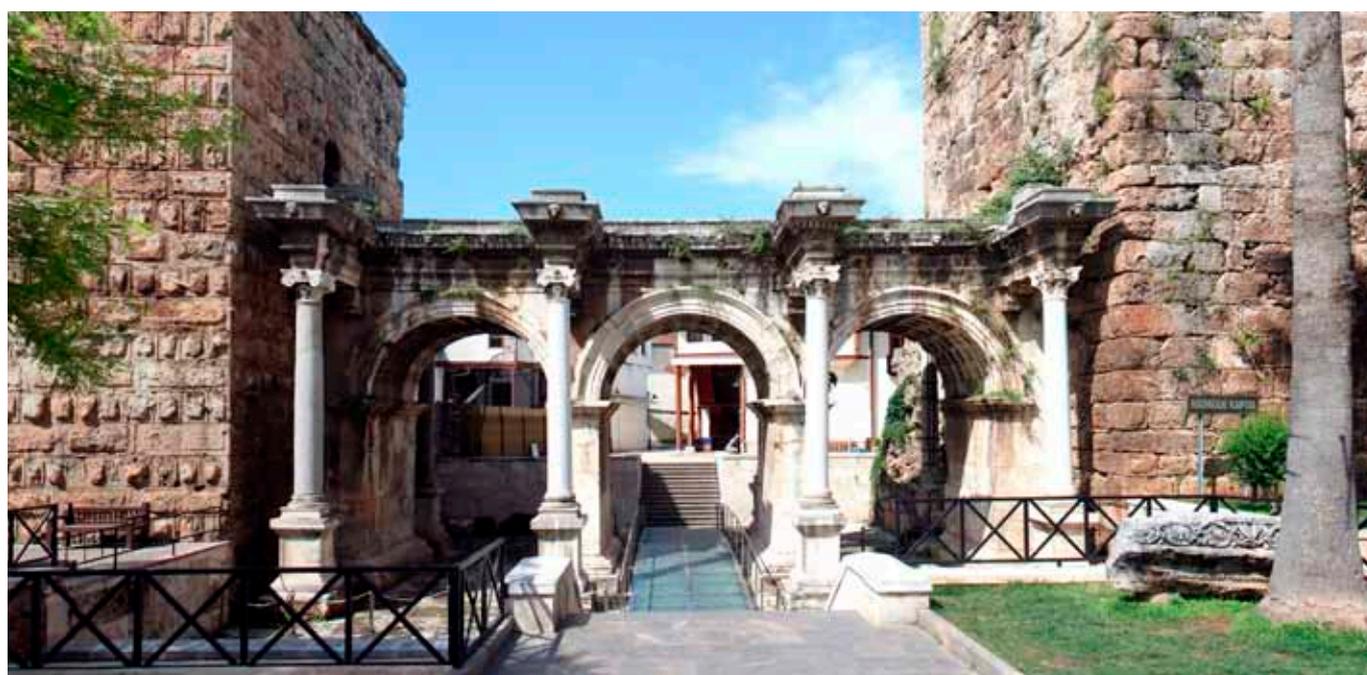
On 1 January 2009, the monetary unit in Turkey was changed to the Turkish lira (TL or TRY), which comes in bank notes of 5, 10, 20, 50, 100 and 200 TL. Smaller denominations come in coins of 1 TL and 50, 25, 10, 5 and 1 kuruş (kr.). 1 lira equals 100 kuruş. The exchange rates are around 1 US dollar = 1.82 TL, and 1 euro = 2.35 TL.

The most recent exchange rate values may be accessed at the web site of the Central Bank of the Republic of Turkey ([www.tcmb.gov.tr/yeni/eng](http://www.tcmb.gov.tr/yeni/eng)).

Convertible foreign currency can be exchanged at the airport, hotels and exchange offices, as well as at all banks, in accordance with the daily announced exchange rates.

In Turkey, travellers' checks are rarely accepted. We recommend that you cash your travellers' checks at the banks.

ATMs can be found in even the smallest Turkish towns. Most accept international credit cards or bank cards (a strip of logos is usually displayed above the ATM). Almost all ATMs have a language key to enable you to read the instructions in English.



Hadrian's Gate, Antalya.

## Value-added tax

Value-added tax (VAT), in Turkey called KDV, is 18%. VAT is usually included in quoted prices. Certain shops are authorized to refund the tax.

## Credit cards

International credit cards are widely used. Major credit cards (American Express, Visa, Diner's Club, MasterCard, Access, JCB, Eurocard etc.) are accepted in most establishments. Most ATMs accept international credit or bank cards.

## Electricity supply

The electrical current in Turkey is 220 volts, 50 cycles alternating current (AC). Wall outlets take Continental-style plugs with two round prongs.

## Communication

Turkey has a highly sophisticated communication system. In addition to the usual postal and telephone services, GSM telephones can be used through international roaming agreements. Please contact your GSM operator for more information. It is possible to use most cellular phones in Turkey.

Public telephones have two different systems. Some of them work with cards while others work with tokens. Cards and tokens are both sold in post offices and tobacco shops. For international calls it is advisable to purchase cards.

All over Turkey, phone numbers consist of two sections: the 3-digit area code, and the 7-digit number. Calls within an area require only the 7-digit number. Calls to a different require 0 + area code + 7-digit number. International calls require 00 + country code + area code + number.

## Accommodation

\*All prices include VAT.

### Kervansaray Hotel Lara ★★★★★ (Congress venue)

Location: Lara  
Single room: 129.00 €  
Double room: 175.00 €

### Kervansaray Hotel Kundu ★★★★★

Location: Kundu  
Single room: 129.00 €  
Double room: 175.00 €

### Titanic Beach Resort Hotel ★★★★★

Location: Lara  
Single room: 175.00 €  
Double room: 235.00 €

### Miracle Hotel ★★★★★

Location: Lara  
Single room: 180.00 €  
Double room: 240.00 €

### Falez Hotel ★★★★★

Location: Konyaalti  
Single room: 80.00 €  
Double room: 130.00 €

### Lara Hotel ★★★★★

Location: Lara  
Single room: 60.00 €  
Double room: 80.00 €

### Bilem Hotel (boutique hotel)

Location: Lara  
Single room: 60.00 €  
Double room: 80.00 €

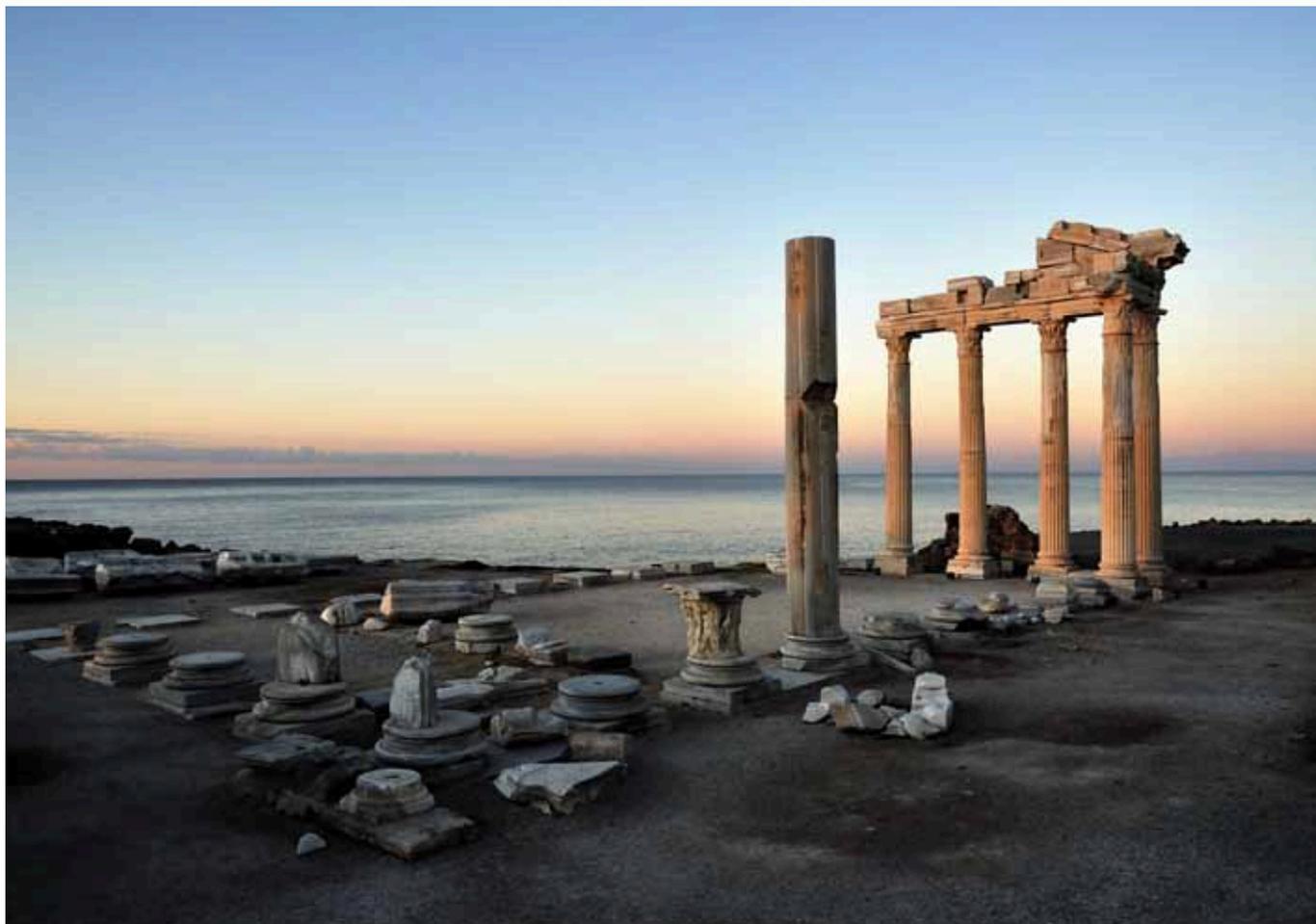
## Congress venue: Kervansaray Hotel Lara Convention Center and Spa

With its post-modern design and a glass facade covering 65 000 m<sup>2</sup>, the Kervansaray Lara Hotel Convention Center and Spa stands in 110 000 m<sup>2</sup> of grounds on the heavenly Lara Beach.

The hotel's 3309 m<sup>2</sup> convention center consists of an auditorium for 2000 people, 15 different meeting halls, a 1425 m<sup>2</sup> lobby and the latest technological facilities, offering an excellent service for both vacations



Congress venue: the Kervansaray Hotel Lara.



The Temple of Apollo, Side.

and meetings. The Kervansaray Hotel Lara is 10 km from Antalya International Airport, and it is the venue of the 30th ISTA Congress 2013.

**Contact:**

Lara Turizm Merkezi Antalya Türkiye  
+90 242 352 20 00  
+90 242 352 20 32  
www.kervansarayhotels.com.tr

**Social programme**

**Post-Congress tours (19–21 June 2013)**

Istanbul (2 nights, 3 days tour)  
İzmir (2 nights, 3 days tour)  
Kapadokya (2 nights, 3 days tour)  
Antalya (2 nights, 3 days tour)

**Tour prices:**

Up to 15 March 2013: 750 €  
16 March–15 May 2013: 900 €

For details, see <http://ista2013antalya.org/social.php>

**Accompanying persons programme (12, 14, 16 June)**

12 June: Perge – Aspendos – Düden tour with boat trip

09:30 Departure from the Hotel  
10:00–13:00 Perge – Aspendos – Düden  
13:30–18:30 Boat trip with lunch  
19:30: Return to Hotel

14 June: Side – Manavgat tour

09:30: Departure from the Hotel  
11:00–12:30: Kemer  
13:00–14:30: Lunch  
15:00–18:00: Side – Manavgat  
19:30: Return to Hotel

16 June: Alanya tour with boat trip

09:30: Departure from the Hotel  
11:30–13:30: Alanya  
14:00–18:00: Boat trip with lunch  
20:00: Return to Hotel

**Tour prices:**

Bookings up to 15 March 2013: 75 €  
Bookings 16 March–15 May 2013: 90 €  
VAT is included in all prices.

**Cancellations**

Up to 15 March 2013: full refund (excluding bank charges).  
Between 15 March and 30 April 30, 2013: 50% refund (excluding bank charges).  
After 30 April 2013: no refund.  
All refunds will be made after the Congress.

To book any of the above tours, please contact:

Flap Tour  
441. CADDE No: 1  
06610 Birlik-Çankaya – Ankara  
Turkey  
Phone: (+90) 312 454 0000  
Fax: (+90) 312 454 0001  
Web: [www.flaptour.com.tr](http://www.flaptour.com.tr)  
Mail: [ista2013antalya@flaptour.com.tr](mailto:ista2013antalya@flaptour.com.tr)

# ISTA Seed Symposium 2013

## Antalya, Turkey, 12–14 June 2013

Alison A. Powell

ISTA Executive Committee Member, ISTA Seed Vigour Committee Chair and Seed Symposium Convenor

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

Anyone interested in the origins and diversity of crop, ornamental and wild plants will find Turkey a fascinating country. Two of Vavilov's Centres of Origin (i.e. Near Eastern and Mediterranean) extend into Turkey. This indicates that centres of origin and diversity of several crop plants and many plant species lie within its borders.

Archaeological findings gathered from the large Neolithic settlement of Çatalhöyük, situated on the Konya Plain in Central Anatolia, have provided evidence for the domestication of both crops and animals in this area as early as 7500 to 5700 BC. Wheat and barley have been identified there, along with peas, almonds, pistachios, and various fruits harvested from trees in the surrounding area. Sheep were domesticated and evidence also suggests the beginning of cattle domestication. The Konya Plain remains a major location for wheat production in Turkey. The archaeological investigations in Çatalhöyük continue today and many of the objects found can be seen in the world renowned Museum of Anatolian Civilisations in Ankara.

Genetic resources from Turkey have therefore played an important part in the development of agriculture. In addition, primitive land races, wild crop relatives and other wild plant species from Turkey continue to provide new sources of important traits for varietal improvement to enhance agricultural production. They will also have contributed to the impressively wide range of crops grown in Turkey today. The conservation of these genetic resources for future use is a major concern and seeds provide a convenient means of their storage in *ex situ* gene banks established in many parts of the world

It was therefore appropriate to develop a theme for the 30th ISTA Seed Symposium that related to the contribution that the diversity of species found in Turkey has made to plant breeding and the conservation of that genetic diversity. Plant breeding plays a crucial role in the improvement of the traits found in our crop and ornamental plants.

