Singapore's experience of proficiency testing and demonstrating competency



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Terminology:



Proficient is being able to use a skill.

Competent is knowing a skill.

When you become **proficient** in something, you will then be **competent** and will be able to accomplish many things.

Proficient -----> Competent

Proficiency Testing (PT)

Evaluation of participant performance against pre-established criteria by means of <u>Interlaboratory comparisons</u>. " PT is a test of accuracy by comparing the results obtained by one laboratory with the "true" value."

Interlaboratory Comparison

Organisation, performance and evaluation of measurements or tests on the same or similar items by two or more Laboratories in accordance with pre-determined conditions.

ISO Journey: 2005 – 2019, Plant Health Laboratories, Singapore

ISO 17025:

General Requirements for the Competence Of Testing & Calibration Laboratories



ISO 17025:2017: General Requirements for the Competence of Testing & Calibration Laboratories

• A set of requirements used by laboratories to show that they operate a quality management system and that they are **technically competent to do the work that they do**. (*Soft Infrastructure*)



Laboratory Accreditation under ISO 17025

- List of ISO 17025 accredited laboratory tests (subjected to technical review)
- Quality policies & management
- Processes document management, health & safety, information technology, facilities management, human resources & equipment management
- Standard Operating Procedures
- Forms many forms
- Internal Audit 1/yr
- External surveillance audit 1 every year
- External renewal audit 1 every 4 years



List of ISO 17025 Accredited Tests: Singapore

Morphological		Biochemical	Molecular		Chemical
Entomology		12. Extraction and morphological identification of papaya mealybugs, <i>Paracoccus marginatus</i> Williams and Granara de Willink (Insecta: Hemiptera: Pseudococcidae)		22. Enzyme-Linked Immunosorbent Assay for the detection of <i>Cymbidium mosaic virus</i> in orchid samples	
1. Detection of Khapra beetles, <i>Trogoderma g</i> (Insecta: Coleoptera: Dermestidae) from store pro-	<i>ranarium</i> Everts ducts	13. Extraction and morphological identification of <i>Frankliniella</i> <i>occidentalis</i> Pergande (Insecta: Thysanoptera: Thripidae) from orchids and plant products.		23. Enzyme-Linked Immunosorbent Assay for the detection of <i>Odontoglossum ringspot virus</i> in orchid samples	
2. Detection of <i>Thrips palmi</i> Karny (Insectation Thripidae) from Orchids and plant products	Thysanoptera:	14. Extraction and morphologica Glover (Insecta: Hemiptera: Aphie	al identification of <i>Aphis gossypii</i> didae) from plants	24. Detection solanacearum S	of <i>Ralstonia solanacearum</i> using a <i>Ralstonia</i> creening Test Kit from vegetable samples
3. Detection and identification of <i>Bemisia taba</i> (Insecta: Hemiptera: Aleyrodidae) from aquatic plan	<i>aci</i> (Gennadius) nts	15. Extraction and morphological <i>aonidum</i> (Linnaeus, 1758) from h	identification of <i>Chrysomphalus</i> ost plants	25. Microscopio <i>Plumeria</i> specie	c Identification of <i>Coleosporium plumeriae</i> from s
4. PCR identification of <i>Bemisia tabaci</i> (Genn Hemiptera: Aleyrodidae)	adius) (Insecta:	Nema	tology		Soil Management
5. RT-PCR identification of <i>Thrips palmi</i> Thysanoptera: Thripidae)	Karny (Insecta:	16. Extraction and identification of	of plant nematodes from soil	26. Soil extracta	ble Phosphorus
6. Detection of Mediterranean Fruit Fly, <i>Ceratitis c</i> . Diptera: Tephritidae) (Wiedemann) from fresh fruits	<i>apitata</i> (Insecta:	17. Extraction and identification tissues	n of plant nematode from plant	27. Soil extracta	ble Potassium
7. Detection of Queensland Fruit Fly, <i>Bactrocera t</i> (Insecta: Diptera: Tephritidae) from fresh fruits	tryoni (Froggatt)	18. Staining of plant nematodes in	n-situ within plant tissues	28. Soil extracta	ble Calcium
8. RT-PCR identification of <i>Frankliniella occiden</i> (Insecta: Thysanoptera: Thripidae)	talis (Pergande)	19. Detection and morphological crimp/foliar nematode, <i>Aphelench</i> plants.	identification of strawberry noides fragariae from ornamental	29. Soil extracta	ble Magnesium
9. Detection and identification of American serper <i>Liriomyza trifolii</i> (Burgess)(Insecta: Diptera: Agr their host plants	ntine leafminers, omyzidae) from	20. Detection of rice root nemato aquatic plants	des, <i>Hirschmanniella oryzae</i> from	30. Soil extracta	ble Manganese
10. Detection of guava fruit fly, <i>Bactrocera</i> (Insecta: Diptera:Tephritidae) from fruits	correcta (Bezzi)	Phytopa	athology	31. Soil extracta	ble Zinc
11. Identification of fruit fly via barcoding or cytochrome oxidase 1 (mtcoi) gene	of mitochondrial	21. Isolation and identification of a vegetable samples	Fusarium oxysporum from		

