



Norad



RESEARCH
PROGRAM ON
Wheat



Cap Dev Lectures series: Breeding autogamous cereals - a complete lecture from *Parents to Farms*

Filippo M Bassi
senior durum wheat breeder



icarda.org

International Center for Agricultural Research in the Dry Areas

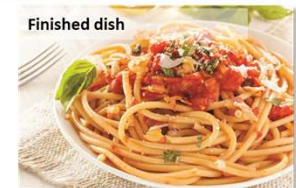
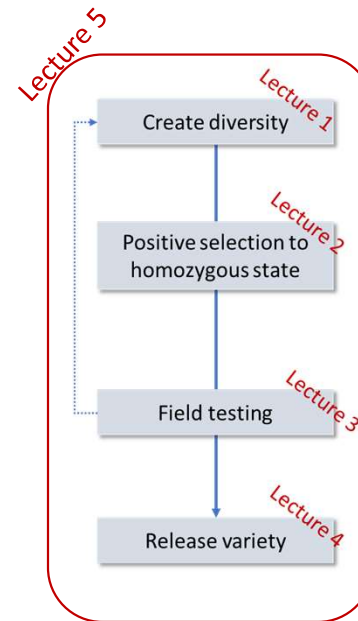
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Lecture 6 – April 26th 2022

- **Working as a breeder**
 - What do you need in your CV
 - Where to work
- **End of lectures self test**
 - 10 questions, 2 min each + 3 min explanation
 - Certificate



Working as a breeder: what to put in CV?

Filippo Maria Bassi - Curriculum Vitae

1. Personal information

Born: 07/07/1982

Gender: male

Twitter: @fillobax

Research gate score: 27.27

H-index: 19



Be in the field

2. Higher education degree

2

3. Previous positions and periods of appointment

3

4. Students' supervision

4

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2. Higher education degree

Ph.D. Plant Breeding & Genetics, 2013. North Dakota State University, Fargo (USA)

MSc. Plant Biotechnology, 2008. Università di Modena e Reggio Emilia, Reggio Emilia (Italy) /
ACPF, Adelaide (Australia)

“breeding”

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MSc. Plant Biotechnology, 2008. Università di Modena e Reggio Emilia, Reggio Emilia (Italy) /
ACPF, Adelaide (Australia)

3. Previous positions and periods of appointment

- Visiting scientist at the Leibniz Institute of Gatersleben (IPK) (Germany) 2008;
- Research fellow (PhD) at North Dakota State University (NDSU) (USA) 2009-2012;
- Durum Breeder – Senior Scientist, ICARDA, Rabat (Morocco) 2012 to date.

4. Students' supervision

1. Samir Alahamad. 2015-2018. *Speed pre-breeding for rapid trait pyramiding in durum wheat (Triticum turgidum)*. PhD candidate. University of Queensland, Australia.

Working as a breeder: what to put in CV?

5. Varieties released

Year	Country	Variety name	Pedigree
2013	Lebanon	LAHN 3	20048 <u>Traikia(Mor)</u> /Mrb5//Stj3
2013	Lebanon	<u>Berdawni</u>	Stj3//Bcr/Lks4

Ask your supervisor if you have contributed to any?

6. Workshops, Training, and Relevant Conferences

5

7. List of publications

6

Working as a breeder: what to put in CV?

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2013	Lebanon	Berdawni	Stj3//Bcr/Lks4

6. Workshops, Training, and Relevant Conferences

- 2007, Adelaide (Aus) Transformation Workshop. *Trainee*
- 2008, Bologna (It). From seed to pasta. *Poster presentation*
- 2013, Clermont-Ferrand (Fr) Genomic Selection in Wheat Workshop. *Trainee*
- 2014, Malmo (Swe) Plant Genomic Prediction and Selection Course. *Trainee*
- 2016, Rabat (Mor), 1st International Symposium on Crop Genomic Selection. *Organizing chair*
- 2017, Rabat (Mor), 1st International PhD Students Symposium. *Organizing chair*.
- 2018, Rabat (Mor), 2nd International PhD Students Symposium. *Organizing chair*.