However, it is often forgotten that without attention to seed quality during production and storage of the seed, consumers may not appreciate the new traits due to the poor establishment and subsequent growth. Conservation in gene banks also requires careful consideration of the effects of collection of seed, drying and processing on seed quality, as well as the establishment of optimum conditions for long term seed storage.

Thus, the location of the 30th ISTA Congress and Seed Symposium in Turkey, led to the development of the theme for the Seed Symposium:

### **Evaluation of seed quality: a key step in exploiting the benefits of plant breeding and genetic conservation**

The ISTA Seed Symposium will cover a wide range of seed related topics, including:

- Genetic conservation
- Seed pathology
- Habitat regeneration
- Seed germination and dormancy
- Seed quality and plant breeding
- Application of molecular markers
- Seed quality evaluation
- Seed physiology and stress responses

The symposium will be made up of five oral sessions (see below), and two poster sessions, each of 2 hours, covering the same topics. Each oral session will be chaired by a lead speaker who is well known in the field of seed science and technology.

### **Session topics**

#### **Session 1: Role of quality evaluation in seed production**

Multiplication of new cultivars; maintenance of genetic purity; environmental and maternal effects on quality; production and processing; conventional and organic seed production; epidemiology and modelling; seed treatments.

**Chair and Lead Speaker:** Francisco Krzyzanowski, EMBRAPA Soja, Brazil

**Presentation title:** The role of quality evaluation in seed production as exemplified by soybean seed production.

To reach the standards of seed certification systems, several quality parameters should be followed: genetic and physical purities, physiological quality and seed health. Genetic purity is the basis to reach high cultivar quality in seed production. The fundamental steps to produce soybean breeder seed are the selection of typical plants of the required cultivar, threshing each plant individually, multiplication of plant per line and line per block, and genetic analysis of each generation based on seed morphological genetic descriptors. Nowadays, application of molecular markers, originating from seed biotechnology, can be used alongside the above procedures to ensure genetic purity throughout seed production under the certification system. The use of measurements of physiological quality (germination and vigour) at several stages in seed production will be illustrated by reference to soybean seed production in Brazil. Categories of tetrazolium staining (TZ) have been developed to indicate seed vigour as well as germination. Experience in the use of TZ to monitor and maintain quality during harvesting, drying, processing, storage and delivery will be described. Seed health is assured through seed pathology tests, such as the blotter test, which,

along with the results of the tetrazolium test offers a complete diagnosis of soybean seed quality, supporting the correct decision for seed treatment. High vigour, healthy and genetically pure soybean seeds produce seedlings and plants of high agronomic performance which can result in productivity increases. The considerations above lead us to understand how seed science and seed technology are closely linked and underline the importance of the scientific work within ISTA for quality evaluation in seed production.

### **Session 2: Seed storage for commercial use and genetic conservation**

Seed collection and handling effects on germination and longevity; seed moisture content and water activity; storage conditions in relation to quality; orthodox and recalcitrant seeds, identification of quality traits in non-crop species.

**Chair and Lead Speaker:** Robin Probert, Millennium Seed Bank, RBG Kew, UK

**Presentation title:** Pre-storage factors critically affect the quality of seeds for storage and use: a review of the underlying biology and practical implications

Orthodox seed storage behaviour is an acquired trait. Immature seeds, on their way to becoming 'orthodox', are in fact 'recalcitrant' because drying at this early stage in seed development is lethal. The ability of seeds to withstand drying is acquired around the time of mass maturity in most species but resistance to ageing (seed longevity) is acquired after this and for most species peaks around the time of natural dispersal. However, the exact timing of the acquisition of seed quality traits varies across plant species and this poses significant challenges for effective harvesting, processing and storage, particularly for non-crop species. Uniform seed ripening, resistance to shattering and reduction of seed moisture content to ambient levels on

the plant is peculiar to highly bred cereal crops. Variation in flowering times resulting in considerable developmental variation in seeds and fruits and seed dispersal at high moisture levels is the norm for some crops and the vast majority of non-crop species. The commercial production of high quality, native wildflower seeds for habitat creation and landscape-scale restoration projects, is particularly challenging. To maximise yield, seeds are often harvested or collected for conservation before they have reached peak maturity and this practice will compromise storage potential unless appropriate post-harvest handling techniques are used. This presentation will describe recent research that has elucidated the patterns of acquisition of seed quality traits in a range of non-crop species. Post-harvest handling methods that ensure that seed storage potential is maximised will be highlighted.

(The co-author of this paper is Fiona Hay, T.T. Chang Genetic Resources Center, International Rice Research Institute, the Philippines)

### **Session 3 (ISSS collaborative session): Physiological, biochemical and molecular markers of seed quality**

Stress and desiccation tolerance, genomics, proteomics, development and maturation, regulation and induction of dormancy, germination; seed longevity; disease resistance.

**Chair and Lead Speaker:** Françoise Corbineau, Université Pierre et Marie Curie-Paris 6, Paris, France

**Presentation title:** Markers of seed quality: from a physiological to a molecular approach

Seed quality results from the functioning of the genome but is also largely regulated by numerous factors intervening throughout the seed life, from its development on the mother plant up to sowing, including

storage. Methods of evaluation of seed quality providing accurate prediction of seed performance under field conditions are then needed by the seed industry. Various physiological tests, i.e. germination tests in suboptimal conditions of temperature, oxygenation and water potential of the medium, or accelerated ageing and controlled deterioration allow sensitive differentiation between seed lots. However, a better understanding of the biochemical, cellular and molecular mechanisms involved in the acquisition of seed vigor during seed development, in the germination process, and in seed ageing allow various new markers of seed quality to be suggested. Among them, electrolyte leakage, ethylene or ethanol production during imbibition, cell cycle markers, soluble sugar metabolism (in particular, the raffinose family oligosaccharides), specific proteins (11S globulin B-subunit, biotinylated proteins, heat-shock protein) and the efficiency of the Reactive Oxygen Species scavenging through antioxidant defense system (e.g. catalase activity), seem to be promising. Use of global approaches such as transcriptomics, proteomics or metabolomics could result in identification of other markers, and seed quality evaluation would also benefit from non-invasive techniques such as X-ray, thermography, imaging system, etc. However, among all the markers suggested, for a seed company, methods must be fast and easy to perform in routine testing, and be applicable to different batches of the same species.

### **Session 4: Advanced methods in seed quality evaluation**

Automatic and computer based methods; image analysis; DNA-based methods; variety identification; purity analysis; seed pathology; germination.

**Chair and Lead Speaker:** Beni Kaufman, Pioneer, USA

**Presentation title:** Next generation seed quality testing

Seed quality is defined and measured along a number of axes: is the seed of the right variety (varietal ID tests)? Is it genetically pure (genetic purity tests)? Does it contain the right traits (trait purity tests), with no adventitious presence of unintended GM seed (AP/GMO tests)? Is it physically pure, free from debris or inert matter (purity tests)? Is the seed intact and free from disease and pathogens (various seed health tests); is the seed vigorous (cold test, accelerated aging test) and how well will it germinate (warm test, tetrazolium test)? The way we define seed quality is not likely to change soon; however, the methods we test it by are evolving constantly. In this presentation, some of the new and emerging technologies will be presented, these include, DNA based methods such as highly multiplexed polymerase chain reaction (PCR), isothermal amplifications and next generation sequencing; various physiological measurements using advanced digital methodologies and small molecule monitoring. The pro and cons of the new methods will be discussed and their utility to measure the different seed quality parameters will be compared to the present day practices.

### Session 5: Evaluation and improvement of physiological quality

Evaluation of germination and vigour; seed quality in relation to field establishment, transplant production, land reclamation/regeneration; response to stress (e.g. pathogens, drought, salinity, soil contaminants).

**Chair and Lead Speaker:** Alison Powell, University of Aberdeen, UK

**Presentation title:** Electrical conductivity measurements of solute leakage: past and current use and their future application for rapid assessment of germination and vigour.

Leakage of solutes from seed during imbibition, measured using electrical con-

ductivity of seed soak water, has played an important role in both research into seed physiology and in seed testing. In physiology, conductivity measurements have frequently been used to provide support for hypotheses of membrane changes during imbibition, physical damage to membranes and membrane deterioration during storage. The evidence for changes in membrane structure and composition that may result in changes in membrane integrity and hence solute leakage from seeds will be re-examined. Changes in leakage will be shown to be associated primarily with dead, not living, tissue, and the role of membrane integrity in living cells questioned. In seed testing, the electrical conductivity test identifies differences in vigour amongst seed lots of grain legumes, high leakage being linked to low vigour. There have also been reports over a number of years in which differences in solute leakage, either from bulk seed samples or single seeds, have been linked with germination in a number of species. The suitability of the conductivity test for species of mono- and dicotyledons will be discussed in relation to seed morphology. This will lead to a discussion of the importance of dead tissue in determining solute leakage and vigour in grain legumes, and of dead seeds in predicting the germination of small dicotyledonous species on the basis of solute leakage. Finally, the future prospects for application of conductivity measurements as a rapid method of determining germination and vigour, in commercial seed production and to support the realisation of plant breeding programmes, will be considered.

### Poster sessions

**Chair:** Hülya İlbi, Ege University, İzmir, Turkey

Posters will be presented on topics from all the above oral sessions.

### Information for authors of submitted abstracts

**Deadlines:** Abstracts for papers have now been submitted and are being reviewed by the symposium convenor and a small scientific committee. Authors of papers considered for oral presentation will be contacted in November for further information on experimental results, additional to the abstract.

**5 November 2012:** Authors informed whether papers submitted for poster presentation have been accepted.

**10 December 2012:** Authors informed whether papers have been accepted for oral presentation. Authors of papers not accepted for oral presentation will be invited to present their work as a poster.

**8 February 2013:**

Deadline for payment of registration fee by authors of accepted oral papers.

**If the presenter of an oral paper has not registered, the paper will be replaced in the programme.**

Deadline for acceptance of an invitation to present an offered oral paper as a poster

**8 March 2013:** Deadline for payment of registration fee by authors of accepted poster papers. **If none of the poster authors has registered by this time, it will not be possible to present the poster and the abstract will not be published.**

**Funding:** Authors of proposed papers are encouraged to explore possible sources of funding for their attendance at the symposium as early as possible. **ISTA cannot offer any financial support to authors of papers.** However, a letter of acceptance of a paper for oral presentation (subject to funding) can be provided to assist in funding applications from early December 2012; letters of acceptance of poster papers can be provided on request from early November 2012. ■

# How to become an ISTA Voting Delegate at the Ordinary General Meeting

**Michael Muschick**  
ISTA Secretary General

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**W**ithin ISTA, all decision-making power lies in the hands of the Governments (*Article 12 Voting (a), The Articles of the ISTA*).

It is up to each Government to decide whether it wants to exercise its voting rights.

This governmental decision has no influence on the decision of a laboratory or a person to become a Member of the Association, to use the services provided by the Association or to participate in the work of the Association.

If a Government wishes to exercise its voting rights within ISTA, the Government needs to:

- nominate a Designated Authority representing the Government of the country and supply this information (contact details) to the ISTA Secretariat;
- ensure that at least one seed-testing expert in the country is an ISTA Personal Member;
- designate at least one Personal Member to represent that Government in the affairs of the Association (designated Personal Members are referred to as ‘Designated Members’);
- nominate one Designated Member to exercise the voting rights on behalf of that Government for each ISTA Ordinary General Meeting.

In other words, Personal Members wishing to exercise voting rights on behalf of their Governments at the Ordinary General Meeting need to:

- become a Designated Member;
- have a nomination by their Government to exercise the voting rights on behalf of their Government at that particular Ordinary General Meeting.

## How to become a Personal Member

A person wanting to become a Personal Member of ISTA needs to apply for personal membership (or, in conjunction with a laboratory, apply for laboratory membership, as the laboratory representative is also considered a Personal Member of the Association).

The appropriate application forms can be obtained from the ISTA Secretariat, or downloaded from the ISTA web site. The Executive Committee will decide on your application to become a Personal Member.

## How to become a Designated Member

Designated Members are Personal Members of the Association who have been nominated by their Designated Authority to represent those Governments in the affairs of ISTA.

The appropriate submission form can be obtained from the ISTA Secretariat, or downloaded from the ISTA web site, and the ISTA Secretariat can assist Personal Members with the information on the relevant governmental authority (= Designated Authority) in their country which has the authority to designate

Personal Members as Designated Members. The designation process for becoming a Designated Member is a country-specific procedure, in which ISTA bodies are not involved.

## How to be nominated as a Voting Delegate

At the beginning of each calendar year, the ISTA Secretariat sends out letters to each Designated Authority, asking them to nominate one Designated Member to exercise the voting rights at the Ordinary General Meeting for that year.

From the nominations (of Designated Members) received from the Designated Authorities, the Secretariat then generates the roll call for the Ordinary General Meeting (list of names of Designated Members who were nominated by their Designated Authority to vote at the Ordinary General Meeting on behalf of their Governments). These Designated Members are then referred to as Voting Delegates.

If a Designated Authority does not give any indication as to who should exercise the voting rights, a Designated Member wishing to exercise the voting rights for his country must provide a letter from his Designated Authority which indicates that he has been nominated as Voting Delegate for that meeting. This letter must be submitted to the ISTA Secretary General at least 24 hours before the start of the Ordinary General Meeting.

Before the Ordinary General Meeting, the nominated Voting Delegates must collect their voting cards at the announced ISTA Secretariat desk. The voting rights can then be exercised on behalf of that Government. ■

**30th ISTA Congress, Antalya, Turkey, 12–18 June 2013**  
**Online registration now open: [www.seedtest.org/2013](http://www.seedtest.org/2013)**

# Time to get involved in ISTA Committees?

**Steve Jones**

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The main aim of this article is to start ISTA colleagues thinking seriously about who they would like to see on the Executive Committee (ECOM) and who they want as the next Vice-President, well ahead of the time that decisions will be made at the June 2013 meeting. In addition there are the ISTA Technical Committees that need members.

June 2013 is an important date for ISTA committees as it is the end of one three-year work period and the start of the next. One of these committees is the ECOM. The election of ECOM members for 2013 to 2016 and election of the new Vice-President of ISTA will take place at the ISTA Congress in Antalya. The Vice-President is elected for 2013-2016 and then automatically becomes the ISTA President for 2016-2019.

Our current Vice-President is also our acting President, Joël Léchappé, and he will take up his own Presidency in June 2013 for the period 2013 to 2016. Joël will need the help and support from an active Executive Committee that will be elected at the June 2013 meeting. If you want to become involved in ISTA at the ECOM level, now is the time to think about it.

## **Who is eligible to be elected as the ISTA Vice-President?**

Any Designated Member from any country can be nominated by two Designated Members at the June meeting, after which all Designated Members vote on the nominated candidates. Election is by a simple majority.

