



ISTA
Seed Quality Assurance

ISTA Secretariat

Richtiarkade 18, 8304 Wallisellen, Switzerland
Phone: +41 44 838 60 00 | Fax: +41 44 838 60 01
Email: ista.office@ista.ch
www.seedtest.org

Document OGM22-03

Activity report of the International Seed Testing Association (ISTA) Committees 2021

This yearly Activity Report was prepared by the Technical Committees, the Executive Committee, and the Secretariat of the Association.

The document contains the reports of the Executive Committee, the Technical Committees and of the Secretary General and includes the financial statements of the International Seed Testing Association for 2021, the budget for 2021 and preliminary budget for 2022.

This document is submitted to all ISTA Designated Authorities, ISTA Members and ISTA Observer Organisations for information two months prior to the ISTA Ordinary General Meeting 2022.

The Activity Report was endorsed by the Executive Committee for submission to the ISTA Ordinary General Meeting 2022, to be held on May 11, 2022, for acceptance by the nominated ISTA Designated Members voting on behalf of their respective Governments.

Contents

A. Report of the Executive Committee (ECOM) 2021	4
1. Composition of the Executive Committee	4
2. Meetings of the Executive Committee	5
3. Activities of the Executive Committee Working Groups	5
3.1 Accreditation Working Group	5
3.2 Articles of the Association Working Group	7
3.3 International Relations and Designated Authorities Working Group	7
3.4 Events Working Group	8
3.5 Marketing and Publication Working Group	8
3.6 Science and Technology Working Group	9
3.7 Technical Committee Working Group	9
3.8 Membership Fees Working Group	10
3.9 Young@ISTA Working Group	10
3.10 ISTA – ISF Seed Health Working Group	11
3.11 Vegetable Seed Industry Working Group	11
B. Reports of the Secretary General, Proficiency Test Committee, Rules Committee, Editorial Board and Seed Science Advisory Group	12
1. ISTA Membership	12
2. Activity Report of the Rules Committee	14
3. Accreditation Programme	18
3.1 Proficiency tests 2021 preparation and dispatch	18
3.2 Reporting of Proficiency test results	18
3.3 Goals and objectives	19
3.4 Audit programme	20
3.6 Accreditation administration	21
3.7 Document updates	21
3.8 Accreditation figures	21
3.9 New system auditor at ISTA Secretariat	24
3.10 Contracted auditors	25
3.5 Sales of ISTA Certificates	25
4. ISTA Publications and Products	25
4.1 ISTA Handbooks and Proceedings	25
4.2 Calibration Samples	26
5. ISTA Training and Education Programmes	26
5.1 ISTA Workshop overview	26
6. Scientific Journal ‘Seed Science and Technology’: Report of the Editorial Board	26
6.1 Editorial figures for 2021	27
6.2 Sales of ‘Seed Science and Technology’ 2017– 2021 Seed Science Advisory Group	28

7. Wild Species Working Group	29
8. Report of the ISTA Secretariat	30
8.1 Secretariat staff	30
8.2 Secretariat work	31
8.3 Function	31
9. Finances of the Association	35
C. Reports of the Technical Committees	41
1. ATC Advanced Technologies Committee	41
2. BSC Bulking and Sampling Committee	44
3. FSC Flower Seed Committee	49
4. FTS Forest Tree and Shrub Seed Committee	52
5. GER Germination Committee	54
6. GMO Committee	61
7. MOI Seed Moisture Committee	64
8. NOM Nomenclature Committee	67
9. PUR Purity Committee	69
10. SHC Seed Health Committee	73
11. Statistics Committee	76
12. STO Storage Committee	79
13. TEZ Tetrazolium Committee	86
14. VAR Variety Committee	88
15. VIG Seed Vigour Committee	92

A. Report of the Executive Committee (ECOM) 2021

1. Composition of the Executive Committee

This report has been prepared by members of the Executive Committee (ECOM), with specific input from Chairs of the ECOM Working Groups (WGs) for the period 1 January 2021 to 31 December 2021. Details from the February 2022 ECOM meeting are not included but will be reported on at the 2022 annual ISTA meeting.

The Executive Committee 2020-2021 was composed of:

Officers:

Steve Jones (President)	Canada
Keshavulu Kunusoth (Vice-President)	India

Members-at-large:

Craig McGill (Immediate Past President)	New Zealand
Ignacio Aranciaga	Argentina
Valerie Cockerell	United Kingdom
Sylvie Ducournau	France
Ruel Gesmundo	Philippines
Berta Killermann	Germany
Claid Mujaju	Zimbabwe
Leena Pietilä	Finland
Rita Zecchinelli	Italy

Ex-Officio member: Attilio Lovato (ISTA Honorary President), Italy

This is the third report for the 2019-2022 Executive Committee, elected at the Ordinary General Meeting in July 2019, Hyderabad, India.

The work of the Executive Committee is guided by the 2019-2022 ISTA Strategy reviewed and voted on by the membership at the Hyderabad meeting. Implementation of the strategy is a key goal of the Association and within the Executive Committee implementation is achieved through input from the ECOM Working Groups (WG). The role of the working groups is to propose solutions on specific topics and where appropriate develop policy for discussion and decision by the Executive Committee. The ISTA President is a member of all the working groups but does not Chair any working groups. The President is the Chair of the ECOM meetings.

The working groups established for the 2019-2022 triennium (working group Chair in brackets) are: Accreditation (Rita Zecchinelli), the Articles of the Association (Keshavulu Kunusoth), International Relations and Designated Authorities (Craig McGill), Events (Berta Killermann), Marketing and Publications (Ignacio Aranciaga), Membership Fees (Keshavulu Kunusoth), Science and Technology Working Group (Leena Pietilä), Technical Committees (Valerie Cockerell), Seed Health (Valerie Cockerell), Vegetable Seeds Industry (Berta Killermann). See sections A.3.1 to A.3.11 for reports from the Working Groups.

In 2020 the International Relations and Designated Authority working groups were merged with Craig McGill as the chair. The joint ISTA-ISF Seed Health Working Group re-established regular meetings between ISF and ISTA members (Valerie Cockerell and Valerie Grimault).

2. Meetings of the Executive Committee

The date and location of the February 2021 and 2022 ECOM meetings were agreed in 2020 at the ECOM meeting in Bologna, Italy. In 2021 both the ECOM meeting and annual meeting were virtual. As after the Bologna meeting the COVID-19 situation developed worldwide and ECOM meetings became virtual to allow more regular discussion and decisions for ISTA.

The ECOM agreed to make the Ordinary General Meeting (OGM) in Verona, Italy a virtual meeting and again in 2021 for the meeting planned for Cairo, Egypt. Both were possible as virtual meetings due to the emergency Swiss COVID laws. ISTA held the OGM voting by email. Although a difficult situation the result was that 48 out of the 53 ISTA Designated voting members eligible to vote for their countries/distinct economies voted on the annual OGM agenda topics in 2020 and 47/48 In 2021. There was also the opportunity to discuss the ISTA Rules proposals in advance of the vote on proposals in a virtual meeting and this will now become an annual event. This is largest number of eligible ISTA members voting for many years.

During 2021 the ECOM continued to hold monthly 2-hour meetings and along with the ISTA Secretariat used these regular virtual meetings to continue to progress the work of the Association. One thing was to progress the move of the Secretariat to a new office location in 2021.

The work of the member ISTA labs was seen to be essential to allow the free movement of seed for planting around the world and the Secretariat and ECOM adapted their work to support the association's members in doing this, including a move to remote auditing. By the end of 2021 the auditing team had caught up on all the audits delayed from 2020, those planned for 2021 and even audited some new laboratories in 2021. This was a huge effort to support the ISTA accreditation program and the laboratories worldwide, thanks to everyone involved.

The 2021 annual ECOM business meeting for February 2021 planned for Saskatoon, Canada became five 2-hour virtual sessions, concentrating on key decisions needed for 2021 and was highlighted in the April 2021 edition of STI (No. 161).

It was also decided in the interest of safety and on-going travel restrictions linked to the COVID-19 pandemic to make the 2021 OGM planned for Cairo, Egypt into a virtual meeting.

The detailed work of the ECOM within their working groups are reported in section A.3.

3. Activities of the Executive Committee Working Groups

The Executive Committee working groups have worked on the following:

3.1 Accreditation Working Group

Members: Rita Zecchinelli (Chair), Berta Killermann, Valerie Cockerell, Sylvie Ducournau, Florina Palada, Steve Jones.

Activities in 2021. As consolidated over the time, the main task of the ECOM Accreditation Working Group (AWG) is to assist and support the ISTA Accreditation and Technical Department (ATD) in the accreditation related issues.

ISTA auditors

In 2021, a new System Auditor was selected with the support of AWG and is now employed at the Secretariat (started 1st March 2021).

Despite the COVID-19 situation, the effort to strengthen the ISTA auditor team continued. Four more candidates to be approved as contracted ISTA auditors are in different steps of the process (two Technical Auditors, one System Auditor and a GMO expert). At the end of the year, most of the auditors have participated in an online meeting which was an opportunity to greet each other, exchange some opinions and exchange wishes for a Merry Christmas.

Remote audits

2021 was a very special year, due to the COVID-19 pandemic that affected many activities. The emergency situation prevented the carrying out of many on-site audits all over the world. Traveling was very difficult at first, then in fact not possible. The on-site assessments were started again in September 2021.

The AWG and ATD did their best to adapt to the situation as it evolved. A new procedure on how to perform remote/partially remote audits has been approved and implemented at the end of 2020 and applied as well in 2021 for 59 audits. In total, 12 audits were performed with on-site assessment in Europe only.

The consequences of the difficulties encountered in 2020 also entailed a discussion on the criteria adopted in the timing/scheduling of audits and on the validity of accreditation certificates.

Due to this specific situation, 22 audits planned for 2020 were performed in 2021 in addition to the audits planned for 2021. Four candidates for accreditation were also audited.

In total 72 audits were planned and 71 performed. One laboratory asked for a voluntary suspension until the end of the year.

Status of ISTA accreditation

The AWG collaborated as always in the evaluation of specific cases in which the status of an accredited laboratory was questionable due to the PT performance results or other reasons.

Review or strengthening of quality documentation

Reviewing and updating documents is a continuous ongoing process. In 2019 and 2020 there was an intense discussion within the AWG and ATD aimed at the revision of the ISTA Accreditation Standard for Seed Testing and Seed Sampling, and a draft of a new revision was ready to be proposed for approval.

The AWG and ATD instead decided to postpone the revision in order not to create additional burdens on the laboratories during the pandemic. The revision will be discussed for approval of the ECOM in the 2022 February ECOM meeting.

SharePoint is used now to administrate the audit process. This tool has proven to be very efficient.

Cooperation with the ISTA Technical Committees

The AWG and ATD often contact the ISTA Technical Committees in order to clarify specific issues arising during audits or for clarifications relating to the ISTA Rules. A particular case is that of the collaboration with the Proficiency Test Committee for the development and improvement of the PT programme. The collaboration with the Variety Committee must also be commended as this year the first PT for DNA-based methods was organised.

On the other hand, ATD and AWG have been contacted by TCOMs for matters related to the accreditation standard, for example to include chapters on quality controls in handbooks being drafted.

Challenges

The year 2021 was difficult, as already mentioned. In addition to the strong impact on the audit programme, other initiatives have been temporarily frozen.

This is the case of the review of the accreditation standard, but also of other ongoing studies, such as the one relating to the audit organization for multi-sided laboratories and the study about the audit structure (definition of "categories" of laboratories, based on the scope of accreditation in the aim to differentiate the duration and cost of the audit). For multi-site laboratories, a new directive was proposed by the AWG and approved by the ECOM at the end of the year and will come into force on January 1, 2022

Special projects

The interactive learning tool on how to complete ISTA Certificates was finalised and is available on the ISTA website; the related procedure was revised with the support of the Rules Committee.

The Crop Groups table from the application for accreditation was revised and approved by the ECOM.

Three Quality Assurance On-line Workshops were organised.

Two new platforms are now being used: GoToMeeting for the remote audits (five licences) and GoToTraining for the on-line Quality Assurance Workshops.

3.2 Articles of the Association Working Group

Members: Keshavulu Kunusoth (Chair), Craig McGill, Andreas Wais, Steve Jones.

The ISTA Articles Working Group progressed an Articles change proposals for voting on at the 2021 virtual meeting.

The Articles change proposals was worked on during 2021, submitted for vote at the virtual OGM in 2021 and was accepted by the membership.

The ISTA Articles Working Group did not progress any Articles change proposals for voting on at the 2022 ordinary general meeting.

3.3 International Relations and Designated Authorities Working Group

Members: Craig McGill (Chair), Keshavulu Kunusoth, Claid Mujaju, Ruel Gesmundo, Olga Stöckli, Steve Jones, Andreas Wais,

The focus of the working group is on strengthening interaction between ISTA, its Designated Authorities and other international organisations. Specifically, the International Relations and Designated Authorities Working Group International Relations Working Group develops the international relations policy for discussion and approval by the Executive Committee, coordinates the representation of ISTA in international fora and meetings with ISTA's Designated Authorities including during Annual Meetings and Congresses. In addition, the Secretary General meets with the Designated Authorities individually when visiting countries which have an ISTA Designated Authority. As a result of the COVID-19 pandemic international travel including visits by the Secretary-General with individual Designated Authorities has not been possible. Similarly, attendance at international fora have been largely virtual for most of 2021.

As a result of the cancellation of the 2021 ISTA Annual Meeting in Cairo the meeting with the Designated Authorities planned for the Annual Meeting did not take place. In its place a virtual meeting was held on 3 June 2021 with the ISTA Designated Authorities and ISTA Designated Members to provide information on the voting documents for the Ordinary General Meeting. In addition, on 1 December 2021 a second virtual meeting was held with the ISTA Designated Authorities and ISTA Designated Members to discuss and receive their feedback on the draft 2022-2025 ISTA Strategy.

The international organisations ISTA's interactions fall into five groups:

1. Regulatory organisations, including at the national level, the Designated Authorities (DA) of member countries and international organisations such as OECD, FAO, UPOV, IPPC. ISTA has regular contact with FAO and OECD. ISTA participates at OECD Meetings as observer organisation on a regular basis and in 2021 also a virtual meeting was held with OECD.
2. Organisations related to the accreditation work of ISTA such as the International Laboratory Accreditation Cooperation (ILAC). As an ILAC stakeholder, ISTA participates in the annual meetings organised by ILAC. In 2021 the meeting was held virtually. ISTA is continuing to publish information on ISTA activities in ILAC's news bulletin.
3. Scientific fora and collaboration with other associations such as ISSS (International Seed Science Society). With ISSS a webinar series was started in 2021. Two joint webinars took place and it was agreed to continue these webinars in future.
4. Technical collaboration with other organisations to harmonise seed testing methods worldwide such as AOSA/SCST in the United States, ISTA always has representation at the AOSA/SCST Annual Meeting and the ABRATES Congress in Brazil. The later was postponed to 2022. In 2021 the ISTA Vice President

Keshavulu Kunusoth represented ISTA at the virtual AOSA/SCST Annual Meeting. ISTA works with ISHI through ISF with a ECOM Working Group on Seed Health.

5. Collaboration and exchange of information with the seed trade and seed industry. At the international level this is ISF and at the regional level it is with organisations such as AFSTA, APSA, ASTA, Euroseeds and SAA. An online meeting with ISF was held in February 2021 and with APSA in November 2021. The ISTA Secretary General attended the ISF Virtual Congress in July 2021 as well as the AFSTA Congress in Kenya, the Euroseeds Congress in Prague and the ASTA Meeting in Chicago. The Vice President and Secretary General met with SAA during the ASTA meeting and are planning more meetings with SAA in the future. Detailed reports of these meetings can be found in Seed Testing International.

Another activity is the World Seed Partnership, a collaboration between ISF, ISTA, OECD, UPOV and WFO, within which is a platform for key information on seeds and the role of each organisation in the partnership within the seed sector. The aim of the World Seed Partnership is the improvement of security of seed supply nationally and regionally. Projects in Nigeria, Myanmar and Mongolia remain on hold because of the COVID-19 pandemic.

3.4 Events Working Group

Members: Berta Killermann (Chair), Rita Zecchinelli, Keshavulu Kunusoth, Craig McGill, Olga Stöckli, Andreas Wais, Steve Jones.

The Events Working Group develops the events policy for the Association for discussion and approval by the Executive Committee and supports the Secretariat in the organisation of ISTA events, in particular Annual Meetings and Congresses.

In 2021 the working group was involved in the organisation of:

1. The ISTA Annual Meeting 2021 in Cairo, Egypt including the elaboration of a common programme and the Plant Health Seminar.
2. The 33rd ISTA Congress 2022 in Christchurch, New Zealand, including the elaboration of a common programme, the scientific seed symposium programme and the presentation of the Technical Committee work (cancelled due to COVID-19).
3. A shortened ISTA Annual Meeting 2022 in Cairo, Egypt (instead of New Zealand).
4. The ISTA Annual Meeting for 2023 in St. Petersburg, Russia, including the elaboration of a common programme and a seminar.

3.5 Marketing and Publication Working Group

Members: Ignacio Aranciaga (Chair), Berta Killermann, Andreas Wais, Olga Stöckli, Yoana Uzunova and Karen de la Rosa.

The Marketing and Publication Working Group aims to develop the marketing and publication policy in the Association for discussion and approval by the Executive Committee. It also supports and assists the Secretariat with marketing initiatives.

In 2021, a diverse range of digital marketing initiatives were undertaken via ISTA social media channels LinkedIn, activities have continued with regular posts. The Newsletter is sent once a week. On Twitter ISTA has more than 1700 followers and on LinkedIn more than 8000 with an increased level of engagement. Finally, on You Tube, ISTA has over 1000 subscribers.

The ISTA President and Secretary General participated in the First Analyst training course developed by Uruguay (Web training course) with two welcome videos. At the same meeting, Ignacio Aranciaga (ECOM Member at Large) also gave a presentation about ISTA with the objective to encourage other colleagues from the region to participate in ISTA.

In 2021 the Webinar series for information of the membership continued with an interview of the ISTA President Steve Jones by the Secretary General. The same type of activity was developed with the colleagues involved in the ISTA PT system.

At the same time the Marketing and Publication Working Group has worked with the Rules Committee to ensure the 2021 International Rules for Seed Testing is available in four languages (English, French, German and Spanish). With the aim to promote the use of the ISTA Rules worldwide and to attract more people to participate in ISTA, the single chapters of the ISTA Rules had a 50% discount during the months of January and February.

Finally, it is important to mention that the implementation of the weekly newsletter gave the possibility to increase the contact with the members and with other organisations and colleagues around the world, permitting more fluid information on several key topics for the Association.

3.6 Science and Technology Working Group

Members: ECOM members of the working group: Leena Pietilä (Chair), Valerie Cockerell, Sylvie Ducournau , Craig McGill, Andreas Wais, Steve Jones.

Technical Committee members: Bert Van Duijn (Advanced Technology), David Johnston (Germination), Ruoqing Wang (Purity) and Ernest Allen (Rules).

The purpose of the Science and Technology Working Group is to develop policy and oversee science and technology within the Association. The aim is based in ISTA strategy Goal 4: Strengthen the Science and Technology underpinning ISTA, to develop innovative research to make the link between scientific developments and applications in seed sampling and testing, and to allow the requirements of the seed sector to be met.

No special achievements to list for 2021.

3.7 Technical Committee Working Group

Members: Valerie Cockerell (Chair), Craig McGill, Leena Pietilä, Ruel Gesmundo, Claid Mujaju, Nadine Ettel, Andreea Militaru, Andreas Wais, Steve Jones.

The Technical Committee Working Group develops Technical Committee policy for discussion and approval by the Executive Committee. This group is also responsible for initial evaluation of applications for the 100 000 CHF special project fund and providing a recommendation to the ECOM on a decision.

In 2021 the group met on eight occasions. Work included evaluation of the three proposals received as a result of the 2020 call for special projects, two proposals were approved by the ECOM for funding.

The two projects are:

1. Use of equilibrium relative humidity measurements for determining the moisture content status of stored seed. Submitted by the Moisture and Storage committees.
2. The updating of seedling images for handbooks and training as a basis for regular image collection. Submitted by: Germination Committee.

Both projects will provide benefits to the membership through improved images of seedlings for germination analysis and training, and examination of the potential use of equilibrium relative humidity measurements in relation to seed storage.

A meeting was held with TCOM Chairs on 14 April 2021 to discuss the options for virtual presentations of TCOM activities to the membership in light of the decision to have a virtual Annual meeting in 2021.

The second topic looked at the possibilities of online training using 'GoToTraining' with Andreas Wais providing feedback from ISTA's virtual Quality Assurance Workshop trial organised by the ISTA Secretariat with course work prepared and executed by Florina Palada and Joël Léchappé.

The third topic introduced the first action of the ECOM Working Group 'Expansion of Seed Testing in Developing Countries' to create a list of tropical species traded in developing countries and discussed with the TCOMs how to prioritise their inclusion in the ISTA Rules.

The majority of the meetings of this working group concentrated on the updating of the Directive 'Responsibilities of ISTA Technical Committees'. Updates have been drafted based on changes within the organisation and requests from TCOMs on more clarity in topics such as ECOM liaison officer role, TCOM members and code of ethics, as well as succession planning for TCOMs. The next step is to share the updated document and discuss with the TCOMs in early 2022.

3.8 Membership Fees Working Group

Members: Keshavulu Kunusoth (Chair), Craig McGill, Rita Zecchinelli, Valerie Cockerell, Andreas Wais, Steve Jones

The Working Group on Membership Fees is aimed to assist and support the determination of appropriate ISTA membership fees for laboratory, sampling entity, the additional for an accredited laboratory, personal membership and associate membership.

To determine the ISTA membership fees the working group uses as criteria the costs involved in the operation of the Association, support for the technical activities, documentation, office rental, travel costs and inflation rate in the Switzerland. The year 2021 was very challenging year for ISTA as the second wave of the COVID-19 pandemic impacted the health and economic growth at a global level. Despite the resurgence of COVID-19 pandemic, ISTA has witnessed steady income/revenue and the Working Group concluded that there is no need to increase the membership fees. Therefore, the membership fees remained unchanged and the provision of 10% discounts for early payments, i.e. on or before 31 December 2021 were maintained.

3.9 Young@ISTA Working Group

Members: Keshavulu Kunusoth (Chair), Craig McGill, Berta Killermann, Sylvie Ducournau, Andreas Wais, Steve Jones

The Young@ISTA working group was established with the aim of developing the concept of Young@ISTA as a means of attracting young seed professionals into the association. This will enable a younger generation to become involved in ISTA and continue the activities of ISTA into the future, empower seed professionals to lead innovative solutions in seed science and testing and also facilitate an ongoing contribution of seed professionals within ISTA.

