

# ISTA Seed Storage Technical Committee



**Presenter:** Jayanthi Nadarajan (Chair Seed Storage Technical Committee)

**Location:** Verona, Italy

**Date:** 30 May 2023

# Committee Membership

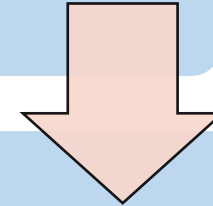


		Country	Active since
1	Chair: Jayanthi Nadarajan	New Zealand	2019
2	Vice-Chair: Steven Groot	Netherlands	2016
3	Cathy Offord	Australia	*
4	Joseph Asomaning	Ghana	2013
5	Andreas Börner	Germany	2010
6	Sershen Naidoo	South Africa	2011
7	Christina Walters	USA	2000
8	Xiang-Yun Yang	China	2011
9	Moctar Sacandé	Italy	2001
10	G V Jagadish	India	2019
11	Nelson Barbosa Machando-Neto	Brazil	2022
12	Umarani Sinniah	Malaysia	2022
13	Louise Colville	UK	2022
14	Elisa Monteze Bicalho	Brazil	2022
15	Irfan Afzal	Pakistan	2022
	ECOM Liaison officer: Keshavulu Kunusoth		

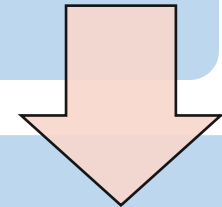
## STO TCOM Objectives



The main objective is to develop and/or improve effective medium- and long-term seed storage techniques.



The second aim is to continue to generate knowledge and deliver innovations in seed storage.

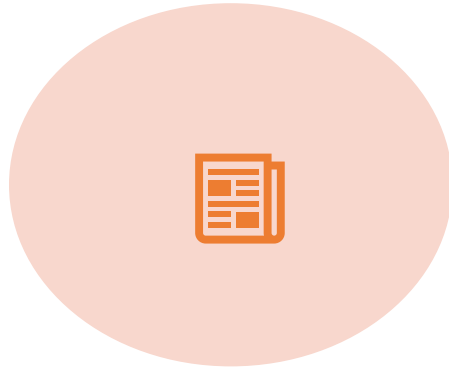


To play a role as a centre of knowledge creator and technology transfer platform.

# Activity report on the committee's work programme



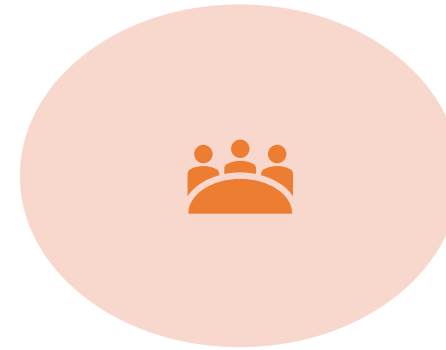
**KNOWLEDGE  
AND  
TECHNOLOGY  
DEVELOPMENT**



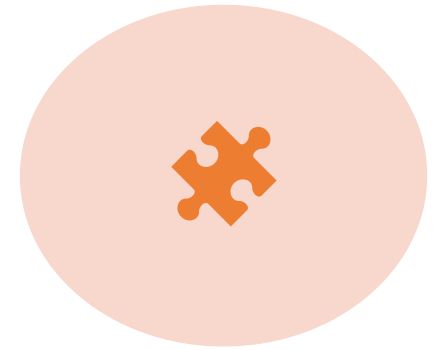
**PUBLICATIONS**



**SEMINARS**



**WORKSHOPS**



**SPECIAL  
PROJECTS**

	<b>Proposed finalisation</b>
<b>A1. Development of new scientific knowledge on optimum storage of recalcitrant seeds</b>	2025
<b>A2. Development of effective storage methods for desiccation tolerant, short-lived intermediate, oily and exceptional species</b>	2025

## Case study: Enhancing cryobiological knowledge of *Syzygium maire*

van der Walt K, Burritt DJ & Nadarajan J. 2022. [https:// doi.org/10.3390/plants11081056](https://doi.org/10.3390/plants11081056)

