



RESEARCH
PROGRAM ON
Wheat



Technical Report

TRAINING COURSE
ON
Seed Health Testing

9 – 13 May, 2016
Terbol, Lebanon

Organized by
International Center for Agricultural Research in the Dry Areas (ICARDA)

In cooperation with
Lebanese Agricultural Research Institute (LARI)

Under the support of
Japan International Cooperation Agency (JICA)
Arab Fund for Economic and Social Development (AFESD)
CGIAR Research Program (CRP) on Wheat



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EXECUTIVE SUMMARY

Name of the project

Capacity Development in Agriculture for Afghanistan and Regional countries

Partners

Japan International Cooperation Agency (JICA)
Arab Fund for Economic and Social Development (AFESD)
CGIAR Research Program (CRP) on Wheat
International Center for Agricultural Research in the Dry Areas (ICARDA)
Lebanese Agricultural Research Institute (LARI)

Purpose

To enhance Capacity Development of government officials and researchers who are engaged in agricultural development in Afghanistan and other countries.

Specific objectives of the training course on Seed Health Testing

Up-to-date knowledge and enhanced capacity on best practice for seed health testing.

Specific outputs

Seven professionally-trained NARS partners from Afghanistan, two from Lebanon, and six from other countries: one from Syria, one from Iraq-Erbil, one from Egypt, and three from Tunisia on improving skills for seed health testing with an emphasis on dryland agriculture. While seven Afghanis, two Lebanese, one Iraqi and one Egyptian are funded by JICA, two Tunisian were funded by CGIAR Research Program (CRP) on Wheat and the others were sponsored by Arab Fund for Economic and Social Development (AFESD).

Specific outcomes

Design, implement, manage, analyze and report on research and development in seed Health Testing and acquire up-to-date information on research and practical activities in seed health testing in each participating country.

GENERAL OVERVIEW

The aim of seed health testing is to provide crop producers with quality seed to increase crop productivity and quality and achieve food security and poverty reduction. Seed health testing is an integral part of seed production in all functional national seed supply systems. To improve crop productivity for greater food security, the Japanese International Cooperation Agency (JICA) funded a training project for Afghanistan and selected countries in the West Asia and North Africa (WANA) region covering a wide range of agriculture research for development disciplines including seed. This course was one of three courses on seed-related issues to be organized in 2016.

PURPOSE

The movement of germplasm involves a risk of accidentally introducing plant quarantine pests (viruses, fungi, bacteria, nematodes, insect pests and weeds) along with the host plant materials (mainly seeds) and poses a special risk to the importing countries. Of particular concern to the seed industry is seed used for sowing. Seed-borne pathogens may cause disease or death of plants resulting in crop losses and thereby, productive. In order to minimize risks, and avoid the transmission of seed-borne pathogens into countries effective testing procedures are required to ensure that distributed materials are free of pests.

This course included various methods for the detection of seed-transmittable pathogens. Lectures and hands on experiments were given on methods that are used in seed health testing.

TARGETED AUDIENCE

A total of 15 trainees (primarily seed specialists and researchers, details in Annex III) from six countries (Afghanistan, Egypt, Iraq, Syria, Lebanon and Tunisia) participated in the course. While seven Afghanis, two Lebanese, one Syrian and one Egyptian were funded by JICA, two Tunisians were funded by the CGIAR Research Program (CRP) on Wheat and the remaining participants are sponsored by the Arab Fund for Economic and Social Development (AFESD).

ORGANIZING COMMITTEE

Mr. Charles Kleinermann, Head, ICARDA Capacity Development Unit (CDU) - c.kleinermann@cgiar.org

Dr. Safaa Kumari, Head of ICARDA Seed Health Laboratory/Plant Virologist, (BIGM) - s.kumari@cgiar.org

Mr. Masafumi Tamura, Technical Training Officer, ICARDA CDU (m.tamura@cgiar.org)

For the list of trainers, please refer to Annex II.

COURSE STRUCTURE

The course program consisted of class room lectures, technical visits and practical sessions on seed health testing (Annex I). A training manual on seed health testing and reference materials of PowerPoint presentations on seed health testing were distributed to the trainees. All the training materials were provided to the trainees at the end of the course.

COURSE IMPLEMENTATION

The five-day course was designed to cover major quarantine seed-borne pests of food legume and cereal crops, seed health testing methods, methodology of seed sampling, seed certification and quality, and management of seed-borne pest.