Process of Method Development to Provision of Test:



How to Assess the Competence of Staff

ISO 17025:2017 Requirements:

personnel qualification and competence and documentation of it including requirements for education, qualification, training, technical knowledge, skills and experience;

responsibility, authority and interrelationship of all personnel who manage, perform or verify work affecting the results of laboratory activities;

□ appointed personnel responsible for handling of the management system;

□ additional personnel;

□ job descriptions;

procedures and records for determining competence requirements, selection of personnel, training of personnel, supervision of personnel, authorisation of personnel and monitoring of competence of personnel.

Singapore's Experience: Proficiency Assessment & Competency

	New officers	Experienced officers	
1. Define Responsibilities	Role Clarification formAssigned specific designed	nations	
2. Recruitment	 Define competencies in 	n Job Description	
3. Training	 Personnel Training Orientation Training records Training: In-house training, Quality system induction, ASEAN regional trainings etc. 	 Lost/missing certificates -> Competency Documentation signed by Lab Director; Personnel Training Orientation Training records Training: In-house training, Quality system induction, ASEAN regional trainings etc 	
4. Proficiency Assessment	 Overseas Proficiency Testing Programme i.e Wanalytical laboratories (WEPAL) – plants, soil, In-house testing of "blind" samples Defined frequency under ISO 17025 i.e. scheder 	Vageningen Evaluating programme for sediments and organic waste; FAPAS dule of PT for officers.	
	 Verification of identification – plant clinics, or 	verseas experts.	
5. Authorisation	 Competent officers are then authorised to perform specific tests. 		

Singapore's Experience: Competency

Like any conformity assessment, the assessment of competence has to be done according to a specification. Specification = Defined Competency

Define competency specifications for different defined roles for Recruitment.

	Role				
	Registration Officer	Laboratory Analyst	Verifying Officer	Approving Officer	
	Admin avagutiva	Scientist/ Snr Lab	Scientist/Snr	Snr/Principal	
	Aumin executive	Technologist	Scientist	Scientist	
Education background	Min. Cambridge	Min. Cambridge	Min. University	Min. University	
	"O" Level	"O" Level	degree ¹	degree	
Knowledge of Laboratory Services	Basic	Intermediate	Advanced	Advanced	
Knowledge of Quality System	Yes	Yes	Yes	Yes	
Knowledge of Workplace Safety &					
Health	Yes	Yes	Yes	Yes	
Proficient in tests	N.A.	Yes	Yes	No ²	
Relevant working experience	N.A.	N.A.	Min. 1 year ³	Min. 3 years	

For an experienced scientist:

An example of Competency Documentation signed by the Lab Director.

Name of Officer:	Name of Validator: Director		
The office	er possesses the ability to perform th	ne task as re	equired.
Competencies		Yes	No
1. Procedures for isolation & identification of pl	ant pathogenic bacteria/fungi	\checkmark	
2. Procedures for serological testing of plant part	thogenic virus.	\checkmark	
3. Interpretation of results for tests carried out	by the Plant Pathology	\checkmark	
4. Troubleshooting and review of procedures us	ed in the Plant Pathology	\checkmark	
5. Training of staff on procedures used in the Pla	ant Pathology	\checkmark	



Singapore's Experience: Proficiency Testing Programme



WEPAL Soil Proficiency Testing Programme:

- PT programme: the participating laboratories receive 4 dried soil samples every 3 months.
- Participating laboratories analyse the samples according to their own procedures and for those elements and parameters they are interested in.
- Participating laboratories submit their results to Wageningen University
- Results are processed at Wageningen University & published every 3 months under code names.
- Singapore Methold: Mehlich 3 (Major & trace elements) : P, K, Mg, Mn, Ca & Zn
- Z score of <u><</u> 3.
- 4 samples can be allocated to more than 1 testing officer to perform the testing to obtain the results.