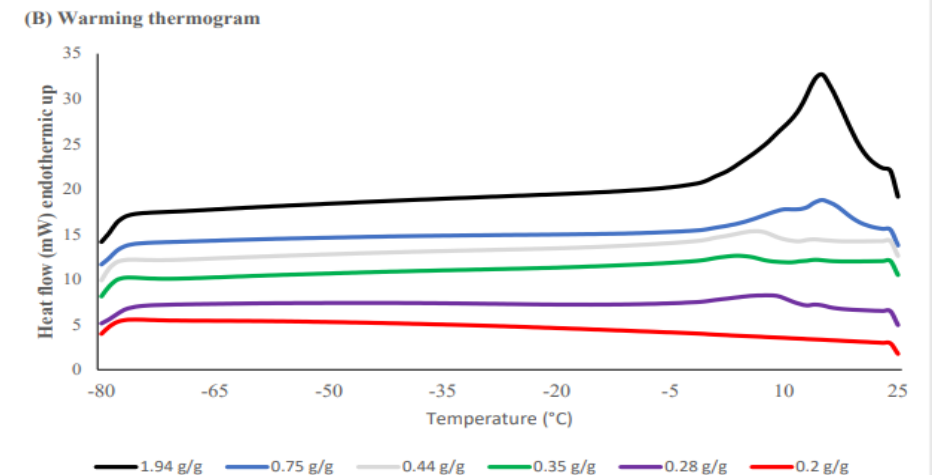
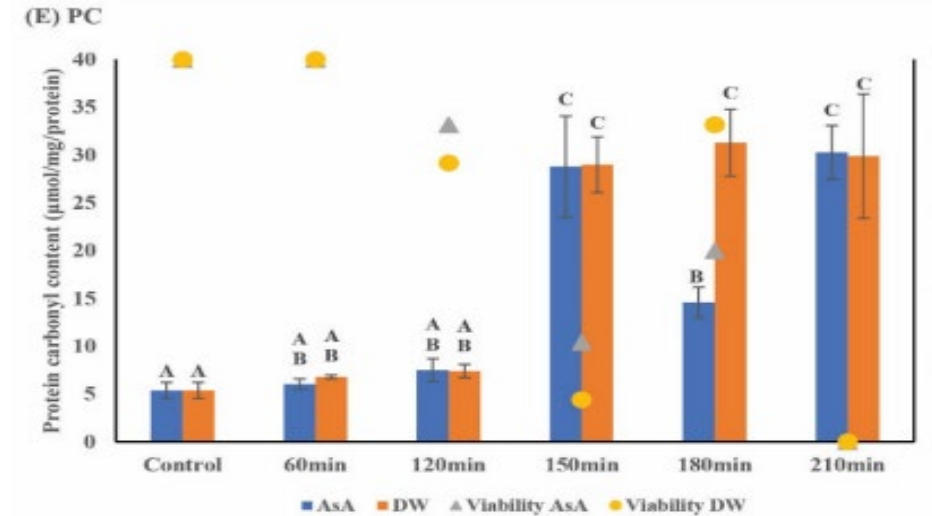
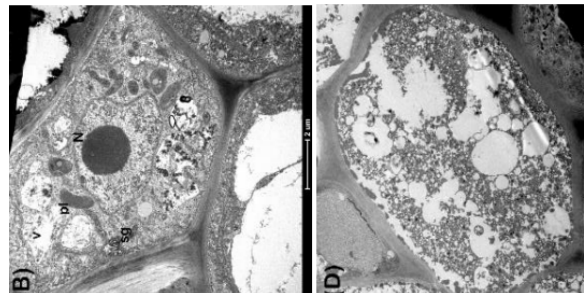
- Swamp maire is a highly threatened Myrtaceae tree species endemic to New Zealand
- Recalcitrant species – embryo cryopreservation for long-term conservation
- The seeds/ embryos exhibits classic recalcitrant behaviour:
  - large seeds /embryos
  - highly metabolic seeds (storage is only possible for c. 6 months)
  - desiccation sensitive
  - high level of oxidative stress during excision and desiccation
- We investigated viability, oxidative stress, thermal properties and ultra-structure of the embryos after desiccation to various MC.