Add here this set of lectures

7. List of publications

- 1. Bassi, Filippo M., A.R. Bentley, G. Charmet, R. Ortiz, and J. Crossa. 2016. Breeding schemes for the implementation of genomic selection in wheat (*Triticum* spp.). *Plant Science*, 242:23-36.
- 2. Zaim M., K. El Hassouni, .., and Filippo M. Bassi. 2017. Wide crosses of durum wheat (*Triticum durum* Desf.) reveal good disease resistance, yield stability, and industrial quality across Mediterranean sites. *Field Crops Research*, 214:219-227.
- 3. Filippo M. Bassi and M. Sanchez-Garcia. 2017. Adaptation and stability analysis of ICARDA durum wheat elites across 18 countries. *Crop Science*, 57:2419-2430.

Try to publish on “breeders” journals

Working as a breeder: what to put in CV?

8. List of research activities

Pre-breeding

1. Use of *crop-wild relatives* for the delivery of superior elite cultivars with better heat and drought tolerance, including several aspects of cytogenetics and physiology
2. Discovery, validation, and use of several novel markers for *marker assisted selection*
3. Define the *history of a crop* by its allelic migration via genetic diversity studies

Breeding

1. Accelerate breeding cycle via *speed breeding, genomic selection, SSD*
2. Define new product profiles to deliver superior cultivars to farmers faster
3. Conduct meaningful on-farm demonstration via *socio-economic selection indexes*
4. Re-define breeding cycle via early generation multi-location testing to capture more climatic variation and more rapidly adapt to climate change
5. Breeding for *climate change adaptation* by integrating abiotic and biotic tolerances

Agronomy

1. Integration of conservation agricultural practices (*GxExM*)
2. Conduct on farm demonstrations of yield advantages of G and *GxM*

Seed system

1. Promotion of *village-based seed enterprises*
2. Identification of hindering policies

Probably you should start your CV from here



Self test: rules

- You will be given 10 questions, 2 for each lecture
- We will do one question at a time:
 - You will have 2 minutes to reply
 - Then we will dedicate 3 minutes to revise it
- You should write down your replies for your own use
- For each question, you need to select ALL answers that apply
 - If you select **ALL the right answers** then you get 1 point
 - Otherwise, you loose **0.25 point per wrong answer**
 - If you get 8 out of 10 points total, then you have passed
 - If you get less, then you should go revise the lecture for which you failed
- The score is for you alone, no need to share it

Test question 1: example

What does a breeder want?

- A. Achieve genetic gain
- B. Have a good life work balance
- C. Have a family
- D. Reduce her/his salary

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Correct answer: A, B, C

Test question 2: example

Was the set of lecture useful?

- A. Amazing
- B. Never spent my time in a better way
- C. What a waste!
- D. Worst teacher ever!

Test question 2: example

Was the set of lecture useful?

- A. Amazing
- B. Never spent my time in a better way
- C. What a waste!**
- D. Worst teacher ever!**

Correct answer: C, D

Test question 3: example

For which of these decisions you can IGNORE the GG equation?

- A. Parents to recycle
- B. What to have for dinner
- C. Number of entries in Stage 1 and Stage 2
- D. Producing certified seeds

Test question 3: example

For which of these decisions you can IGNORE the GG equation?

- A. Parents to recycle
- B. What to have for dinner**
- C. Number of entries in Stage 1 and Stage 2
- D. Producing certified seeds**

Correct answer: B, D



Exam: starts

Ready?

Question 1: lecture 1

Which of these are factors of the genetic gain equation?

- A. Accuracy
- B. Parents selection
- C. Intensity
- D. Heritability

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$$\text{Genetic gain} = \frac{\text{Accuracy} \times \text{Heritability} \times \text{Selection intensity}}{\text{Recycling time}}$$

Correct answer: A, C, D

Question 2: lecture 1

What is true about Omrabi in this pedigree?