## **Does the new Vice-President need to have served on the Executive Committee previously?**

No, but it might be desirable if they had, although they will have three years to 'learn' about how the ECOM works before they become President. If there is more than one candidate for the position of Vice-President, then the past roles of a candidate within ISTA might be something that the voting members would consider before they cast their vote. Note: if there is only one candidate for election as Vice-President the vote is unnecessary.

For the Vice-President, it is a six-year commitment to ISTA for both the person and their country. There is currently no financial support from ISTA for any members of the ECOM to attend meetings, or for payment of the registration fees for ISTA meetings. All the work on the ECOM is voluntary. The only funding that ECOM members receive is when ECOM members are requested to travel to officially represent ISTA at a meeting, and then in some situations travel and expenses are paid for by ISTA rather than their own country.

## **Who is eligible to be elected as an Executive Committee 'Member at Large'?**

Any Designated Member from any country can be nominated by two Designated Members at the June meeting, after which all the designated voting members vote on the nominated candidates. A total of eight ECOM 'Members at Large' are elected. The organiser of the next ISTA Congress in 2016 is automatically the ninth ECOM member.

## **What does the work of the Vice-President or an ECOM member involve?**

About eight days of face-to-face meetings per year, three days around the Ordinary General Meeting and a separate 5- or 6-day meeting (usually in Zurich) in February of each year. Members also reply to e-mails in between meetings, on average

one a week. In addition, ECOM Working Groups are formed, made up of ECOM members who wish to contribute to the work of that group, for example the Management and Finances or International Representation Working Groups. Each ECOM member also acts as an ECOM liaison link to one of the ISTA Technical Committees.

ISTA is by nature an international organisation and ideally wants to have representatives from all regions of the world, on both the ECOM and Technical Committees. However, the official language of ISTA is English, therefore a good comprehension of English is desirable for ECOM members. Even so, ECOM membership can also be a chance to practise and improve your English to the next level within a friendly environment.

I have served on the ECOM of ISTA as a 'Member at Large' (2004-2006, 2010-2013) and also as an ex-officio member (2006-2010). I have made some very good friends as part of the work, from all regions of the world, and learnt a lot about myself and different management styles and practises. Some of the colleagues I have worked with will not be able to continue on the ECOM after 2013, so there will be existing ECOM members not standing for re-election. Equally, every three years is an opportunity for change and renewal within the ECOM, even if colleagues were not planning to stand-down.

I volunteered to write this article because as Rules Chair since 2000 many of you know me and you are used to me presenting things for a vote. I have also found from my role as Rules Chair that the more we can prepare in advance and have all discussed openly the better. Also, one of the ECOM working groups that I have been involved with is the Management and Finances of ISTA, and for me it is extremely important that we have people on the new ECOM willing and able to participate in this on-going challenge to ISTA.

**What do you need to do next?**

**Action 1:** talk with your ISTA colleagues in your laboratory and country and decide whether you would like to become involved in ISTA at the ECOM level .

**Action 2:** if you are interested in serving on the ISTA ECOM as a member or as the Vice-President for the period 2013 to 2016, notify Joël (joel.lechappe@geves.fr) before the 1st February 2013 ready for discussion at the 2013 ECOM meeting,

**Action 3:** make sure that you are designated as a Designated Member by your

country's ISTA Designated Authority. Note: there can be more than one Designated Member per country, but only one Designated Member can vote in June. To be a Designated Member you need to be a Personal Member or laboratory-linked Personal Member of ISTA. Associate Members are not eligible to be elected to the ISTA ECOM.

**Action for ISTA:** Depending on how many applications we receive in advance, we will present profiles of candidates in the April 2013 issue of STI, ready for elections

and voting at the June meeting. Candidates can still be nominated at the June 2013 meeting, but in future years ISTA may consider voting for the ECOM prior to the June meeting, just one of the issues for the new ECOM to work on!

If the Executive Committee is not for you, ISTA's Technical Committees also need members. Get in contact with the current Technical Committee Chairs, who are all listed on the ISTA web site, if you are interested. ■

# The Exhibition of Machines and Equipment for Seed Cleaning in Graz, 1875

A.M. Steiner<sup>1</sup>, M. Kruse<sup>2</sup> and N. Leist<sup>3</sup>

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## The announcement of the Exhibition

In 1875 in Graz, Styria, Austria, the 1st Meeting of the Directors of Seed Testing Stations was held on 20 and 21 September, in conjunction with the 48th Meeting of the Society of German Researchers and Physicians (18–24 September) (Steiner, Kruse and Leist, 2011). At the same time, from 18–22 September, there was also held a four-day Exhibition of Machines and Equipment for Seed Cleaning.

In spite of the fact that it was not announced in Germany until July (Anon., 1875a) and in Austria until August (Anon., 1875b), the exhibition was a great success, thanks to the competence of the three renowned organizers.

The first of these was Prof. Dr. Gustav Wilhelm, Professor for Agronomy at the Styrian Agricultural-Technical High School Joanneum in Graz, Member of the Central Board of the Imperial and Royal Styrian Agricultural Society and also well known as a pioneer and itinerant teacher in higher education. Prof. Wilhelm had

studied agronomy at the Agricultural Academy at Hohenheim (Stuttgart, Germany), which in those days was the foremost institution of its kind in Europe.

The second was Imperial Councillor Friedrich Müller, General Secretary of the Imperial and Royal Styrian Agricultural Society, and the third was the expert machinery dealer Mr. J. Smetan, in Graz, Griesgasse 34.

The announcement specified that the exhibition should present machines and equipment for:

1. threshing and cleaning clover seeds;
2. threshing and cleaning grass seeds;
3. threshing, cleaning and grading cereal seeds.

Applications for admission were to be sent to the Office of the Imperial and Royal Styrian Agricultural Society, or to Prof. Dr. Friedrich Nobbe in Tharand, near Dresden (Saxony, Germany), showing:

- a) name and address of the manufacturer;
- b) number and kind of machines;
- c) required space;
- d) mode of power, i. e. by hand or animal powered;
- e) retail price;
- f) information on whether a company representative would be attending.

The costs for shipping and returning were to be carried by the applicant. Admission was free. Security, insurance and seed lots for testing were provided by the

Imperial and Royal Styrian Agricultural Society, which also organized exemption from customs duty and specially reduced freight rates by rail transport. The site of the Exhibition was the gymnasium of the Agricultural-Technical High School in Graz.

## The display of machines and equipment

The exhibition was reviewed by Wilhelm (1875).

His first report described a clover conditioning machine of Julius Carow & Co., Prague, consisting of a huller, a ventilator and a set of sieves. Hulling was accomplished by passing the precleaned seed through a feed hopper onto two pairs of cylinders, one above the other. Of each pair of cylinders, one was of grooved steel, the other covered by rubber, with the cylinders rotating at different speeds. Subsequently, an airstream, in combination with two screens, separated the clover seeds into two containers, one with the fraction of smaller seeds, the other with the fraction of upgraded larger seeds. This expensive machine was animal powered, and had an hourly output of 20–34 kg. It was recommended only for specialized seed producers and co-operatives.

In Styria at that time, about 600 t of red clover seeds were produced yearly on an area of some 6000 ha.

Two hand sieves of brass wire, with different mesh sizes for separating clover seeds, were exhibited by Ferdinand Jergitsch, Klagenfurt (Carinthia, Austria), and two similar hand sieves of iron wire by J. Dominick, Schweidnitz (Silesia, Germany; now Swidnica, Poland). A neat little inexpensive clover-cleaning machine was presented by Mayer & Co. from Kalk near Deutz (Rhineland, Germany). In this machine, the seeds fell from a feed hopper into an inclined rotating cylinder of zinc plate with oblong holes, where the seeds were constantly mixed. Compared to a flat-screen separation, this cylinder screen separation was much more efficient, in particular when separating ribwort seeds. The hourly output was approximately 25 kg.

For the conditioning of clover seeds there were improved air screen separators, as displayed by Clayton and Shuttleworth, Lincoln (England), John Baker, Wisbech (England) and Kühne, Wieselburg (Lower Austria). The "Dresdner Cereal Cleaning and Sorting Machine" of Schubart and Hesse, Dresden, was in widespread use and enjoyed a notable reputation, not least for its all-round capability (Figure 1). This machine was delivered with a set of 12 screens, from which three suitable screens were selected and fitted for any specific cleaning process.

Another kind of machine were the trieurs or indented cylinder separators, mostly used to separate the round seeds of corn cockle, cleaver and vetches from the oblong seeds of cereals. The separation principle needs no further explanation here. On display were both single-action machines, with one size of indents along the full length of the cylinder, and double-action machines, with two different indent sizes in a cylinder with two segments. These medium-priced machines were flexible and could be adapted to solve specific problems. Depending on the size of the machine, the hourly output of cereal seeds was between 100 to 350 kg. Exhibitors were Lhuillier, Dijon (Côte-d'Or, France; Figure 2), Pernollet (Paris), Mayer & Co., and Harter-Ainé, Bar-sur-Aube (Aube, France). The single-action machines were considered satisfactory for agricultural seeds, while the double-action machines

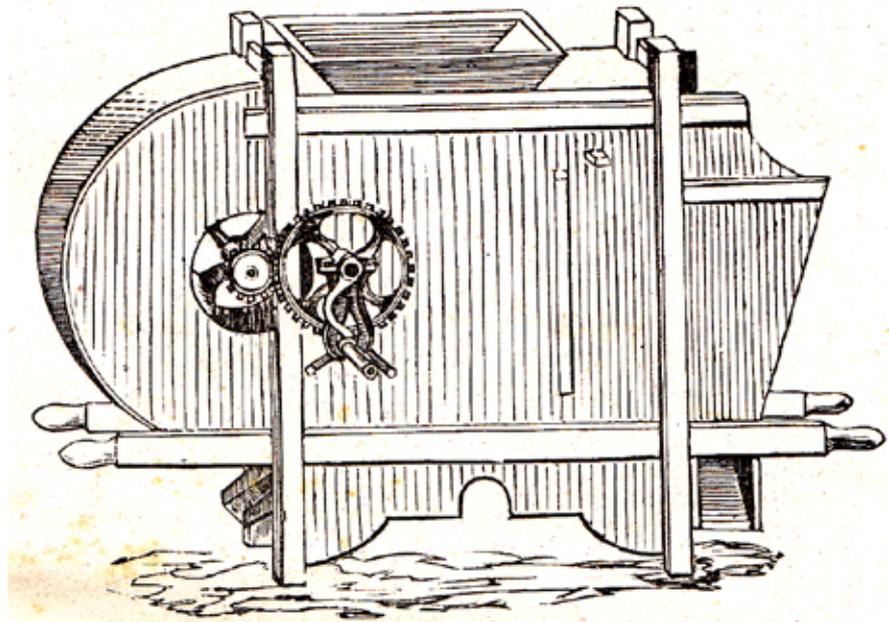


Figure 1. The Dresdner Cereal Cleaning and Sorting Machine of Schubart and Hesse, Dresden (Saxony, Germany); from Nobbe, 1876.

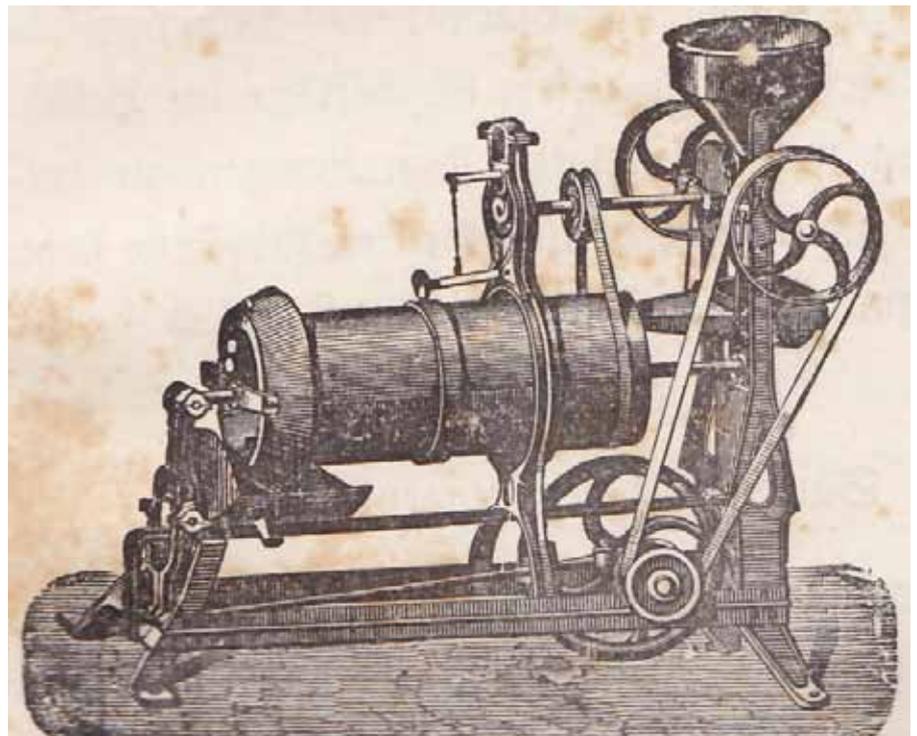


Figure 2. Indented cylinder separator of Lhuillier, Dijon (Côte-d'Or, France); from Nobbe, 1876.

were recommended for industrial purposes such as malting. The accurate separation of corn cockle seeds was crucial because of their high toxicity in animal feed, and their uselessness in the distilling of spirits.

Finally, there was a gravity separator for cereals by Hignette (Paris), with a triangular oscillating deck with partitions

rendering very clean and uniform seeds (Figure 3). In smaller types, the deck was shaken directly by hand (see Figure 3), in larger types by a hand-operated crank with a gear drive transmission to produce the oscillating motion of the deck. The larger cleaning machines needed at least two, usually three, and in certain cases four persons

to set up the machine for the various cleaning tasks, and to operate and control the cleaning process.

In addition to the exhibition of machinery, Nobbe demonstrated dynamic spears such as Nobbe triers in different sizes, and different types of walking sticks for sampling seed lots. They were manufactured and supplied by master tinsmith Mathes from Tharand. A highly valuable exhibit was a comprehensive collection of weed seeds on four display boards by Dr. Kohler, Reutlingen (Württemberg).

On 21 September 1875, at 12:30, the participants of the First Meeting of Directors of Seed Testing Stations and other interested parties (Steiner, Kruse and Leist 2011) gathered to visit the Exhibition for demonstrations and to test the functions and production efficiency of the cleaning machines on display.