*Syzygium maire* grows in muddy, waterlogged habitat (A) and commonly produces pneumatophores (B) to aid in oxygen uptake. The red fleshy berries (C) mature in summer with a single embryo per seed (D).

# Case study: Enhancing cryobiological knowledge of *Syzygium maire*

- Fresh embryos had a MC of c. 1.9 g/g with 100% viability but rapid desiccation to MC < 0.3 g/g significantly reduced viability
- Decreased activities of the enzymatic antioxidants superoxide dismutase, catalase and glutathione peroxidase
- **Sevenfold increase in the production of protein carbonyls and lipid peroxides**
- Differential Scanning Calorimetry analysis showed no ice nucleation after 210 min desiccation (MC c. 0.2 g/g)
- Ultra-structural damage following drying
- Needs multidisciplinary approach



# Hermetic storage of seed in flood affected areas of Pakistan



**Irfan Afzal** from the STO TCOM and University of Agriculture, Faisalabad Pakistan in collaboration with Concern Worldwide provided help to flood victims in Pakistan;

1) through relief camps provided food and feed supplies

2) provided seed of demand driven crops to ensure food security and poverty alleviation of small-scale farmers

3) hermetically sealed drums (160 L) and hermetic bags (50 kg capacity) were provided to the small farmers for preservation of quality seed for next growing season







# B. Publications (2)



B2. Scientific Publications			
	Target: 60 publications in 3 years	Proposed finalisation	Collaboration
<p>Global Science and Technology, v. 14, p. 8-12.</p> <p>Journal of Seed Sciences (antiga Revista Brasileira de Sementes), v. 44, p. e202244012-11.</p> <p>Seed Science Research, v. 31, p. 1-9.</p> <p>Plants, 11, 1056. <a href="https://doi.org/10.3390/plants11081056">https:// doi.org/10.3390/plants11081056</a>.</p> <p>Acta Hortic. 1334. ISHS 2022. DOI 10.17660/ActaHortic.2022.1334.19 Proc. II International Symposium on Tropical and Subtropical Ornamentals Eds.: Krisantini et al.</p> <p>Chapter in <i>Plant Regeneration from Seeds</i> (pp. 259-273). Academic Press.</p> <p>Food Chemistry 373:131020. <a href="https://doi.org/10.1016/j.foodchem.2021.131020">https://doi.org/10.1016/j.foodchem.2021.131020</a></p> <p>Frontiers in Plant Science 13. <a href="https://doi.org/10.3389/fpls.2022.1050411">https://doi.org/10.3389/fpls.2022.1050411</a></p> <p>A PhD thesis (supervised by Nadarajan J).</p> <p>A Masters thesis (supervised by Nadarajan J).</p> <p>Journal of Horticulture and Forestry, 14(1), 1-9. DOI: 10.5897/JHF2021.0681</p> <p>Plants 11: 35. <a href="https://dx.doi.org/10.3390/plants11010035">https://dx.doi.org/10.3390/plants11010035</a></p> <p>Plant Biol. 24: 836-845. <a href="https://doi.org/10.1111/plb.13421">https://doi.org/10.1111/plb.13421</a></p> <p>Physiol. Plant. 174: e13698. <a href="https://dx.doi.org/10.1111/pp1.13698">https://dx.doi.org/10.1111/pp1.13698</a></p> <p>Front. Plant Sci. 13: 1049323. <a href="https://dx.doi.org/10.3389/fpls.2022.1049323">https://dx.doi.org/10.3389/fpls.2022.1049323</a></p> <p>Plants 11: 598. <a href="https://dx.doi.org/10.3390/plants11050598">https://dx.doi.org/10.3390/plants11050598</a></p> <p>Cereal Res. Commun. 50: 709–715. <a href="https://dx.doi.org/10.1007/s42976-021-00240-3">https://dx.doi.org/10.1007/s42976-021-00240-3</a></p> <p>Plants 11: 2105. <a href="https://dx.doi.org/10.3390/plants11162105">https://dx.doi.org/10.3390/plants11162105</a></p>	<p>2025</p> <p>18 articles published in 2022</p> <p>On target</p>	<p>Committee members with various international collaborators covering seed storage biology</p>	