The first day: Prior to the course introduction, a zero assessment test was undertaken to examine the background knowledge of the trainees in order to ensure that the level of lecturing, practical sessions, and exercises were adapted to the level of knowledge of the group. Following the zero assessment, Dr. Safaa Kumari introduced **Seed Health Testing & Quarantine**, and also **major quarantine seed-borne pests of food legume and cereal crops**. Mr. Abdul Rahman Moukahel in collaboration with Dr. Safaa Kumari introduced the **methodology of seed sampling**.

On the second day, Dr. Safaa Kumari introduced **detection methods of seed-borne pests**, and this was followed by trainees conducting three **laboratory detection methods (Centrifuge Washing Test, Freezing Blotter Test, and Direct Inspection/Visual Examination)** at ICARDA's seed health Laboratory in Terbol accompanied by Dr. Kumari and Mr Moukahel.

On the third day, trainees spent the whole day at **ICARDA's seed health laboratory** and conducted four **laboratory detection methods (Tissue blot immunoassay, Slide Agglutination Test, Nematode Extraction Test, and Agar Plate Test)** accompanied by Dr. Kumari & Mr Moukahel.

On the fourth day, Dr Safaa Kumari introduced the trainees to **management of seed-borne pests**, followed by a visit to the **Advancing Research Enabling Communities Center (AREC) in American University of Beirut**. Trainees explored a series of demonstration sessions on **seed processing** followed by lectures on **Seed Certification Components and Functions, Seed Quality Attributes and Evaluation Methods, Seed Processing and Storage** in Quality Seed Production by Dr. Abdoul Aziz Niane.

On the final day, the trainees together with Mr. Moukahel visited **the fumigation unit and fields at ICARDA's Terbol station**. This was followed by discussions and a final assessment of the trainees. The assessment indicated an average score of 81.7% and an average improvement of 30.7% (for more information about the zero assessment scores, please refer to Annex IV).



Participants during field inspection, ICARDA Terbol station, May 13, 2016

Zero – Final ASSESSMENT

A zero assessment was conducted on the first day of the training. The results showed that the knowledge of the trainees was basic: 6 trainees received a score under 40% ; 7 Trainees received a score between 40 and 60%. For more information, please refer to Annex IV. The average percentage group score at the zero assessment reached a score of 52.8%.

In order to evaluate the knowledge that the trainees gained after a week of training, a final assessment was conducted and the results showed a tangible improvement. The percentage group score increased by 83.9%, and a 31.1% of average gain in knowledge. One trainee received a score of 100%, and 15 trainees received a score between 80-95%, while only two trainees scored between 40-45% (See details in Annex IV).

GENERAL COURSE EVALUATION BY TRAINEES

At the end of the training course, each participant provided their feedback on their perception of the effectiveness of the training course format and content.

64% of the participants qualified the course as excellent and 35% qualified it as very good. Participants expressed their interest in giving more time for lectures by extending the course duration, which will also allow more time for discussion and group work.

With respect to the technical level of the topics covered in the training, 78% of the participants considered that the delivered material was very useful.

CONCLUSION

The trainees nominated for the course were of high quality and appeared eager to participate. The mixture between lectures, practical work and discussions appeared to work well, and the enthusiasm of the trainees over the five-day course appeared to remain high. The course evaluations supported the approach taken, and the pre and post-knowledge assessment tests demonstrated an overall improvement in understanding the material.

The financial support of JICA, AFESD, CRP Wheat and the logistical support by LARI and course arrangements made by ICARDA CDU and ICARDA office in Lebanon were crucial in the organization and success of the course. The technical visit to ICARDA's seed unit facilities at the Advancing Research Enabling Communities Center (AREC) of the American University of Beirut, and the demonstration of their seed processing and storage facilities and management practices were highly appreciated. Special thanks goes to Ms. Ghinwa Salhab for the exceptional logistic support provided throughout the course.