### Concluding remarks

Altogether, 13 manufacturers had seed cleaning machines on display. Three showed flat-screen and cylinder screen separation equipment, five air screen separation systems, four indented cylinder separators and one a gravity separator. The exhibition of triers and the seed collection provided an attractive complement to the event. The manufacturers came from Austria, Bohemia, France, Germany and Great Britain. In view of the considerable number and different kinds of machines, as well as their places of manufacture, this exhibition of 1875 can well be considered a highly respectable international exhibition, even when compared with the World's Fairs of 1873 in Vienna and 1889 in Paris.

Friedrich Nobbe, who for 35 years had been in the forefront of seed science and technology, never saw seed testing as an activity by itself, but always interconnected with organizational requirements, economic demands, seed business interests, consumer interests, advisory services, research and public welfare (Steiner, 1994, 2004; Steiner et al., 2011). The combination of the First Meeting of the Directors of Seed Testing Stations and of the Exhibition of Machines and Equipment for Seed Cleaning in Graz in 1875 is a convincing demonstration of this attitude, which was fortunately common in those days of enthusiastic pioneering seed production and seed quality testing.



Figure 3. The gravity separator of Josse, Ormesson-sur-Marne (now Val-de-Marne, France) as exhibited by Hignette (Paris, France); from Nobbe, 1876.

### Acknowledgement

This paper is dedicated to our dear colleague Dr. Hans Fuchs, former Head of the Seed Testing Laboratory Munich/Freising-Weihestephan, ISTA Alumnus, and for many years a member of the ISTA Equipment Committee and the ISTA Vigour Committee, on the occasion of his 75th birthday.

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# ISTA membership changes

Status 1 September 2012

## New Member Laboratories

### Argentina ARML0400/ARML0401

Laboratory representative: Rita del Valle Araoz  
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### Serbia YUML0400/YUML00401

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## Call for registration:

# 17th ISTA GMO Proficiency Test on soya (see p. 58)

# The 2007 ISTA Seed Health Committee Official Method Review

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The Seed Health Method Validation Programme requires that methods approved as Official Methods should be reviewed every 5 years to ensure their continuing effectiveness and suitability. Official Seed Health Testing Methods are found in the International Rules for Seed Testing 2012, Annex to Chapter 7, Seed Health Testing Methods. There are 8 ISTA Official Seed Health Testing Methods that were approved in 2002 (Table 1) and were therefore due for review in 2007. As part of the review process a questionnaire was sent to all ISTA Member Laboratories and a copy was posted on the ISTA web-site for other interested bodies to respond.

Twenty-three laboratories answered the 2007 method review questionnaire. Most laboratories stated that the methods were suitable for the purpose they were used for, however, several laboratories suggested further improvement (high priority) was required. These suggestions/comments are summarized below.

## Method 7-001b and 7-002b (*Alternaria dauci* and *A. radicina* / *Daucus carota*)

- Requires an option to use streptomycin where bacterial saprophytes are a problem
- Add antibiotics in the media for agar methods (see Method 7-014)

## Method 7-015 (*Neotyphodium* / *Festuca* and *Lolium* spp.)

- Add a way to distinguish viable fungi
- Need a cheaper method

## Method 7-016 (*Phomopsis* / *Glycine max*)

- Option on MA (Malt Agar) at 20 °C
- Alternative reagents (low priority)
- Alternative reagent (blotter)
- There are no treatments to inhibit germination of seedlings in the agar method that make the evaluation process become difficult

## Method 7-017 and 7-018 (*Alternaria* and *Colletotrichum* on *Linum*)

- Amalgamation with other methods (see method 7-007, 20 °C dark or under UV)
- For both to use the same temperature 20 °C (that is used in method 7-007), the same light (dark as 7-007) or NUV/ dark, 12/12 (as in 7-017 and 7-018).
- Same method should be useful for *Botrytis*, *Alternaria* and *Colletotrichum*. Sometimes it would be useful for surface sterilization of the seeds
- Alternative reagents

Suggestions for technological changes in methods included the following:

- Add the size of working sample in the methods 7-001a, 7-001b, 7-002a, 7-002b, 7-015, 7-016, 7-017, 7-018
- Add antibiotics

In response to the question of whether the methods used for treated seeds, the following replies were received:

Two laboratories used the methods on treated seed and one laboratory rarely. One of these laboratories reported that if the seeds were treated they added the

sentence “This method is not covered by the International Rules for Seed Testing” on the certificate.

All the other laboratories replied that they did not use these methods on treated seeds.

## SHC proposals

As a result of the review and in particular comments received via the questionnaires, the SHC makes the following proposals for each method.

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

1. Accept Method with new review date (2012)
2. Propose new wording for sample preparation section

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

1. Accept Method with new review date (2012)
2. Propose new wording for sample preparation section

### Method 7-002a (*Alternaria radicina* / *Daucus carota*)

1. Accept Method with new review date (2012)
2. Propose new wording for sample preparation section

**Table 1.** The eight ISTA Official Seed Health Testing Methods to be reviewed in 2007

Method No.	Pathogen	Host
7-001a (Blotter)	<i>Alternaria dauci</i>	<i>Daucus carota</i>
7-001b (Malt agar)	<i>Alternaria dauci</i>	<i>Daucus carota</i>
7-002 a (Blotter)	<i>Alternaria radicina</i>	<i>Daucus carota</i>
7-002b (Malt agar)	<i>Alternaria radicina</i>	<i>Daucus carota</i>
7-015	<i>Neotyphodium</i> spp.	<i>Festuca</i> and <i>Lolium</i> spp.
7-016	<i>Phomopsis complex</i>	<i>Glycine max</i>
7-017	<i>Alternaria linicola</i>	<i>Linum usitatissimum</i>
7-018	<i>Colletotrichum lini</i>	<i>Linum usitatissimum</i>

**Method 7-002b (*Alternaria radicina* / *Daucus carota*)**

1. Accept Method with new review date (2012)
2. Propose new wording for sample preparation section

**Method 7-015 (*Neotyphodium* / *Festuca* and *Lolium* spp.)**

1. Accept Method with new review date (2012)
2. Propose new wording for sample preparation section

**Method 7-016 (*Phomopsis* / *Glycine max*)**

1. Accept Method with new review date (2012)
2. Propose new wording for sample preparation section

**Method 7-017 (*Alternaria* on *Linum*)**

1. Accept Method with new review date (2012)
2. Propose new wording for sample preparation section
3. SHC to establish working group to look at alignment of method with methods 7-007 and 7-018

**Method 7-018 (*Colletotricum* on *Linum*)**

1. Accept Method with new review date (2012)
2. Propose new wording for sample preparation section
3. SHC to establish working group to look at alignment of method with methods 7-007 and 7-017

**General editing**

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

In conclusion, no formal requests for changes or withdrawal of any of the methods under review were submitted to the ISTA Secretariat or the ISTA-SHC since their adoption in 2002. Although this indicates that the methods are fit for purpose, it has been brought to the attention of the SHC that some laboratories were not entirely happy with all methods. The reviews were therefore intended to give all seed health laboratories the opportunity to contribute to the first five year review of Methods approved in 2002.

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

# ISTA Seed Health Committee Official Method Review 2010 and 2011

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**Table 1.** The two ISTA Official Seed Health Testing Methods reviewed in 2010, the number of respondent laboratories using individual methods and whether they consider them fit for purpose.

Method	Pathogen	Host	No. of laboratories using method	Fit for purpose?	
				Yes	No
7-019	<i>Xanthomonas campestris</i> pv. <i>campestris</i>	<i>Brassica</i> spp.	3	3	0
7-020	<i>Xanthomonas hortorum</i> pv. <i>carotae</i>	<i>Daucus carota</i>	3	3	0

The Seed Health Method Validation Programme requires that methods approved as Official Methods should be reviewed every 5 years to ensure their continuing effectiveness and suitability. Official Seed Health Testing Methods are found in the International Rules for Seed Testing 2012, Annexe to Chapter 7, Seed Health Testing Methods. There are 12 ISTA Official Seed Health Testing Methods that were approved in 2001 and 2006 (Table 2), one in each of 2004 and 2005 (listed in Table 1) and were therefore due for review in 2010 and 2011. As part of the review process a questionnaire was sent to all ISTA Member Laboratories and a copy

was posted on the ISTA web-site for other interested bodies to respond.

**Report on the 2010 Review questionnaire**

As there was only one method approved in both 2004 and 2005 the review questionnaire for both methods was sent to laboratories in 2010. Five laboratories from five different countries answered the 2010 method review questionnaire. Of these, one

laboratory did not use either of the two methods.

**Replies to the questionnaire**

**7-019**

All three laboratories that used Method 7-019 reported it fit for purpose. However, one laboratory stated that ‘Reliability: we need an improved method to detect the pathogen localized internally in seeds and to be applicable for treated seeds’ and that this was considered a ‘high priority’.

**7-020**

All three laboratories that used Method 7-020 reported it fit for purpose. One laboratory reported ‘DNA extraction: In the method, there is no DNA extraction step. In our laboratory, we use a NaOH extraction which gives better results on the tested strains (based on comparison between the two methods).’

To the question “neither method is validated for use on untreated seed. Do you have a need to test treated seeds for these pathogens? If yes please give a brief explanation”:

Two comments were received:

- 1) ‘Yes. Some seed companies need a Xcc certificate for cabbage seeds which are treated with chemicals. The country where seed companies will export the treated seeds requires an ISTA Certificate, but treated seed samples are not applicable to ISTA Rules.’
- 2) ‘We receive treated seeds often and we have to wash off the fungicide as this can inhibit bacterial growth on semi-selective media. Having a validated, reliable, and repeatable method for fungicide treated seed would be beneficial.’

**SHC proposals**

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

**Method 7-019 *Xanthomonas campestris* pv. *campestris* / *Brassica* spp**

1. Accept Method with new review date (2015).

2. Propose new wording for sample preparation section.
3. SHC working group to work on validation of a method using hot water treated seed.

**Method 7-020 *Xanthomonas hortorum* pv. *carotae* / *Daucus carota***

1. Accept Method with new review date (2015).
2. Propose new wording for sample preparation section.

**Report on the 2011 review questionnaire**

Table 2 reports the 13 Seed Health Methods reviewed in 2011.

Twelve of the above methods (7-003 to 7-014)(Table 2) were accepted in 2001 and were reviewed in 2006. Improvements to these methods since the 2006 review are included in Table 3.

**Replies to the 2011 method review questionnaire**

Seventeen laboratories from 14 countries answered the 2011 review questionnaire (Table 4).

**7-003**

Eight laboratories found the method fit for purpose. The following comment was made:

The preparation of 3% malt solution is not clear. The following table should be added to the protocol:

**Preparation of Malt Solution**

Compound	g/l
Malt extract (manufacturer?)	30
De-ionised/distilled Water	1000 ml

- It is not written if the solution has to be previously sterilized and time of autoclave.
- It is not written if the filter paper has to be clean or autoclaved.
- Where do you put the filter paper? On the bottom of the plate or on the lid?
- Do you seal the plates with Parafilm? In order to prevent moisture loss: Is it possible to wrap the plates with aluminium foil to prevent moisture loss and to incubate in darkness?
- Is it possible to incubate the plates in closed containers?
- **Examination:** We think that it is not necessary to examine for roots showing a soft rot. We should look with the aid of the binocular for typical grey mycelium like it is shown in figures no. 2 and 3. In low magnification inexperienced examiner can confuse *Cladosporium* sp. with *Botrytis* sp.
- It gives trend of infection as the time of observation is in stages.
- Confusion between incubation (it is written 9 days) and examination 5 days, 7 days, 9 days and it is repeated 7 and 9 days. Could it be written “during incubation seeds have to be...” Is it necessary to check 3 times all plates? Could it be added depending on the infection?
- Why in materials the method assume a petri dishes with a diameter of 9 cm and

**Table 2.** The thirteen ISTA Official Seed Health Testing Methods reviewed in 2011

Method	Pathogen	Host
7-003	<i>Botrytis cinera</i>	<i>Helianthus annuus</i>
7-004	<i>Leptosphaeria maculans</i>	<i>Brassicaceae</i>
7-005	<i>Ascochyta pisi</i>	<i>Pisum sativum</i>
7-006	<i>Colletotrichum lindemuthianum</i>	<i>Phaseolus vulgaris</i>
7-007	<i>Botrytis cinerea</i>	<i>Linum usitatissimum</i>
7-008	<i>Caloscypha fulgens</i>	<i>Picea engelmannii</i> and <i>Picea glauca</i>
7-009	<i>Fusarium circinatum</i> ( <i>Fusarium moniliforme</i> var. <i>subglutinans</i> )	<i>Pinus taeda</i> and <i>Pinus elliotii</i>
7-010	<i>Drechslera oryzae</i>	<i>Oryza sativa</i>
7-011	<i>Pyricularia oryzae</i>	<i>Oryza sativa</i>
7-012	<i>Alternaria padwickii</i>	<i>Oryza sativa</i>
7-013	<i>Ustilago nuda</i>	<i>Hordeum vulgare</i>
7-014	<i>Septoria nodorum</i>	<i>Triticum aestivum</i>
7-021	<i>Xanthomonas axonopodis</i> pv. <i>phaseoli</i> and <i>X. axonopodis</i> pv. <i>phaseoli</i> var. <i>fuscans</i>	<i>Phaseolus vulgaris</i>

**Table 3.** Suggested further improvements to methods after 2006 review and actions by SHC since the 2006 review.

Method	Pathogen	Desired improvement after 2006 review	Action by SHC since last review
7-003	<i>Botrytis cinerea/ Helianthus annuus</i>	Reagents (replace 3% malt agar) Alternative filter paper (Whatman No.1 too specific).	1. Introduced wording to allow use of different 'blotter' papers where equivalent. 2. Re-evaluated the use of 3% Malt Agar. Changes to be introduced in 2012 (Seed Testing International, April, 2011)
7-004	<i>Leptosphaeria maculans/ Brassicaceae</i>	Alternative to 2,4-D. Alternative filter paper (Whatman No.1 too specific). Specificity, Sensitivity & Reproducibility.	Data from 2002 Comparative Test (CT) rejected. New CT being organized (2011) with objective to remove use of 2,4-D for freezer blotter method.
7-005	<i>Ascochyta pisi/Pisum sativum</i>	Add other pea pathogens ( <i>M. pinodes</i> and <i>P. medicaginis</i> var <i>pinodella</i> )	Extension of method for 2 further pathogens ( <i>Mycosphaerella pinodes</i> & <i>Phoma medicaginis</i> var. <i>pinodella</i> ) CT completed 2011 and submitted to ISTA for approval Under ISTA Method Validation Programme.
7-006	<i>Colletotrichum lindemuthianum/ Phaseolus vulgaris</i>	Reagents Specificity, Sensitivity & Reproducibility.	–
7-007	<i>Botrytis cinerea/ Linum usitatissimum</i>	Alignment of methods 7-017, 7-018 and 7-007 all pathogens of <i>L. usitatissimum</i> .	New working group established and work ongoing to align methods 7-007, 7-017 & 7.018.
7-008	<i>Caloscypha fulgens</i>	<i>Picea engelmannii</i> and <i>Picea glauca</i>	–
7-009	<i>Fusarium moniliforme</i> var. <i>subglutinans</i> ( <i>Fusarium circinatum</i> )	<i>Pinus taeda</i> and <i>Pinus elliotii</i>	Pathogen name updated. SHC maintaining links with Plant Protection Organisations on new proposals for testing this quarantine pathogen. Decision whether to withdraw method being considered
7-010	<i>Drechslera oryzae/ Oryza sativa</i>	Specificity, Sensitivity & Reproducibility. Reagents	–
7-011	<i>Pyricularia oryzae/ Oryza sativa</i>	Specificity, Sensitivity & Reproducibility. Reagents	–
7-012	<i>Alternaria padwickii/ Oryza sativa</i>	Specificity, Sensitivity & Reproducibility. Reagents	–
7-013	<i>Ustilago nuda/Hordeum vulgare</i>	Replace lactophenol Use funnel containing glycerol:water 2:1 to aid cleaning of embryos. Add use of trypan blue.	Lactophenol replaced by lactic acid method in 2008.
7-014	<i>Septoria nodorum/ Triticum aestivum</i>	Add <i>Microdochium nivale</i> and <i>Fusarium</i> spp. Include complementary methods (e.g. luminous blotter test or freezing blotter method)	No progress for aligning with Method 7-022 <i>Microdochium</i> spp.