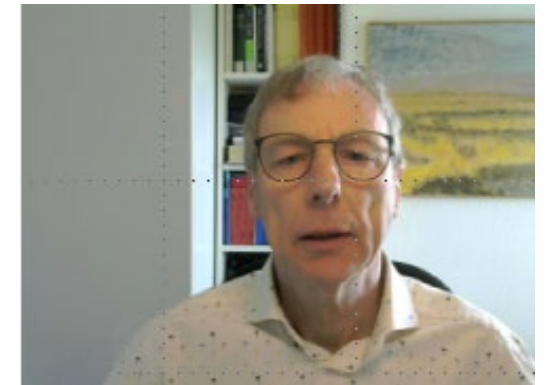
## C. Seminars (1)

### 1. ISTA Congress, Cairo 8-11 May 2022

- STO TCOM was represented virtually by Irfan Afzal, Steven Groot and Jayanthi Nadarajan.
- The technical committee presentation was made on 9<sup>th</sup> May 2022 with Jayanthi gave an update on the STO TCOM activity updates covering membership, seed storage handbook writing, ISTA special project, publications, conferences, and workshops.
- Steven presented on 'The quantitative effect of oxygen on seed storage'
- Irfan's presentation covered "Quinoa seed priming and longevity, role of oxygen and moisture on seed longevity of rice, and dry chain technology for safe storage of maize seeds".



Irfan Afzal

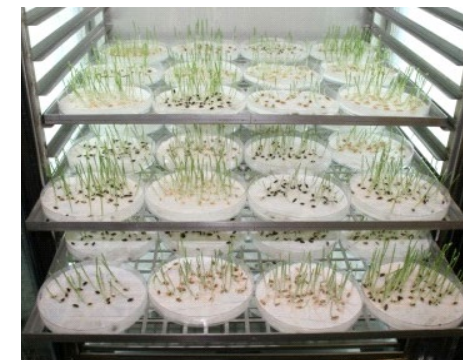


Steven Groot

## 2. The ISTA Seed Symposium Athens, November 4-6, 2022

- Topic: 'Quality Seed for Sustainable Agriculture' which was covered by five sessions:
  - Seed microbial interaction
  - Heirloom and wild species for sustainability
  - New Technologies
  - Molecular understanding of seed dormancy and deterioration
  - Biomolecular techniques for species and varietal assessment
- STO TCOM was represented by **Andreas Börner**.
- Presentation title: **Seed banks – a reservoir for molecular studies on seeds**
- Session: **Molecular understanding of seed dormancy and deterioration**
- Provided a platform for discussion and knowledge transfer on advances in seed science and technology.

<https://www.seedtest.org/en/annual-events/ista-seed-symposium-2022-product-10023.html>



## C. Seminars (3)



### 3. Empowering Seed Industry in Malaysia 2022

- A conference and an international webinar on “**Paving the way for Seed Industry Symposium 2022**” were organised by the Department of Agriculture, Malaysia in collaboration with the Ministry of Agriculture and Food Industry (MAFI), ASEAN Seed Council (ASC), National Seed Association Malaysia (NSAM) and the Asia & Pacific Seed Association (APSA) on 10-12 October 2022.
- The event was organised in a hybrid form with the physical session held at the Pacific Regency Hotel, Kuala Lumpur, Malaysia.
- **Jayanthi Nadarajan** represented ISTA Seed Storage Committee and presented an invited talk on “**Seed Storage and Conservation Science: Advances and applications for seed industry**”.
- Attracted over 3000 participants from seed industry, research and government organisations



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Ruj Kami : JP.KPP.100-9/1/1/2 JLD.9 (52)  
Tarikh : 28 September 2022