CABI Microbial Identification:

- "Unofficial" PT programme: Submit 3 fungal samples to Microbial Identification Services in the Centre for Agriculture and Bioscience International (CABI), United Kingdom (UK) to verify the identification.
- 3 samples of Fusarium oxysporum / Coleosporium plumeriae identified by testing officers submitted to CABI, UK for identity verification.
- Results of CABI, UK verification of testing officer's proficiency in identification of *Fusarium oxysporum*



Overseas Expert Consultation:

- "Unofficial" PT programme: Submit samples to an overseas expert i.e entomology or nematology to help with the identification (Require CV of experts).
- Slide mounts insect/nematode specimens; images
- Australia, US etc.

IPPC Guide to delivering phytosanitary diagnostic service (2016):

Proficiency testing determines the performance of individual laboratories for specific tests or measurements and is used to monitor laboratories' continuing performance. This testing will also provide ongoing evidence of an individual's competency.

Singapore's Experience: Competency

IPPC Guide to delivering phytosanitary diagnostic service (2016)

For successful and reliable diagnosis of plant pests, it is essential that staff have (i) adequate training,	
(ii) the opportunity to build experience and(iii) can demonstrate competence.	All stages of the training must be recorded and shall cover: Stage 1 – Reading relevant instructions (e.g. SOPs)
	Stage 2 – Observing the task being performed by a trained member of staff
	Stage 3 – Carrying out the task under supervision

Stage 4 – Assessment of competence to carry out the task unsupervised.

Competence is assessed using, where possible, at least one of the following:

- spiked recovery experiments
- repeat analysis of previously analysed samples
- analysis of reference or proficiency test materials
- comparison of results of trainer and trainee.

Singapore's Experience: Competency to obtain the desired lab results.

QA Form 5.5	rm 5.5 QA Form 5.5: PROFICIENCY TESTING RECORDS				Version Number: 3		
Name of 1 st Ope Date: Programme / As	erator:	Name of 2 nd O Test(s)	perator (where applicable):				
CASE REF &	RESULT OBTAINED BY 1st	RESULT OBTAINED BY 2 nd	ACTUAL RESULTS BY ASSESSOR	PROFICIENCY RATING			
				IN OPERATOR	2 OPENATOR		
SSESSMENT OF OMPETANCY	COMPETENT/NOT COMPETENT DATE:	COMPETENT/NOT COMPETENT DATE:					
roficiency rating	: 1 = Able to carry out procedur 2 = Able to carry out part of th	e or test AND interpret test results, ne procedure or test	where applicable. 3 = Requires further training				
riginal Issue Dat	e: 1 Apr 2013	Page	_ of _	Effective Da	te: 1 Nov 2015		

Proficiency Rating:

- 1 = Competent and can interpret results
- 2 = Competent technically
- 3 = Requires further training
- 4 = Check standards /Controls / Equipment before re-assigning



Singapore's Experience: Learning Points after 14 years

- 1. Compliance to ISO 17025 Requirements:
 - Good framework to start establishment of your systems, procedures & policies.
 - a. Commitment from the Management Walk the Talk
 - b. Need the Team's Buy-In continuous learning journey
 - SOPs good guidance but subjected to review.
 - c. Be Open
- 2. Gaps exist in proficiency assessment for plant health diagnostics.
 - a. Availability in proficiency assessment programme ie. types of plant pests; types of tests etc.
 - b. Costs





Reference:

- 1. ISO 17025: 2017 General Requirements for the Competence of Testing & Calibration Laboratories
- 2. EPPO PM 7/98 (3) (2018): Specific requirements for laboratories preparing for accreditation for a plant pest diagnostic activity.
- 3. IPPC Guide to delivering phytosanitary diagnostic service (2016)

Thank you