The concept was developed in collaboration with a group of young seed professionals who first came together in 2019 during the ISTA Congress in Hyderabad, India. The working group established a forum on LinkedIn as a community for young seed professionals to share their insights and experiences, ask for guidance, and build valuable regular connections and interactions. It is an open forum for any interested young seed professional to join, share, learn and exchange the knowledge on seed science and technology.

More than 200 seed professionals have joined the forum and are actively participating in interactions, discussions and connecting with each other. As a part of the promotion strategies, the working group has defined the selection criteria, and developed simple application formats for enabling young people to apply for one-time financial support to attend ISTA events like workshops, trainings (including laboratory-to-laboratory training), annual meetings, congresses, conferences and also financial support for publication of research publication. All these activities have the aim of inspiring a new generation to become involved in ISTA.

3.10 ISTA – ISF Seed Health Working Group

Members: Valerie Cockerell (Chair), Valerie Grimault, Rose Souza Richards.

The purpose of this working group is to provide a forum to discuss seed health related topics that concern both organisations and explore synergies to be had in combining forces. Three meetings were held in 2021. Discussions regarding each organisation's pest lists considered how we could communicate future updates, and where there might be potential to share information for common crops of interest.

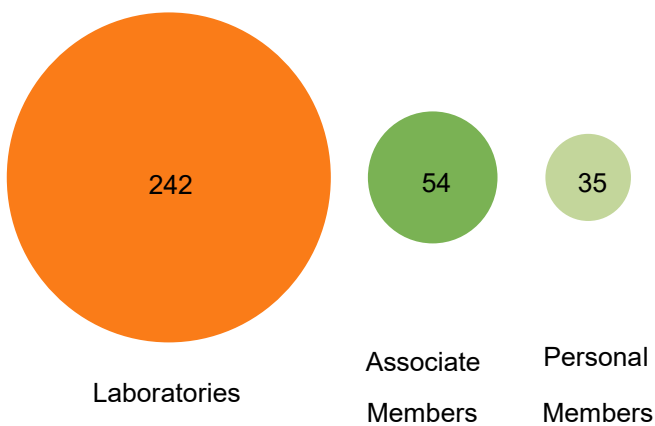
3.11 Vegetable Seed Industry Working Group

Members: Berta Killermann (Chair), Merel Langens (Vice-Chair), colleagues from the vegetable seed industry, seed industry, ISF and ISTA.

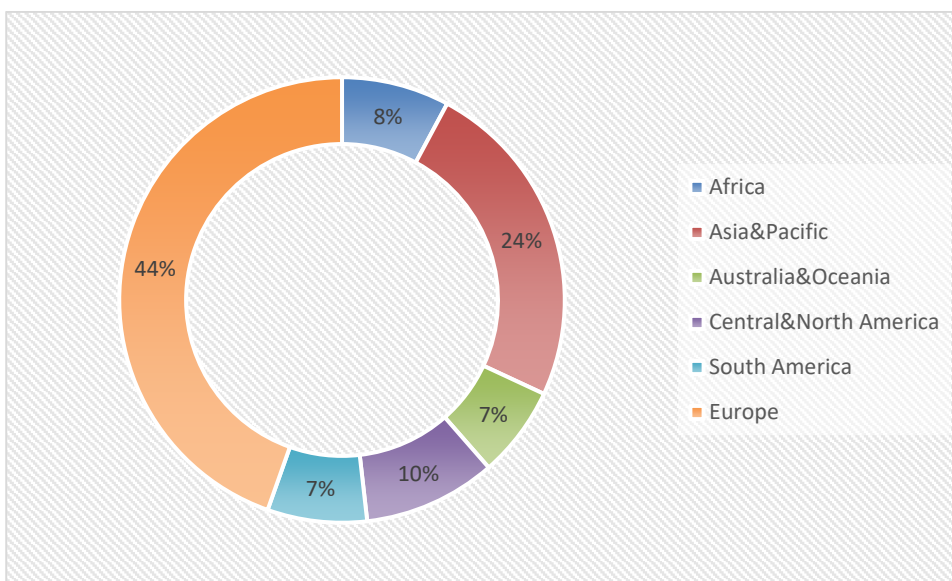
The Vegetable Seed Industry Working Group has members from the Seed Industry, ISF, ECOM, Technical Committees and ISTA Secretariat. In 2021 the Working Group met via conference calls. The first species of the agreed experiment with the vegetable seed industry to provide data to increase the number of sub-lots of vegetable seeds was sampled and tested. Discussion is still on-going. The sub-lot experiment will continue in 2022. The possibility to reduce the weight of the working sample for the other seed determination for fruity crops is also under consideration.

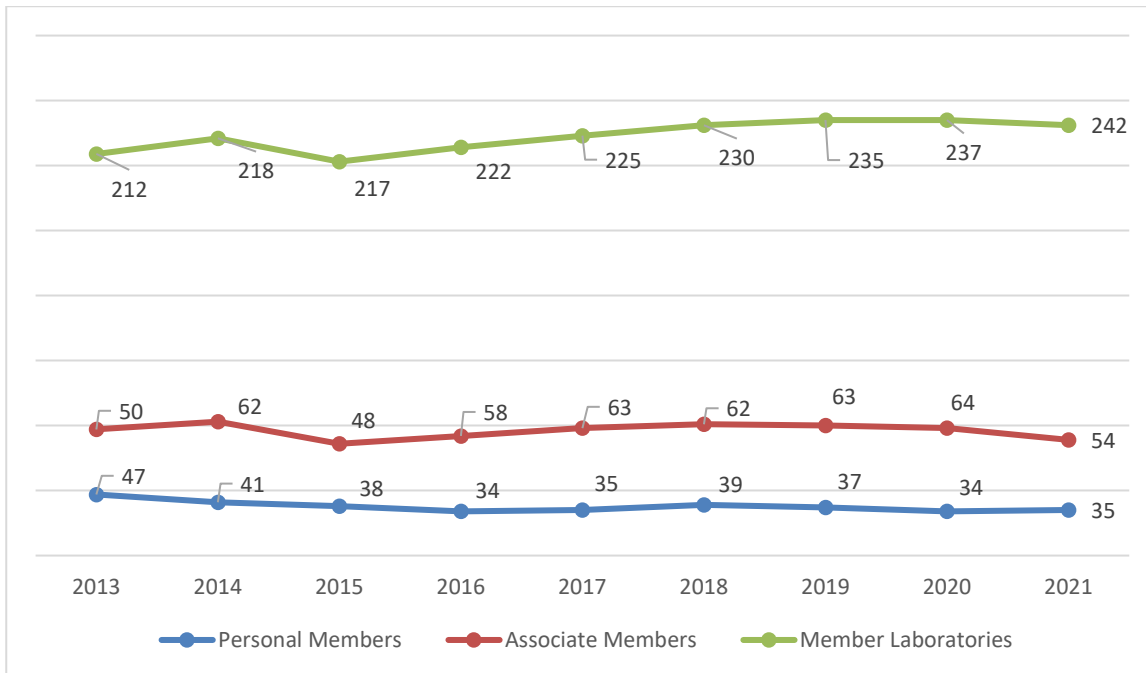
B. Reports of the Secretary General, Proficiency Test Committee, Rules Committee, Editorial Board and Seed Science Advisory Group

1. ISTA Membership



ISTA has at least one member in 83 countries





Honorary Members

According to section III., Article 4 (h) of the Articles of the ISTA:

“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.”

The elected Honorary Life Members as of 2021 are:

Joël Léchappé (2019)

Grethe Tarp (2016)

Alison A. Powell (2013)

Ronald Don (2008)

Norbert Leist (2007)

Furthermore, Attilio Lovato was elected Honorary President at the Congress 2001.

2. Activity Report of the Rules Committee

The ISTA Rules Committee is composed of the Honorary President, all the Chairpersons of the Technical Committees (TCOMs), the Chief Editor of SST, the AOSA Rules Committee Chair and the SCST Co-Chair. As part of joint initiatives with AOSA, the AOSA/SCST Rules Chairs are *ex officio* members of the ISTA Rules Committee and the ISTA Rules Chair is an *ex officio* member of the AOSA Rules Committee. The Chair and Vice-Chair of the ISTA Rules Committee are appointed by the ISTA Executive Committee (ECOM).

The following is a list of the current ISTA Rules Committee members:

Chair:	Ernest Allen	United States
Vice-Chair:	Susan Alvarez	United States
Observer:	Florina Palada (ISTA Secretariat)	
ECOM liaison officer:	Ignacio Aranciaga	Argentina
Members:	Ruojing Wang (PUR)	Canada
	Didier Demilly (PTC)	France
	Gillian Musgrove (GER)	United Kingdom
	Eddie Goldschagg (BSC)	South Africa
	Elisa Vieira (FTS)	Brazil
	Valerie Grimault (SHC)	France
	Fiona Hay (EDI)	Denmark
	Stefanie Krämer (TEZ)	Germany
	Jean-Louis Laffont (STA)	France
	Enrico Noli (GMO)	Italy
	Axel Goeritz (MOI)	Germany
	Alison A. Powell (VIG)	United Kingdom
	Jayanthi Nadarajan (STO)	New Zealand
	Bert van Duijn (ATC)	Netherlands
	Ana Laura Vicario (VAR)	Argentina
	Melanie Schori (NOM)	United States
	Rita Zecchinelli (FSC)	Italy
	Gil Waibel (WSWG)	United States
<i>Ex-officio:</i>	Todd Erickson (AOSA)	United States
	Desirae Jones (SCST)	United States
	Attilio Lovato (Honorary President)	Italy

Activities

The ISTA Rules Committee is responsible for reviewing the annual Rules proposals and ensuring that the proposals are technically consistent between the different chapters. Rule proposals can come from anyone but are usually made by one of the TCOMs or by the ISTA Accreditation Department. The procedures for submitting proposals, such as adding new species or methods to the ISTA Rules are outlined in the Introduction to the Rules. The Rules Chair is responsible for editing the Rules and presenting the proposals for amending and voting at the Ordinary General Meeting (OGM) on behalf of the ECOM and the Rules Committee.

Due to the ongoing Coronavirus pandemic, the ISTA Rules Session was conducted via virtual meeting on 20 May 2021. ISTA Designated Voting Members received details on electronic voting procedures during the OGM. Electronic voting opened following the virtual OGM held on 3 June 2021. Voting concluded on 11 June 2021.

The updated electronic version of the 2022 ISTA Rules was made available to the membership for download on 1st December 2021. This was made possible by the dedicated teamwork of the Rules Committee, the TCOMs, the ECOM, and the ISTA Secretariat, starting with the coordination of the proposals by Nadine Ettl (ISTA Secretariat) and Andreea Militaru (ISTA Secretariat); the preparation of the translation into Spanish, French, and German by the translators in Argentina, France, and Germany as coordinated by Ignacio Aranciaga, Clotilde Polderman-Roussille and Elke Nitschke; and final publishing, proofreading, editing, and membership distribution by Karen De La Rosa (ISTA Secretariat), Vanessa Sutcliffe (HeartWood Editorial), and Agnes Hegedus (ISTA Secretariat).

The effective date for the 2022 ISTA Rules is 1st January 2022. For details on how to download the electronic version, see the Publications section of the ISTA website. While the ISTA Rules are available in French, German, and Spanish, the official reference version of the ISTA Rules is the English version.

Overview of Rules change proposals approved at OGM21

Changes to the 2022 Edition of the ISTA Rules approved at the Ordinary General Meeting in June 2021 can be found on the ISTA website at:

<https://www.seedtest.org/upload/cms/user/OGM21-05ISTARulesProposals2022.pdf>

The supporting validation reports are also available at:

<https://www.seedtest.org/upload/cms/user/OGM21-06ISTAMethodValidationReports202211.pdf>

Summary of Changes to the ISTA Rules for 2022

Chapter 1

1.5.2.2: Removal of obsolete website information.

1.5.2.4: Addition of the ISTA List of Stabilised Plant Names as the primary source for reporting other seeds.

Chapter 2

2.2.12; 2.2.13: Clarification that additives used to treat or coat seed may contain more than one of the listed ingredients.

2.5.2.1: Correction of reference to 2.2.12 which defines treated seeds.

2.5.2.2.1: Changes to enable a more accurate description of the various types of dividers that may be used for sample reduction.

2.5.3: Change to insert cross-reference to Chapters 3 and 4 for clarification on how the different fractions of working samples should be stored after testing.

Table 2C Part 1: Addition of *Chenopodium quinoa*.

Table 2C Part 1: *Salvia hispanica* moved to Table 2C Part 1, from Table 2C Part 3, as it should be regarded as an agricultural crop. Consequently, the maximum seed lot size is adjusted to the maximum for small seeded agricultural species, i.e. 10000 kg; the minimum submitted sample size and other seed by number working sample are increased to 35 g.

Table 2C Part 1: Editorial change to correct wrongly labelled table section.

Chapter 3

3.2.1: Rewording about use of the term 'ergot.'

3.5.2: Improvement to text related to proposal C.2.3 (Storage of the samples). Changes clarify the intent of 3.5.2 and harmonise it with wording in 4.5.2.

3.7: Removal of obsolete website information.

Table 3B Part 1: Editorial corrections of nomenclature changes approved in the 2019 ISTA List of Stabilised Plant Names. Removal from table of *Anagallis*, *Dorotheanthus*, *Osteospermum*, *Piptatherum* and *Stachys*.

Table 3B Part 1: Result of changes to the ISTA List of Stabilised Plant Names used in Table 2C for *Megathyrsus maximus* and *Thinopyrum elongatum*.

Table 3B Part 1: Editorial corrections of nomenclature changes approved in the 2019 ISTA List of Stabilised Plant Names.

Table 3B Part 1: Addition of *Chenopodium*.

Table 3B Part 2: Proposal to assign a PSD to *Ornithopus sativus*.

Table 3B Part 2: Result of changes to the ISTA List of Stabilised Plant Names used in Table 2C for *Megathyrsus maximus*.

Chapter 4

4.7: Addition of the ISTA List of Stabilised Plant Names as the primary source for reporting other seeds.

Chapter 5

5.2.8.1: Addition of the seedling abnormality criterion 32/07 to *Allium* spp. regarding primary infection.

5.4.2, 5.4.3.4, 5.6.2.1, 5.6.2.2, 5.10: Consequential changes resulting from the addition of agar (A) as a primary media for *Pinus sylvestris* in Table 5A Part 2.

5.6.1: Change colon (:) symbol to a forward slash (/) to denote division in proportional calculations.

5.6.2.1.1: Proposal to remove the word 'upright' regarding the top of paper (TP) method.

5.10: Addition of cellulose paper (CCP) as a primary media for the top of paper (TP) method.

Table 5A Part 1: Addition of *Chenopodium quinoa*.

Table 5A Part 1: Addition of crepe cellulose paper (CCP) as a primary media for the top of paper (TP) method for *Glycine max*.

Table 5A Part 1: Editorial corrections of nomenclature changes approved in the 2019 ISTA List of Stabilised Plant Names.

Table 5A Part 1: *Salvia hispanica* moved to Table 2C Part 1, from Table 5A Part 3.

Table 5A Part 1: Statement for use of CCP for TP method moved from 'Additional advice' column to 'Additional directions' for *Zea mays*.

Table 5A Part 2: Addition of agar as a primary media for *Pinus sylvestris*.

Table 5A Part 3: Addition of the germination temperature of 20°C for *Eustoma exaltatum*.

Chapter 7

Methods 7-005, 7-006, 7-014, 7-016 and 7-022: Changes to achieve harmony between pretreatment descriptions for several similar methods.

Methods 7-013a and 7-013b: Allows the optional use of methyl blue stain to aid visualisation of fungal hyphae.

Method 7-019a: Correction of the temperature for DNA extraction indicated in the validation report.

Chapter 8

8.8.1: Editorial change to divide section 8.8.1 into two sub-sections.

Chapter 9

9.2.7, 9.3.2.7: Cross-reference to 1.5.2.22 gives clear advice on how to report moisture results for species listed in Table 2C but not listed in Table 9A.

Chapter 18

18.8.1: Clarification on how to report purity content of seed mixtures. This proposal was approved for the 2020 edition of the ISTA Rules. The change, however, was placed in the wrong place within 18.8.1. This editorial change corrects the error.

Sales of online ISTA Rules for 2019-2021							
Item		2019		2020		2021	
		Sold	Income (CHF)	Sold	Income (CHF)	Sold	Income (CHF)
Royalties from direct download sales (remitted in USD)	Full Rules issues	37	CHF 16'000.00	35	CHF 14'426.00	22	CHF 9'357.60
	Single chapters	57	CHF 4'800.00	57	CHF 3'465.00	70	CHF 3'427.00
Sales via Secretariat (CHF)	Multiple-user access (e.g. non-member labs)	16	CHF 22'400.00	14	CHF 19'600.00	18	CHF 25'200.00
	Single-user access (Associate Members)	32	CHF 7'360.00	39	CHF 9'446.24	40	CHF 10'854.00
Total		142	CHF 50'560.00	145	CHF 46'937.24	150	CHF 48'838.60

3. Accreditation Programme

Report of the Proficiency Test Committee and standard PT coordinator

This is an overview of the standard proficiency test program; the activity related to the seed health proficiency test and to the GMO Proficiency Test is presented under the related Committee chapters.

3.1 Proficiency tests 2021 preparation and dispatch

In 2021, three standard proficiency test rounds (PT) were prepared by PT Leaders and dispatched to laboratories from the ISTA Secretariat, according to the 2020–2022 Programme Plan (see Table B.3.1).

Table B.3.1. List of species and test types for 2021

Round	Species	Test round scope	Test leader	Sample number	Number of participants
21-1	<i>Zea mays</i>	G, M, V (radicle emergence)	Didier Demilly	3 x 240	201
	MIX for training	Purity Committee		200	
21-2	<i>Medicago sativa</i>	P, OSD, G, TZ, OIC	Leanne Duncan	3 x 215	180
21-2	<i>Alnus glutinosa</i>	G	Sergio Pasquini	3 x 150	85
21-3	<i>Fagopyrum esculentum</i>	P, OSD, G, TSW	Monika Holubicova	3 x 240	200

P - purity, OSD - other seeds determination, G - germination, M - moisture determination, TZ - tetrazolium test, V - vigor, OIC - reporting on an ISTA Certificate, MIX - a mixture of other seeds for seed identification, TSW – Thousand seed weight test

The statistical analysis and reports for the PT round 21-1 *Zea mays* and PT round 21-2 *Medicago sativa* has been finalised and published during the year. The PT round 21-1 *Zea mays* also included the seed mixture exercise.

The statistical analysis and reports for the PT round 20-1 *Phaseolus vulgaris*, PT round 20-2 *Allium porrum*, PT round 20-3 *Felicia* sp and PT round 20-3 *Festuca pratensis* were reported in 2021. The PT round 20-2 *Allium porrum* included the TSW test which was not rated as the very first application of this test within the standard Proficiency Test Programme. The PT round 20-3 *Festuca pratensis* included the seed mixture exercise which is also not under the rating system as the training exercise provided by the ISTA Purity Committee.

The distribution of the PT21-2 on *Alnus glutinosa* to participants was postponed from April 2021 until December 2021.

Thousand Seed Weight Test planned in the PT round 21-3 *Fagopyrum esculentum* is for the first time going to be rated.

3.2 Reporting of Proficiency test results

In 2021, four PT leaders prepared 2'535 samples, performed 36 heterogeneity tests, and added 17'515 seeds in the samples for the OSD test. Also 200 mixture seed sample were prepared by the Purity Committee for training purposes. Statistical analysis was done on PT results, and individual reports were sent by the ISTA Secretariat to laboratories (1580 preliminary and final reports). Summary reports are available on the ISTA website: https://www.seedtest.org/en/proficiency-test-rounds-_content---1--3461--1193.html

The following diagrams represent the trend in performance of accredited laboratories versus non-accredited for the year 2021. It is noticeable that voluntary participants have a less A and B ratings and more C and BMP ratings in comparison with accredited laboratories.

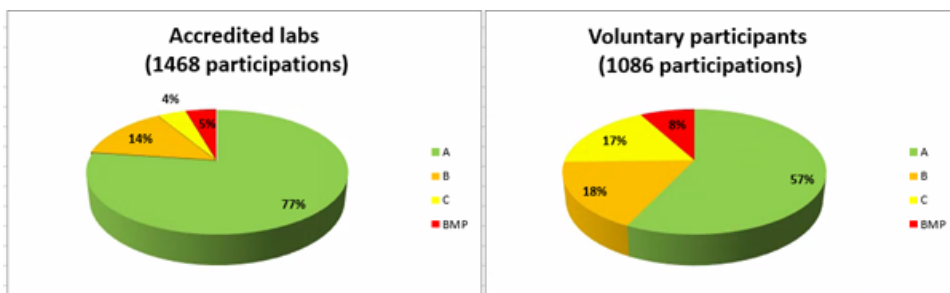


Figure 1: Laboratories rating for the year 2021 for all tests and all participants. Comparison between accredited and voluntary participating laboratories.

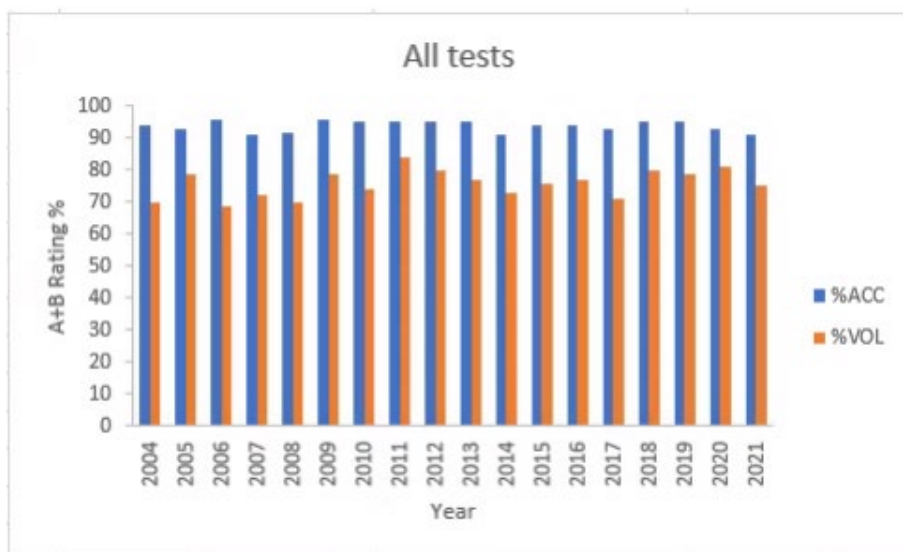


Figure 2: A and B ratings trend for accredited and non-accredited laboratories

The figure 2 shows that rating A and B is always higher for accredited compared to volunteers' laboratories. The percentage of A and B ratings for accredited laboratories since 2004 is quite stable and always higher than 90%. This shows the high proficiency of accredited laboratories. This gives confidence in the test results of accredited laboratories.