**Table 4.** Number of respondent laboratories using individual methods and whether they consider them fit for purpose.

Method	Pathogen	No. of laboratories using method	Fit for purpose?	
			Yes	No
7-003	<i>Botrytis cinerea/ Helianthus annuus</i>	8	8	0
7-004	<i>Leptosphaeria maculans/ Brassicaceae</i>	6	4	2
7-005	<i>Ascochyta pisi/Pisum sativum</i>	11	10	1
7-006	<i>Colletotrichum lindemuthianum/ Phaseolus vulgaris</i>	12	11	1
7-007	<i>Botrytis cinerea/ Linum usitatissimum</i>	6	5	1
7-008	<i>Caloscypha fulgens/ Picea engelmannii</i> and <i>Picea glauca</i>	0	0	0
7-009	<i>Fusarium circinatum</i> ( <i>Fusarium moniliforme</i> var. <i>subglutinans</i> )  <i>Pinus taeda</i> and <i>Pinus elliotii</i>	1	1	0
7-010	<i>Drechslera oryzae/ Oryza sativa</i>	4	4	0
7-011	<i>Pyricularia oryzae/ Oryza sativa</i>	4	4	0
7-012	<i>Alternaria padwickii/ Oryza sativa</i>	4	4	0
7-013	<i>Ustilago nuda/Hordeum vulgare</i>	8	8	0
7-014	<i>Septoria nodorum/ Triticum aestivum</i>	6	6	0
7-021	<i>Xanthomonas axonopodis</i> pv. <i>phaseoli</i> and <i>X. axonopodis</i> pv. <i>phaseoli</i> var. <i>fuscans/ Phaseolus vulgaris</i>	3	2	1

in the description of the method it is suggested two different diameters (80 and 90 mm). The Whatman filter paper we have, No. 1, Cat No. 1001 090, is 90 mm and not 88 mm.

**Examination 7-003-4:** In doubtful cases confirmation.....ribbon-like (sometimes twisted) hyphae and tufts of branching conidiophores. – high priority.

**7-004**

Four laboratories found the method fit for purpose.

Two laboratories found the method not fit for purpose stating that 1) method should be ‘without 2,4D solution’, medium priority and 2) ‘the principle of the method is good. In our comparisons (last year) 2,4-D is better than FB. But 50 seeds per dish is too many (we use 25) and, the description of the pathogen and images needs to be updated’ – high priority.

The following comments were made:

- 1) description of minimum distance between seeds when placed on filter paper. Gives the laboratory possibilities to use different size Petri dishes and equivalent filter papers – low priority.
- 2) pycnidia are produced more efficiently and mycelium criteria are easily observed on malt agar. Method should include MA – low priority.
- 3) Four layers of filter paper are soaked in DI water, drained up to the drip stage and placed on a plastic tray 20 × 20 cm, 3 cm depth. Seeds are placed on the moist paper by the aid of a vacuum board (it is easier and quicker than manual) and then the tray is covered by a transparent nylon bag. In this case sowing density is 50 seeds per one tray. If germination of the seeds will be avoided, by using deep freeze or 2,4-D, usually it will not be possible to see infected seedlings in the blotter test as it is described in Fig. 2. – high priority.

**7-005**

Ten laboratories found the method fit for purpose.

One laboratory found the method not fit for purpose and suggested the use of light instead of darkness and that this was of medium priority.

Comments made by three laboratories:

- 1) Method but better with NUV-light.
- 2) Greater specificity and reproducibility required – low priority.
- 3) It is highly recommended to compare the infection levels with and without the addition of antibiotics to Malt agar and PDA. CCP – The malt agar source can influence the results. Whenever a new batch of malt agar is used a check on the quality should be made using a reference lot with a known infection level or a reference culture. – high priority.

**7-006**

Eleven laboratories stated that the method was fit for purpose, whilst one stated that it was not fit for purpose but no comment was provided.

The following comment was made by one laboratory: Fig. 1 is confusing because it is not explained and mentioned in the text. This figure may stay in the protocol only by adding the paragraph from the previous working sheets: “Direct inspection Lesions on severely infected seeds may be either brown with whitish centres surrounded by a pale brown to dark brown area or reddish lesions of variable size (Fig.1). Direct inspection is not a dependable method, as not all infected seeds bear symptoms and on dark-skinned varieties symptoms are more difficult to see.” – low priority. A photo was provided.

**7-007**

Five laboratories found the method fit for purpose.

One laboratory found the method not fit for purpose and stated ‘done as 7-017 and 7-018, not possible to use two different methods, important one method for all diseases of Linum’.

The following comments were given by two laboratories:

- 1) More specificity and sensitivity required – low priority
- 2) Fig. 1 is confusing because it is not explained and mentioned in the text. This figure may stay in the protocol only by adding the paragraph from the previous working sheets: « Direct inspection Heavily diseased seed samples have grey dull aspect instead of a bright appearance (Fig. 1), but individually infected seeds are difficult to select. Infected seeds may have a healthy appearance, therefore direct inspection is useful only for indicating heavily diseased lots. » – low priority

**7-009**

One laboratory found the method fit for purpose but stated that ‘It is recommended to examine characters on CLA (macroconidia, microconidia and polyphialides) and PDA (mycelial growth and agar pigmentation). Fusarium species / Nelson, Toussoun and Marasas.’

**7-010**

Four laboratories found the method fit for purpose.

One comment was received based on Methods 7-010, 7-011 and 7-012: Details about preparation of Petri dishes are missing; How many layers of filter paper should be used? Should the filter papers be dipped in distilled, or tap water? We used 3 layers of filter paper, Whatman No. 1, 9.0 cm. We dipped the filter papers in sterile distilled water. Please see the book: Common Laboratory Seed Health Testing Methods for Detecting Fungi, S. B. Mathur, Olga Kongsdal (2003), pages 89-98. After the 4th day of incubation we noticed that the blotters were too dry so we added 1.5 ml of sterile distilled water to each petri dish. Usually in our laboratory (not for rice) we use the following blotter test: Seeds are placed evenly on 4 layers of moist filter paper on a plastic tray 20X20 cm, 3 cm depth, covered by a transparent nylon bag. Then

the trays are taken carefully to the incubation room. – high priority.

**7-011**

Four laboratories found the method fit for purpose, no comments.

**7-012**

Four laboratories found the method fit for purpose, no comments

**7-013**

Eight laboratories found the method fit for purpose.

Six laboratories provided comments:

- 1) alternative reagents: 1 L lactic acid solution should be composed of 900 ml lactic acid and 100 ml glycerine – high priority.
- 2) alternative incubation method for step 2.5 – high priority.
- 3) laboratory already using the new version 7-013b.
- 4) reproducibility, sensitivity – high priority.
- 5) alternative reagents – e.g., optional use of a stain to make identification easier. Should the duration of boiling the embryos in lactic acid solution be stated as a critical control point (CCP)? – high priority.
- 6) staining of embryos improve detection. Method should include staining – low priority.

**7-014**

Six laboratories found the method fit for purpose.

Three laboratories provided comments:

- 1) sensitivity, specificity – high priority
- 2) would be better to align with Microdochium – low priority
- 3) In preparation of media and solutions it is written that 1 mg of Streptomycin sulfate is added to the agar. Is it correct? In the method it is written 100 ppm Streptomycin sulfate. For aligning with method 7-022 Microdochium spp. this laboratory provided a suggestion for improvement of 7-022.

**7-021**

Two laboratories found the method fit for purpose.

One laboratory found the method not fit for purpose as a ‘pathogenicity test could give a false positive’ – high priority.

Other comments:

- 1) method should propose to soak in water – low priority
- 2) reproducibility and sensitivity – high priority.

**To the question: ‘is there a need to respond to a technological change in one or more methods ? If yes explain in a few words.’:**

Six laboratories responded ‘No’.

Comments from other laboratories:

- 1) 7-021: Pathogenicity test not suitable. It must be replaced by PCR to check suspect colonies of Xap.
- 2) Yes, perhaps an alternative test method (e.g. morphological, ELISA, PCR, etc.) could be given for the tests selected, in so far as is reasonably practicable. I appreciate that this is currently being done for *Ustilago nuda* with the ‘Nordic Method’.
- 3) In method 7-013, at Point 2.5, the change of reagent from lactophenol to lactic acid solution has meant another change is required in incubation, from boiling embryos for 5 minutes, to 20 minutes incubation at either room temperature or 37 °C to avoid damaging embryo scutellums with the highly acidic lactic acid solution.

**To the question: ‘most methods are not validated for use on treated seed. Do you have a need to test treated seeds for these pathogens ? If yes please give brief explanation.’:**

Seven laboratories responded ‘No’.

Comments from other laboratories:

- 1) We do have a need to test treated seeds.
- 2) 7-003 *Botrytis cinerea* on *Helianthus annuus*: The majority of the samples arrive treated. We have experience

that strong pathogen infection can be detected even on treated seeds.

- 3) Method 7-021: Most seed samples are treated.
- 4) We do have a need to test treated seeds for most of the tested pathogens and then we add to the result’s report the following remark: “Seed treatments may affect the performance of this test and hence the reliability of the results”.
- 5) Yes, for treated seeds with chemical and disinfested seeds.
- 6) We regularly use the test on treated seeds – to evaluate the efficacy of seed treatments. But this is not the same as evaluating the health status of the seed. Also one could never ‘validate’ a test method for all possible seed treatments. So the status generally should stand as not being validated for use on treated seed. There is perhaps also often a need to define ‘treatment’ – probably the wording should be ‘chemical, biological or physical. Is ‘priming’ a treatment? It also has effects on apparent seed health status.
- 7) Sometimes we get asked to test treated seed but not of the above methods. The problem is that for one treatment it can be possible but for example with biological treatments the bacteria will not start to be active on some artificial substrates.

**In general**

**Important remarks:**

1. It is necessary to add critical control points (indicated by CCP) to every testing method (regarding agar manufacturer, examination, etc.).
2. Reference Material – It is necessary to plate an infected seed sample by the target pathogen or reference cultures, parallel to the tested seed sample. A positive control should be separated from the tested sample in order to avoid disruption of the results. In case the laboratory does not have a positive control, morphological descriptions,

- photos and diagrams from the professional literature should be used.
3. According to our experience it is possible to dissolve Streptomycin Sulfate in sterile water without filter sterilization.
  4. Some laboratories recommend the use of quarter-strength (¼) potato dextrose agar (PDA) because it encourages sporulation and saves money.
  5. All the photos should be in colour (please note: 7-007-7 Fig 3 compared with 7-003-6) and in the best quality.
  6. The host name should appear in English (in brackets) in every title of testing method.

### SHC proposals

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

#### Method 7-003 *Botrytis cinerea* *Helianthus annuus*

1. Accept Method with new review date (2016).
2. Propose new wording for media preparation and examination sections.

#### Method 7-004 *Leptosphaeria maculans* *Brassicaceae*

1. Accept Method with new review date (2016).
2. Propose new wording for sample preparation section.
3. SHC Working Group to submit validation data for alternative to current 2,4-D method.

#### Method 7-005 *Ascochyta pisil* *Pisum sativum*

1. Accept Method with new review date (2016).
2. Propose new wording for sample preparation section.
3. Extension of method for two extra pathogens (*Mycosphaerella pinodes* & *Phoma medicaginis* var. *pinodella*) submitted to ISTA for approval under ISTA Method Validation Programme.

#### Method 7-006 *Colletotrichum lindemuthianum* *Phaseolus vulgaris*

1. Accept Method with new review date (2016).
2. Propose new wording for sample preparation and examination sections.

#### Method 7-007 *Botrytis cinerea* *Linum usitatissimum*

1. Accept Method with new review date (2016).
2. Propose new wording for sample preparation and examination sections.
3. SHC to establish working group to look at alignment of method with methods 7-017 and 7-018.

#### Method 7-008 *Caloscypha fulgens* *Picea engelmannii* and *Picea glauca*

1. Accept Method with new review date (2016).
2. Propose new wording for sample preparation section.

#### Method 7-009 *Fusarium circinans* *Pinus taeda* and *Pinus elliottii*

1. Accept Method with new review date (2016).
2. SHC maintaining links with Plant Protection Organisations on new proposals for testing this quarantine pathogen. Decision whether to withdraw method being considered.

#### Method 7-010 *Drechslera oryzae* *Oryza sativa*

1. Accept Method with new review date (2016).
2. Propose new wording for sample preparation section.

#### Method 7-011 *Pyricularia oryzae* *Oryza sativa*

1. Accept Method with new review date (2016).
2. Propose new wording for sample preparation section.

#### Method 7-012 *Alternaria padwickii* *Oryza sativa*

1. Accept Method with new review date (2016).

2. Propose new wording for sample preparation section.

#### Method 7-013 *Ustilago nuda* *Hordeum vulgare*

1. Accept Method with new review date (2016).
2. Propose new wording for sample preparation section.

#### Method 7-014 *Septoria nodorum* *Triticum aestivum*

1. Accept Method with new review date (2016).
2. Propose new wording for sample preparation section.
3. SHC to consider amalgamating 7-022 *M. nivale* method sheet with Method Sheet 7-014.