Annex I: Course Program

Date / Time	Session	Trainer
Monday, May 9		
8:30 – 9:30	Registration and Zero assessment	
9:30 – 10:00	Opening session	ICARDA & LARI representatives
10:00 – 10:30	Coffee break	
10:30 – 13:00	Lecture 1 – Introduction: Seed Health Testing & Quarantine	Dr. Safaa Kumari
13:00 – 14:00	Lunch break	
14:00 – 15:30	Lecture 2 – Major quarantine seed-borne pests of food legume and cereal crops	Dr. Safaa Kumari
15:30 – 16:00	Coffee break	
16:00 – 17:00	Lecture 3 – Seed sampling: Methodology	Dr. Safaa Kumari/ Mr. Abdul Rahman Moukahel
Tuesday May 10		
8:30 – 10:00	Lecture 4 - Detection Methods of Seed-borne Pests	Dr. Safaa Kumari
10:00 – 10:30	Coffee break	
10:30 – 17:00	Practical Session 1 - Laboratory Exercises (Part I) <ul style="list-style-type: none"> - Centrifuge Washing Test (for cereal fungal diseases) - Freezing Blotter Test (for cereal fungal diseases) - Direct Inspection/Visual Examination (for legume & cereal storage insect pests & weed seeds) 	Dr. Safaa Kumari / Mr. Abdul Rahman Moukahel
13:00 – 14:00	Lunch break (Lunch box)	
Wednesday May 11		
8:30 – 17:00	Practical Session 2 - Laboratory Exercises (Part II) <ul style="list-style-type: none"> - Tissue blot immunoassay (for legume & cereal viral diseases) - Slide Agglutination Test (for legume & cereal bacterial diseases) - Nematode Extraction Test (for legume & cereal nematode pests) - Agar Plate Test (for legume fungal diseases) 	Dr. Safaa Kumari / Mr. Abdul Rahman Moukahel
10:00 – 10:30	Coffee break	
13:00 – 14:00	Lunch break (Lunch box)	
Thursday May 12		
08:30 – 10:30	Lecture 5 - Management Seed-borne Pests	Dr. Safaa Kumari
10:30 – 11:00	Coffee break	
11:00 – 12:00	Lecture 6 - Seed Certification Components and Functions	Dr. Abdoul Aziz Niane
12:00 – 13:00	Lecture 7 - Seed Quality Attributes and Evaluation Methods	Dr. Abdoul Aziz Niane
13:00 – 14:00	Lunch break	
14:00 – 17:00	Practical Session 3 - Seed Processing and Storage in Quality Seed Production (AREC)	Dr. Abdoul Aziz Niane
Friday May 13		
8:30 – 13:00	Practical Session 4 - Field Inspection Practical Session 5 - Fumigation Process	Mr. Abdul Rahman Moukahel
13:00 – 14:00	Lunch break	
14:00 – 14:30	<ul style="list-style-type: none"> - Zero assessment - Round up discussions 	ALL
14:30 – 15:00	Coffee break	
15:00 – 16:00	Closing session	JICA, ICARDA & LARI representatives

Annex II: Trainers

Trainers	Name & Surname	Institution	E-mail
1	Dr. Safaa Kumari	BIGM- ICARDA	s.kumari@cgiar.org
2	Dr. Abdoul Aziz Niane	BIGM- ICARDA	a.niane@cgiar.org
3	Mr. Abdul Rahman Moukahel	BIGM- ICARDA	a.moukahel@cgiar.org

**Annex III: List of Participants
JICA**

#	Name	Country	Gender	E-mail address	institution	Phone number
1	Mr Allah Yar Shamsurahman	Afghanistan	M	N/A	Ministry of Agriculture- Seed Certification Lab	+93-1776275914
2	Mr Zabihullah Dawlatzay	Afghanistan	M	dawlatzay_zabihullah@yahoo.com	Ministry of Agriculture- Seed Certification Lab	+93-786384215
3	Mr Abdullah Abed Rahmatgul	Afghanistan	M	abdullahabed2012@yahoo.com	Ministry of Agriculture- Seed Certification Lab	+93-772466052
4	Mr Ahmad Rafi Rafaat Aboubakr	Afghanistan	M	ahmad0093786@gmail.com	Regional manager of field inspection	+93-799252887
5	Mr Nangialai Hakimi	Afghanistan	M	nangialai10hakimi@gmail.com	Machinery Inspector, Heart	+93-796125418
6	Mr Besmellah Muradi	Afghanistan	M	besmellah_muradi@yahoo.com	Data Management Manager	+93-728296296
7	Mr. Samsor Attaullah	Afghanistan	M	shamidi.icarda@gmail.com	field assistant - ICARDA	+93-787606101
8	Ms. Rehab Ahmed Mohamed Abd-Elrahman	Egypt	F	rehab3mm@yahoo.com	ARC	+20-1002279825
9	Ms. Kazhal Hassan Rahim	Iraq	F	kazhalhassan8928@yahoo.com	Research Production unit	+064-7701933643
10	Mr. Hussein Ali Chouman	Lebanon	M	N/A	LARI	+961-71-761703
11	Ms. Rola Abouzeid	Lebanon	F	rola.m.b@hotmail.com	LARI	+961-71-340954