3.3 Goals and objectives

The main goal of PT Committee and PT Coordinator is to prepare and distribute the PT samples to participants in good time and good condition, as well as to timely analyze the laboratories test results. The program contributes strongly to the uniformity and to the proficiency in seed testing. It also serves as monitoring tool for the performance of ISTA accredited laboratories.

The organisation of the standard PTs was the subject of a webinar in December 2021. It is now available on Youtube. Laboratories have detailed information and answers to their questions about the standard PTs with this video.

The distribution of samples remains problematic for some countries or laboratories due to customs or phytosanitary difficulties as already mentioned last year. This is despite all the efforts made by the ISTA secretariat to apply the regulations.

The 2022 program is already ready as the latest year of the triennium program is 2020-2022. The PT leaders started the preparation of the 3 species sample *Glycine max*, *Spinacia oleracea* and *Lolium perenne*. The committee started to prepare the new program plan for 2023-2025. Two members will be leaving the committee and we are therefore calling for applications from new members who would like to be PT leaders for the period 2023-2025.

As in previous years, we expect all accredited laboratories to participate in the 2022 PTs and to achieve an A+B rating of over 90% on all tests. And we also aim to increase the performance of non-accredited laboratories. Despite good results on all tests, both accredited and non-accredited laboratories have shown this year and in previous years difficulties in identifying other seeds added to the OSDs. We hope that the laboratories participating in the Proficiency Tests will take steps to improve their species identification performance for the next OSD PT round.

3.4 Audit programme

2021 was a challenging year, due to the COVID-19 pandemic that affected part of the activities of the Accreditation and Technical Department including the possibility to perform on-site assessment for the planned audits. Traveling was not possible at the beginning of the year and the on-site audits were performed starting with September 2021 in Europe only.

A total number of 71 audits were performed in 2021. This number is due to 21 audits postponed from 2020 and 50 audits with the initial date in 2021, including 4 accreditation audits.

In response to the Covid -19 pandemic, a procedure on how to perform remote/partially remote audits has been approved and implemented at the end of 2020 and applied in 2021 for 59 audits. In total, 12 audits were performed with on-site assessment.

The Auditors Workshop planned in Poznan was postponed for 2022.

3.5 Accreditation under the Performance- Based Approach

By the end of 2021, a number of 13 laboratories were accredited under the principles of the Performance-Based Approach:

Table B.3.16 Laboratories accredited under the principles of Performance-Based Approach

Country/Distinct economy	ISTA laboratory code
ARGENTINA	AR01
AUSTRIA	AT03
DENMARK	DK08
FRANCE	FR03
GERMANY	DE04
HUNGARY	HU01
ITALY	IT01 and IT03
JAPAN	JP03 and JP07
SERBIA	RS02
URUGUAY	UY02
UNITED STATES OF AMERICA	US11

3.6 Accreditation administration

The ISTA Secretary General and the Head of the Accreditation and Technical Department worked together with the ECOM sub-working group on training to develop an online Quality Assurance training workshop for beginners as a test case to identify the needs, including resources, and limitations for online training.

The first on-line workshop was organised as a trial in February 2021 and was successful.

Based on the feedback received from the participants and also the new gained experience of the lecturers there were few improvements done and two Quality Assurance and accreditation for beginners were organised in April 2021 in English language.

The same workshop was planned in French language for the last Quarter of the year and to be hosted in Tunis in collaboration with the African Seed Trade Association (AFSTA) was not performed. The possibility to organise it online in 2022 is considered.

The lecturers preparing all above-mentioned workshops were Dr. Florina Palada, Head of Accreditation and Technical Department, ISTA Secretariat, Dr. Joël Léchappé, ISTA Technical Auditor and ISTA Honorary Life Member.

3.7 Document updates

The following is a list of ISTA accreditation documents relevant for member laboratories were updated in 2021:

[Acc-P-08-How to develop Quality Documentation V2.0 \(seedtest.org\)](#)

[Acc-P-09-HowtorespondtoauditfindingsV3.0.pdf \(seedtest.org\)](#)

[Acc-P-07 How to complete an ISTA Certificates V5.0 \(seedtest.org\)](#)

[Acc-F-09 Application Form for \(Re\)Accreditation V7.0 \(seedtest.org\)](#)

[Acc-D-08 ISTA internal policy to assign an auditor for a specific audit V1.2 \(seedtest.org\)](#)

<https://www.seedtest.org/upload/cms/user/Acc-D-01-TerminationsuspensionwithdrawalV3.0.pdf>

[Admin-P-05-AppealsandComplaintsProcedureV2.0.pdf \(seedtest.org\)](#)

[Admin-F-27ComplaintandAppealsV2.01.pdf \(seedtest.org\)](#)

[Acc-D-07 ISTA Accreditation and Scope of Accreditation Policy V2.1 \(seedtest.org\)](#)

[Acc-D-04 -Accreditation under PBA V3.0 \(seedtest.org\)](#)

<https://www.seedtest.org/upload/cms/user/Acc-D-02-UseofISTALogoV2.0.pdf>

3.8 Accreditation figures

A complete list of accredited ISTA laboratories is shown in Table B.3.17. The regional distribution of the accredited laboratories is given in Figures B.3.19 a and b.

Table B.3.18 List of accredited laboratories – 2021

Country/Distinct Economy	ISTA Laboratory code
Argentina	AR01
Austria	AT03, AT04
Australia	AU01, AU02, AU06, AU07, AU09
Belgium	BE02, BE03
Bulgaria	BG01
Bolivia	BO01
Brazil	BR07, BR08
Canada	CA04, CA08, CA10, CA12
Switzerland	CH01
Chile	CL02
China	CN01, CN04
Czech Republic	CZ03
Germany	DE03, DE04, DE05, DE06, DE07, DE09, DE10, DE13, DE15, DE16, DE17, DE18, DE19
Denmark	DK03, DK04, DK06, DK08, DK09, DK11
Estonia	EE01
Egypt	EG01
Spain	ES01
Finland	FI01
France	FR02, FR03, FR07, FR08, FR09, FR11
United Kingdom	GB01, GB04, GB06
Greece	GR01, GR02
Croatia	HR03
Hungary	HU01, HU02
Indonesia	ID01, ID02, ID03
Ireland	IE01
Israel	IL01
India	IN05, IN06, IN07, IN12, IN14, IN16, IN45
Iran	IR01
Italy	IT01, IT03, IT06, IT07, IT09, IT10
Japan	JP01, JP03, JP05, JP06, JP07
Kenya	KE01
South Korea	KR02, KR03
Lithuania	LT01
Luxemburg	LU01
Latvia	LV01

Moldova	MD01
Malawi	MW01
Mexico	MX01
Netherlands	NL02, NL03, NL05, NL11
Norway	NO01
New Zealand	NZ01, NZ02, NZ03, NZ05
Philippines	PH03
Pakistan	PK01
Poland	PL05, PL07
Portugal	PT01
Romania	RO05, RO06, RO08
Serbia	RS01, RS02, RS03
Russian Federation	RU01, RU03, RU04, RU05, RU06, RU07
Sweden	SE02, SE07, SE09
Slovenia	SI01
Slovakia	SK01, SK02
Senegal	SN01
Thailand	TH03, TH04, TH05
Turkey	TR01
SCT of Taiwan, Penghu, Kinmen and Matsu	TW01
Tanzania	TZ02
Ukraine	UA01
Uganda	UG02
United States of America	US01, US03, US05, US06, US07, US10, US11
Uruguay	UY02
South Africa	ZA01, ZA03, ZA04, ZA05, ZA06
Zambia	ZM01
Zimbabwe	ZW01
Total number of accredited laboratories	149

There were 64 countries/distinct economies with at least one ISTA-accredited laboratory.

REGIONAL DISTRIBUTION OF ISTA ACCREDITED LABORATORIES (%)

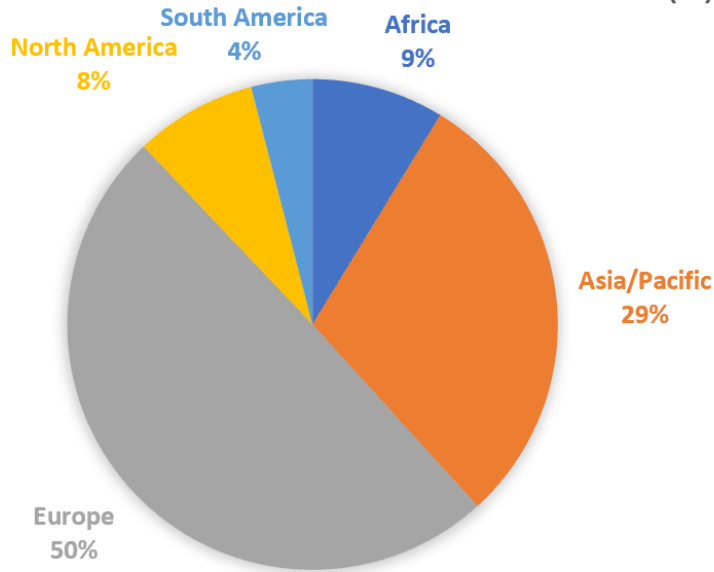
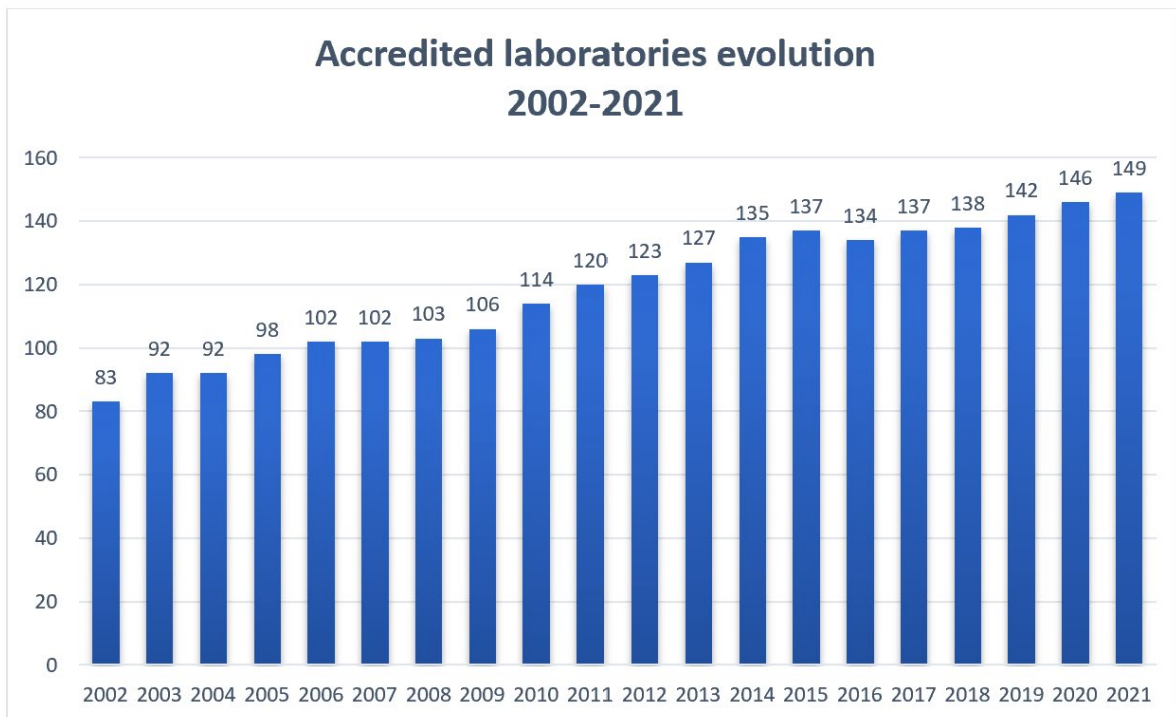


Figure B.3.19 Regional distribution of the 149 ISTA accredited laboratories

Figure B.3.20 Number of ISTA accredited laboratories since 2002



3.9 New system auditor at ISTA Secretariat

A new system auditor at ISTA Secretariat has been employed at 01.03.2021

3.10 Contracted auditors

In 2021 the Accreditation and Technical Department has continued to recruit new contracted system and technical auditors to perform ISTA audits. Four candidates are in different steps of the process.

3.5 Sales of ISTA Certificates

A total of 199'960 certificates were sold by the end of the year (Table B.3.21).

Table B.3.21 Sales of ISTA Certificates

Type of ISTA Certificates	2013	2014	2015	2016	2017	2018	2019	2020	2021
Orange International Seed lot Certificates	150700	190600	160300	158000	204000	190800	163700	202500	181360
Blue International Seed Sample Certificates	7400	6300	10700	8500	14100	15100	11400	15400	18600

4. ISTA Publications and Products

4.1 ISTA Handbooks and Proceedings

Table B.4.1. Total sales of ISTA publications 2017–2021

Type/year	2017	2018	2019	2020	2021
Handbook on Seed Sampling	8	7	6	0	7
Handbook on Seedling Evaluation	22	6	54	40	55
Handbook on Pure Seed Definitions	6	10	12	5	5
Handbook on Moisture Determination	9	8	11	4	7
Handbook on Flower Seed Testing	3	7	3	12	22
ISTA Working Sheets on Tetrazolium Testing Vol. I	3	6	4	1	9
ISTA Working Sheets on Tetrazolium Testing Vol. II	2	1	6	3	5
Various Handbooks/Publications	26	50	44	15	29
Total Publications sold	79	95	140	80	139

4.2 Calibration Samples

The Secretariat offers calibration samples of the grass species *Dactylis glomerata* (3.0 g) and *Poa pratensis* (1.0 g) for General Seed Blowers.

In 2021 3 samples of *Poa pratensis* and 5 of *Dactylis glomerata* were sold.

5. ISTA Training and Education Programmes

5.1 ISTA Workshop overview

In 2021, two online workshops were held online, due to the Covid-19 pandemic.

ISTA Online Workshop on Quality Assurance & ISTA Accreditation for Early Beginners, 13-15 April 2021

ISTA Online Workshop on Quality Assurance & ISTA Accreditation for Early Beginners, 20-22 April 2021

6. Scientific Journal 'Seed Science and Technology': Report of the Editorial Board

Chief Editor:

Fiona R. Hay (The Philippines)

Deputy Editor:

Alison A Powell (United Kingdom)

Vigour (tests, causes of etc), physiology of ageing, also molecular aspects of ageing within limits (on the whole SST papers stay within these!), priming

Associate Editors:

Christophe Bailly (France)

Dormancy, ageing, cell signalling, oxidative stress, markers of seed vigour

Laura Bowden (United Kingdom)

Seed quality, priming, storage

Steven P.C. Groot (Netherlands)

Seed vigour, storage

Fabio Gresta (Italy)

Legume germination, hard seed coat, seed dormancy and dormancy breaking, scarification, seed treatment, weed germination, temperature, light

Valerie Grimault (France)

Seed Health

Brigitte Hamman (South Africa)

Seed germination, seed quality, seed vigour testing, seed enhancement, chemical seed treatments, seed biochemistry and physiology, dormancy, longevity (storage)

Julio Marcos-Filho (Brazil)

Seed physiology and seed quality control, as seed vigour (relationship with seed performance; testing), germination, priming, storage, ..

David Mycock (South Africa)

Seed storage (orthodox and the range to Recalcitrant) in particular Cryostorage; Germplasm conservation; plant cell, tissue and organ culture; plant cell biology

Daniel Perry (Canada)

Variety identification, molecular or DNA markers, polymerase chain reaction (PCR), microsatellite, simple-sequence-repeat, single-nucleotide polymorphism (SNP)

Moctar Sacandé (United Kingdom)

Seed storage, recalcitrant species, germination/dormancy

Uma Rani Sinniah (Malaysia)

Tropical crops germination, storage

Michael Sussman (United States)

Biomolecular techniques and principles pertaining to biotechnology and molecular biology

Alan Taylor (United States)

Seed treatment and coating technologies; Seed water activity/moisture content; Seed quality related to germination/viability

Christopher Wood (United Kingdom)

low temperature storage, dormancy and orchid/palm related papers

Andrea Mondoni (Italy)

Seed dormancy, germination, storage

Shyam S. Phartyal (Germany)

Irfan Afzal (Pakistan)

Ibrahim Demir (Turkey)

Sergey Rosbakh (Germany)

The task of the editorial board is to edit the ISTA scientific journal „Seed Science and Technology“.

Seed Science and Technology (SST) is one of the leading international journals featuring original papers and review articles in all areas of seed quality and physiology as related to seed production, harvest, processing, sampling, storage, genetic conservation, habitat regeneration, distribution and testing.

SST is published in three issues per volume and year with approximately 600 pages.

6.1 Editorial figures for 2021

Papers received: 107

Papers accepted for publication: 24

Papers rejected: 74

Papers published in 3 (virtual) issues: $8 + 8 + 11 = 27$

Full papers in 3 issues: $4 + 7 + 9 = 20$

Research Notes in 3 issues: $3 + 1 + 1 = 5$

Editorial Articles in 3 issues: $1 + 0 + 1 = 2$

Pages published in 3 issues: $77 + 104 + 139 = 320$

Average number of pages per paper: 11.9

Issues published online: 3 (April, August, December)

6.2 Sales of 'Seed Science and Technology' 2017– 2021 Seed Science Advisory Group

	2017	2018	2019	2020	2021
SST Print	101	0	0	0	
SST Online Single	9	0	1	0	1
SST Print+ Online single	4	0	0	0	
SST Print+ Online Multiple	5	0	0	0	
SST OnlineMulptle	35	3	0	0	
SST Back Issues, print	5	5	1	0	
SST Dowload of Individual Chapters	27	18	9	13	11
SST Open Access Fee Full Lengh Paper		18	11	12	15
SST Open Access Fee Research Note		11	11	10	3
Total SST	186	55	33	35	30

MEMBERSHIP LIST			
			change comments
1	CHAIR: Alison Powell	United Kingdom	
2	VICE CHAIR: Brigitte Hamman	South Africa	
3	Birte Boelt	Denmark	
4	Francoise Corbineau	France	
5	Malavika Dadlani	India	
6	Joel Lechappe	France	
7	Tim Loeffler	United States	Approved by ECOM November 2021
8	Stan Matthews	United Kingdom	
9	Alan Taylor	United States	
10	Manuela Nagel	Germany	
11	Jane Thomas	United Kngdom	
12	Adel Zayed	USA	
	ECOM liaison: Leena Pietila	Finland	

Activities, based on Terms of Reference (TORs):

TOR 1: To provide a link between fundamental research and the use of that research to meet the needs of ISTA members.

Prediction of normal germination using an early radicle emergence count: An article to explain the project in terms of proof of concept, the results accumulated so far, future work and its final purpose was published in Seed Testing International. (The potential for new approaches to seed testing: the role of the Seed Science Advisory Group, Seed Testing International (2020), 159, 18 – 22).

The next phase of the project, set up in autumn 2019, has continued through 2021. Six member laboratories of the Germination Committee from Chile, France, Israel, Iran, and UK (2 laboratories) volunteered to work on six different species, taken from the different crop groups for germination. The species selected in consultation with the laboratories are *Capsicum annuum* L., *Eruca sativa* Mill., *Pisum sativum* L., *Phaseolus vulgaris* L. *Sorghum bicolor* (L.) Moench subsp. *bicolor* and *Triticum aestivum* L. subsp. *aestivum*. The number of laboratories testing each species ranges from five (*T. aestivum*) to two (*E. sativa*, *C. annuum*). In this phase of the project, each laboratory has used their normal method of germination testing and taken single early radicle emergence counts at specific times before continuing to an assessment of normal germination. We adopted this approach since the ISTA Rules provide a number of different alternative test conditions for several of the species, including dormancy breaking. Where dormancy breaking (DB) was required, laboratories have, where possible, counted RE both during and after DB. Not surprisingly, laboratories have found it more difficult to accommodate extra work during the pandemic. Data has currently been returned from two laboratories for *T. aestivum* and one laboratory for both *S. bicolor* and *C. annuum*. Analysis of data so far has revealed significant relationships between RE and normal germination in *S. bicolor* and *C. annuum*.

TOR 2: Appraisal of evidence for techniques/equipment available for use in seed testing laboratories

We are evaluating the significance of a scientific paper from employees of a company called Seed-X that reports the non-destructive prediction of germination (Robust seed germination prediction using deep learning and RGB image data. Nehoshtan, Y, Carmon, E, Yaniv, O, Ayal, S & Rotem, O., 2021. *Scientific Reports* 11, Article number: 22030). A report on our comments will be prepared.

TOR 3: Respond to requests from ECOM and TCOM Chairs for advice related to scientific issues.

An article is being prepared for consideration by the ECOM, which will provide an overview of bio-stimulants and the key efficacy claims, and then identify whether or not current ISTA methods are sufficient for evaluating these claims, or whether the development of new ISTA methods might be needed.

7. Wild Species Working Group

MEMBERSHIP LIST			
			change comments
1	CHAIR: Gil Waibel	USA	
2	VICE CHAIR: Ruoqing Wang	Canada	
3	Riad Z. Baalbaki	USA	
4	Laura Bowden	United Kingdom	
5	Ted Chapman	USA	
6	Rachael Davies	United Kingdom	
7	Stefanie Krämer	Germany	
8	Heidi Larson	USA	

9	Sergio Pasquini	Italy	
10	Alison A. Powell	United Kingdom	
11	Victor Vankus	USA	
12	Rita Zecchinelli	Italy	
	ECOM liaison officer: Craig R. McGill	New Zealand	

During the past year, the Wild Species Working Group has worked to develop a web site (wild-seeds.net). The web site is available of review, and we are in the process of adding content. Several methodology chapters have been written and posted, and others are being written. A protocol page has been designed but protocols will not be available until we have adequate material to share. A limited number of seed images have been posted to help us develop the gallery, along with functional search mechanisms are in development. We will be adding images to the gallery as they are available. A comprehensive glossary has been developed and offers a compilation of definitions including those offered by seed testing organizations. Combining definitions can be helpful to some web site users to pinpoint the meaning of a term. An algorithm will be developed to help efficiently build the protocol sheets. In addition, a hovering feature (over any term posted on the website) is being created to automatically pull up the definitions in the glossary to help a reader understand terminology when needed. We are thankful for the support and donations from many ISTA, many seed companies, and the American Seed Trade Association (ASTA). For those curious who has donated to the working group, see <https://wild-seeds.net/about/donors/>.

Once the web site's development and content are well underway, we will be looking for volunteers from around the world to help us build the protocol sheets of species from many countries and/or regions. Any seed analysts or researchers who would like to help are invited to contact Gil Waibel (gpwaibel@gmail.com).

8. Report of the ISTA Secretariat

8.1 Secretariat staff

This report lists the activities and changes in the Secretariat during 2021, where the Secretariat had no unplanned staff changes:

Yoana Uzunova returned from her maternity leave in Mid 2021 and her temporarily replacement, Sven Molenaar, left the Secretariat as scheduled.

On Publication (Rules, ISTA Handbooks and Website) Vanessa Sutcliffe of HeartWood Editorial assists the Secretariat with respect to proofreading and InDesign publication now as well for the STI publication.