#### Method 7-021 *Xanthomonas axonopodis* pv. *phaseoli* and *X. axonopodis* pv. *phaseoli* var. *fuscans* *Phaseolus vulgaris*

1. Accept Method with new review date (2016).
2. Propose new wording for sample preparation section.

### General editing

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

In conclusion, no formal requests for changes or withdrawal of any of the methods under review were submitted to the ISTA Secretariat or the ISTA-SHC since their adoption in 2001, 2004, 2005 and 2006. It may appear that all the methods are thus considered fit for purpose. However, it was brought to the attention of the SHC that various laboratories were not entirely happy with all methods. The reviews were therefore intended to give all seed health laboratories the opportunity to contribute to the second five year review of Methods approved in 2001, and to those approved in 2004, 2005 and 2006.

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

**30th ISTA Congress, Antalya, Turkey, 12–18 June 2013**  
**Online registration now open: [www.seedtest.org/2013](http://www.seedtest.org/2013)**

# Information from the ISTA Accreditation System

R. El-Khadem

ISTA Accreditation and Technical Department

The number of ISTA-accredited laboratories is increasing worldwide from year to year. Up to the end of 2011, 123 laboratories with ISTA accreditation were counted. Five first-accreditation audits were performed in 2011 in Asia and Europe, and some more are scheduled to take place in Asia in 2012.

## Reporting on ISTA Certificates, a part of the ISTA Proficiency Test Programme

Re-accreditation audits are scheduled every three years, and between two audits, laboratory performance is monitored by the ISTA Proficiency Test Programme. Once every year the Proficiency Test Programme includes a reporting exercise. Participating laboratories receive a specimen ISTA Certificate and are asked to report the result

of one of the tested samples. In 2011, the proficiency test round samples "11-2 T.aes" on *Triticum aestivum* were shipped to the 149 participants together with one Orange International Seed Lot Certificate (OIC) as a specimen. The test round comprised requests for purity, other seed determination, germination, moisture determination and viability testing. 100 participants were accredited laboratories and obliged to perform at least one of the scheduled tests. 49 laboratories were volunteers. Volunteer laboratories are either accredited laboratories that are not accredited for the related crop group or non-accredited laboratories.

Some certificates were not evaluated, and were considered to be invalid, if they were handwritten or contained signs of alterations or erasures, or the signature or stamp or date of issue were missing.

94 of the 100 obligatory-test participants submitted an OIC for review, of which 5 were invalid. There were hence 89 valid OICs for further evaluation.

35 of the 49 voluntary participants submitted an OIC for review, of which 9 were invalid. There were hence 26 valid OICs for further evaluation.

The valid OICs were evaluated by the Accreditation and Technical Department. Table 1 shows a selection of the detected non-conformities.

The major non-conformity for issuing OICs was in the area of reporting the results of the other seed determination (27% of the obligatory-test and 65% of the volunteer laboratories). The results were either missing or incomplete. Frequently, the results were incorrectly reported. A high number of non-conformities were also observed in the reporting of the other seed fraction of the purity analysis (16% of the obligatory-test and 19% of the volunteer laboratories).

10% of the OICs submitted from obligatory-test laboratories showed incomplete or incorrect information when reporting information provided by the applicant, information about the testing and issuing laboratory or information about the sampling laboratory.

Not all obligatory-test laboratories were also obliged to participate in moisture determination and viability testing. This explains why only 79 laboratories reported their moisture results. Of these, 22 laboratories did not report which moisture method had been applied, which is not in accordance with the ISTA Rules. Similarly, only 68 laboratories reported viability results on the OICs, and 7 of these used a deviating method without indicating this on the OIC.

The test results of the voluntary laboratories are not presented in this paper.

This exercise on reporting test results on a specimen ISTA Certificate shows that there are areas where reporting is relatively uniform among ISTA laboratories worldwide. However, it also identifies areas where improvements in reporting are

**Table 1.** Selected non-conformities of reporting in Proficiency Test "11-2 T.aes" on *Triticum aestivum*

	Obligatory-test participants (n = 89)	Volunteer participants (n = 26)
Information about the applicant incomplete or not in accordance with instruction letter	9 (10%)	3
Information about the seed lot incomplete (weight or category missing, misspelling)	4	4
Information about the testing and issuing laboratory incomplete (e.g. laboratory code missing)	9 (10%)	2
Information about the sampling laboratory incomplete (e.g. laboratory code or laboratory name missing or not following instruction)	9 (10%)	5
Date of sampling missing or wrong (e.g. wrong date format)	1	3
Date of sample receipt implausible, missing or wrong	3	3
Date test conducted implausible, missing or wrong	4	3
Test number very likely not unique in laboratory	1	2
Purity: results do not add up to 100.0 %	3	1
Purity: kind of inert matter missing	1	0
Purity: kind of other seeds not correct (missing, synonyms used, misspelling, seed count included)	14 (16%)	5 (19%)
Other seed determination: results missing, incomplete or incorrectly reported (e.g. weight of sample missing, type of test, misspelling, not reported under "Other determinations")	24 (27%)	17 (65%)
Germination: number of days missing, implausible or transcription error	3	1
Germination: results do not add up to 100	1	0
Germination: method missing or transcription error	1	1

necessary. These areas seem to be problematic for obligatory-test laboratories, but also for volunteer laboratories. Further investigations are needed to identify the root causes of the described non-conformities. Once they have been identified, further steps shall be defined to improve uniformity in reporting seed testing results on International Certificates.

### Non-conformities identified during ISTA (re-)accreditation audits

The non-conformities identified in quality management systems during ISTA audits in 2011 were summarized. Each non-conformity was assigned to one single category. Categories included document control, training, certificate, monitoring, non-conforming work/corrective actions, internal audits etc. Figure 1 shows the the ten most important categories of non-conformities.

23% of the recorded non-conformities were related to document control issues. Typical non-conformities in this area were:

- Documents and/or forms were not controlled (e.g. version number, page numbers, total page number missing).
- Uncontrolled or old versions of documents were in use.
- Documents were not updated after ISTA Rules changes.
- The master-list of controlled documents was missing or incomplete.

12% of non-conformities were related to the training procedure, e.g.:

- The training of samplers and/or analysts was not performed.
- The training was performed but no records were available.
- The internal auditors of the laboratory did not obtain any training.

During the review of the issued ISTA Certificates, the auditors recorded non-conformities with a share of 10% of the total recorded audit findings. The following is an extract of possible non-conformities:

- No copies were available of issued ISTA Certificates (including the stamp and signature).

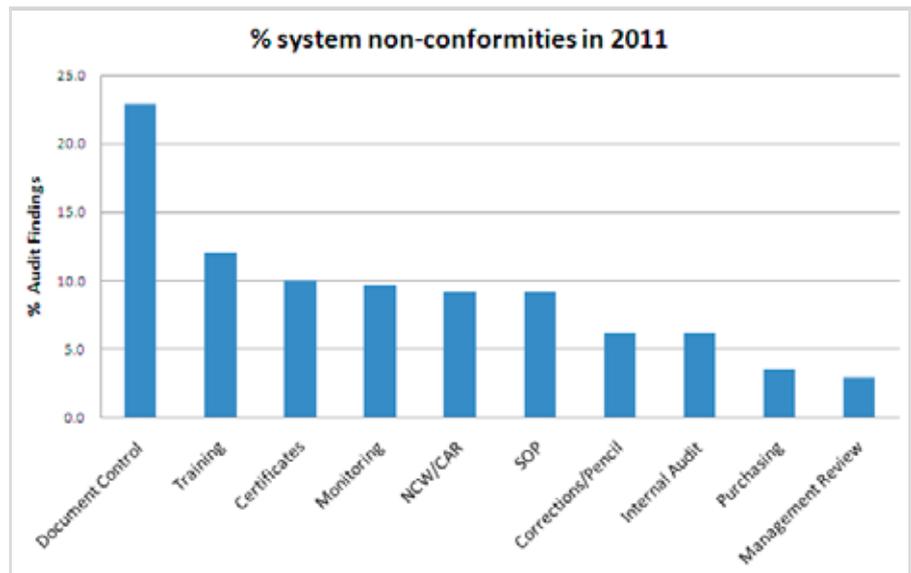


Figure 1. System non-conformities identified in audits in 2011, listed by category. NCW = non-conforming work; CAR = corrective action report; SOP = standard operating procedure

- Certificates were not issued in accordance to the ISTA Rules.
- Certificates were issued for species or tests not listed in the laboratory's scope of accreditation.
- Effectiveness of corrective actions was not measured.
- The laboratory did not follow up after poor performance in the ISTA Proficiency Test Programme.

As described in the current ISTA Accreditation Standard, seed testing laboratories must have a monitoring programme in place. 10% of the non-conformities were connected with the monitoring process:

- No monitoring programme of staff was in place.
- No monitoring programme covering all tests within the laboratory's scope of accreditation was in place.
- No monitoring was done for the last two years.
- The obtained data was not recorded in such a way to allow trends to be detected.

For the continuous improvement of the laboratory's quality management system, the laboratory must report non-conforming work (NCW) and record appropriate corrective actions (CAR). 9% of the total audit findings were issues related to this process:

- Non-conforming work was not recorded.
- Corrective actions were taken but not recorded.

9% of the total non-conformities were categorized as issues related to standard operating procedure (SOP). In general, this category comprises findings where a documented procedure (SOP or work instruction or however called) is missing, incomplete or incorrect, e.g.:

- The laboratory did not follow its own SOP.
- Documents were missing for a process.
- Documents were not complete or did not reflect the steps in the required detail.
- Documents needed revision.

The remaining non-conformities were assigned to other categories of which none exceeded 7%; they are therefore not presented here.

With this summary report we hope to have shared valuable information for accredited laboratories and for those seeking accreditation. The information should help laboratories to evaluate their own quality systems and check their compliance with the ISTA Accreditation Standard. ■

# Laboratory accreditation changes

Status 1 September 2012

## Re-accreditations

### Australia AUDL0600

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### AUDL0900

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### Czech Republic CZDL0300

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### France FRML0600

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**Termination of accreditation****Denmark DKML0500**

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**INML1200**

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Seed Testing Laboratory  
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Quthbullapur Mandal  
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**South Korea KRDL0100**

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Experiment Research Institute of NAQS  
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Youngdeungpo-Gu, Seoul

## Call for registration: 17th ISTA GMO Proficiency Test on soya (*Glycine max*)

The 17th ISTA GMO Proficiency Test will focus on the detection and/or the quantification of transgenic events in a defined number of soya seed samples.

The ISTA GMO Proficiency Test is open not only to laboratories involved in GM seed testing, but also to laboratories involved in food and feed GM testing.

Your laboratory can select the appropriate method to detect the presence or absence of GM seeds and to quantify their presence in samples of conventional seeds.

Since GMO testing has been included in the ISTA Accreditation Programme, participation in the ISTA GMO Proficiency

Tests is obligatory for those ISTA member laboratories which have GMO testing methods in their scope of accreditation.

Laboratories interested in participating should please send a completed registration form to the ISTA Secretariat before 15 November 2012.

The registration form, a detailed announcement and the proceeding deadlines can be found on the ISTA web site under the link: [www.seedtest.org/GMOPT](http://www.seedtest.org/GMOPT)

For further information please contact the ISTA Secretariat:

E-mail: [tcom.admin@ista.ch](mailto:tcom.admin@ista.ch)  
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# ISTA Vigour Testing Workshop

İzmir, Turkey, 4–6 June 2013

The Seed Technology Centre, Ege University and ISTA Vigour Committee invite you to a workshop on seed vigour testing, to be held in İzmir, Turkey from 4th to 6th June 2013. The workshop will be made up of lectures, interactive seminars and practical experience in vigour testing. It will also offer the opportunity for general discussion of seed vigour and time for participants to ask specific questions regarding vigour testing procedures.

### Workshop content

This workshop will include new developments in seed vigour that have occurred over the last two years and potential future developments in vigour testing as well as established vigour tests.

### Lecture topics

- Introduction to seed vigour, its physiological basis and importance in crop production
- Conductivity test for *Pisum sativum*, *Phaseolus vulgaris*, *Glycine max*
- Controlled deterioration test for *Brassica* sp; application to other small seeded vegetables
- Radicle emergence test: development and validation. Examples: maize, cotton, *Brassica*, pepper, cucurbits, general applicability
- Accelerated ageing test for soybeans
- Seed ageing/metabolic repair hypothesis: the basis of all vigour tests
- Factors affecting seed vigour
- Use of seed vigour

### Practical work

All participants will complete the conductivity test and assess results from the controlled deterioration and radicle emergence tests. There will be demonstration of stages in the accelerated ageing and controlled deterioration tests.

### Question and answer sessions

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

### Presenters of the workshop

- Dr Alison Powell (Chair of ISTA Vigour Committee, University of Aberdeen, UK),
- Dr Stan Matthews (ISTA Vigour Committee, University of Aberdeen, UK)
- Dr Hülya İlbi (ISTA Vigour Committee, Seed Technology Centre, Ege University, Turkey).

### Location

The workshop will take place at the Seed Technology Centre, Ege University, İzmir, Turkey. The university campus (<http://ege.edu.tr>) is situated in Bornova, part of the Province of İzmir, the third largest city in Turkey. The University is based in 3700 ha of parkland and is a focus for the educational and cultural life of İzmir. The campus is 15 km from Adnan Menderes airport and about 10 km from central İzmir, and is linked to the city centre by frequent bus and underground services.

The city of İzmir itself is 8000 years old, with a history dating back to the Neolithic Age; the ancient name of the city is Smyrna. It is a harbour city and has had a place in the commercial economy of the Mediterranean region since the 16th century. Both domestic and foreign trade have been highly developed in İzmir thanks to its free-trade zones, international fairs and industrial zones. The harbour is the biggest importer and the second biggest exporter of the country, and the city is the touristic, industrial and cultural centre of the Aegean Region. İzmir also incorporates the nearby ancient cities of Ephesus, Pergamon, Sardis and Klazomenai, and centres of international tourism such as Kuşadası, Çeşme, Mordoğan and Foça.

It is easy to reach Antalya, the location of the 30th ISTA Congress, by air and bus. There are direct flights from İzmir to Antalya twice a day via Sunexpress Airways ([www.sunexpress.com](http://www.sunexpress.com)).