AFESD

#	Name of nominee	Country	Gender	E-mail address	institution	Phone number
12	Mr. Rami Hamwi	Syria	M	rami.hamwe@gmail.com	GCSAR	+963-955187807
13	Mr. Ikbal Chaieb	Tunisia	M	ikbal_c@yahoo.fr	CRRHAB	+216-98624118

ICARDA – CRP Wheat

#	Name of nominee	Country	Gender	E-mail address	institution	Phone number
14	Ms. Marwa Ben Omrane	Tunisia	F	marwabenomrane@gmail.com	ICARDA	+216-52555803
15	Ms. Samia Mghandef	Tunisia	F	samia19@rocketmail.com	ICARDA	+216-94452696

Annex IV: Zero assessment-Scores

JICA

Name	Country	Zero assessment		
		Initial test (%)	Final test (%)	Gain in knowledge (%)
Mr Allah Yar Shamsurahman	Afghanistan	35	90	55
Mr Zabihullah Dawlatzay	Afghanistan	60	90	30
Mr Abdullah Abed Rahmatgul	Afghanistan	85	100	15
Mr Ahmad Rafi Rafaat Aboubakr	Afghanistan	50	90	40
Mr Nangialai Hakimi	Afghanistan	35	90	55
Mr Besmellah Muradi	Afghanistan	65	85	20
Mr Samsor Attaullah	Afghanistan	55	90	35
Ms Rehab Ahmed Mohamed Abd-Elrahman	Egypt	60	95	35
Ms Kazhal Hassan Rahim	Iraq	50	70	20
Mr Hussein Ali Chouman	Lebanon	30	45	15
Ms Rola Abouzeid	Lebanon	25	40	15
Averages		51.0	81.7	30.7

AFESD

Name	Country	Zero assessment		
		Initial test (%)	Final test (%)	Gain in knowledge (%)
Mr Rami Hamwi	Syria	70	80	10
Mr Ikbal Chaieb	Tunisia	70	80	10
Averages		70	80	10

ICARDA – CRP Wheat

Name	Country	Zero assessment		
		Initial test (%)	Final test (%)	Gain in knowledge (%)
Ms Marwa Ben Omrane	Tunisia	20	85	65
Ms Samia Mghandef	Tunisia	55	95	40
Averages		37.5	90.0	52.5

Total Averages

Averages	Zero assessment		
	Initial test (%)	Final test (%)	Gain in knowledge (%)
	52.8	83.9	31.1

Annex V: Zero assessment-Test sample

Name:

Country:

PLEASE CHOOSE THE CORRECT ANSWER (ONLY ONE)

1. **Which of the following is a seed-borne disease in chickpea? (5 marks)**
 - Spot Blotch (*Bipolaris sorokiniana*)
 - Ascochyta blight (*Ascochyta rabiei*)
 - Flag smut (*Urocystis agropyri*)

2. **Which of the following is a seed-borne disease in wheat? (5 marks)**
 - Common bunt (*Tilletia tritici* & *Tilletia laevis*)
 - Alternaria blight (*Alternaria alternata*)
 - Gray mold (*Botrytis cinerea*)

3. **The first cereal seed-borne disease occupies the top of the quarantine list worldwide is: (10 marks)**
 - Tan spot (*Pyrenophora tritici-repentis*)
 - Karnal bunt (*Tilletia indica*)
 - Khabra beetle (*Trogoderma granarium*)

4. **Which of the following viruses is a seed-borne in cereal crops (barley/wheat)? (5 marks)**
 - Barley yellow dwarf virus (BYDV)
 - Barley stripe mosaic virus (BSMV)
 - Barley yellow striate mosaic virus (BYSMV)

5. **Which of the following viruses is a seed-borne in legume crops (faba bean/lentil)? (5 marks)**
 - Broad bean stain virus (BBSV)
 - Faba bean necrotic yellows virus (FBNYV)
 - Bean leafroll virus (BLRV)