In March 2021, Stelle Marcu joined the Secretariat as auditor in training.

Thus, at the end of the year 2020 the Secretariat numerates the following 12 members of staff corresponding to 10.8 full time equivalent employees:

Role	Name	%FTE
Secretary General	Dr. Andreas Wais	1
Head of Accreditation and Technical Department / Acting Secretary General	Dr. Florina Palada	1
TCOM Manager	Nadine Ettel	0.6
TCOM Administration	Andreea Nicoleta Militaru	0.8
System Auditor, Quality Management & Standard PT Coordinator	Branislava Opra	1
System Auditor in training	Stella Marcu	1
Accreditation, Audit and PT Administration	Neelam Lagah	1

Finance, Sales and HR Management	Agnes Hegedüs	1
IT Business Solution Manager	Sejal Patel	1
Events, Membership and Documentation Manager	Olga Stöckli	1
Publication, Marketing & Communication Specialist	Yoana Uzunova	0.6
Marketing & Communication Assistant	Karen de La Rosa	0.8

8.2 Secretariat work

A long-term goal of the Secretariat was to move to another location in the area. The search was successful and in Q2 the Secretariat moved to Wallisellen (Richtiring 32, postal address Richtiarkade 18). This new location is more modern build facility with better infrastructure (i.e Internet capabilities, safety both to reach and work also late hours, social possibilities, and energy wise).

Due to the requirement of the Swiss Government, the Secretariat staff was mainly working from home during 2021, which made the move more easily to happen.

8.3 Function

8.3.1 Administration

Lead by Secretary General. The Administration team includes Agnes Hegedüs and Olga Stöckli.

The main tasks of Agnes are the financial administration, invoicing, settling all incoming and outgoing payments, ISTA publications and products sales administration, general office, HR assistance and time recording administration, as well as membership administration on the financial aspects.

Olga is responsible for the Events organisation, Administration documentation and all Membership administration. She leads the documentation and preparation of the contractual agreements needed upfront ISTA events. Olga is responsible for the registration process. ISTA events include, but are not limited to OGM, Congresses and ECOM Meetings. Membership administration includes receiving and responding to membership queries; managing the membership database; handling all communication with members regarding their membership and payments and coordinating the assignment of designated authorities and voting nominations. Olga's responsibility increased due to the implemented PL process for the Annual Meetings and Congresses.

8.3.2 Human Resources

The Secretary General heads HR. Agnes Hegedüs took over HR Assistant tasks since 2017.

Agnes, Florina Palada and the Secretary General maintained the HR Handbook, which is updated every year.

During the pandemic the Secretariat operates under a 4-step pandemic plan since January 2020. This plan is still in place and at least monthly meetings of the Agnes, Florina and the Secretary General are held to adapt the plan due to current requirements.

8.3.3 Finance

The Secretary General oversees the finances of the Association in the framework of the annual budget. Accounting is divided between Ronny Dossenbach of Buff Treuhand AG and Agnes Hegedüs. ISTA accounts are annually audited by BDO AG.

As requested by the auditors, the ECOM started a project to register the association in the Swiss Commercial Register as an Association. This project is ongoing and will allow ISTA to work more effective and seamless with institutions within Switzerland. The project is under finalisation with the ISTA lawyer Thomas Brunner.

Following the Office365 initiative all bookkeeping is now virtual. This does not only save paper, but also showed clear benefits during the COVID-19 measures like home office, as documents were exchanged easily between different locations.

8.3.4 IT

Computing hardware, connectivity and software is outsourced to InfoPro, a company in Bern, which is also acting as a place of the ISTA virtual storage of data and host for all ISTA used programs and databases. In the area of

Invoice preparations ISTA collaborates with Prima, accompany located in Zurich. The current website is hosted by MySign AG (maintenance of the website contents is done by the Secretariat staff).

A software change to Office365 was done in 2019 and nearly completed in 2020. This process is ongoing and under the project management of Sejal Patel. Since 2020 and the COVID-19 pandemic ISTA also transferred this system as to be used by TCOMs, ECOM and other external cooperates (including auditors) to have access to areas of ISTA document drives, where it is needed for a seamless communication. The project also allows TCOMs to increase their internal communication as well the communication with the Secretariat. Most TCOMs make use of this by now.

In Q4 2020 ISTA introduced LinkedIn learning as a tool for staff training in the Secretariat. This was continued in 2021.

Both, Office365 solutions and LinkedIn learning are delivered to ISTA on a reduced rate (NPO rate).

8.3.5 Marketing

Social media and digital marketing

The ISTA YouTube channel has more than 1'000 subscribers, which nearly doubled since 2020. All relevant actions are now posted here, and it became the main host for all ISTA video information.

Further ISTA continued to use its Twitter account, which is used for quick information to the stakeholders and interested parties. ISTA has now about 1'700 followers on Twitter, increasing by about 50 % during last year.

At the end of 2021, the ISTA LinkedIn profile counted over 8'000 followers. This corresponds to an increase of about 15 % as compared to the same time a year before. Posting on LinkedIn is done up to three times a week. The posts mainly include news about the association. LinkedIn allows more in-depth information as it is not limited to the number of signs, like Twitter.

Since Q4 ISTA has a relevant introduction in Wikipedia, which is giving information on all relevant topics (https://en.wikipedia.org/wiki/International_Seed_Testing_Association).

Key performance indicator reports of all social media are shared within the Marketing Working Group.

The website required changes of CMS, as the old one is not supported anymore and does not allow a lot of changes as well not a perfect view on mobile devices, which are more and more used. After the approval of the budget by the Ordinary General Meeting a project was started to renew the website completely. The outcome is a new website with new features serving the needs of the ISTA stakeholders. It will be launched within Q1 2022.

World Seed Partnership

The World Seed Partnership (WSP) is a joint initiative by now five international organizations:

- International Seed Testing Association (ISTA)
- International Seed Federation (ISF)
- Organization for Economic Co-operation and Development (OECD)
- International Union for the Protection of New Varieties of Plants (UPOV)
- World Farmer Organisation (WFO)

The mission of the World Seed Partnership is to provide a focal point for information on internationally harmonised seed systems and to communicate their role in supporting sustainable agriculture.

Regular web conferences took place in 2021 in order to move this project forward. Due to the COVID-19 situation no new projects were defined for 2021.

8.3.6 Representation

During 2019, ISTA was represented by the Officers, other ECOM Members, the Secretary General, other Secretariat staff or other ISTA members at all major events of partner organisations, international seed trade associations, scientific and other international organisations in the area of seed science and politics. This resulted in closer cooperation with the African Union, SAA, AOSA/SCST, OECD, FAO, APSA, AFSTA, Euroseeds, UPOV and ASTA. The Secretary General also had contact with several DAs. The Secretary General is also member of the African Union Working group on seed quality and certification.

8.3.7 Event organization

New way to work had to be developed for ISTA and across the world. ISTA is a global organisation and faced a number of challenges. Decisions were made to cancel the Annual Meeting in Cairo, Egypt and following the emergency Swiss COVID laws held the OGM vote by email. Although a difficult situation the result was that 47 out of the 53 ISTA Designated voting members eligible to vote for their countries/distinct economies voted on the annual OGM agenda topics and ISTA Rules proposals we had discussed via the virtual meetings.

8.3.8 Publications

ISTA Rules

The updating, formatting, coordination and integration of the different translations and other required maintenance of the source files performed by Vanessa Sutcliffe with support of the Secretary General, Nadine, Andreea, Karen with support from the Rules TCOM. The rules were published December 01, 2021, to enable laboratories to access the changes on time.

Seed Testing International (STI)

An editorial team of STI consisted of Andreas, Florina and Sejal (as the responsible person for STI).

Mailing lists and distribution was organised by Agnes.

The two scheduled issues of STI (no.161 and no. 162) were successfully and timely produced and distributed due to the leadership of Sejal.

Seed Science and Technology (SST)

The Editorial Board headed by Fiona Hay edits SST.

Uploading of Fast-track and the final articles and amending the DOI registrations is implemented by SST typesetter Lucie Eng.

Current Website

Only the Marketing & Communication group at the Secretariat maintains the website upon request on Secretariat staff information depending on their relevant role.

The project towards the redesign and construction of a new ISTA website is described above.

Newsletters

Newsletters are prepared weekly by the Marketing team. Different members of the Secretariat staff depending on the subject contribute to these Newsletters.

8.3.9 TCOM

Nadine Ettl manages the TCOM work with the help of Andreea Militaru, this includes:

The on-going coordination and management of the TCOMs annual cycle including all reports and studies, information updating of the TCOM web sites.

Coordination and administration of the Method Validation Programme.

Set-up and coordination of the 100K-project as well as the SH-project (seed as a pathway), which is running in GEVES.

Leading the organisation of the DNA, GMO and SH Proficiency Test rounds and communication with laboratories, data entry and management.

Andreea is coordinating the workshops organisation, registration and management, TCOM Members and handling TCOM Membership Applications, updating TCOM website. In person workshops were not performed in 2021 due to travel restrictions. A program was set up to perform online workshops, which will started in 2021.

Training and maintenance of the TCOM area in Office365 is done by Nadine and Andreea.

8.3.10 Accreditation

Florina Palada manages the accreditation as Head of the Accreditation and Technical Department.

Auditing

Organised, arranged and partly performed by Florina and Branislava with support of Neelam, as well as a team of contracted system and technical auditors around the world.

Activities include:

- Pre-accreditation and pre-audit activities related to the interested laboratories/sampling entities
- Initial and re-accreditation audits of applicants and existing accredited laboratories/sampling entities
- Following up of corrective actions

Neelam provides the Audits administration and Certificate shipment and administration.

Neelam is providing administrative support to the Accreditation and Technical Department; this includes coordinating with the laboratories and the auditors the Audit schedule. Assisting with materials and documentation in preparation for audits. Making travel arrangements for the Auditors.

Organising and conducting a Proficiency Test Programme as well as the Mini-Proficiency Test Programme

Standard PT is under the responsibility of Branislava, Neelam supports her.

Work includes:

- Obtaining seed for some Proficiency Test rounds
- Managing registration
- Obtaining relevant documents for shipment
- Shipment
- Data entry and analysis
- Reporting

Other activities of the Accreditation and Technical Department

- Organisation of Quality Assurance Workshops
- Training of the new system auditor at ISTA Secretariat
- Recruiting and training of contracted system and technical auditors
- Optimisation of the database

Certificates

Two projects are currently running concerning ISTA Certificates.

- Electronic Certificates. After a feasibility project performed by Massey University, Palmerstone North (NZ) and approval of the Budget by the 2020 Ordinary General Meeting. A project was started with MySign to realise the use of electronic Certificates. The Website will play a major role in this project. A beta testing is foreseen in 2022. The project is led by the Secretary General.

- **Interactive Certificates:** This project, which enables ISTA laboratories to learn more about ISTA Certificates and their use (how to fill where and what). It is also be used for trainings within ISTA laboratories. The project was completed early 2020 with the help of Branislava and Florina and is continuously updated.

9. Finances of the Association

In January 2022, the ISTA accounts were audited by financial auditors BDO AG, who found them to be in well order. The report of the financial auditors is included after the presentation of the key financial figures.

The total turnover increased by 10 % compared to previous year mainly due to more audits in 2021, postponed from 2020, where the income in 2020 was only realised in 2021 and therefore went into the accruals and released in the 2021 budget. Therefore, the 2021 budget showed a higher income in audits than in regular years. The commission of Certificates is stable over the years with a clear trend upwards. The turnover increased to a total of 2'858'198 CHF for 2021, which is significantly lower than the 2021 budget (2'954'428 CHF). Reasons for this are highlighted below. The financial result shown for the year 2021 is negative. The balance of 5'904 CHF could only be reached by taking 40'000 CHF from the reserves, which is significantly lower than budgeted (855'000 CHF), i.e., most projects financed could be served by the regular cash flow.

Some areas to highlight include:

Membership subscription: The decrease of 20'812 CHF compared to previous year was due to more payments using the 10 % discount option. This was expected, but still 9'150 CHF higher than budgeted.

ISTA Annual Metting: The ISTA Annual Metting in Cairo was cancelled and held virtually due to the COVID-19 pandemic. This related in less cost and no income. The expenditures of 7'881 CHF are mainly due to preparations and virtual meeting cost.

ISTA Rules sales: Sales increased again marginally by 2'472 CHF compared to previous year. The discount of single chapter sales beginning of 2021 had no effect on the sales volume. They will not be continued in future.

Accreditation: The reason for the higher income on audits of 259'840 CHF is mainly due to more audits realized in 2021 due to the shifting of 22 audits initially planned for 2020 to 2021. Expenditures did raise accordingly.

Seed Science and Technology subscriptions: The income from sales and publication fees staid stable compared to previous year. For 2022 a decrease may happen due to special promotions for publication.

For 2022 a balanced budget is presented with an expected result of 74 CHF an using 499'000 CHF from the reveres, which is mainly due for 3 years of the 100'000 CHF project, eCertificates, new website, and auditors in person training. All these projects with some smaller ones mount up to 522'733 CHF, which means that part of them can be covered by the cash flow.

The reserves decreased at end of 2021 by 40'000 CHF to be at 4'570'000 CHF. That means that the 2021 budget could to a great extend be finances from the cash flow, despite projects financed during 2021, only using about 5% of the use from the reserves scheduled, which is partly due to the financial income.

ISTA draft Budget 2022	2020	2021	Budget 2022	Proposed 2023
INCOME				
<i>Subscriptions</i>				
Annual Membership Subscription	1'236'291.17	1'215'478.78	1'236'995.70	1'236'000.00
Accreditation Subscription	164'138.40	168'300.00	173'196.00	173'000.00
Annual Meetings	0.00	0.00	86'650.00	140'000.00
Technical Committees WS	0.00	0.00	60'000.00	90'000.00
STI Advertisement	0.00	0.00	1'500.00	1'000.00
	1'400'429.57	1'383'778.78	1'558'341.70	1'640'000.00
<i>Service Centres</i>				
ISTA Rules	50'200.64	52'672.13	55'000.00	55'000.00
Accreditation Audits	442'969.00	702'809.00	613'571.00	613'000.00

Activity Report of the ISTA Committees 2021

Proficiency Test incl. GMO	6'000.00	30'000.00	27'000.00	25'000.00
QA Workshops	0.00	7'546.93	8'000.00	10'000.00
Seed Science and Technology	21'317.09	20'989.67	20'000.00	20'000.00
Technical Publications and calibration samples	19'510.22	31'862.01	22'000.00	20'000.00
Certificates	678'925.00	661'375.02	666'250.00	665'000.00
Website	0.00	0.00	0.00	0.00
	<i>1'218'921.95</i>	<i>1'507'254.76</i>	<i>1'411'821.00</i>	<i>1'408'000.00</i>
Losses in receivables	-21'337.53	-32'836.00	-15'642.00	-15'000.00
Total Income	<i>2'598'013.99</i>	<i>2'858'197.54</i>	<i>2'954'520.70</i>	<i>3'033'000.00</i>

EXPENDITURE				
<i>Direct Costs</i>				
Annual Meetings & Congresses	-62'487.22	-7'880.67	-124'400.00	-180'000.00
Executive Committee+President	-15'486.40	-8'055.58	-40'000.00	-40'000.00
Technical Committees WS and 3K grants	-55'410.74	-62'187.37	-94'200.00	-115'000.00
Seed Testing International	-31'087.90	-28'659.09	-30'000.00	-30'000.00
	-164'472.26	-106'782.71	-288'600.00	-365'000.00
<i>Service Centres</i>				
ISTA Rules	-11'676.51	-10'627.34	-18'500.00	-20'000.00
Accreditation Audits	-153'901.99	-250'306.03	-362'510.00	-350'000.00
Proficiency Test incl. GMO	-45'303.23	-59'372.81	-46'500.00	-45'000.00
QA Workshops	0.00	-498.34	-8'500.00	-10'000.00
Seed Science and Technology	-55'798.42	-55'507.85	-55'000.00	-55'000.00
Technical Publications and calibration samples	-5'786.24	-15'970.07	-17'500.00	-17'500.00
Certificates	-106'676.18	-420'062.21	-90'000.00	-90'000.00
Provisions for fluctuations	0.00	40'000.00	499'000.00	125'000.00
	-379'142.57	-772'344.65	-99'510.00	-462'500.00
<i>Personnel expenses</i>				
Salaries	-1'164'760.30	-1'222'088.05	-1'224'695.03	-1'237'000.00
Social Security and insurances	-281'387.50	-297'744.75	-367'408.51	-371'000.00
Other personnel expenses incl. Recruitments	-25'583.06	-6'467.95	-5'000.00	-5'000.00
Staff Training	-9'519.54	-9'646.84	-30'000.00	-30'000.00
Secretary General Cost not covered otherwise	0.00	0.00	-30'000.00	-30'000.00
	-1'481'250.40	-1'535'947.59	-1'657'103.54	-1'673'000.00
<i>Operating Costs</i>				
Office Costs	-241'774.82	-328'371.65	-264'000.00	-265'000.00
Travel Costs (International Representation)	-28'677.89	-12'761.95	-40'000.00	-40'000.00
Marketing Costs	-23'795.43	-28'969.75	-20'000.00	-20'000.00
Website	-40'880.77	-212'249.97	-20'000.00	-20'000.00
Projects	0.00	0.00	-522'732.70	-150'000.00
	-335'128.91	-582'353.32	-866'732.70	-495'000.00
Depreciation of tangible fixed assets	-2'415.78	-21'528.43	-15'000.00	-11'000.00
Financial costs	-297'377.38	-150'812.42	-35'000.00	-35'000.00
Financial income	35'470.21	277'709.53	7'500.00	10'000.00
Prior-period costs	-510.97	-949.68	0.00	0.00
Prior-period income	67'651.57	40'715.57	0.00	0.00
Total Expenses	-2'557'176.49	-2'852'293.70	-2'954'446.24	-3'031'500.00
Result	40'837.50	5'903.84	74.46	1'500.00

2020 YEAR END CLOSING	ACCOUNT 2019	ACCOUNT 2020	ACCOUNT 2020
ASSETS			
<i>Currents Assets</i>			
<i>Cash</i>			
Petty Cash (Accounts 1000,1001,1002)	6'008.88	5'314.40	4'905.58
Postal account (Accounts 1010,1011,1015,1016)	118'873.46	68'439.07	53'137.55
Zürcher Kantonalbank, current account (Account 1020)	1'477'830.92	2'520'248.84	2'524'680.23
Zürcher Kantonalbank, deposit account (Account 1021)	499'666.17	499'248.70	499'105.71
Zürcher Kantonalbank, USD account (Account 1025)	65'614.21	2'941'954.79	248'035.63
Zürcher Kantonalbank, EUR account (Account 1026)	1'079'575.20	1'005'148.48	860'674.29
Zürcher Kantonalbank, EUR account Congrss (Account 1030)	0.00	0.00	0.00
Zürcher Kantonalbank, GBP account Congrss (Account 1031)	58'723.24	43'092.27	52'909.40
Zürcher Kantonalbank, USD asset management account (Account 1055)	-	-	113'998.46
	3'306'292.08	7'083'446.55	4'357'446.85
<i>Trade receivables</i>			
Membership subscriptions, certificates and publications (Accounts 1100,1111,1112,1113)	74'622.70	33'737.91	56'241.66
Allowance on doubtful accounts (Account 1120)	-7'000.00	-3'500.00	-5'600.00
	67'622.70	30'237.91	50'641.66
<i>Other accounts receivable</i>			
Other accounts receivable (Account 1108,1109,1110,2320)	16'021.78	44'036.45	17'801.21
Withholding tax (Account 1150)	11'973.37	11'615.67	2'608.44
Value added Tax (Account 1155,1156,1157,2055,2057)	10'189.04	12'180.79	69'765.59
	38'184.19	67'832.91	90'175.24
<i>Accrued income and prepaid expenses</i>			
Prepaid expenses (Accounts 1300)	438'201.54	79'916.15	74'933.35
	438'201.54	79'916.15	74'933.35
<i>Fixed assets</i>			
Financial assets (Account 1400,1410)	3'319'441.98	154'118.00	2'852'370.51
Tangible fixed assets (Accounts 1500,1520)	5'500.00	5'900.00	63'000.00
	3'324'941.98	160'018.00	2'915'370.51
	7'175'242.49	7'421'451.52	7'488'567.61

Activity Report of the ISTA Committees 2021

LIABILITIES + EQUITY			
Short-term liabilities			
Trade creditors (Account 2000,2001,2002,2005,2006,2007)	-57'700.72	-54'602.58	-224'126.00
Other accounts payable (Accounts 2200,2220,2250,2260,2270,2280,2321)	-20'613.25	-33'948.70	-3'959.25
Advance payments (Accounts 2100,2101,2102,2103,2104,2106,2107,2108,2109,2110,2112)	1'423'873.53	1'514'065.20	-1'559'493.25
Accrued expenses (Accounts 2120,2121,2122,2123,2124,2125,2126,2127,2128,2129,2300,2310,2350,2355,2360,2366,2367,2370,2371)	-177'789.83	-282'732.38	-198'982.61
	-	-	-
	1'679'977.33	1'885'348.86	-1'986'561.11
Long-term liabilities			
Provisions (Account 2910)	-	-	-
	4'610'000.00	4'610'000.00	-4'570'000.00
	-	-	-
	4'610'000.00	4'610'000.00	-4'570'000.00
Equity			
Equity (Account 2800)	-877'931.77	-885'265.16	-926'102.66
Profit/Loss (Account 2998)	-7'333.39	-40'837.50	-5'903.84
	-885'265.16	-926'102.66	-932'006.50
	-	-	--
	7'175'242.49	7'421'451.52	7'488'567.61



Phone 044 444 35 55
Fax 044 444 35 35
www.bdo.ch

BDO Ltd
Schiffbaustrasse 2
8031 Zurich

Report of the statutory auditor on the limited statutory examination
to the Ordinary General meeting of

ISTA International Seed Testing Association, Wallisellen

As statutory auditor, we have examined the financial statements (balance sheet, income statement and notes) of ISTA International Seed Testing Association for the financial year ended December 31, 2021.

These financial statements are the responsibility of the executive committee. Our responsibility is to perform a limited statutory examination on these financial statements. We confirm that we meet the licensing and independence requirements as stipulated by Swiss law.

We conducted our examination in accordance with the Swiss Standard on the Limited Statutory Examination. This standard requires that we plan and perform a limited statutory examination to identify material misstatements in the financial statements. A limited statutory examination consists primarily of inquiries of company personnel and analytical procedures as well as detailed tests of company documents as considered necessary in the circumstances. However, the testing of operational processes and the internal control system, as well as inquiries and further testing procedures to detect fraud or other legal violations, are not within the scope of this examination.

Based on our limited statutory examination, nothing has come to our attention that causes us to believe that the accompanying financial statements do not comply with Swiss law and the articles of association.