### Local organiser

Hülya İlbi, Ege University, Faculty of Agriculture  
 Telephone: +90 232 3111971 or +90 232 3394304  
 Fax: +90 232 3115030  
 Email: [hulyailbi@gmail.com](mailto:hulyailbi@gmail.com); [hulya.ilbi@ege.edu.tr](mailto:hulya.ilbi@ege.edu.tr)

### Accommodation

Accommodation is available either at the Anemon Ege Hotel or the Guest House of Ege University.

Anemon Ege Hotel (<http://english.anemonhotels.com/otel.aspx?otel=anemonizmir>) is a short walking distance from the Seed Technology Centre where the workshop will be held. Rooms with breakfast cost € 75 per night (single) or € 95 per night (double). Room fee also includes the transportation between airport and hotel.

Anemon Ege Hotel:  
 Tel. +90 232 373 48 62  
 Fax +90 232 373 48 63

The Guest House of Ege University (<http://konukevi.ege.edu.tr>) is also a short walking distance from Seed Technology Centre. Rooms with breakfast cost € 30 per night (single) or € 45 per night (double). However, you would need to arrange your own transport from the airport to the hotel. A taxi will cost approximately € 40–45.

Guest House Ege University:  
 Fax: + 90 232 339 99 93; reservation phone: +90 232 388 1447 4  
 E-mail: [konukevi@mail.ege.edu.tr](mailto:konukevi@mail.ege.edu.tr)

Participants should make their own accommodation arrangements. When making your hotel reservation, please copy your e-mails or faxes to the local organiser, or inform her where you will be staying.

**Registration**

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

ISTA members (includes ISTA laboratory member staff): € 450  
 Non-members: € 575

Payment for the ISTA Vigour Testing Workshop is required in euros before **3 May 2013**.

Please note: For cancellations made before 15 April 2013, registration fees are refundable less a € 50 administration fee. For cancellations made after 15 April 2013, registration fees are non-refundable.

If you would like to attend the workshop, please fill in the registration form ([www.seedtest.org/vig-test](http://www.seedtest.org/vig-test)). An invoice will be sent to you, which must be paid before participation can be confirmed. Payment can be made by credit card upon individual request to the ISTA Secretariat.

**Registration deadline**

**3 May 2013**

# ISTA Workshop on Purity and Germination

## Ankara, Turkey, 6–9 June 2013

The Variety Registration and Certification Center (VRCC) and Laboratories Ankara in Turkey is looking forward to hosting the Purity and Germination Workshop.

**Location**

VRCC Meeting Hall and Laboratories, Ankara, Turkey

**Local organizer**

Kamil Yilmaz, ISTA Executive Committee Member

**Main lecturers**

Jane Taylor (Vice-Chair of ISTA Purity Committee)  
 Sylvie Ducournau (Chair of ISTA Germination Committee)

**Aim of the workshop**

The aim of this workshop is to present theoretical aspects of purity and germination testing, results, calculations and reporting; quality assurance and the practical application of ISTA rules on different species. (PURITY: purity testing procedures; pure seed definitions; seed identification; other seed determination. GERMINATION: germination testing procedures; seedling evaluation).

**Workshop content**

The workshop will consist of lectures and practical exercises. It will offer the opportunity for general discussion on purity and germination testing, as well as for specific questions regarding testing procedures. The ISTA Rules and the ISTA Handbooks will be discussed and used during the workshop. Language of the workshop is English.

**Preliminary programme**

- Introduction to ISTA
- The history of purity testing and current pure seed definitions
- Seed identification: e.g. family features and difficult to distinguish species
- Germination calculations and tolerances
- ISTA Universal List
- Current and future work of the ISTA Purity and Germination Committees
- Testing procedures for germination
- Seedling evaluation
- Calculations and tolerances (purity and germination)
- Quality assurance aspects (purity and germination)
- Workshop dinner

**Preliminary list of species**

- Cereals: *Triticum* spp., *Hordeum vulgare*
- Forage crops: *Medicago sativa*, *Vicia sativa*, *Trifolium repens*
- Sugar beet: *Beta vulgaris*
- Coated seeds: *Beta vulgaris*, *Medicago sativa*, *Brassica napus*
- Mixtures of seeds (seed identification and separation): *Lolium* spp., *Festuca* spp., *Poa* spp.

**General information**

Ankara is the capital of Turkey and the country’s second largest city after Istanbul. The city has a mean elevation of 938 metres (3,077 ft). Centrally located in Anatolia, Ankara is an important commercial and industrial city. It is the centre of the Turkish Government, and houses all foreign embassies. It is an important crossroads of trade, strategically located at the centre of Turkey’s highway and railway networks, and serves as the marketing centre for the surrounding agricultural area. The city was famous for its long-haired Angora goat and its prized wool (mohair), a unique breed of cat (Angora cat), Angora rabbits and their prized wool (Angora wool), pears, honey, and the region’s muscat grapes.

**Travel information**

The International Esenboga Airport is 30 km north of the city center. Transportation is provided by HAVAS shuttle buses, as well as taxis. There are flights to all the other cities in Turkey, with many each day to Istanbul.

**Hotel information**

The seed lab is near Ankara city centre. There are several hotels with easy walking access to the shopping areas and restaurants of Ankara.

Special rates have been negotiated with the Gür Kent Hotel (4-star; € 45 incl. VAT per night) and the Dedeman Hotel (5-star; € 75 incl. VAT per night) for the duration of the workshop. Pick-up and drop-off on the days of the workshop have also been organized for these hotels.

Participants will be collected from these two hotels at 08:00 free of charge.

If participants would like to stay elsewhere they will be responsible for getting to and from the Ankara Variety Registration and Certification Center (VRCC) themselves. Check-in is at the VRCC Meeting Hall and VRCC Laboratories.

Please note: Hotel fee to be paid locally by participant. Please use booking reference “ISTA Workshop” to get the special rate. Hotel reservations will need to be made by participants with their own credit cards directly with the hotels.

Gür Kent Hotel (4-star; € 45 incl. VAT per night, bed and breakfast)

Mithatpaşa Cad. No: 4, 06410 Yenışehir-Ankara

Tel: 0 (312) 435 50 50 (pbx 24 hat)

Fax: 0 (312) 434 46 57

E-mail: bilgi@gurkenthotel.com, rezervasyon@gurkenthotel.com

Dedeman Hotel (5-star; € 75 incl. VAT per night bed and breakfast)

Akay Cad. Büklüm Sok. 1 06660 Ankara

Tel: +90 (312) 416 8800

Fax: +90 (312) 417 6214

E-mail: ankara@dedeman.com

**Official workshop dinner**

The official course dinner will be on one of the workshop days. The dinner will be free of charge.

**Registration fees**

ISTA Members (includes ISTA laboratory member staff): € 280

Non-members: € 380

Payment is required before 3 May 2013.

Please note: For cancellations made before 15 April 2013, registration fees are refundable minus a € 50 administration fee.

For cancellations made after 15 April 2013, registration fees are non-refundable.

The number of participants is restricted to a maximum of 20.

If you would like to attend the workshop please fill in the registration form ([www.seedtest.org/pur-ger](http://www.seedtest.org/pur-ger)). An invoice will be sent to you, which has to be paid before the participation confirmation will be generated. Payment can be made by credit card upon individual request to the ISTA Secretariat.

**Registration deadline**

**3 May 2013**

**30th ISTA Congress, Antalya, Turkey, 12–18 June 2013**  
**Online registration now open: [www.seedtest.org/2013](http://www.seedtest.org/2013)**

# ISTA Workshop on Seed Sampling

## Chisinau, Moldova, 20–23 March 2012

Andrei Mihalachi

Deputy Head of Department of Seed Control

General Inspectorate for Phytosanitary Surveillance and Seed Control  
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The Republic of Moldova has been an ISTA member country since 2008, and since 2010 also has an ISTA-accredited laboratory at the SE “State Centre for Certification of Seed Material”.

In March 2012, the General Inspectorate for Phytosanitary Surveillance and Seed Control as the designated authority for certification of seed material organized an ISTA workshop on seed sampling.

There were 30 participants from 18 countries at the workshop, which consisted of lectures (general principles of seed sampling, the ISTA Handbook on Seed Sampling, dividing the samples into submitted samples, training aspects for samplers,

audit elements for licensed samplers) and practical exercises (sampling of cereals and other species in bags, big bags and boxes).

The lecturers were Mr. Gerry Hall from Science and Advice for Scottish Agriculture (SASA) and Mr. Eddie Goldschagg from the South African National Seed Organization. The Chair of the ISTA Bulk-ing and Sampling Committee (BSC), Mrs. Leena Pietilä from the Finnish Food Safety Authority Evira, was also present.

The lectures were given at the Chateau Vartely, a modern tourist complex with high European standards, professional service and special programmes.

The practical exercises took place at AMG-Agroselect (a sunflower seed production company with seed factory) at Soroca. During the practicals the participants carried out seed sampling from various types of containers, and learned how to divide composite samples into submitted samples. There were lively discussions and



valuable contributions from the participants during both lectures and practicals.

The social programme consisted of visits to the monastery of Curchi, the fortress of Soroca, a historic fort in the north of Moldova, and the archeological complex Old Orhei, which is situated in the valley of a tributary of the Dniestr–Raut River. It is



located in a well-defined historical and geographical area, known since ancient times as “Codrii Orheiului” or “Tara Orheiului” (Land of Orhei) – once forming a distinct territorial component of one of the many medieval Romanian countries in the immense Carpathian-Danubian region. At Old Orhei, nature and human civilization have blended organically, forming a unified ensemble a thousand years old.

On the last day of the workshop, which took place at the ISTA-accredited seed testing laboratory, Mrs. Leena Pietilä gave a presentation of the present work and experiments of the BSC, as well as the committee’s plans for the future, and presented all participants with training certificates.



## ISTA Workshops on Variety Testing and Flower Seed Testing Roelofarendsveen, Netherlands, 6–9 June 2012

Anton Grim<sup>1</sup> and Hedwich Teunissen<sup>2</sup>

<sup>1</sup>Manager, Seed Analysis & Nematology; <sup>2</sup>Senior Research Scientist, Variety Identification

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h.teunissen@naktuinbouw.nl

From 6–9 June, Naktuinbouw was host to two ISTA workshops, one on variety testing and one on flower seed testing. Both workshops were held at the Naktuinbouw facility in Roelofarendsveen in the Netherlands. A total of 61 participants came from all over the world (North and South America, Europe, Africa, Asia, Australia and New Zealand) to visit these two four-day workshops.

The participants represented universities, governmental laboratories, governmental agencies, commercial seed companies and private laboratories.

Before their respective workshops, all participants were given an introduction to the three main departments of Naktuinbouw and their work (Inspections, Variety Testing and Laboratories) and a tour through the greenhouses and laboratories.

### Workshop on Variety Testing

The programme of the Variety Testing workshop was quite full. It tried to give the participants a complete overview of the whole procedure from sampling, DNA extraction, performing fingerprints, analysis of fingerprints to storage of the fingerprints in a database, allowing advanced

comparative analysis with a lot of statistics behind it.

We started with some general information on DNA by Daniel Perry, DNA marker technologies and genotyping for variety identification by Hedwich Teunissen, followed by PCR, PCR-based markers and marker system development (e.g. all related subjects such as the design of good primers) by Daniel Perry.



Participants of the ISTA Workshops on Variety Testing and Flower Seed Testing



At work in the R & D laboratory at Naktuinbouw

After this theoretical information, the participants were divided into three groups to extract DNA from three different species (wheat, potato and *Phalaenopsis*) with three different methods and protocols (quick and dirty, Qiagen commercial kit and CTAB based). The *Phalaenopsis*/CTAB subgroup designated themselves as ‘Dream Team’ but could they demonstrate their excellent output and dedicated work attitude in the final genetic analysis?

The resulting DNA was checked on gel for quality and quantity and was the basic ingredient for the next practical exercise: fingerprinting using SSR. The generated DNA fragments were then separated on Licor Gel (polyacrylamid). The hard work started when Bruno Pot (lecturer from Applied Maths) introduced the software package BioNumerics to all participants for the analysis of biological data. Naktuinbouw uses this software for daily genetic analysis and the management of databases, and our aim was to introduce this valuable package to the participants working in the same field of interest.

In addition to the whole procedure from plants to DNA fingerprinting and variety identity, both in theory and in practice, there were some more lectures. Berta Killermann gave a nice overview of protein electrophoresis-based identification methods and conventional methods. Keshavulu Kunusoth gave a presentation on the work he does in India on molecular markers for variety identification and purity assessment in rice, and Daniel Perry explained in a presentation the work that is going on in the CGC in the field of variety identification. In the last presentation of this workshop, Hedwich Teunissen explained more about the work at Naktuinbouw: the use of molecular markers and variety identification in cases of suspected infringements of PBR, forensic studies on plant pathogens and as support for DUS testing.

### Workshop on Flower Seed Testing

The aim of the Flower Seed Testing workshop was to gain knowledge and some experience in flower seed testing. The

theoretical information was followed by practical work. The participants started with the determination of other seeds in two flower mixtures in which *Begonia* or *Lavandula* were the main species.

The knowledge gained with this practice was helpful in the lecture and practice of the Pure Seed Definitions of *Begonia* and *Lavandula*, which were presented by Zita Ripka. She also gave an overview of the work of the Flower Seed Committee by leading the participants through the Flower Seed Handbook.

Sylvie Ducournau presented her lectures on the germination of *Pelargonium* and *Zinnia*. The information on methodology, seedling type and abnormalities were very helpful in the following practical work with these species.

Stefanie Krämer held a lecture on tetrazolium testing in flower seeds, followed by lectures on tetrazolium testing on *Viola* and *Primula*. The samples for the practical work were prepared by the participants, and the staining process was done by members of the Naktuinbouw Laboratory. The samples were well-prepared, and everyone could see whether the cuttings made on the seeds before staining were done well.

Every participant had the opportunity to check their sample on viability. In addition to the two prepared species, Stefanie lectured about the other species (*Lavandula* and *Zinnia*).

The work of ISTA and the Flower Seed Committee was presented by Rita Zecchinelli. Very special was her presentation on “How to complete an ISTA Orange Certificate”.

Tolerance tables, the Germination tolerance calculator and Table G9 of Miles (1963) were the topics of the lecture on statistical aspects in flower seed testing by Anton Grim.



Excursion to flower seed company



Practice of variety testing

### Social programme

The participants of both workshops were invited to visit several excursions. On Friday, 8 June, the programme started with a visit to Flora Holland in Aalsmeer. An impressive overview was given on the world biggest flower auction. The process of selling flowers and distributing them to the buyers was impressive and most of all very colourful.