Omrabi / Mna1 // Ter1 /3/ Faraj

- A. Is the female contributing its cytoplasm
- B. Is the male contributing its pollen
- C. Contributes 12.5 % of the final genome
- D. Is the most recent parent added to the cross

Question 2: lecture 1

What is true about Omrabi in this pedigree?

Omrabi / Mna1 // Ter1 /3/ Faraj

12.5%

12.5%

25%

50%

- A. Is the female contributing its cytoplasm
- B. Is the male contributing its pollen
- C. Contributes 12.5 % of the final genome
- D. Is the most recent parent added to the cross

Correct answer: A, C



Question 3: lecture 2

Which traits can be effectively selected for in F2 to F4?

- A. Grain yield
- B. Plant height
- C. A complex trait tagged by one or few well validated marker
- D. Biomass



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- A. Grain yield
- B. Plant height**
- C. A complex trait tagged by one or few well validated marker**
- D. Biomass

Correct answer: B and C

Question 4: lecture 2

What is true for the line represented by this selection history?

ICD15-024-0SAN-015MCH-2TR-0STR

- A. It is a 2015 cross
- B. It was achieved using off-season advancement
- C. It was obtained as a selected bulk approach with 15 spikes
- D. It is a F4:5, hence 87.5% homogeneous and 93.8% inbred

Question 4: lecture 2

What is true for the line represented by this selection history?

ICD15-024-0SAN-015MCH-2TR-0STR

F1

F1:2

F1:3

F4

F4:5

- A. It is a 2015 cross
- B. It was achieved using off-season advancement
- C. It was obtained as a selected bulk approach with 15 spikes
- D. It is a F4:5, hence 87.5% homogeneous and 93.8% inbred

Correct answer: A, B, C, and D

Question 5: lecture 3

Which statements are true?

- A. Stage 2 test less progenies than Stage 1
- B. Stage 1 plot size is normally larger than Stage 2
- C. Stage 1 are replicated many times
- D. Stage 2 are tested at one location

Question 5: lecture 3

Which statements are true?

- A. Stage 2 test less progenies than Stage 1**
- B. Stage 1 plot size is normally larger than Stage 2
- C. Stage 1 are replicated many times
- D. Stage 2 are tested at one location

Correct answer: A



Question 6: lecture 3

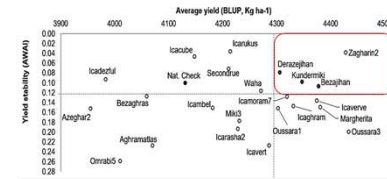
What can be done to get better varieties ?

- A. Increase the number of entries tested in Stage 1
- B. Reduce the number of lines selected for Stage 2 while increasing accuracy
- C. Control GxE effect using stability analysis
- D. Select testing environments that represent well your targeted agro-ecology

Question 6: lecture 3

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Correct answer: A,B, C, and D

Ratio (%)	Stage 1	Stage 2	STD differential	Genetic gain
10.0%	2 400	240	1.750	1.00
5.0%	2 400	120	2.063	1.18
1.0%	2 400	24	2.665	1.52
0.5%	2 400	12	2.892	1.65
0.1%	2 400	2-3	3.253	1.86



Question 7: lecture 4

Which are undeniable requirements to achieve release?

- A. Defining a selection index
- B. Generate spikes that are highly homogeneous
- C. Outperform the check
- D. Make sure the plant looks the same across years



Question 7: lecture 4

Which are requirements to achieve release?

- A. Defining a selection index
- B. Generate spikes that are highly homogeneous**
- C. Outperform the check**
- D. Make sure the plant looks the same across years**

*DUS (Distinctness, Uniformity and Stability)
VCU (Value for Cultivation and Use)*

Correct answer: B, C, and D



Question 8: lecture 4

Which one is the best design for demo plots?