Zurich, 25 January 2022

BDO Ltd

David Schraner
Auditor in Charge
Licensed Audit Expert

ppa. Niklaus Stamm
Licensed Audit Expert

Enclosures
Financial statements

BDO Ltd, with its statutory seat in Zurich, is the legally independent Swiss member firm of the international BDO network.

C. Reports of the Technical Committees

You will find on the following pages the reports of the Technical Committees for the calendar year 2021. These reports give an indication of progress towards achievement of the working programmes approved by the TCOM.

Activity Working Programmes arranged in alphabetical order of Committee:

ATC	Advanced Technologies Committee
BSC	Bulking and Sampling Committee
FSC	Flower Seed Committee
FTS	Forest Tree and Shrub Seed Committee
GER	Germination Committee
GMO	GMO Committee
MOI	Moisture Committee
NOM	Nomenclature Committee
PUR	Purity Committee
SHC	Seed Health Committee
STA	Statistics Committee
STO	Storage Committee
TEZ	Tetrazolium Committee
VAR	Variety Committee
VIG	Vigour Committee

1. ATC Advanced Technologies Committee

A. COMMITTEE MEMBERSHIP LIST			
			change comments
1	CHAIR: Bert van Duijn	Netherlands	
2	VICE-CHAIR: Francisco G. Gomes Jr.	Brazil	
3	Birte Boelt	Denmark	
4	Kent Bradford	United States	
5	Mailén Ariela Martinez	Argentina	
6	Henry Bruggink	Netherlands	
7	Aurélie Charrier	France	
8	Devaraja Achar	India	
10	Zhujun Zhu	China	
11	Brigitte Hamman	South Africa	

1 2	Mieczyslaw Grzesik	Poland		
1 3	Tomoko Sakata	Japan		
1 4	Sebastian Bobber	Germany		
1 5	Giovanny Lopez	Netherlands		
B. PUBLICATIONS				
<u>B1. Publications to accompany the Rules</u>				
<u>B3. Scientific information publications</u>				
				remarks
	Publication title	proposed	collaboration	update
		finalisation		progress
1	ATC Web-pages			Content to be added continuously
2				
3	Overview of all image forming technologies and their application to seeds	Continues		Presented (partly) at different meetings. In prep for web publication.
4	Info paper on nanotechnology	2022		Working group established. Progress slow
5	Efficient detection of insects in seed lots: a current challenge to be overcome	2022	SHC, ISTA Special project 20-1: Exploration of Methods for Detecting Insects in Seed Lots.	Seed Testing International (2021) 162; 16-22
6	Preliminary Survey Summary on ISTA Special project 19-1	2022	PUR, ISTA Special Project 19-1: Assessment on available technologies of imaging and image analysis for other seeds determination, purity analysis and germination	Seed Testing International (2021) 162; 53-55
7	Chapter X-ray imaging in "Handbook of Tree and Shrub seed testing"	Postponed	Tree and Shrub Seed Committee	
8	Advanced Technologies Committee Report	2021		Seed Testing International (2021) 162; 23
9	Exploration of Methods for detecting Insects in Seed Lots:	2022	SHC, ISTA Special project 20-1: Exploration	Seed Testing International (2021) 161; 26

	An ISTA-supported Project		of Methods for Detecting Insects in Seed Lots.	
C. WORKSHOPS AND SEMINARS				
<u>C1. Training and education workshops</u>				
				remarks
	workshop subject	proposed	collaboration	update
	location	finalisation		progress
1	Workshop on Imaging technologies for seed evaluation, Italy	June 8-11, 2020	Italy	Postponed till after Covid-19 issues are cleared
2	Workshop on advanced seed technologies	2021 (?)		Planned for St. Petersburg, Russia. Postponed till all Covid-19 issues are cleared
3	Small workshop in relationship to ISTA funded project New Technologies for Other Seeds Determination	2021	PUR	Denmark.
4				
<u>C2 Seminars</u>				
				remarks
	Seminar subject	proposed	collaboration	update
	location	finalisation		progress
1	Seminars on advanced seed technologies	2020/2022		China postponed till after Covid-19 issues are cleared
2	Seminar: Advancements and innovation in seed testing: from science to robust test.	May, 2022		At the ISTA Congress 2022, Cairo, Egypt
D. Proficiency Tests				
	Proficiency Test Subject	proposed	collaboration	remarks update
		finalisation		progress
1				
E. QUESTIONS TO THE COMMITTEE				
	subject of question			from
1				
F. SPECIAL PROJECTS				
	project title / subject			remarks

	collaborating committees	proposed	collaboration	update
		finalisation		progress
1	Overview of image forming technologies and their application to seeds	Continuous		For new ISTA web pages
2	X-ray seed imaging literature data-base for ISTA web pages	2022		For new ISTA web pages
3	Nanotechnology for seeds; a first exploration	2022		Working group established
4	Mathematical modelling in seed testing	2022		Working group established
5	Finding new technologies	continuous		
6	Imaging in Tree and Shrub seed testing"	2022	Tree and Shrub Seed Committee	On going
7	New Technologies for Other Seeds Determination	2021	PUR	ISTA sponsored special project
8	Assessment on available technologies of imaging and image analysis for other seeds determination (OSD), purity analysis and germination.	2022	PUR, GER	ISTA sponsored special project
9	Exploration of methods for detecting insects in seed lots	2022	SHC	ISTA sponsored special project

2. BSC Bulking and Sampling Committee


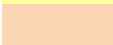
COMMITTEE MEMBERSHIP LIST			
			change comments
1	Chair: Eddie Goldschagg	South Africa	
2	Vice-Chair: Corinne Guimier	France	Elected 2021
3	Ignacio Aranciaga	Argentina	
4	Lotta Claesson	Sweden	Will step down from Committee 2022
5	Gerry Hall	United Kingdom	
6	David Johnston	United States	
7	Birte Krogh	Denmark	

8	Michael Kruse	Germany		
9	Bülent Öztürk	Turkey		
10	Cza Realubit	The Philippines		
11	José Maurício Pereira	Brazil		
12	Leena Pietilä	Finland		Step Down as interim Vice-Chair 2021
13	Justin Salter	New Zealand		
14	Evans Tembo	Zambia		
15	Ad Toussaint	Netherlands		Will step down from Committee 2022
	Steve Jones (ECOM Liaison)	Canada		
A. RULES DEVELOPMENT				
<u>A1. Introduction of New Methods</u>				
				remarks
	Method name	proposed	collaboration	update
	subject	finalisation		progress
1	Validation of the tube trier	2024		Working group established
2	Sampling of <i>Orobanche</i> & <i>Striga</i>	2022	PUR, RUL	Discussed, no special methods needed, voted and approved that test results could be reported OIC. Rulke change Proposal to be submitted by PUR
<u>A2. Introduction of New Species</u>				
				remarks
	Species and test	proposed	collaboration	update
		finalisation		progress
1	<i>Chenopodium quinoa</i> Willd. Table 2C requirements	2021	PUR, GER	Approved at 2021 AM
2				
<u>A3. Introduction of Rules Changes</u>				
				remarks
	Subject	proposed	collaboration	update
		finalisation		progress
1	Number of Sub-Lot Certificates	2023	ISF Veg WG, STA	Waiting for recommendation from ISTA/ISF Veg WG
2	Size of submitted and Working Samples for Vegetable Seed	2023	ISF Veg WG, STA	Waiting for recommendation from ISTA/ISF Veg WG
3	Revision of 2.2.12 Treated seed & 2.2.13 Coated seeds	2021		Rule Change Proposal for 2022 approved at ISTA AM 2021
4	Updating of descriptions of mechanical dividers	2021		Rule Change Proposal for 2022 approved at ISTA AM 2021
5	Soil & Boerner divider minimum channels	2021		Rule Change Proposal for 2022 approved at ISTA AM 2021

6	Storage of samples – reference to Chapters 3 & 4	2021	PUR	Rule Change Proposal for 2022 approved at ISTA AM 2021
7	Move <i>Salvia hispanica</i> from Table 2C Part 3 to Table 2C Part 1	2021		Rule Change Proposal for 2022 approved at ISTA AM 2021
8	Proposal to include formula to calculate minimum number of submitted samples in ISTA Rules	2021		Discussed, Proposal not approved by BSC, not submitted, the Rules were clear enough, will update current formula in Sampling Handbook
B. PUBLICATIONS				
<u>B1. Publications to accompany the Rules</u>				
				remarks
	Publication title	proposed	collaboration	update
		finalisation		progress
1	ISTA Handbook on Seed Sampling	2022	ISTA Accreditation Department	Nearing finalisation, Submitted to ISTA for distribution as electronic copy, waiting for verification by Editor
<u>B2. Training publications on specific seed testing topics</u>				
				Remarks
	Publication title	proposed	collaboration	Update
		finalisation		Progress
1	Supporting material for 'Train the trainers'	2023		Discussion will start after finalisation of Handbook
2	Supporting material for 'Train the trainers' – video clips	2023		Will continue when COVID-19 travel restrictions allow
3	Develop new video clips for sampling and sample division	2023		Will commence when COVID-19 travel restrictions allow
<u>B3. Scientific information publications</u>				
				remarks
	Publication title	proposed	collaboration	update
		finalisation		progress
1				
C. WORKSHOPS AND SEMINARS				
<u>C1. Training and education workshops</u>				
				remarks
	workshop subject	proposed	collaboration	update
	location	finalisation		progress
1	ISTA Workshop on Seed Sampling and Quality Assurance in Sampling, Denmark	2022	DFL Seeds A/S, Denmark	In planning, moved to 2022 due to COVID-19 travel restrictions in 2020/2021.
2	2 x ISTA Workshop on Seed Sampling and Quality Assurance in Sampling, Aug/Sept 2021, Turkey	2022	VRSCC, Turkey	Moved to 2022 due to COVID-19 travel restrictions in 2020/2021. Two Sampling Workshops planned for consecutive weeks Aug/September 2022 due to

				anticipated high attendance by Turkish participants
	D. Proficiency Tests			
	Proficiency Test Subject	proposed	collaboration	remarks update
		finalisation		progress
1.				
	E. SPECIAL PROJECTS			
	project title / subject			remarks
	collaborating committees	proposed	collaboration	update
		finalisation		progress
1	Supporting material for 'Train the trainers' – further development of video clips	2023	ECOM, MOI	7 videos posted for public use on ISTA YouTube. Several new videos planned
2	Q & A Webpage	2023	SEC	In progress, waiting for Secretariat
3	Translation of Application for Seed Sampling Calculations (2nd phase) continue, further developments and enhancements to the App, updates	2023		App now available in addition to Four new languages added, App now available in 15 languages. Waiting for translations by volunteers for more languages. Table 3B data added (PSD) to the App
	F. QUESTIONS TO THE COMMITTEE			
	subject of question			from
				country
1	Stitching clean white labels on bag, then paste self-adhesive labels over it - acceptable (integrity may be compromised)			Greece
2	Validation of manual samplers from the seed stream necessary? Same way as any sampling equipment, samplers			USA
3	Information on hybrid seeds? Same as for OPV of the same species			Unknown
4	Tolerance for moisture results on samples take 3 day apart from the same seed lot (None)			Belgium
5	Riffle dividers to be checked only by one or all operators? Where documented in ISTA publications? - One enough, agreement between BSC and Auditors.			Argentina
6	Issuing OICs for <i>Benincasa hispida</i> - not listed			Thailand
7	Sampling for Seed Health			Israel
8	Sampling of small tomato lots, examples. (x 2)			Unknown
9	Sampling requests (form)			France
10	Verification methods for analysts using the spoon method.			Argentina
11	Zip (cable) ties as seals - need to be unique? Yes			USA
12	More info on Sampling Workshop in Denmark			Germany

13	Sampling small containers, number of containers & weight to be indicated on OIC as sampling has an influence		Argentina
14	Species in Group A for Automatic sampling		Italy
15	Several questions on sampling for quality assurance (accreditation) - answered		China
16	Which triers to use - answered		China
17	Trier suppliers - answered		China
18	May BIC be issued for different coloured tomato seed? - Yes		India
19	Maximum seed lot sizes for encrusted seeds		Belgium
20	Large seed lots vs Bulking of lots		Accreditation Dept
21	Dividers check at various locations same lab		Accreditation Dept
24	Dividers check		USA
25	Sampling small containers, number of containers & weight to be indicated on OIC as sampling has an influence		Switzerland
26	Proposal to add formula for determining sampling units to the ISTA Rules, add (= containers in Table 2A)		Israel
27	Inspection windows in seed processing plant before the automatic sampler, needs to be locked? - No.		USA
28	Mixing before dividing - must combine? - No		Scotland
29	Sampling from big composite samples, Sealing of ducts of automatic samplers		Accreditation Dept

-  New project
-  New proposed finalisation date

3. FSC Flower Seed Committee

COMMITTEE MEMBERSHIP LIST				
		Country		change comments
1	Rita Zecchinelli (Chair)	Italy		
2	Sarah Dammen (Vice Chair)	USA		
3	Rachael Davies	United Kingdom		
4	Meriam Dekalo Karen	Israel		
5	Alice Di Sacco	United Kingdom		
6	Sylvie Ducournau	France		
7	Erik van Egmond	Netherlands		
8	Stefanie Kramer	Germany		
9	Maria Marin	Croatia		
10	Lucele Pretorius	South Africa		
11	Zita Ripka	Hungary		
12	Soo-Young KIM	South Korea		
13	Shizka Takeuchi	Japan		
A. RULES DEVELOPMENT				
<u>A1. Introduction of New Methods</u>				
	Method name	proposed	collaboration	remarks update
	subject	finalisation		progress
1	<i>Eustoma exaltatum</i> : new germination method	2020	GER	Finalized. Rules change proposal approved. (S. Takeuchi, R. Zecchinelli)
2	Addition of 20°C for <i>Papaver somniferum</i>	2022	GER	Organised by Vladislava Gregorová, CZ. The analysis of the results in progress.
<u>A2. Introduction of New Species</u>				
	Species and test	proposed	collaboration	remarks update
		finalisation		progress
1	<i>Passiflora edulis</i> (Cancelled)	2021	GER	To be started (S. Ducournau)
<u>A3. Introduction of Rules Changes</u>				
	Subject	proposed	collaboration	remarks update
		finalisation		progress
1	Sample size for flower species (Table 2A part 3)	2021	BSC	Data collection in progress. Not easy. (R. Zecchinelli)
2	Clarification about OSD for species listed in Table 2A, part 3	2020	BSC	To be started (R. Zecchinelli)
B. PUBLICATIONS				

<u>B1. Publications to accompany the Rules</u>				
	Publication title	proposed	collaboration	remarks update
		finalisation		progress
1	ISTA Handbook on Flower Seed Testing: new sheets			ISTA Flower Seed Testing Handbook - 2 nd Edition 2020 (electronic format) released (Z. Ripka) 2nd edition modified and reissued in 2021 (one sheet removed because doubled)
<u>B2. Training publications on specific seed testing topics</u>				
	Publication title	proposed	collaboration	remarks update
		finalisation		progress
1	Collaboration in the project of the website TSWS (Testing Seeds of Wild Species): wild flower species		WS	In progress (R. Davies)
<u>B3. Scientific information publications</u>				
	Publication title	proposed	collaboration	remarks update
		finalisation		progress
C. WORKSHOPS AND SEMINARS				
<u>C1. Training and education workshops</u>				
	workshop subject	proposed	collaboration	remarks update
	location	finalisation		progress
1	ISTA Workshop on Tetrazolium Testing and Equilibrium relative humidity (ERH) determination for Wild Species and Flowers	2022?	TEZ, MOI	Postponed due to Covid-19 pandemic (S. Kramer, M. Marin, R. Zecchinelli)
<u>C2. Seminars</u>				
	Seminar subject	proposed	collaboration	remarks update
	location	finalisation		progress
D. Proficiency Tests				
	Proficiency Test Subject	proposed	collaboration	remarks update
		finalisation		progress
1	ISTA PT 20-3 <i>Felicia heterophylla</i>	2020	PTC	Samples distributed (Z. Ripka)
2	ISTA PT Programme 2022/25	2023 (TBC)	PTC	Under discussion (Z. Ripka)
3				
F. SPECIAL PROJECTS				
	project title / subject	proposed	collaboration	remarks update
	collaborating committees	finalisation		progress

Activity Report of the ISTA Committees 2021

1	Participation in the preparation of the exercise on seed mixture (distribute with PT samples)	2019-22	PUR -PTC	Ongoing (S. Takeuchi)
2	Collaboration with AOSA: comparison of species listed in AOSA and ISTA Rules	2022	AOSA	To be started (S. Dammen)
3	Collection of information about Flower seed Testing by ISTA laboratories	2022		To be started
4	Inventory of TZ methods used by the laboratory for flower species	2022	TEZ	To be started (S. Kramer, TBD R. Zecchinelli)

E. QUESTIONS TO THE COMMITTEE

	subject of question			from
				Country
1	Inclusion of <i>Malva</i> spp. in the ISTA Rules tables			ISTA Secretariat
2	Flower crop group (in relation to accreditation scope)			ISTA Accreditation Department
3	Germination of <i>Begonia</i> spp.			USA
4	Germination of <i>Adenium obesum</i>			Thailand, ISTA member laboratory


	New project
	New proposed finalisation date


4. FTS Forest Tree and Shrub Seed Committee

COMMITTEE MEMBERSHIP LIST				
			change comments	
1	Chair: Elisa Vieira	Brazil		
2	Vice-Chair: Viktor Vankus	USA		
3	Magdalena Beza	Poland		
4	Lena Bezděčková	Czech Republic		
5	Valerie Blouin	France		
6	Marija Gradecki-Postenjak	Croatia		
7	Dave Kolotelo	Canada		
8	Isolde Dorothea Kossmann Ferraz	Brazil		
9	Stefanie Krämer	Germany		
10	Shelagh McCartan	United Kingdom		
11	Heidi Røsok Bye	Norway		
12	Edoardo Vincenti	United Kingdom		
13	Chandrashekara Vokkaliga Devegowda	India		
A. RULES DEVELOPMENT				
<u>A1. Introduction of New Methods</u>				
			remarks	
	Method name	proposed	collaboration	update
	subject	finalisation		progress
1	Introduction of Agar substrate for <i>Pinus sylvestris</i>	2021	GER	Finalized
2	Validation of germination test for <i>Jatropha curcas</i>	2022		Leader: Elisa Vieira
<u>A2. Introduction of New Species</u>				
			remarks	
	Species and test	proposed	collaboration	update
		finalisation		progress
	None			
<u>A3. Introduction of Rules Changes</u>				
			remarks	
	Subject	proposed	collaboration	update
		finalisation		progress
	None			
B. PUBLICATIONS				

B1. Publications to accompany the Rules				
				remarks
	Publication title	proposed	collaboration	update
		finalisation		progress
1	Guide to Amazonian Fruits, Seeds and Seedlings	2021		Print version released.
2	None			
B3. Scientific information publications				
				remarks
	Publication title	proposed	collaboration	update
		finalisation		progress
	None			
C. WORKSHOPS AND SEMINARS				
C1. Training and education workshops				
				remarks
	workshop subject	proposed	collaboration	update
	location	finalisation		progress
1		31 August, 2021, online meeting		Elisa Vieira presented ISTA FTSCom activities during the meeting.
2	Participation at the OECD Forest Scheme meeting	11 and 12 th October 2021, online meeting		Edoardo Vincenti
C2. Seminars				
				remarks
	Seminar subject	proposed	collaboration	update
	location	finalisation		progress
	None			
D. PROFICIENCY TESTS				
	Proficiency test subject	proposed	collaboration	update
	location	finalisation		progress
	None			

E. SPECIAL PROJECTS				
	project title / subject			remarks
	collaborating committees	proposed	collaboration	update
		finalisation		progress
	None			
F. QUESTIONS TO THE COMMITTEE				
	subject of question			from
				country
G: Further Comments - Responsibilities				
	<u>leader of working groups</u>			
	Revision of the Forests and Shrub Handbook. Leader: Victor Vankus			

 New project

 New proposed finalisation date

5. GER Germination Committee

COMMITTEE MEMBERSHIP LIST				
				change comments
1	CHAIR: Gillian Musgrove	United Kingdom		
2	VICE-CHAIR: David Johnston	United States of America		
3	Ignacio Aranciaga	Argentina		
4	Janek Bartel	Canada		
5	Sarah Dammen	United States of America		
6	Gillian Durrant	United Kingdom		Joined Committee November 2021
7	Erik van Egmond	Netherlands		
8	Meriam Dekalo Keren	Israel		
9	Sylvie Ducournau	France		
10	Hortense Faucher	France		Retired November 2021
11	Lesly Gonzalez Galaz	Chile		
12	Aidin Hamidi	Iran		

13	Andrea Jonitz	Germany		
14	Augusto Martinelli	Argentina		
15	Dot Vittrup Pedersen	Denmark		
16	Melissa Phillips	United States of America		Joined Committee November 2021
17	Rita Zecchinelli	Italy		
A. RULES DEVELOPMENT				
<u>A1. Introduction of New Methods</u>				
				remarks
	Method name	proposed	collaboration	update
	subject	finalisation		progress
1	Addition of 20°C for <i>Anethum graveolens</i> germination	2021		This work was carried out by Lucie Robineau and Sylvie Ducournau. This method validation has been submitted as a Rules Proposal
2	Addition of 20°C for <i>Papaver somniferum</i>	2022	FSC	The work is organised by Vladislava Gregorová, CZ. The analysis of the results is in progress..
3	Addition of dormancy breaking methods for <i>Cannabis sativa</i> (hemp)	2022	AOSA/SCSTand CFIA	This work is at an early stage and will be taken forward by Ruoqing Wang.
<u>A2. Introduction of New Species</u>				
				remarks
	Species and test	proposed	collaboration	update
		Finalisation		progress
1	Introduction of a germination method for <i>Jatropha curcas</i>	2022	FTS	The study will be carried out by Elisa Vieira, Brazil from FTS committee.
2	Introduction of a germination method for Dwarf Saltwort (<i>Salicornia bigelovii</i> Torr. and <i>Salicornia persicum</i>)	2022	STA, BSC, PUR	<p>The study is carried out by Aidin Hamidi.</p> <p>A preliminary study has been set up to find the best germination conditions for 3 Dwarf Saltwort species (<i>Salicornia bigelovii</i> Torr., <i>S. persicum</i> and <i>Salicornia perspolitana</i>)</p> <p>The germination tests were conducted by planting seeds as TP and BP during 7, 14 and 28 days, at 20, 25, 30 and 35 °C constant temps. and 20-30 and 20-35 °C alternative temperatures.</p> <p>The light requirement has also been tested.</p> <p>This work is ready to be taken forward as a method validation study if seed lots are available,</p>
3	Introduction of a germination method for Saatar (<i>Zataria multiflora</i> Boiss.)	2021	STA, BSC, PUR	<p>This study is carried out by Aidin Hamidi.</p> <p>For Camelthorn (<i>Alhagi camelorum</i> F.) seeds hardness remove the best results achieved through seeds</p>

	and Camelthorn (<i>Alhagi camelorum</i> F.).			<p>treatment by 100 °C hot water during 1 minute and by seeds treatment with concentrated sulphuric acid during 25 and 30 minutes. The germination tests were conducted by planting seeds as TP, BP and in sand during 7, 14 and 28 days, at 10, 20 and 30°C constant and 20-30 °C alternative temperatures.</p> <p>Saatar (<i>Zataria multiflora</i> Boiss.) seeds planted as top, between paper and in sand substrates and germinated in 5, 10, 20 and 25° C constant and 20-30 ° C alternative temperatures in a calibrated germinator during 7, 14, 21 and 28 days as four 50 seeds replications. Results revealed the best germination and maximum normal seedlings percent achieved by planting seeds as top paper in 20° C constant temperature during 14 days.</p>
4	Introduction of <i>Diplotaxis</i> spp.	2022	STAT, BSC PUR	Early stages of considering germination methods for adding this species to the ISTA Rules. Still need to discuss with BSC and PUR Committee.
A3. Introduction of Rules Changes				
				remarks
	Subject	proposed	collaboration	update
		Finalisation		progress
1	Pre-washing of <i>Beta</i> seeds	2022	RUL	A method validation study will be led by Lesly Gonzalez Galaz, Chile. This method validation study test plan has been submitted to reviewers and preliminary testing is ongoing in the organising laboratory
B2. Training publications on specific seed testing topics				
				remarks
	Publication title	proposed	collaboration	update
		Finalisation		progress
1	Early counts of radicle emergence, counted manually and by image analysis, can reveal differences in the production of normal seedlings and the vigour of seed lots of cauliflower.	2022	VIG, STA Takashi Shinohara, Sylvie Ducournau, Stan Matthews, Marie-Helene Wagner and Alison A Powell	<i>Seed Science and Technology</i> , 49 , 3, 219-235
2	ISTA Handbook of Seedling Evaluation (Spanish Version)	2022	Secretariat	The Handbook is undergoing translation into Spanish by Augusto Martinelli (in progress)
C. WORKSHOPS AND SEMINARS				
C1. Training and education workshops				
				remarks
	workshop subject	proposed	collaboration	update
	location	finalisation		progress