#### Dr. Jayanti Nadarajan

Chair, Seed Storage Committee of International Seed Testing Association (ISTA)  
120 Mt Albert Road, Sandringham,  
Auckland, New Zealand

Dear Dr.,

#### INVITATION TO BE THE SPEAKER

It is our great pleasure to announce that the Department of Agriculture, Malaysia in collaboration with the Ministry of Agriculture and Food Industry (MAFI), ASEAN Seed Council (ASC), National Seed Association Malaysia (NSAM) and the Asia & Pacific Seed Association (APSA) is organising a conference on “**Empowering Seed Industry 2022**” and the “**International Webinar on Paving the Way for Seed Industry Symposium 2022**”. The event is organized in a hybrid form where the physical session will be held at Pacific Regency Hotel and Suites, Kuala Lumpur while the international webinar will be conducted VIRTUALLY from the **10-12 October 2022**.

### 4. ISSS/ISTA Webinar on fundamental and applied aspects of seeds

- Two joint ISSS/ISTA webinars were held in June and December 2022.
- Louise Colville was in the organising committee for these webinars.
- The first was focussed on the topic of seed development and viability.
- The most recent webinar was held in collaboration with the International Network for Seed-based Restoration (INSR) on the topic of “Web-based resources for seed scientists”.
- This included a presentation by Simone Pedrini (Curtin University, Australia) on “Native seeds for ecological restoration and the new life of SID (Seed Information Database)”.
- Simone demonstrated the new look Seed information Database (<https://ser-sid.org/>) that was developed by the Royal Botanic Gardens Kew and is now hosted by the Society for Ecological Restoration.
- Details and recordings of previous ISSS/ISTA webinars are available here:

<https://www.seedtest.org/en/events/iss-ista-webinars.html>





Louise Colville

Secretary | [International Society for Seed Science](#)



# D. Workshops

Proposed workshops	Target	Committee member responsible
1. A workshop on seed storage in Brazil in conjunction with the seed storage symposium	2025	 <p>Nelson Barbosa Machado-Neto</p>
2. Regional Seed Storage Workshop in Pakistan	2023	 <p>Irfan Afzal</p>

# E. ISTA Special Projects (1)



	Target	Collaboration
<p><b>1. Ongoing project</b></p> <p>Use of equilibrium relative humidity measurements for determining the moisture status of stored seeds.</p> <p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>i) To assess current use and interest in using seed eRH to assess the moisture status of seeds;</li> <li>ii) To understand the reproducibility of seed eRH measurement in different laboratories around the world</li> <li>iii) Development of a proposal for next steps towards incorporating eRH measurement into the ISTA Rules.</li> </ul>	<p>2023</p> <p>ongoing</p>	<p>ISTA Seed Moisture Committee [Led by Fiona Hay (Moisture Committee) and Jayanthi Nadarajan (Storage Committee)]</p>



# E. ISTA Special Projects (2)



	Target	Collaboration
<p><b>2. New proposed project</b> Storage of halo-primed sunflower seeds under anoxic conditions to improve post-storage vigour and viability and subsequent seedling salt and drought tolerance.</p> <p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>i) To investigate whether cross-tolerance (drought and salinity) can be induced in sunflower seedlings by seed priming</li> <li>ii) To assess whether an anoxic storage atmosphere can reduce the deleterious effects of priming on storage longevity priming in sunflower seeds</li> <li>iii) To identify the physiological and biochemical mechanisms that may underlie this priming induced seedling stress tolerance</li> </ul>	<p>2025</p> <p>(proposal submitted to ISTA assessment committee in January 2023)</p>	<p><b>PI:</b> Elisa Monteze Bicalho (Storage Committee) – Federal University of Lavras, Lavras, Minas Gerais, Brazil.</p> <p><b>Co-investigator:</b> Sershen Naidoo – University of the Western Cape, South Africa</p> <p><b>External collaborators:</b> Yara Brasil Fertilizantes SA Barembreg do Brasil AS Federal University of Viçosa, Brazil</p>

Acknowledgements: to all STO TCOM members

Thank you!

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