The Friday afternoon excursions were to the Enkhuizen region for a visit to Kieft/PanAM, a flower seed company, or Enza Zaden, a vegetable seed company. The day ended with an spectacular boat tour on the lakes and small canals of Aalsmeer. The many small islands of which most are used for the production of lilacs (*Syringa vulgaris*) were a delight to see. ■

## ISTA Workshop on Germination Testing Saskatoon, Canada, 17–19 September 2012

Steve Jones

Member, ISTA Executive Committee; Chair, ISTA Rules Committee

Canadian Food Inspection Agency  
Saskatoon Laboratory  
Saskatoon, Sask. S7N 4L8  
Canada  
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This was the third year that the CFIA's Seed Science and Technology Section (SSTS) based in Saskatoon hosted an ISTA workshop. SSTS is an ISO17025- and ISTA-accredited laboratory working on behalf of the Government of Canada to train, test and monitor the quality of seed and seed analysts in Canada. Janine Maruschak (Section Head, Seed Science & Technology Section) and Steve Jones (Chief of Germination and Purity) opened this year's workshop, which was about germination.

The 21 participants from Canada, France, Special Customs Territory of Taiwan, Penghu, Kinmen and Matsu and the USA enjoyed practical sessions and discussions over the three-day workshop on the ISTA Seedling Evaluation Handbook, QA,

accreditation, calculations, tolerance tables, proficiency testing and the ISTA Rules process. The practical sessions included examples of different germination media: on top of paper, in rolled towels, in sand, soil plus crepe paper and organic growing media. Examples came from a range of species: alfalfa (*Medicago sativa*), canary grass (*Phalaris canariensis*), canola (*Brassica*

*juncea*), flax (*Linum usitatissimum*), maize (*Zea mays*), lentils (*Lens culinaris*), lettuce (*Lactuca sativa*), soybean (*Glycine max*), sunflower (*Helianthus annuus*), tall fescue (*Festuca arundinacea*) and wheat (*Triticum aestivum*). The assessment of normal and abnormal seedlings created good discussion, especially on the use of root-to-shoot ratios for the species where *Lolium* is the



example species for the seedling group, and whether this approach should be expanded to other seedling groups. Discussions so far would suggest not, as for many species there are so many different factors that can affect the root-to-shoot ratio, such as light, temperature or time of assessment.

The current and future work of the ISTA Germination Committee was highlighted by Sylvie Ducournau, the lead lecturer and current Chair. Sylvie's co-lecturer was Sarah Dammen from the ISTA-accredited SGS laboratory in the USA.

The mainly North American participants also took the opportunity to discuss differences between the ISTA and AOSA germination evaluations and provided ideas for future work on harmonisation for the ISTA Germination Committee to consider in its work planning for 2013–2016.



The participants enjoyed the dry and generally good autumn weather, especially for the official dinner on the river boat on the South Saskatchewan River that loops through Saskatoon. Marc Sabourin (Saskatoon Laboratory Director) joined us on the riverboat. Thankfully, the predicted overnight temperature did not reach  $-5\text{ }^{\circ}\text{C}$  but a couple of mornings were cool! The official dinner on the first day of the workshop allowed people to get to know each other, and also see most of Saskatoon's bridges and an active beaver lodge.

During the workshop there was also the chance to tour the SSTS laboratory, which included a tour of the CFIA's National Seed Herbarium (NSH). The guided tour given by Ruoqing Wang, the Head of the NSH, gave participants an insight into the unique seed reference collection based in Saskatoon, and talked about seed imaging and the use of LUCID keys in seed identification.

This year's Saskatoon berry crop was not as good as normal, so during the breaks the home baking tradition could only include blueberry tarts, scones and jam rolls this year! However, this time there was the added treat of recipe cards, so that the participants could make their own 'treats' when they got home.



The workshops would not have been possible without the dedication and expertise of the whole team at SSTS, who were there to help prepare samples, complete the day-to-day work and make sure that the workshops were interesting and enjoyable. Once again, both participants and hosts enjoyed their time together sharing, learning and exchanging ideas. As hosts we have gained a lot from the workshops, and would like to thank all the participants, lecturers and SSTS staff, as well as the ISTA Secretariat, who have helped to make these workshops a success. This year, special thanks are due to GEVES, France and SGS, USA, for allowing Sylvie and Sarah the time to lecture at the workshops. ■

## 9th ISTA Seminar on Statistics for Seed Testing Ottawa, Canada, 26–28 September 2012

Cheryl Dollard<sup>1</sup>, Kirk Remund<sup>2</sup> and Jean-Louis Laffont<sup>3</sup>

<sup>1</sup>Chair, ISTA GMO Committee; <sup>2</sup>Vice-Chair, ISTA Statistics Committee, <sup>3</sup>Chair, ISTA Statistics Committee

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From September 26 through 28, 2012, the ISTA Statistics Committee held its 9th Seminar on Statistics for Seed Testing at the Canadian Food Inspection Agency's Ottawa Plant Laboratory. Held only every three years, this seminar aims to provide

a forum where seed testing professionals can increase their level of understanding of statistical methods and analysis associated with seed testing, and gain confidence in using statistical tools developed by the ISTA Statistics Committee. Also, it gives participants and presenters the opportunity for open discussions on best statistics practices in their laboratories.

There were 22 participants from Canada, the US, Sweden, France and the Netherlands, representing seed companies, government, private laboratories, industry, and other seed organizations. Seminar topics were presented by Jean-Louis Laffont

(DuPont Pioneer, France, Chair, ISTA Statistics Committee), Kirk Remund (Monsanto Company, US, Vice-Chair, ISTA Statistics Committee), Bonnie Hong (DuPont Pioneer, US), Tim Perez (Monsanto Company, US), Gabriel Carré (Syngenta Seeds SAS, France), Zivan Karaman (Limagrain, France), and Professor Sabry Elias (Oregon State University Seed Lab, US, Chair, AOSA Statistics Committee). Cheryl Dollard (Canadian Food Inspection Agency, Canada, Chair, ISTA GMO Technical Committee) coordinated local arrangements with kind support from the host organization and staff.

The first day of the workshop was opened by Jean-Louis Laffont and Cheryl Dollard who welcomed everyone and set the stage for the next three days. Linda DeVerno, Director of the Ottawa Plant Laboratory wished the group good discussions and encouraged all to find time to enjoy the beautiful attractions found in Ottawa. Lecturers and participants then had the opportunity to introduce themselves, and the Seminar was officially opened.

Over a three-day period, the program covered a range of important topics in statistics for seed testing, including equivalence testing, an overview of the European Food Safety Authority approach for safety evaluation of GMOs, measurement uncertainty, tolerance tables, acceptance sampling, generalized linear models, germination calculators and an overview of SeedCalc, R and R-Excel. Participants were encouraged to ask questions throughout, which led to excellent discussions and exchanges. The presentations not only provided background and technical instruction on statistical methods of data analysis, but also conveyed the importance of using such methods to ensure proper analysis of test data, and also to interpret what the results actually mean.

The program content was high level and the days were jam packed, yet the atmosphere was relaxed and fun. Transportation

to and from the lab each day in a big yellow school bus was entertaining and gave participants and lecturers alike the opportunity to get to know each other better. Day 3 brought 'friendly competition' among the group to win fresh baked sugar cookies by correctly answering questions posed by the lecturers. The beautiful fall weather was perfect for an excursion into the city centre, where participants could visit the historic By Ward Market – one of Canada's oldest public markets. There was time to stroll and explore boutiques, pubs, galleries and cafés before taking a guided tour of the Centre Block on Parliament Hill – an example of Victorian gothic architecture and the centre of the Canadian Government. The tour included a visit to the Library of Parliament – a working collection housed in a stunningly beautiful room surrounded by white pine panelling engraved with flowers, masks and small figures. The group also had the chance to observe the Members of Parliament debate the future of the country from the Public Gallery of the House of Commons. Following the visit to the market, a delightful dinner for the group was held at The Black Tomato, sponsored by DuPont Pioneer.

The OLF presentation auditorium lent a sense of formality to the proceedings, but the genial nature of the lecturers and participants created an informal atmosphere

where all openly shared their experiences and particular statistical problems and questions. Although the subject matter was advanced and the presentations sophisticated, the overall atmosphere was relaxed, and there were many discussions among the participants and lecturers. The three days ended with great success, with expressions of thanks from everyone, and the presentation of official certificates to all the participants and instructors.

Many thanks to all who were involved in delivery of ISTA's 9th Statistics Seminar: CFIA's Ottawa Laboratory Fallowfield senior management – Dr. Karen Jesset and Linda DeVerno – for graciously offering the host facility; to Cheryl Dollard and members of the OLF staff – especially Marie-Eve Auclair, Lysane Maynard, Beata Fiturski, Alexandre Blain, Marie-Rose Mukagasana, Marie-Jose Côté, and Eliane Guillemette, for local coordination and daily "behind the scenes" activities; to DuPont Pioneer for generous financial support for dinner at The Black Tomato; to the lecturers for sharing their time and expertise; and in particular, to the participants for such enthusiasm. Finally, thanks to Martina Haefeli, Agnes Hegedüs, and many others at the ISTA Secretariat for organization and facilitation. ■

## Qualification courses of Russian seed testing specialists Riga, Latvia, 27 February–2 March 2012

Elena Tkachenko<sup>1</sup> and Irina Kozyreva<sup>2</sup>

<sup>1</sup>ISTA Personal Member; <sup>2</sup>Head of Biological Research Department

Testing Laboratory for Product Safety and Quality Evaluation  
Federal Centre of Quality and Safety Assurance  
for Grain and Grain Products  
140100 Ramenskoe  
Russian Federation  
ruml0500@gmail.com

permanent support, mutual understanding and help of the Secretariat of the Association and ISTA laboratory members.

This has led to the development of beneficial relations and the exchange of professional experience between the ISTA laboratory members of the Russian Federation and the National Seeds Testing Laboratory of the Republic of Latvia (part of the Seed Testing Department of the Ministry of Agriculture) with regard to the training of specialists for ISTA accreditation.

In 2011, eight Russian seed analysts, from five federal state-funded institutions



When you participate in any meeting of the International Seed Testing Organization (ISTA) for the first time, the first thing you hear is "welcome to the ISTA family". And from then on you enjoy the



under the jurisdiction of the Federal Service for Veterinary and Phytosanitary Surveillance, visited the hospitable city of Riga. In February 2012, a further 15 specialists from Russia had an opportunity to increase their professional level.

As usual, responsibility for arranging and preparing the courses on behalf of the Russian Federation was in the hands of specialists from the Testing Laboratory for Product Safety and Quality Evaluation of the FSFI (Federal Centre of Quality and Safety Assurance for Grain and Grain Products) of the Federal Service for Veterinary and Phytosanitary Surveillance (Rosselkhozadzor). On the Latvian side,

a great deal of work was done by the Seed Testing Department of the Republic of Latvia and specialists of the National Seed Testing Laboratory.

At the beginning of the training course, the Russian seed analysts were welcomed by the head of the State Plant Protection Service of the Republic of Latvia, Kristine Kjago. They then had an opportunity to acquaint themselves with the work of the Seed Testing Department of the Latvian Ministry of Agriculture and the National Seed Testing Laboratory, and the system of seed certification in the Republic of Latvia.

During the course, important questions concerning the work of laboratories in

accordance with the ISTA Accreditation Standard were discussed, such as the elaboration and implementation of the system of guarantee of work of the laboratory, calibration of laboratory equipment, labeling of seed lots, usage and storage of seed collections, proficiency testing, changes in the International Rules for 2012, and the issuing of the International Certificates.

There were also lectures and practical work on sampling, purity testing, other seed determination, determination of the thousand-seed weight, moisture determination, germination testing and health of agricultural plants.

Sampling was held under real conditions on the basis of seed complex-cleaning system.

At the end of the course, the Russian specialists received certificates of their participation in the course.

The Russian party would like to warmly thank the Seed Testing Department of the Ministry of Agriculture of the Republic of Latvia, and personally the head of the State Plant Protection Service of the Republic of Latvia, Kristine Kjago, the head of the Seed Testing Department, Velta Evelone, the Chief of the Latvian National Seed Testing Laboratory, Solvita Berga, and all specialists of the laboratory for the high standard of the arrangement of the courses. ■



**30th ISTA Congress, Antalya, Turkey, 12–18 June 2013**  
**Online registration now open: [www.seedtest.org/2013](http://www.seedtest.org/2013)**

2012	1 November	UPOV Council	Geneva, Switzerland	www.upov.int
	5–9 November	APSA: Asian Seed Congress	Bali, Indonesia	www.apsaseed.org
	4–7 December	ASTA Corn & Sorghum and Soybean Seed Research Conference	Chicago, Illinois, USA	www.amseed.org
2013	5–8 March	AFSTA Congress 2013	Mauritius	http://afsta.org/
	27–29 May	ISF World Seed Congress	Athens, Greece	www.worldseed2013.com
	4–6 June	ISTA Vigour Testing Workshop	İzmir, Turkey	www.seedtest.org/vig-test
	6–9 June	ISTA Workshop on Purity and Germination	Ankara, Turkey	www.seedtest.org/pur-ger
	12–18 June	ISTA Congress	Antalya, Turkey	www.seedtest.org/congress2013
	24 October	UPOV Council Meeting	Geneva, Switzerland	www.upov.int
2014	16–19 June	ISTA Annual Meeting	Edinburgh, UK	
2015	15–18 June	ISTA Annual Meeting		

## Advertising rates 2013

Position/size	Monochrome (euros)	Colour (euros)	Dimensions (trimmed)	Dimensions of artwork (+ 3 mm bleed overall)
Outside back cover	–	2120	210 × 297 mm	216 × 303 mm
Inside front/back cover	–	1820	210 × 297 mm	216 × 303 mm
Full page	810	1210	210 × 297 mm	216 × 303 mm
2/3 page (vertical)	610	1010	133 × 297 mm	139 × 303 mm
1/3 page (vertical)	250	500	71 × 297 mm	77 × 303 mm
1/2 page (landscape)	400	810	210 × 148.5 mm	216 × 154.5 mm
1/3 page (landscape)	250	500	210 × 99 mm	216 × 105 mm

### All rates include bleed if required.

### Front of page (right-side page): +10%

For other sizes or special requests, please contact us directly.

### Discounts

ISTA Members: –10%

2 ads in same issue (can be different): –5%

Repeat ad in following issue: –5%

### Artwork specifications

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

### Technical information

Circulation: 1500 copies worldwide

Inside pages: semi-matt coated 135 g/m<sup>2</sup>

Cover pages: glossy coated 170 g/m<sup>2</sup>

### Deadlines

Publication dates: April/October

Booking advertising space: 15 February/

15 August (confirmation of placement by e-mail)

Artwork delivery: 1 March/1 September

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# Seed Testing

INTERNATIONAL

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