1	ISTA Workshop Purity & Germination - Ukraine	TBD	PUR	The lecturers need to be appointed and the programme has to be reviewed with the Ukraine ISTA laboratory. The organization and the timeframe need to be discussed again. Delayed from May 2020 due to COVID-19.
2	ISTA Workshop on Germination, Tetrazolium & Vigour – Izmer, Turkey	TBD	TZ VIG	The lecturers are appointed and programme in place. Delayed from March 2020 due to COVID-19.
3	ISTA Workshop on Germination & Tetrazolium - New Zealand	TBD	TZ	No further update. Delayed due to COVID-19.
4	ISTA Workshop Purity & Germination – Ankara, Turkey	TBD	PUR	The lecturers are appointed and programme in place. Delayed from May 2021 due to COVID-19.
5	ISTA Workshop Purity, Germination and Moisture Committee - Iran	TBD	PUR MOI	Request December 2021. Still in early stages of discussion.
D. PROFICIENCY TESTS				
	Proficiency test subject	proposed	collaboration	update
	location	finalisation		progress
1	20-3 <i>Festuca pratensis</i> 20-3 <i>Felecia</i> sp.	2021	PTC	Completed Completed
2	21-1 <i>Zea mays</i>	2021	PTC	Completed
3	21-2 <i>Medicago sativa</i> 21-2 <i>Alnus glutinosa</i>	2021 2022	PTC	Completed In progress (delayed)
4	21-3 <i>Fagopyrum esculentum</i>	2022	PTC	In progress
E. SPECIAL PROJECTS				
	project title / subject			remarks
	collaborating committees	proposed	collaboration	update
		finalisation		progress
1	Maize root system evaluation – Study of the definition of the minimum number of secondary roots necessary to compensate a defective primary root	2022		This study is carried out by Aidin Hamidi. The objective is to evaluate the influence of the secondary roots (number and development) on the normal Maize seedling evaluation The proposed experiment is: - The selection of seed samples from various varieties - The germination of the seeds in laboratory and, at the end of the test, the selection of seedlings with 1) well

				<p>developed primary root, 2) defective primary root with different number and development of secondary roots</p> <ul style="list-style-type: none"> - The transplanting of the developed seedlings into the field to evaluate the plant growth in crop conditions. <p>The project carried out by collaboration with Iranian Universities. Results to be finalised in 2022.</p>
2	Assessment on available technologies of imaging and image analysis for other seeds determination (OSD), purity analysis and germination.	2022	ATC PUR	<p>Two surveys have been prepared, one for laboratories and one for the technology providers.</p> <p>The information collected will only be used for research purposes aimed at:</p> <ul style="list-style-type: none"> - Promoting technology development in the application used for seed testing. - Analysing and identifying potential solutions and strategies for the speedy application of advanced technology in seed testing. - Providing information to assist laboratories in making informed decisions on whether to use imaging and AI technologies in seed testing.
3	Radicle emergence and conductivity tests to predict germination of five vegetable Brassic species. (ISTA special project)	2022	VIG	<p>Comparative test for radicle emergence completed and data being analysed. First research paper published, two further papers in preparation</p>
4	Update Seedling Images for Handbooks and Training as a basis for regular image collection (ISTA Special Project)	2022	Secretariat	<p>This work is led by Janek Bartel and is in progress.</p> <p>The objective of this project is to improve the quality of images in the Handbook to current standards. Approximately 20 percent of the total pictures to be replaced have been taken. Finding Abnormalities in seed lots is the biggest challenge, slowing down the process of getting images ready for approval.</p>
F. QUESTIONS TO THE COMMITTEE				
	subject of question			from
				Country
1	Differences between the ISTA Rules and Seedling Evaluation Handbook			Australia
2	<i>Allium porrum</i> germination evaluation			Sweden
3	<i>Helianthus annuus</i> seedling evaluation			USA
4	Testing of seeds by weighted replicates and expression of results			Argentina

5	Pre-washing of <i>Beta vulgaris</i> when seed is encrusted			Iran
6	<i>Fritillaria persica</i> position of plumule and radicle			Iran
7	Reporting Germination on an Orange International Certificate			Israel
8	Seed preparation for testing <i>Solanum lycopersicum</i>			Iran
9	Germination test duration			Switzerland
10	Germination method for <i>Coffea arabica</i>			Nepal
11	Germination procedures-growing media specification checks: cleanliness and innocuity			China
12	Germination retesting and reporting of results			France
13	Seedling evaluation of <i>Festuca pratensis</i>			Brazil
14	Seedling evaluation group for <i>Aeschynomene americana</i>			Switzerland
15	Clarification of germination method of <i>Capsicum annuum</i> and <i>Fregaria vesca</i>			Switzerland
16	Substrate testing requirements			South Africa
17	Use of the vacuum counter			Switzerland
18	Lighting specification requirements			Norway
19	<i>Glycine max</i> seedling evaluation			France
20	Possibility of <i>Diplotaxis tenuifolia</i> germination method being added to the ISTA Rules			United Kingdom
21	Germination method for <i>Nigella sativa</i>			Turkey
22	Clarification on Cucurbit seedling evaluation			Netherlands
23	Seedling evaluation of <i>Allium porrum</i> following ISTA Proficiency Test			Various
24	Clarification of fresh seed using Tetrazolium at the end of a germination test			USA

25	Lighting specification requirements			Iran
26	Substrate testing requirements			Bangladesh
27	<i>Beta vulgaris</i> seedling evaluation			Switzerland
28	Phytotoxicity testing of media			Indonesia
29	Checking of temperature probes			Indonesia
30	Replicate preparation of <i>Arachis</i> spp.			Switzerland
31	<i>Brassica</i> spp. seedling evaluation			Mauritius
32	Pre-chilling recommendations			India
33	<i>Zea mays</i> seedling evaluation			Finland
34	Completion of an OIC when fresh seed have been determined by tetrazolium			Germany
35	<i>Zea mays</i> seedling evaluation			Denmark
36	<i>Brassica</i> spp. seedling evaluation			South Africa
37	Germination laboratory requirements			Pakistan
38	ISTA Germination Toolbox Rounding Programme			Sweden
39	<i>Cucumis</i> spp. seedling evaluation			Mauritius
40	Substrate testing requirements			Switzerland
41	Water retention of media			Australia
42	Reporting germination results on an OIC			Switzerland
43	Disinfection prior to germination			Turkey
44	Reporting species with hard seeds on ISTA Proficiency tests			Japan
45	Tolerance tables			Iran
46	<i>Chrysanthemum coronarium</i> (<i>Glebionis coronaria</i>) seedling evaluation			Japan

	New project
	New proposed finalisation date

6. GMO Committee

COMMITTEE MEMBERSHIP LIST			
		Country	
1	CHAIR: Enrico Noli	Italy	
2	VICE-CHAIR: René Mathis	France	
3	Elizabeth Bates	Belgium	
4	Sofia Ben Tahar	France	
5	Tajinder Grewal	Canada	
6	Lutz Grohmann	Germany	
7	Andrea Jonitz	Germany	
8	Jean-Louis Laffont	France	
9	Dwarkesh Parihar	India	
10	Elena Perri	Italy	
11	Kirk Remund	United States	
12	Ana Laura Vicario	Argentina	
13	Bruno Zaccomer	France	
14	Dabing Zhang	China	
15	Ray Shillito	United States	
	<p><i>The composition of the Committee is going to change due to the planned retirement of some members. Several new candidacies have already been received.</i></p>		
A. RULES DEVELOPMENT			
<u>A1. Introduction of New Methods</u>			
<u>A2. Introduction of New Species</u>			

<u>A3. Introduction of Rules Changes</u>			
Subject	proposed	collaboration	
	finalisation		
<i>A thorough revision of Chapter 19 has been carried out, with the aim of improving, clarity, consistency and precision. It reflects the work carried out in collateral work (the development of the Handbook on GMO testing - in preparation - and the establishment of a List of standardised terms in GMO testing. The work encompasses several sections of the Chapter, for a total of 19 proposed items, including one containing 10 new definitions, the redrawing of the central figure, and a new table. Several rearrangements of text and editorial changes were also carried out to improve clarity.</i>	2021	-	
B. PUBLICATIONS			
<u>B1. Publications to accompany the Rules</u>			
Publication title	proposed	collaboration	
	finalisation		
GMO Testing Handbook (R. Mathis and E. Noli WG Leads) <i>Progress made in 2021 in Chapter 6.</i>	2023	STA, VAR, <i>Audit team at Secretariat</i>	
<u>B3. Scientific information publications</u>			
Publication title	proposed	collaboration	
	finalisation		
C. WORKSHOPS AND SEMINARS			
<u>C1. Training and education workshops</u>			
workshop subject	proposed	collaboration	
Location	finalisation		

	No training workshops this year		
D. Proficiency Tests -			
	Proficiency Test Subject	proposed	collaboration
		finalisation	
	<p><i>December 2021</i></p> <p>PT23 – Soybean</p> <p><i>Running of this PT was delayed by difficulties in finding suitable seed material with appropriate phytosanitary documentation.</i></p> <p><i>A complex organisation was necessary to allow movement of material to the Preparing laboratory and then for sample distribution, which was delayed to January/February 2022. Issues related to sample shipping are not completely resolved.</i></p> <p>PT24 – Maize: <i>In early stages of preparation – planning with Industry.</i></p> <p>PT25 – Cotton?: <i>In early stages of preparation – planning with Industry.</i></p>	<p>2022</p> <p>2022</p> <p>2023</p>	<p>Secretariat STA</p>
E. Questions to the Committee - Since date of last report			
	Question subject	Date	From (Country)
	<i>Clarification on how reporting results from GMO semi-quantitative test (group testing approach)</i>	<i>16/06/2022</i>	<i>Auditors</i>
	<i>Clarification on what type of Performance Data a lab should provide for getting accreditation using group testing approach</i>	<i>18/06/2021</i>	<i>Auditors</i>
	<i>Accreditation for GMO testing in species where reference material for obtaining performance data is not available and/or where PTs have been organised or could be organised for the same reason</i>	<i>06/07/2021</i>	<i>Auditors</i>
	<i>Reporting GMO results when using group testing</i>	<i>20/09/2021</i>	<i>Auditors</i>
	<i>All the above questions concerned topics currently debated within the Committee, particularly in the development of the Handbook for GMO testing</i>		
	No questions to the Committee		
F. SPECIAL PROJECTS			
	project title / subject	proposed	collaboration

	collaborating committees	finalisation	
3	ISTA GMO Website: (E. Bates, WG Lead) No updates	Ongoing	Secretariat
4	ATC Contact: (A. L. Vicario) No updates	Ongoing	Advanced Technology Com.
5	Statistical tools for GMO Testing: (J.-L. Laffont, WG Lead) Continued collaboration for PT design	Ongoing	STA
6	WG on Standardized Terms (E Noli, WG Lead) <i>WG has further reviewed the list of standard terms used in GMO testing. A draft version of standard terms for GMOs in maize, soybean, canola and cotton, based on Biosafety Clearing House and Eugenius databases is being prepared. This shall be associated with adjustments in the GMO database at the ISTA Secretariat which allows the management of laboratory accreditation and auditing, and their participation to the Proficiency Test Program. The work is proceeding in connection with the preparation of the GMO Testing Handbook and will improve the description of the accreditation process (meeting of the Committee on the documents proposed for the standardized terms).</i>	Ongoing 2021	Audit Team and TCom Manager at Secretariat

7. MOI Seed Moisture Committee

COMMITTEE MEMBERSHIP LIST			
			change comments
1	CHAIR: Axel Goeritz	Germany	chair since 4-2020
2	Jette Nydam	Denmark	
3	Gerarda de Boer-Raatgever	Netherlands	
4	Sergio Pasquini	Italy	
5	Susan Alvarez	United States	
6	Baymolo Goma	Zambia	
7	Wen-Ju Yang	Separate Customs Territory of Taiwan	
8	Celine Herbert	France	
9	Fiona Hay	Denmark	Joined June 2020
10	Tanja Petrovic	Serbia	
11	Selma Kurt	Turkey	Joined December 2019

12	Ramesh D M	India		Joined October 2020
13	Brady Carter	United States		Joined September 2021
A. RULES DEVELOPMENT				
<u>A1. Introduction of New Methods</u>				
				remarks
	Method name	proposed	collaboration	update
	subject	finalisation		progress
1	Use of equilibrium Relative Humidity (eRH) as an alternative method for the determination of seed moisture status	2022	FTS, STA	The use of eRH for testing of coated seeds to be investigated. Experiments have been conducted to see whether determination of seed equilibrium relative humidity can be used for coated seeds, i.e. whether a coating changes the equilibrium moisture content-relative humidity relationship Special eRH project was funded in 2021 and will be executed in 2022.
<u>A2. Introduction of New Species</u>				
				remarks
	Species and test	proposed	collaboration	update
		finalisation		progress
1	<i>xFestulolium</i>	2022	STA	Data re-analysed and Method Validation Report revised. Rules change proposal is planned to be prepared for 2023.
2	<i>Helianthus annuus</i>	2022		Elena Nicolae from the Central Laboratory for Quality of Seeds and Planting Material in Romania will lead this work. Proposal for a comparative test currently being prepared.
<u>A3. Introduction of Rules Changes</u>				
				remarks
	Subject	proposed	collaboration	update
		finalisation		progress
1	Checking the need for grinding of small species with hard seeds - <i>Medicago sativa</i> , <i>Lotus pedunculatus</i> , <i>Lotus corniculatus</i> , <i>Trifolium pratense</i> , <i>Trifolium repens</i> ,	2023	STA	This work has not yet conducted due to staffing issues but is planned to progress in 2022.
B. PUBLICATIONS				
<u>B1. Publications to accompany the Rules</u>				
				remarks
	Publication title	proposed	collaboration	update

		finalisation		progress
1	Review and update Handbook on Moisture Determination	2023	Secretariat	Lead is named and chapters to work on are given to resp. members, planned changes on moisture calculator will influence the handbook as well
B3. Scientific information publications				
				remarks
	Publication title	proposed	collaboration	update
		finalisation		progress
1	Excel tool for calculation of moisture test results	2020		Tool is published on the website.
2	Extension of the Excel Moisture calculator on the homepage regarding routine tests and QM	2022		
3	Moisture Content of cereal lots before and after seed treatment	2022		Project is conducted by Tanja Petrovic, draft of report is done
C. WORKSHOPS AND SEMINARS				
C1. Training and education workshops				
				remarks
	workshop subject	proposed	collaboration	update
	location	finalisation		progress
D. PROFICIENCY TESTS				
	Proficiency test subject	proposed	collaboration	update
	location	finalisation		progress
1				
E. QUESTIONS TO THE COMMITTEE				
	subject of question	Month		from
				country
1	Correct moisture estimation procedure for Pennisetum glaucum	Apr 2020		India
2	Moisture Test on Eragrostis spp.	May 2020		South Africa
3	Moisture Test on Seed mixtures	Jun 2020		ISTA Secretariat
4	Moisture Test on lentils	Aug 2020		Finland
5	Determination of Moisture content in coated seeds	Nov 2020		Argentina
6	There are results of a comparison of high and low temperature method in Raphanus sativus. Is it possible, to take the high temp method?	Oct 2020		India
7	How to test Carthamus tinctorium?	Nov 2020		Moldova

8	How often has Silica gel to be regenerated?	Dec 2020		ISTA Secretariat
9	Reporting temperatures of the oven	Apr 2021		ISTA Secretariat
10	How to report results for species not in table 9A	mar 2021		Italy
11	How to draw a moisture sample	Nov 2021		US
12	testing proofness of moisture bags	Nov 2021		US
13	Acceptable time of storing moisture samples for retesting	Nov 2021		US

8. NOM Nomenclature Committee

COMMITTEE MEMBERSHIP LIST			
			change comments
1	CHAIR: Melanie Schori	United States	
2	VICE-CHAIR: Ernest Allen	United States	
3	Susan Alvarez	United States	
4	Bernard Baum	Canada	Has stepped down
5	Michel Chauvet	France	
6	Axel Diederichsen	Canada	
7	Marco Hoffman	Netherlands	
8	John Wiersema	United States	
	Deborah Meyer	United States	Joined committee
F. SPECIAL PROJECTS			
project title / subject			remarks
collaborating committees	proposed	collaboration	update
	finalisation		progress
Updates to ISTA Stabilised List for species added to Rules			ECOM approved the immediate addition of species added to the Rules for inclusion in the ISTA Stabilised List, meaning that new species will be added outside of the six-year update cycle. Other names that will be added to the next edition but that are not in the Rules will be made available in a document on the NOM page for people to view if they wish. There are 22 names that members have asked to have included in the next edition. NOM has developed a form for requests to add names to the Stabilised List.
E. QUESTIONS TO THE COMMITTEE			

Activity Report of the ISTA Committees 2021

	subject of question	date		from
				country
1	Addition of <i>Papaver cambricum</i>	January		France
2	Updates to ISTA Universal List	January		Canada
3	Names in Proficiency Test procedure	January		France
4	Name changes in Rules	March		United States
5	Identification in audit results	March		Italy
6	Name changes in <i>ISTA List of Stabilized Plant Names</i>	June		United States
7	Corrections and names not in <i>ISTA List of Stabilized Plant Names</i>	July		Germany
8	Use of ssp. vs. subsp.	August		Switzerland
9	Name changes in Table 3B	September		United States
	New project			
	New proposed finalisation date			

9. PUR Purity Committee

COMMITTEE MEMBERSHIP LIST (2019-2022)				
	Members	Country	Member since	
1	CHAIR: Ruoqing Wang	Canada	2009	
2	VICE-CHAIR: Andrea Jonitz	Germany	2010	
3	Augusto Martinelli	Argentina	2007	
4	Aurelie Charrier	France	2018	
5	Axel Goeritz	Germany	2017	
6	Carrie Lewis	United States	2016	
7	Deborah Meyer	United States	1995	
8	Dot Vittrup Pedersen	Denmark	2013	
9	Sue Cousins	New-Zealand	2017	
10	Kepha Oganda	Kenya	2010	
11	Maria Duter	New Zealand	2011	
12	Selma Kurt	Turkey	2016	
13	E. (Erik) van Egmond	Netherlands	2019	
14	Mary Watson (formerly Mary Reid)	U.K	2019	
15	Sumaia Mahmuda	Bangladesh	2021	
A. RULES DEVELOPMENT				
<u>A1. Introduction of New Methods</u>				
	Method name	Proposed/ finalisation	collaboration	Remarks/ update/ progress
No new methods were introduced in 2021				
<u>A2. Introduction of New Species</u>				
	Species and test	Proposed/ finalisation	collaboration	remarks /update /progress
1.	Working weight determination for a New species introduced into ISTA Rules	In the work plan	BSC, STA	A method in drafting
<u>A3. Introduction of Rules Changes</u>				
	Subject	Proposed /finalisation	collaboration	Remarks/ update /progress
1	C 3.2.4 Soil Percentage Test and C 3.7 Soil test reporting	voted		proposed for 2022
2	C.3.7 Reporting for impurity retest	voted		proposed for 2022

3	C1.5.2.4 Determination of other seeds by number C 4.7 Reporting for dusk like seeds	Voted	BSC	proposed for 2022
4	A 3.7 and 4.7 Reporting results	voted		proposed for 2022
5	4.2.4 Reduced test	Project closed		No proposal generated
6	3.2.3 Inert matter, Fern Spores	In progress		Project Lead assigned
7	Revision Chapter 14: x-ray	In progress	ATC, FTS	Working group delivers the tasks with an agreed time line.
8	Revision Chapter 11: Coated seeds	In the work plan		Project lead assigned
9	Name update for Table 3B	In Progress	BSC, NOM	Need a final review
B. PUBLICATIONS				
<u>B1. Publications to accompany the Rules</u>				
	Publication title	Proposed /finalisation	collaboration	Remarks/ update/ progress
1	PSD Handbook Revision	In the work plan		Project lead assigned
<u>B2. Training publications on specific seed testing topics</u>				
	Publication title	Proposed/finalisation	Collaboration	Remarks/ update/ progress
1	Seed ID for tropical grass species and weeds	Published on the ISTA website	Dr. Doris Groth Myriam Alvisi	Published on the ISTA website at: https://www.seedtest.org/upload/cms/user/SeedIdentificationofEightUrochloaBrachiariaSpeciesCultivatedorWeed2.pdf
2	Training materials for seed ID on the ISTA universal list	In progress		Project for 2021-2023, project started in July 2021
3	Publish an inventory of references of Seed ID	In the work plan		Project lead assigned
4	Publish FAQ in ISTA website to the PUR committee	In the work plan		Project lead assigned
5	Standardization on training materials used in ISTA purity workshop	In the work plan		Project lead assigned
<u>B3. Scientific information publications</u>				
	Publication title	Proposed /finalisation	Collaboration	Remarks/ update/ progress