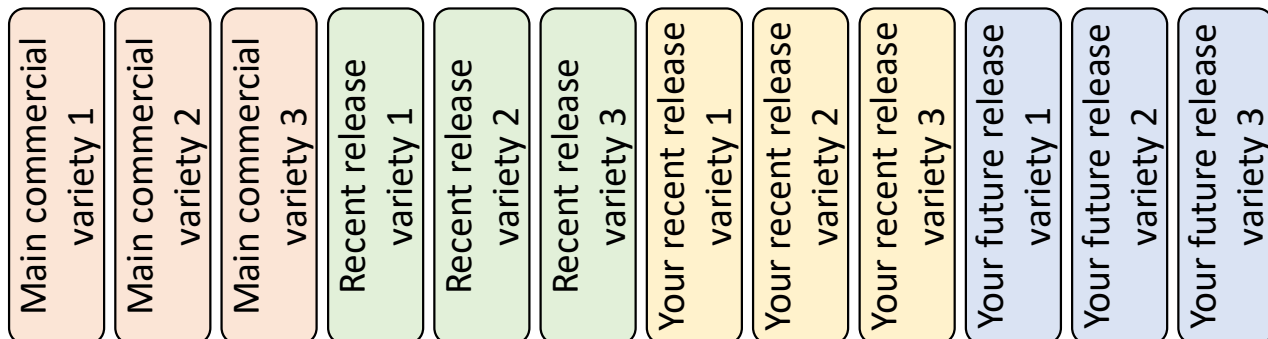
- A. Start the demo with the recently released varieties
- B. Start the demo with the main cultivate varieties
- C. Present a high number of elites that will be released in a few years
- D. Make plots of 5 m²

Question 8: lecture 4

Which one is the best design for demo plots?

- A. Start the demo with the recently released varieties
- B. Start the demo with the main cultivate varieties**
- C. Present a high number of elites that will be released in a few years
- D. Make plots of 5 m²

Correct answer: B



Question 9: lecture 5

How genomics can boost genetic gain?

- A. Increase intensity in F2
- B. Improve accuracy of selection between Stage 1 and Stage 2
- C. Accelerate recycling time
- D. Reduce heritability of traits

Question 9: lecture 5

How genomics can boost genetic gain?

- A. Increase intensity in F2
- B. Improve accuracy of selection between Stage 1 and Stage 2**
- C. Accelerate recycling time**
- D. Reduce heritability of traits

Correct answer: B and C

$$\text{Genetic gain} = \frac{\text{Accuracy} \times \text{Heritability} \times \text{Selection intensity}}{\text{Recycling time}}$$

Accuracy:	reduce experimental error
Heritability:	markers are not affected by GxE
Intensity:	predict more entries without testing them
Time:	predict early and then recombine



Question 10: lecture 5

How genomics can improve breeding operations?

- A. Deploy a selection index at Stage 1
- B. Select parents based on genetic diversity
- C. Reduce the costs of breeding
- D. Protect Intellectual Properties



Question 10: lecture 5

How genomics can improve breeding operations?

- A. Deploy a selection index at Stage 1**
- B. Select parents based on genetic diversity**
- C. Reduce the costs of breeding
- D. Protect Intellectual Properties**

Correct answer: A,B, and D



Done

Well done!!

Did you get 8 points?



Certificate of completion

Cap Dev Lectures series:

Breeding autogamous cereals - a complete lecture from *Parents to Farms*

With this document we certify the completion of a series of six lectures covering all main aspects of plant breeding presented by Filippo M Bassi, Senior Scientist of ICARDA. The topic covered were:
i. Parental selection; ii. Advancement to inbreeding; iii. Stage 1 & 2 yield trials; iv. Stage 3, release, and commercialization of seeds; v. Molecular breeding approaches; vi. Exam

Charles Kleinermann,

Capacity Building Unit of ICARDA

Team Leader

icarda.org