6. **Which of the following seed-borne diseases is a bacteria pathogen? (5 marks)**
 - Anthracnose (*Colletotrichum lindemuthianum*)
 - Alternaria blight (*Alternaria alternata*)
 - Basal glum rot (*Pseudomonas syringae* pv. *atrofaciens*)

7. **Seed-borne pathogens can attach the seeds by one of the following stages: (10 marks)**
 - The mother plant get infected by the pathogen, it attack seeds also
 - During processing & transportation
 - During storage
 - All the above

8. **The main objectives of the Seed Health Testing is: (5 marks)**
 - Test the health status of germplasm
 - Minimize the phytosanitary risks associated with the movement of germplasm
 - Prevent the spread of seed-borne diseases
 - All the above

9. **Is it possible to control seed-borne viruses chemically? (5 marks)**
 - No
 - Yes

10. **The most important and harmful storage insect worldwide is: (10 marks)**
- Granary weevil (*Sitophilus granaries*)
 - Khapra beetle (*Trogoderma granarium*)
 - Grey Mold (*Botrytis cinerea*)
11. **One of the disadvantage of the fumigation process is: (5 marks)**
- Wide spectrum
 - Reach pests in their most remote hiding places
 - No protective residue so that is possible re-infest seeds immediately after treatment
12. **The best option for controlling bunt and smut diseases in cereal crops under field conditions is: (5 marks)**
- Chemical application
 - Seed testing
 - Plant rouging
13. **Management of seed-borne pests can be done through: (5 marks)**
- Crop production practices
 - Seed fumigation
 - Plant quarantine
 - All the above
14. **The suitable test for detecting *Ascochyta rabiei* in chickpea is: (5 marks)**
- Freezing Blotter Test (FBT)
 - Embryo Test (ET)
 - Agar Plate Test (APT)
15. **Which of the following is the best test for detecting seed-borne viruses of legume and cereal crops? (5 marks)**
- Tissue-blot immunoassay (TBIA)
 - Centrifuge Washing Test (CWT)
 - Agar Plate Test (APT)
16. **The common test for detecting seed-borne bacteria is: (5 marks)**
- Slide agglutination test
 - Indicator-inoculation test
 - Nematode Extraction Test
17. **The structure in the figure is: (5 marks)**
- Nematode eggs
 - Pupa of insect
 - Spore of fungus
 - Virus particle



Annex VI: General Course Evaluation

I. Contents of the course:

Item/rating/percentage	OVERALL AVERAGE
Relevance of the course to your job 1=Not relevant; 5=Very relevant	3.7
Accomplishment of subject matter 1=Inadequate 5=Very comprehensive	4.3
Clarity of course objectives 1=Not clear; 5=Very clear	4.3
Level of lectures 1=Too basic 5=Too	3.9
Time allocated for discussions 1=Too short 5=Too long	3.1
Interaction with participants enrolled in the course 1=Very low 5=Very high	4.3
Overall, how would you rate this course 1=Poor 5=Excellent	4.6

II. Schedule and time allocation:

Item/rating/percentage	OVERALL AVERAGE
Percentage of Time allocated to lectures 1=Too short 5=Too long	3.1
Usefulness of Lectures 1=not useful 5=useful	4.5

III. Teaching aids:

Item/rating/percentage	OVERALL AVERAGE
Effectiveness of teaching aids in general 1=Not effective 5=Very effective	4.5
Clarity of slides/overheads/Powerpoint 1=Not clear 5=Very clear	4.7
Handouts and material 1=Not useful 5=Very useful	4.7

IV. Administrative arrangements:

Item/rating/percentage 1=NI 5=Excellent	OVERALL AVERAGE
Pre-course communication	4.5
Travel arrangements	4.3
Quality of the accommodation	4.2
Payment of allowance on time	4.6
Transportation	4.8
Lecture rooms	4.9

V. Your comments and suggestions on the course:

1. Please state the three most important ideas/concepts that you learned from this course

- Breeding and seed certification components and function
- Fumigation process
- Seed diseases, virus, and fungus
- Seed born diseases and its control
- Field inspection
- Slide agglutination test
- Sampling and sampling size

2. Suggestions for future improvement of the courses

- The course will be longer than 5 days.
- More practices for different methods of seed inspection

3. Do you recommend this course to be repeated in the future?

Yes
100%

No

End