	Preliminary Survey Summary on ISTA Special Project 19-1	Published	ATC	Seed Testing International, Oct 2021, Page 53-55
C. WORKSHOPS AND SEMINARS				
<u>C1. Training and education workshops</u>				
	workshop subject /location	Proposed /finalisation	Collaboration	Remarks/ update/ progress
1.	Workshop to Ukraine	proposed	GER	In discussion
2	Workshop to Iran	proposed	GER, MOI	In discussion
3	PUR Open meeting	completed		Make a wide update to ISTA members
D. PROFICIENCY TESTS				
	Proficiency test	Proposed /finalisation	Collaboration	Remarks/ update/ progress
1	Seed Mixture for Cuscuta-Round 9	2020	PTC, accreditation department	Delivered by Nicolae Elena from a lab of Romania, supported by Dot Vittrup Pedersen for PT 20-3
2	Seed Mixture Round 10	2021	PTC, accreditation department	Delivered by Axel Goeritz for PT 2021-1
3	Seed Mixture Round 11	2022	PTC, accreditation department	Delivered by Andrea Jonitz for PT22-1
F. SPECIAL PROJECTS				
	Project title /subject	Proposed /finalisation	Collaboration	Remarks/ update/ progress
1.	Assessment on available technologies of imaging and image analysis	2019-2021	ATC, GRM, other organisations	Officially started on November 2019
2.	Training materials for seed ID on the ISTA universal list	Completed work plan and author training	Four PUR members and their organizations	Project started in July 2021 for three years
3.	Look into ways of training in seed identification and practical purity work	2019-2021	ECOM/ISTA accreditation department	One meeting was conducted

E. QUESTIONS TO THE COMMITTEE

	subject of question (see more details in PUR Teams)	date	country
1	TR reporting in purity analysis	2021-01-07	Iran
2	Seed ID Assistance	2021-01-17	Israel

3	Seed ID Assistance	2021-02-01	Netherland
4	PSD 2	2021-02-04	New Zealand
5	Purity Working Sample Weight	2021-02-10	Japan
6	Proposal and clarification on 18.8.1	2021-03-02	Argentina
7	interpretation on "difficult to identify"4.5.1. b	2021-03-04	ISTA Auditor
8	Anemometer Calibration	2021-04-14	ISTA Accreditation
9	ID Raphanus sp	2021-04-22	Israel
10	Blowers-problems with electrostaticity	2021-06-02	Brussel
11	PSD 40-confirmation	2021-06-04	Ireland
12	Gravity Table Seed Sorting	2021-06-10	Denmark
13	OSD-Pelleted seed sample	2021-06-14	Iran
14	Purity Reporting	2021-06-16	France
15	Purity 3.5.1-Decimal Places	2021-06-29	France
16	Purity reporting on numbers of other species	2021-07-07	ISTA Accreditation
17	Seed ID inquiry	2021-07-20	India
18	OSD Reporting	2021-08-17	Japan
19	Treated or Encrusted Seeds??	2021-09-28	France
20	Seed ID Inquiry	2021-10-07	India
21	Seed ID Inquiry	2021-10-12	Iran
22	Testing advice for encrusted seeds	2021-10-13	Denmark
23	Interpretation of 3.5.2.4	2021-10-19	ISTA Accreditation
24	Seed ID Inquiry	2021-10-27	Poland
25	<i>Solanum nigrum</i> berry or seeds?	2021-10-29	France
26	Determine Purity Components Decimal Places	2021-11-03	Canada
27	Testing Encrusted Orchardgrass	2021-11-19	U.S.A
28	Report on Disease Bodies	2021-11-23	Finland
29	Pure Seed Determination	2021-12-17	Korea

10. SHC Seed Health Committee

COMMITTEE MEMBERSHIP LIST				
				change comments
1	CHAIR: Valerie Grimault	France		Chair
	VICE-CHAIR:			Vice chair
2	Ilaria Alberti	Italy		
3	Rouke Bakker	New Zealand		
4	Mark Buimer	Netherlands		
5	Gary Munkvold	United States		
6	Rosa Piña González	Chile		Since June 2016
7	Dorota Szopinska	Poland		
8	Xiulan Xu	China		Since June 2017
9	Wen-Hsin Chung	Separate Customs Territory of Taiwan, Penghu, Kinmen and Matsu		Since June 2018
10	Stephan Brière	Canada		Since June 2018
11	Isabelle Serandat	France		Since June 2019
12	Marian Mc Ewan	United Kingdom		Since June 2019
13	Kohei Osaki	Japan		Since June 2019
14	Ruud Barnhoorn	Netherland		Since June 2019
15	Dr. Mahesh B	India		Since June 2021
A. RULES DEVELOPMENT				
<u>A1. Introduction of New Methods</u>				
				<u>remarks</u>
	Method name	proposed	collaboration	update
	subject	finalisation		progress
1	<i>Fusarium graminearum</i> , <i>F. langsethiae</i> , <i>F. culmorum</i> , <i>F. poae</i> ... – Cereals new method	2013-2022	Nibio Norway	Test plan accepted by ISTA, based on plating on media and morphological identification, collection of isolates performed, analytical specificity performed, analytical sensitivity under progress (obtaining seed samples)
2	<i>Fusarium oxysporum</i> on tomato – new method	2013-2022	Naktuinbouw, GEVES, Microlab	Test plan accepted by ISTA, dilution plating, PCR for identification and pathogenicity test confirmation, analytical specificity under progress (Pathogenicity to finalize), analytical sensitivity performed

3	<i>Ascochyta rabiei</i> chickpea	2013-2022	GEVES	Part of a research project at GEVES. Test plan accepted by ISTA, based on plating on media and morphological identification, collection of isolates performed, analytical specificity performed, analytical sensitivity under progress
4	<i>Tilletia</i> species/wheat	2018-2022	GEVES	Test plan accepted by ISTA, comparison of existing methods performed, variables between methods compared, choice of method to validate under progress, analytical sensitivity under progress
5	<i>Pseudomonas syringae</i> pv. <i>glycinea</i>	2018-2023	USDA	Project to compare existing methods in order to select one to validate, protocol chosen, isolate collection under progress. Test plan started.
7	<i>Botrytis cinerea</i> on hemp seeds	2019-2023	CREA, GEVES	Test plan accepted by ISTA, analytical specificity performed, analytical sensitivity under progress
A3. Introduction of Rules Changes				
				<u>remarks</u>
	Subject	Proposed finalisation	collaboration	Update progress
1	PCR detection of <i>L. maculans</i>	2019-2023	Canadian Food Inspection Agency	Project phase
2	Alternative to 250µm sieve for method 7-031	2022	GEVES	Report finalised, reviewed by SHC.
3	Five year Method reviews	2018-2019	?	Questionnaire 2019, 2020, 2021 will be grouped, lead to find taking over from Terry Aveling
4	<i>Ascochyta</i> pea comparing NUV/dark	2016-2022		Infected seeds to be found
	Harmonisation of pretreatment with hypochlorite	2019-2020	Ilaria Alberti, Kohei Osaki, Rosa Pina, Isabelle Serandat, Dorota Szopinska,	Voted June 2021
B2. Training publications on specific seed testing topics				
				<u>remarks</u>
	Publication title	proposed	collaboration	update
1	Seed Health Handbook	2013-2022	Terry Aveling ? to take over	12 chapters under review
C. WORKSHOPS AND SEMINARS				
C1. Training and education workshops				
				<u>remarks</u>
	Workshop subject	proposed	collaboration	update
	location	finalisation		progress

1	Seed Health Workshop Pretoria South Africa, Seed health methods using PCR, ELISA, dilution plating and indexing methods	2020	University Pretoria, Starke Ayres	Cancelled
2	Online training project	2021-2022	All SHC	Program prepared: 2 days of lectures + demonstration videos, presentations under progress
C2. Seminars				
				<u>remarks</u>
	Seminar subject	proposed	collaboration	update
	location	finalisation		progress
	ISTA Plant Health Seminar for International Year of Plant Health	2021	CREA	Done May 2021, online
	qPCR <i>Leptosphaeria maculans</i> + SH symposium	2023	Canadian Food Inspection Agency	Seed Health seminar and workshop, 2023 Ottawa, Canada
D. PROFICIENCY TESTS				
	Proficiency test subject	proposed	collaboration	update
	location	finalisation		progress
1	7-028 Tobamoviruses	2020-2021	GEVES	Done 2021
2	7-029, <i>Pseudomonas syringae</i> pv. <i>pisi</i>	2021-2022	Naktuinbouw	Preparation under progress
3	7-031, <i>Ditylenchus dipsaci</i>	2020-2021	GEVES	Under progress, samples sent
4	7-014, <i>Parastagonospora nodorum</i>	2019-2022	CREA	Planned 2022
5	7-022, <i>Microdochium nivale</i>	2019-2022	SASA	planned
6	7-006 <i>Colletotrichum lindemuthianum</i>	2019-2022	NARO	planned
7				

F. SPECIAL PROJECTS				
Project title / subject				remarks
collaborating committees	proposed	collaboration		update
	finalisation			progress
ISTA Reference Pest List:	2018-2022	GEVES		11 crops published, New project on 34 crops under progress. Paper for EPPO bulletin accepted
Statistical tool	2019-2022	Statcom		Set up a tool on the model of the germination tool
NSHS-ISTA collaboration	2020-2022	NSHS		Compare validation guidelines for mutual recognition Done and guidelines updated
Insect detection/identification project	2021-2022	ATC, ANSES-LSV		Review of existing methods and evaluation of these methods on selected insect/crop models to detection and identification of insects on and in seeds. Project started January 2021, literature review done, questionnaire done, species/insect of interest chosen, method to evaluate chosen, obtention of healthy and infected samples and sampling under progress.

New project

New proposed finalisation date

11. Statistics Committee

COMMITTEE MEMBERSHIP LIST			
			change comments
1	CHAIR: Jean-Louis Laffont	France	
2	VICE-CHAIR: Kirk Remund	United States	
3	Gabriel Carré	France	
4	Mustapha El Yakhlifi	France	
5	Zhou Fang	United States	
6	Bonnie Hong	United States	
7	Winfried Jackisch	Germany	

8	Zivan Karaman	France		
9	Bo-Jein Kuo	Separate Custom Territory of Taiwan, Penghu, Kinmen and Matsu		
10	Ray Shillito	United States		
A. RULES DEVELOPMENT				
<u>A1. Introduction of New Methods/New Species</u>				
				remarks
	Method name	proposed	collaboration	update
	subject	finalisation		progress
1	Statistical reviews of Test Plans and Validation Reports	On-going	Any TCOM	A total (introduction of new methods and introduction of new species) of 5 Test Plans reviewed.
2	Contribution to the analysis of some Validation Studies	On-going	Any TCOM	Support provided to Variety Committee: analysis of three Comparative Tests; developed a new method for assessing within laboratory agreement for marker data (i.e. repeatability for qualitative data).
<u>A3. Introduction of Rules Changes</u>				
				remarks
	Subject	proposed	collaboration	update
	collaborating committees	finalisation		progress
1	Revision of Chapter 19 GMO Committee	November 2021	GMO Committee	
C. WORKSHOPS AND SEMINARS				
<u>C1. Workshops</u>				
				remarks
	Subject	proposed	collaboration	update
	location	finalisation		progress
1	Tobamovirus Workshop: Optimizing Detection of Tobamoviruses in Solanaceous and Cucurbitae Hosts Virtual	February 2021		Gave presentation "An Overview of Possible Protocols for Detection of Tobamoviruses in Host Plants and Seeds".
<u>C2. Seminars</u>				
				remarks
	Subject	proposed	collaboration	update
	location	finalisation		progress
1	"Standard Proficiency Test – Process & Purpose" seminar Virtual	December 2021	ISTA Secretariat Proficiency Test Committee	Participated as panelist.
F. SPECIAL PROJECTS				
	project title / subject			Remarks

	collaborating committees	proposed	collaboration	Update
		finalisation		Progress
1	GM trait percentage estimation using digital PCR (dPCR)	On-going	GMO	Derived the expectation and the variance of the number of empty cells in an occupancy problem when errors occur in characterizing the cells which are empty or not.
2	Protocols for Detection of Tobamoviruses in Host Plants and Seeds.	June 2021		Developed a sampling plan proposal for Tobamovirus detection in Breeding & Development greenhouses.
3	Contribution to the work of the ISTA WG Vegetable Seed Industry	On-going	BSC ECOM	Analyzed an experiment on tomato seed lots conducted by the vegetable seed industry for consideration in a potential ISTA recommendation of increased sub-lots from an original vegetable seed lot.
E. QUESTIONS TO THE COMMITTEE				
	subject of question		Date	From
1	Experiment design		January	Denmark
2	Tolerance tables		February	USA
3	Sampling		February	France
4	Incomplete designs		March	Chile
5	Sampling		March	France
6	PT rating		May	France
7	Tolerance tables		May	India
8	Tolerance tables		May	France
9	Tolerance tables		June	Netherlands
10	Analysis of Method Validation studies		June	Canada
11	Tolerance tables		July	Netherlands
12	Heterogeneity test of TSW		July	France
13	Experiment design		September	Chile
14	Bayesian posterior predictions for GMO testing		September	USA
15	Seedcalc		September	France
16	Homogeneity test for purity		September	New Zealand
17	Rounding procedure for germination results		November	Sweden

12. STO Storage Committee

COMMITTEE MEMBERSHIP LIST		Country	
1	Chair: Jayanthi Nadarajan	New Zealand	
2	Vice-Chair: Steven Groot	Netherlands	
3	Cathy Offord	Australia	
4	Joseph Asomaning	Ghana	
5	Andreas Börner	Germany	
6	Moctar Sacandé	Italy	
7	Sershen Naidoo	RSA	
8	Christina Walters	USA	
9	Xiang-Yun Yang	China	
10	G V Jagadish	India	
11	Umarani Sinniah	Malaysia	
12	Nelson Barbosa Machado Neto	Brazil	
13	Irfan Afzal	Pakistan	
14	Elisa Monteze Bicalho	Brazil	
15	Vacant		
	ECOM Liaison officer: Keshavulu Kunusoth	India	
A. NEW SCIENCE DISCOVERY		Proposed	
A1. Innovation in seed storage			
		2020	
<p>Title: Testing seed longevity at various environments (By Steven PC Groot, Wageningen University & Research, The Netherlands) Research was performed to investigate seed longevity i) Improving seed longevity by hypoxia storage, ii) Analysing damage induced during storage, with emphasis on the mitochondrial functioning, iii) Studying seed ageing under dry conditions using the method of Elevated Partial Pressure of Oxygen (EPPO), and iv) Identification of genes involved in seed longevity. Oxygen absorbers can be used to create an anoxia atmosphere for seed storage. However, the most effective ones contain iron powder and a moisturiser to stimulate oxidation of the iron. Storing small amount of seeds with such an oxygen absorber package will result in an increase of the seed moisture levels. To maintain the desired water activity during storage, this has to be prevented. In collaboration with Lingyun Wu (Shanghai Academy of Agricultural Sciences, China) a method has been developed to determine the amount of water in the oxygen absorber package and compensate that by adding a calculated amount of regenerated silica gel. The method has been published. The effect of oxygen on seed longevity of primed celery seeds was quantified. This showed that oxygen acts on a logarithmic scale and halving the oxygen concentration results each time in around 60% extension of longevity, giving around ten times longer shelf life upon near anoxia storage. These results were reported at the 2021 online conference of</p>		Target achieved	

the International Society of Seed Science. The mitochondrial inner membrane is very sensitive to oxidation during seed storage, which may result in decreased functioning of the mitochondria. As a consequence seeds switch to anaerobic respiration, with the production of ethanol. This can be measured with a breath analyser. In collaboration with the team of Prof. Ibrahim Demir (Ankara University, Turkey) this method was applied to determine seed vigour with six vegetable crops. The results were published in the ISTA journal Seed Science and Technology. The EPPO method has been used to study seed aging under dry conditions. Using Arabidopsis seeds as a model it was shown that the method can also be used to study dormancy release by after ripening during seed storage. Genetic loci showing variation in the response under EPPO conditions, are similar to loci identified by long term dry seed storage. Varying humidity during the EPPO treatment showed partly distinct loci involved in Arabidopsis seed longevity. A PhD project has started to investigate this further. The use of hypoxia seed storage has also attracted the interest of the peanut sector. Transport of peanuts from e.g. the Americas to Europe can sometimes suffer from mould growth on the peanuts and consequently face rejection for use in the food industry. As these peanuts are living seeds, a study was performed on the potential of anoxia during storage and transport. That study showed that storage in containers with a low permeability for oxygen and water vapour, and replacing the air by nitrogen gas, prevented both mould growth and an unwanted increase in free fatty acid levels. The results are published in the Journal Food Chemistry: <https://doi.org/10.1016/j.foodchem.2021.131020>.

Title: Priming of sorghum seeds to improve salt tolerance and to re-invigorate stored seeds (By Elisa Monteze Bicalho, Universidade Federal de Lavras, Brazil and Sershen, University of KwaZulu-Natal, South Africa)

The aim of this project is to use the priming technique in varieties of sorghum seeds to improve salinity tolerance in seeds, seedlings, and adult plants in the vegetative phase. Four contrasting sorghum varieties on water stress were chosen for performing the priming with seeds with abscisic acid (ABA), ascorbic acid (AsA), and water. The unprimed seeds were considered as control. The seeds were treated or not with the priming solutions, dried, and stored for 7-10 days until being sowed into germination boxes (germination chambers) or soil contaminated (greenhouse), both contaminated with increased salt solutions. During the experiments, the germination and growth parameters as well as biochemical analysis were performed. The seeds improved germinability in salt solutions when the priming was applied, even considering the sensible varieties. Regarding plants, we observed that those from seeds treated with AsA priming showed increasing biomass and leaf area at the same salt solutions when compared to plants from unprimed seeds. This way, our first results pointed out an improvement in plants' fitness in salt stress when the priming is applied. Also, we look forward to verifying the priming techniques can be used to re-invigorate stored seeds. The mechanism of this improvement of stress tolerance is being investigated.

B. PUBLICATIONS			
<u>B1. Publications of the seed storage handbook</u>			
		Proposed	Collaborati on
		finalisation	
	Handbook on Seed Storage	2022	
	1. The seed storage handbook chapters have now been finalised with the followings: Chapter 1: Introduction to seed storage biology; Chapter 2: Drying protocols for seed and embryo axis; Chapter 3: Cooling methods and rates; Chapter 4: Seed packaging; Chapter 5: Storage environments; Chapter 6: Cryostorage of seeds and axis; Chapter 7: Short-lived and oily seed storage; Chapter 8: Prediction of seed storage behaviour and seed longevity; Chapter 9: Seed microbiome and storage; Chapter 10: Oxidative modifications during seed storage. Appendix 1 will cover the list of known seed storage behaviour - compiled from the Seed Information Database Kew. The chapter outline and drafts are on STO TCOM Team SharePoint site.	On target	External experts in differenet seed storage biology
<u>B2. Scientific information publications</u>			
	Publication title	Proposed	Collaborati on
		finalisation	
	Target: 20 scientific publications (book chapters and journal articles, including in SS&T) on seed storage.	2022	
		Target achieved	Various external collaborator s
	<ol style="list-style-type: none"> 1. Agacka-Moldoch M, Rehman Arif MA, Lohwasser U, Doroszewska T, Lewis RS, Börner A (2021). QTL analysis of seed germination traits in tobacco (<i>Nicotiana tabacum</i> L.). J. Appl. Genet. 62, 441-444. https://dx.doi.org/10.1007/s13353-021-00623-6 2. Chen X-L, Börner A, Xin X, Nagel M, He J, Li J, Li N, Lu X, Yin G (2021). Comparative proteomics at the critical node of vigor loss in wheat seeds differing in storability. Front. Plant Sci. 12, 707184. https://dx.doi.org/10.3389/fpls.2021.707184 3. Widiarsih S, Nagel M, Börner A, Feussner K, Feussner I, Möllers C (2021). Inheritance of seed quality and seed germination in two doubled haploid populations of oilseed rape segregating for acid detergent lignin (ADL) content. Euphytica 217, 161 https://dx.doi.org/10.1007/s10681-021-02891-z 4. Olaleye IS (2021). Relationship between estimates of fluorescence lifetime and seed viability and vigour of wheat (<i>Triticum aestivum</i>): Influence of seed moisture content. (Master Thesis) Göttingen, Georg-August-Universität Göttingen, Fakultät für Agrarwissenschaften 59 pp. (supervised by Börner A) 5. Diantina S, McGill CM, Millner J, Nadarajan J, Pritchard H, Colville L, McCormick AC (2021). Seed viability and fatty acid profiles of five orchid species before and after ageing. Plant Biology. doi:10.1111/plb.13345 		

6. Michalak M, Plitta-Michalak BP, **Nadarajan J**, Colville L (2021). Volatile signature indicates viability of dormant orthodox seeds. *Physiologia Plantarum*. DOI: 10.1111/ppl.13465
7. van der Walt K, Kemp P, Sofkova-Bobcheva S, Burritt DJ, **Nadarajan J** (2021). Evaluation of droplet-vitrification, vacuum infiltration and encapsulation-dehydration for cryopreservation of *Syzygium maire* zygotic embryos. *CryoLetters* 42(4), 202 – 209
8. Surya D (2021). Comparison of Seed Traits of Tropical (Indonesia) and Temperate (New Zealand) Orchid Species to Support Orchid Seed Conservation. (PhD Thesis) School of Horticultural and Agricultural Science, Massey University, Palmerston North, New Zealand. 200 pp. (supervised by **Nadarajan J**)
9. Kucukhuseyin EB, Memis N, Gokdas Z, **Groot SPC**, Demir I (2021). Ethanol release as an indicator of seed vigour in radish, pepper, watermelon, aubergine, leek and onion seed lots. *Seed Science and Technology* 49 (1). doi: <https://doi.org/10.15258/sst.2021.49.1.01>.
10. **Groot SPC**, van Litsenburg M-J, Kodde J, Hall RD, de Vos RCH, Mumm R (2022). Analyses of metabolic activity in peanuts under hermetic storage at different relative humidity levels. *Food Chem* 373,131020. doi: <https://doi.org/10.1016/j.foodchem.2021.131020>
11. Wu L, Yao D, Li M, **Groot SPC** (2021). Method to create an anoxia environment for seed storage. *Acta Agriculturae Shanghai* 37 (3),102-106
12. Ferreira RA, Oliveira AAD, Silva VND, Pereira AAS, Bernardes MM, **Bicalho EM** (2021). Watching the days go by: Aging during sunflower seed storage under distinct oxygen availability. *Ciência e Agrotecnologia*, 45. doi: <https://doi.org/10.1590/1413-7054202145017921>
 Adetunji AE, Adetunji TL, Varghese B, **Sershen**, Pammenter NW (2021). Oxidative Stress, Ageing and Methods of Seed Invigoration: An Overview and Perspectives. *Agronomy*, 11(12), p.2369
 Pérez L, Acpsta Y, Nápoles L, Carvajal C, Linares C, **Sershen**, Feijoo JCL, Pérez A (2021). Pineapple stem-derived bromelain based priming improves pepper seed protein reserve mobilization and germination. *Physiology and Molecular Biology of Plants*, DOI: <https://doi.org/10.21203/rs.3.rs-355995/v1>
 Chandra J, Parkhey S, Varghese D, **Sershen** Varghese B, Keshavkant S (2021). Towards understanding the basis of desiccation-induced oxidative stress in recalcitrant seeds: The case of *Madhuca latifolia* Roxb. *South African Journal of Botany*, 142, 100-105
 Adetunji AE, **Sershen**, Varghese B, Pammenter NW (2021). Exogenous Antioxidants Enhance Seedling Growth and Yield of Artificially Aged Cabbage and Lettuce Seeds. *Horticulturae*, <https://doi.org/10.3390/horticulturae7090274>.
 Adetunji AE, **Sershen**, Varghese B, Pammenter NW (2021). Effects of exogenous application of five antioxidants on vigour, viability, oxidative metabolism and germination enzymes in aged cabbage and lettuce seeds. *South African Journal of Botany* 137, 85-97
13. Fileti JF, Hengling MM, Gianeti TMR, Hosomi ST, **Pritchard HW**, Machado-Neto NB, Custódio CC (2021). Seed longevity and cryobiotechnology in the orchid genus *Cattleya*. *CryoLetters* 42, 353-365
14. Visscher AM, Latorre Frances A, Yeo M, Yan J, Colville L, Gomez Barreiro P, **Pritchard HW** (2021). Comparative analyses of extreme dry seed thermotolerance in Cactaceae species. *Environmental and*

	<p>Experimental Botany 188, 104514 https://doi.org/10.1016/j.envexpbot.2021.104514</p> <p>15. HAN B, Pritchard HW, Colville L (2021). Gaseous environment modulates role of volatiles in seed ageing. <i>Planta</i> 253, 106. https://doi.org/10.1007/s00425-021-03620-5 April</p> <p>16. Lin L, Ma J, Ai Q, Pritchard HW, Li W, Chen H (2021). Lipid remodeling confers osmotic stress tolerance to embryogenic cells during cryopreservation. <i>International Journal of Molecular Sciences</i> 22(4), 2174; https://doi.org/10.3390/ijms22042174</p>		
	<u>C. SEMINARS</u>		
		Proposed finalisation	Collaborati on
1	<p>13th Triennial International Conference of the International Society for Seed Science: Seed Innovation Systems for the 21st Century, 9-13 August 2021, University of Sussex Brighton, UK. Organisation: Dr Louis Colville & Professor Hugh Pritchard (Kew) supported by a Local Organising Committee and International Programme Committee</p> <p>Target: ISTA session, one invited lecture and at least two oral presentations from the committee.</p>	2021 Target achieved	
2	<p>Australasian Seed Science Conference (ASSC), 5-9 September 2021, Australian National Botanic Gardens, Canberra, ACT, Australia</p> <p>Target: one invited lecture and at least two oral presentation from the committee</p> <p>The Australasian Seed Science Conference was postponed from April 2020 to an on-line conference in September 2021. The intent of this conference was to provide a forum to strengthen professional networks and facilitate an exchange of scientific knowledge relating to advances in seed biology and ecology; seed bank management; and the sourcing, use and importance of seed in traditional and cultural practices. This conference included presentations and workshops on seed banking, with a focus on maximising seed storage potential. Cathy Offord was the main organiser for the scientific programme. Jayanthi contributed as a panellist and an invited speaker for the Fenner conference, which was held in conjunction with the ASSC.</p>	2021 Target achieved (on-line delivery)	
3	<p>A Seed Symposium of the Working Group Seed Science and Certification of the German Society of Plant Breeding and the German Society of Plant Cultivation Research took place from March 9-11, 2021. It was an online meeting attended by 216 participants from 33 countries. The symposium was organised by Andreas Börner, the Head of the Working Group and colleagues. The topic of the Symposium was “Seed Production in Times of Climate Change”. One of the Plenary Speakers was Hugh Pritchard</p>	2021 Target achieved	

4	ISTA Annual meeting. 31 May-03 June 2021, Cairo, Egypt Target: at least two oral presentation from the committee	2021 Target was not achieved as the Congress was cancelled	
5	ISSS/ISTA Webinar on fundamental and applied aspects of seeds 172 people attended the first webinar jointly organised by the International Seed Testing Association (ISTA) and the ISSS on 15 June 2021. Dr Christina Walters, National Laboratory for Genetic Resources Preservation, Fort Collins, USA presented on <i>Seed Ageing during Dry Storage: a Discreet, Discrete Problem</i> . Recording is available here ; ISSS/ISTA Webinar_June 2021 - YouTube..	2021 Target achieved	
6	Conserving Exceptional Plants: Cryobiotechnology and the Model of Oaks. 19-21 October 2021. Virtual symposium. Five oral presentations including one Keynote lecture were contributed by STO TCOM members. Symposium web link: - Cincinnati Zoo & Botanical Garden®	2021 Target achieved	
<u>D. WORKSHOPS</u>			
		Proposed	Collaboration
		finalisation	
	A seed storage workshop in collaboration with Seed Moisture Committee during the ISTA Annual meeting. 31 May-03 June 2021, Cairo, Egypt	2021 Target was not achieved as the Congress was cancelled	ISTA Seed Moisture Committee
<u>E. SPECIAL PROJECTS</u>			
	project title / subject	Proposed	Collaboration
	collaborating committees	finalisation	
1		Target not achieved	

	<p>Post-storage reinvigoration/seed priming and storage for 24 months on Hybrid Sweet Corn, Onion and Hybrid Cabbage seed lots (Led by G.V. Jagadish & Sershen)</p> <ul style="list-style-type: none"> This proposal was withdrawn following complexity imposed by Covid-19 lockdown. 		
2	<p>Use of equilibrium relative humidity measurements for determining the moisture status of stored seeds [Led by Fiona Hay (Moisture Committee) and Jayanthi Nadarajan (Storage Committee)]</p> <ul style="list-style-type: none"> This is an additional proposal in collaboration with MOI TCOM which was successful with funding. 	Target achieved	ISTA Seed Moisture Committee

13. TEZ Tetrazolium Committee

TEZ Tetrazolium Committee			
COMMITTEE MEMBERSHIP LIST			
1	Steffi Krämer (chair)		Germany
2	Sergio Pasquini (vice chair)		Italy
3	Ignacio Aranciaga		Argentina
4	Maria Aranguren		Argentina
5	Alessandra Arioli		Italy
6	Jose de Barros Franca-Neto		Brazil
7	Sunita BH		India
8	Valerie Blouin		France
9	Gary Duffy		Ireland
10	Soo-Yuong Kim		Korea
11	Linda Maile		United Kingdom
12	Augusto Martinelli		Argentina
13	Shaminder Miranpuri		USA
14	Tauhid Parvez		Canada
15	Eunhee Soh		Korea
A. RULES DEVELOPMENT			
<u>A2. Introduction of New Species</u>			
	Species and test	proposed	collaboration
		finalisation	
1	Tetrazolium test on Larix	unknown	
2	Tetrazolium test on Picea	unknown	
3	Tetrazolium test on Glycine max	in process	
4	Tetrazolium test on Pennisetum	unknown	
5	Tetrazolium test on Ulmus campestre	In process	Per validation study
<u>A3. Introduction of Rules Changes</u>			
	Subject	proposed	collaboration
		finalisation	
B. PUBLICATIONS			

	<u>B2. Training publications on specific seed testing topics</u>		
	Publication title	proposed	collaboration
		finalisation	
1	Reorganise Handbook Tetrazolium	unknown	
2	Revision of the TEZ working sheets	ongoing	
3	Continue TEZ Working sheets	ongoing	
	C. Workshop		
	D. PROFICIENCY TESTS		
	Proficiency test subject	proposed	collaboration
	location	finalisation	
1	Allium poroum (PT 20-3)	2020	PTC
2	Medicago melilotus (PT 21-2)	2021	PTC
3	Lolium perenne (PT 22-1)	2022	PTC
	F. SPECIAL PROJECTS		
	project title / subject		
	collaborating committees	proposed	collaboration
		finalisation	
1	none		
	E. QUESTIONS TO THE COMMITTEE		
	TEZ on Knautia arvensi	February 2021	Denmark
	TEZ on Briza	February 2021	Denmarc
	TEZ on Prunus	May 2021	Chile
	Questions on ISTA Certificates	June 2021	USA
	TEZ on Daucus carota	December 2021	South Africa
	TEZ on Ficus	January 2022	Nepal

14. VAR Variety Committee

COMMITTEE MEMBERSHIP LIST				
			change comments	
1	Chair: Ana Laura Vicario	Argentina	Member since 2007	
2	Vice-Chair: Marie-Claude Gagnon	Canada	Member since 2020	
	Former Vice-Chair: Daniel Perry	Canada	Member since 2013 – Retired on June 2021	
3	Anne Bernole	France	Member since 2016	
4	Berta Killermann	Germany	Member since 2004	
5	Chiara Delogu	Italy	Member since 2007	
6	Elisa Vieira	Brazil	Member since 2007	
7	Hedwich Teunissen	Netherlands	Member since 2007	
8	Kae-Kang Hwu	Separate Customs Territory of Taiwan, Penghu, Kinmen and Matsu	Member since 2007	
9	Ksenija Markovic	Serbia	Member since 2013	
10	Ksenija Taski-Ajdukovic	Serbia	Member since 2010	
11	Keshavulu Kunusoth	India	Member since 2010	
12	Verena Peterseil	Austria	Member since 2016	
	Former member : Marie-José Côté	Canada	Member since 2016 – Retired on May 2021	
13	Ana Patricia Fernandez Getino	Spain	Member since 2021	
14	Mariana Menoni	Uruguay	Member since 2021	
A. RULES DEVELOPMENT				
A1. Introduction of New Methods				
			remarks	
	Method name	proposed	collaboration	update
	subject	finalisation		progress
1	DNA based methods for oats and peas.	2021	SEC, STA,	Leader: MJ Côté from Canada. First statistical analysis is finished. Validation report is finished and under discussion with the STACOM. The Rules proposal for peas and oat were sent to the Rules chair.
2	DNA based methods for barley	2022	SEC, STA,	Leader: Verena Peterseil from Austria. Statistical analysis is under discussion. Preparation of the validation report and Rules proposal are pending.
3	Validation of newly developed <i>Lolium</i> markers for determination of annual types in perennial ryegrass varieties.	2023	SEC, USDA, AOSA, STA	Leaders: Giovanni Lopez from the Netherlands (ISTA) and as co-lead Dan Curry from the USA (AOSA). VARCOM presented to ISTA Secretariat a project requesting financial support for validating the markers, which was

				accepted. Sequencing of both annual and perennial varieties is finished. Identification and selection of markers are in progress.
A2. Introduction of New Species				
				Remarks
	Species and test	proposed	collaboration	update
		finalisation		progress
A3. Introduction of Rules Changes				
				remarks
	Subject	proposed	collaboration	update
		finalisation		progress
	DNA-based methods for peas and oat	2021	SEC, STA	Presented to the Rules chair for discussion during the OGM 2022.
B. PUBLICATIONS				
B1. Publications to accompany the Rules				
				remarks
	Publication title	proposed	collaboration	update
		finalisation		progress
2	Handbook - DNA based methods	2022	SEC, STA, GMO, Editorial	No progress since last report.
B3. Scientific information publications				
				remarks
	Publication title	proposed	collaboration	update
		finalisation		progress
1	VARCOM progress report 2021 was published on STI	2021	SEC	Finalized
2	Validation report for pea, summary for STI	2021	SEC	Finished
3	Validation report for oat, summary for STI	2021	SEC	Finished
C. WORKSHOPS AND SEMINARS				
C1. Training and education workshops				
				remarks
	workshop subject	proposed	collaboration	update
	location	finalisation		progress

1	India - Species and Variety testing - DNA based methods, electrophoresis, statistics, conventional methods	2022	SEC	Leader: Kunusoth Keshavulu, India. Organization started. Planned for June, 2019 but postponed due to insufficient registration. Now rescheduled to September / October, 2022.
C2. Seminars				
				Remarks
	Seminar subject	proposed	collaboration	Update
	location	finalisation		Progress
1	Participation at the UPOV BMT meeting	22-24 September 2021, online meeting	SEC	Ana Vicario presented ISTA and VARCOM activities during the meeting
D. PROFICIENCY TESTS				
	Proficiency test subject	proposed	collaboration	Update
	location	finalisation		Progress
1	DNA based methods (SSR) - wheat	2021	STA, SEC, Accreditation Department	PT"0" was organized and finalized by former PT leader Daniel Perry. Individual and final reports were sent to participant laboratories. Samples for wheat PT will be kept, prepared and shipped by Canadian Grain Commission.
E. SPECIAL PROJECTS				
	project title / subject			Remarks
	collaborating committees	proposed	collaboration	Update
		finalisation		Progress
F. QUESTIONS TO THE COMMITTEE				
	subject of question			from
				country
	None			
G: Further Comments - Responsibilities				
<u>leader of working groups</u>				
1	PT leader for DNA-based tests			Ana Vicario (AR)
2	CT leader for soybean, pea and oat			Marie José Côté (CA)
3	CT leader for barley			Verena Peterseil (AT)
4	Lolium WG leader			Giovanni López (NL)
<u>contact persons</u>				
	ECOM			Berta Killermann (DE)

Activity Report of the ISTA Committees 2021

				Keshavulu Kunusoth (IN)
	UPOV			Ana Laura VICARIO (AR)
	Website			None (at present)
	Workshops			To be determined
	Permanent guest from UPOV			Leontino TAVEIRA (leontino.taveira@upov.int)
	Permanent guest from OECD			Gerry HALL (gerry.hall@sasa.gsi.gov.uk)

-
- New project
 - New proposed finalisation date

15. VIG Seed Vigour Committee

COMMITTEE MEMBERSHIP LIST				
			change comments	
1	CHAIR: Alison Powell	United Kingdom		
2	VICE-CHAIR: Hulya Ilbi	Turkey		
3	I-Chen Cheng	Separate Customs Territory of Taiwan, Penghu, Kinmen and Matsu		
4	Ibrahim Demir	Turkey		
5	Carina Gallo	Argentina		
6	Simon Goertz	Germany		
7	G.V. Jagadish	India		
8	Mohammad Khajeh Hosseini	Iran		
9	Tim Loeffler	United States		
10	Stan Matthews	United Kingdom		
11	Carey Matthiessen	Canada		
12	Gillian McLaren	United Kingdom		
13	Takashi Shinohara	Japan		
14	Marie-Hélène Wagner	France		
15	Yan Rong Wang	China		
A. RULES DEVELOPMENT				
A1. Introduction of New Methods				
			remarks	
	Method name	proposed	collaboration	update
	subject	finalisation		progress
1				
A2. Introduction of New Species				
			remarks	
	Species and test	proposed	collaboration	update
		finalisation		progress
1	Radicle emergence test: <i>Elymus nutans</i>	2021		Comparative test abandoned as a result of delays due to Covid
2	Radicle emergence test: <i>Avena sativa</i> .	2021		Comparative test data analysed; test to be repeated when possible .
3	Radicle emergence test: <i>Allium cepa</i>	2021		New seed source identified for comparative test
4	Radicle emergence test: <i>Glycine max</i>	2021		In progress. Further field trial in progress to test relationship between field emergence and radicle emergence.
5	Radicle emergence test: <i>Solanum lycopersicum</i>	2021		Analysis of emergence and radicle emergence data completed. Feasibility of comparative test to be considered

6	Radicle emergence and conductivity tests as potential vigour tests for five vegetable Brassic species. (ISTA special project)	2022	Germination committee	Comparative test for radicle emergence completed and data being analysed. First research paper published, three further papers in preparation
7	Radicle emergence and conductivity test for cabbage (<i>Brassica oleracea</i> var <i>capitata</i>) and cauliflower (<i>B. oleracea</i> var <i>botrytis</i>)	2021	Sakata (India)	Two laboratories have applied both tests to cabbage (6 lots) and cauliflower (9 lots). This data will provide additional information to the ISTA special project (point 6)
8	Radicle emergence test for spinach (<i>Spinacia oleracea</i>)	2022		Work delayed due to Covid
9	Radicle emergence test for sweet corn (<i>Zea mays</i> convar. <i>saccharata</i>)	2022		Conditions for radicle emergence being determined
10	Radicle emergence test for dill (<i>Anethum graveolens</i>)	2022		Laboratory and field tests completed. Further work in progress.
11	Field emergence in barley: comparisons to relate to radicle emergence test	2022		Two field emergence trials and laboratory assessments of radicle emergence completed on untreated and treated seed lots of one winter barley genotype.
12	Radicle emergence test for <i>Oryza sativa</i>	2022		Fifteen seed lots have been tested; further field emergence and other vigour tests are in progress.
13	Radicle emergence test for <i>Sorghum bicolor</i>	2022		Ten seed lots have been tested; further field emergence and other vigour tests are in progress.
A3. Introduction of Rules Changes				
				remarks
	Subject	proposed	collaboration	update
		finalisation		progress
1				
B. PUBLICATIONS 2020				
B3. Scientific information publications				
				remarks
	Publication title	proposed	collaboration	update
		finalisation		progress
1	Early counts of radicle emergence, counted manually and by image analysis, can reveal differences in the production of normal seedlings and the vigour of seed lots of cauliflower.	2021	GER, STA Takashi Shinohara, Sylvie Ducournau, Stan Matthews, Marie-Helene Wagner and Alison A Powell	<i>Seed Science and Technology</i> , 49 , 3, 219-235
2	Radicle emergence test predicts normal germination percentages of onion seed lots with different cultivars and genotypes	2021	İbrahim Demir, Eren Özden, Zeynep Gokdas, Ebrima S. Njie and Mine Aydın	<i>Mustafa Kemal University Journal of Agricultural Sciences</i> , 25 , 434-442
3	Vigour assessment of dill (<i>Anethum graveolens</i> L.) seed	2021	Eren Özden, Nurcan Memis, Burcu Begum	<i>Journal of Agricultural Sciences</i> , 27 , 50-55

	lots in relation to predicting seedling emergence potential		Kenanoglu and Ibrahim Demir	
5	Seed vigour evaluation of rocket (<i>Eruca sativa</i> Mill.) seed lots	2021	Eren Ozden, Nurcan Memis, Zeynep Gokdas, Elif Catikkas and Ibrahim Demir	<i>Journal of the Institute of Science and Technology</i> , 10 , 1486-1493
6	Revision of Vigour Test Handbook	2022	Vigour Committee	Drafts of 6 chapters completed; the remainder in progress
C. WORKSHOPS AND SEMINARS				
C1. Training and education workshops				
				remarks
	workshop subject	proposed	collaboration	update
	location	finalisation		progress
1	'Phenotypic plasticity of seed traits', ISTA/ISSS webinar Seed germination phenotyping in controlled conditions to measure genetic diversity and address climate change	Dec 15 2021	Marie-Helene Wagner, Didier Demilly and Sylvie Ducournau	Presented by Marie-Helene Wagner
2	Seed Vigour course in MSc Seed Technology Faculty of Agricultural Sciences. National University of Córdoba. Argentina			Presented by Carina Gallo
3	Seed quality and vigour tests. Peru seed company			Presented by Carina Gallo
4	Seed Vigor related to Seed Production and Processing presented at AOSA-SCST Webinar	February 16 2021		Presented by Tim Loeffler
5	Practical Considerations of Commercial Seed Storage presented at AOSA-SCST Webinar			Presented by Tim Loeffler
6	Upgrading Seed to Improve Physiological Quality and Stand Establishment, presented at APSA webinar	September 15 2021		Presented by Tim Loeffler
D. PROFICIENCY TESTS				
	Proficiency test subject	proposed	collaboration	update
	location	finalisation		progress
	Radicle emergence test; <i>Zea mays</i>	2021	PT	Completed
F. SPECIAL PROJECTS				
	project title / subject			remarks
	collaborating committees	proposed	collaboration	update
		finalisation		progress
1	Protein and DNA damage and their repairs controlling vigour		M. Khajeh Hosseini	Practical work completed

	and longevity of Desi chickpea seeds			
2	Radicle emergence and seed longevity in cucurbits (<i>Cucurbita pepo</i>)		I Demir	Completed; paper submitted for publication
3	Relationship between radicle emergence counts and final germination: pepper, onion, carrot		I Demir	Research completed, paper in preparation
4	Influence of environmental conditions and farm management on the quality of wheat seeds produced in the Northeast of Iran		M. Khajeh Hosseini	Seed samples collected from 100 farms, purity, 1000 seed weight, seed moisture content, germination assessed. The vigour test is on-going for 100 seed samples.
5	Study of the speed of cell cycle on 15 seed lots of wheat with different vigour levels		M. Khajeh Hosseini	Seed samples collected, germination, vigour assessed. Seed imbibition curves determined.
6	Comparison of quality of pepper seeds produced in both conventional and organic systems		M. Khajeh Hosseini	Seed produced in both systems, germination tests going on.
E. QUESTIONS TO THE COMMITTEE				
	subject of question			from
				country
1	Is there any work on endophytes and seed vigour?	27 January		Canada
2	Request for images of RE in <i>Zea mays</i>	19 January		?
3	Can the RE test be used for <i>Brassica oleracea</i> ?	3 March		ISTA auditors
4	Analysis of data from different vigour tests to assess okra and sweetcorn	5 March		India
5	Equipment and method for applying Accelerated Ageing test to <i>Helianthus annuus</i>	10 March		South Africa
6	RE and CD test as possible vigour tests for <i>Brassica nigra</i>	6 April		India
7	Evaluation of a 2mm radicle in RE test for <i>Zea mays</i>	16 April		The Philippines
8	Guidance on vigour tests for <i>Daucus carota</i> , <i>Brassica oleracea</i> , <i>Allium cepa</i> and <i>Lactuca sativa</i>	30 April		South Africa
9	Longevity of <i>Pisum sativum</i> and vigour of surviving viable seeds	24 May		USA
10	Light requirements for RE test	24 June		India
11	Light requirements for RE test	24 June		India (different lab to above)
12	Use of TZ to assess vigour of <i>Zea mays</i> ; comparison with validated vigour tests	13 July		Serbia
13	Explanation for results of RE test carried out on the same	16 July		Egypt

	seed lots but at the two alternative temperatures			
14	Clarification of the 2mm rule to assess RE in <i>Zea mays</i>	23 July		South Africa
15	Application of the RE test to <i>Gossypium hirsutum</i> : what should be assessed as radicle emergence?	27 September		Iran
16	Effects of metalaxyl on germination after storage	28 September		India
17	Tolerance tables for EC	3 December		Italy

-
- New project
 - New proposed finalisation date