

Barley genetic resources under climate changes: a possible way in field study

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Outlines

- Barley : a typical cereal for the whole world
- Barley landraces: a source of gene richness
- Brainstorming on handling barley accessions
- Conclusion



Barley : a typical cereal for the whole world

-250mm Rainfall

60°N Longitude

4800m altitude



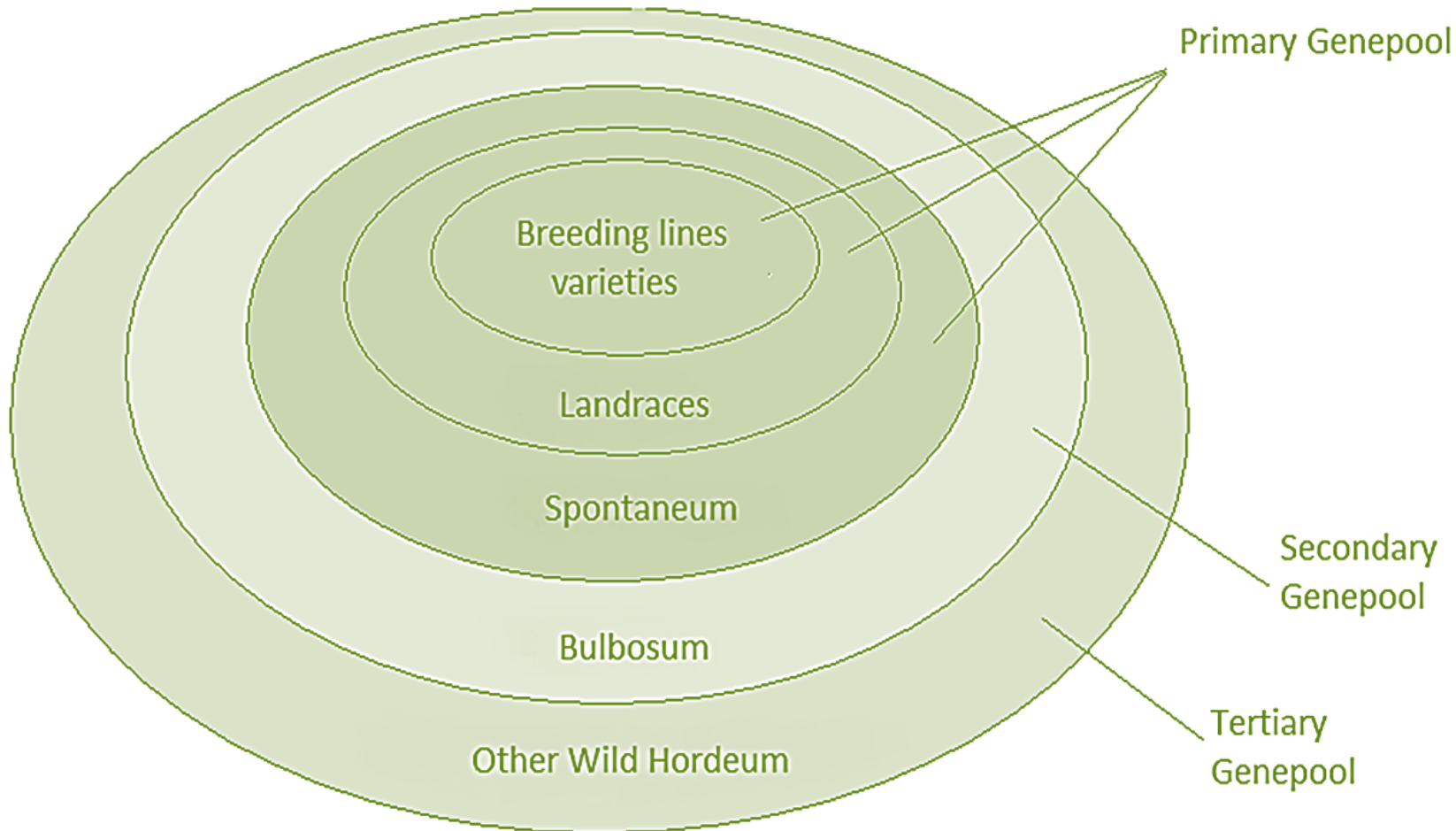
Barley is indeed a food security crop under climate changes

Barley landraces: a source of gene richness

- Oldest domesticated plants in history (10,000 years ago in the Fertile Crescent)
- Genetically heterogeneous populations comprising inbreeding lines and hybrid segregates
- Genetically variable for qualitative and quantitative characters
- Good adaptation to local environmental conditions
- Untapped reservoir of useful genes for adaptation to abiotic & biotic stresses (eg: Rph gene for *Puccinia hordei*)
- Most accessions held in ICARDA's gene banks for securing the gene pools (31 000 barley accessions)



Barley landraces: a source of gene richness



Brainstorming on handling barley accessions

Issues

- The rejuvenation of barley accessions in ex situ conservation is time, space & money consuming
- Limited screening capacity for traits of interest of the massive gene bank collection



Easy way to evaluate large number of accessions for traits of interest ?

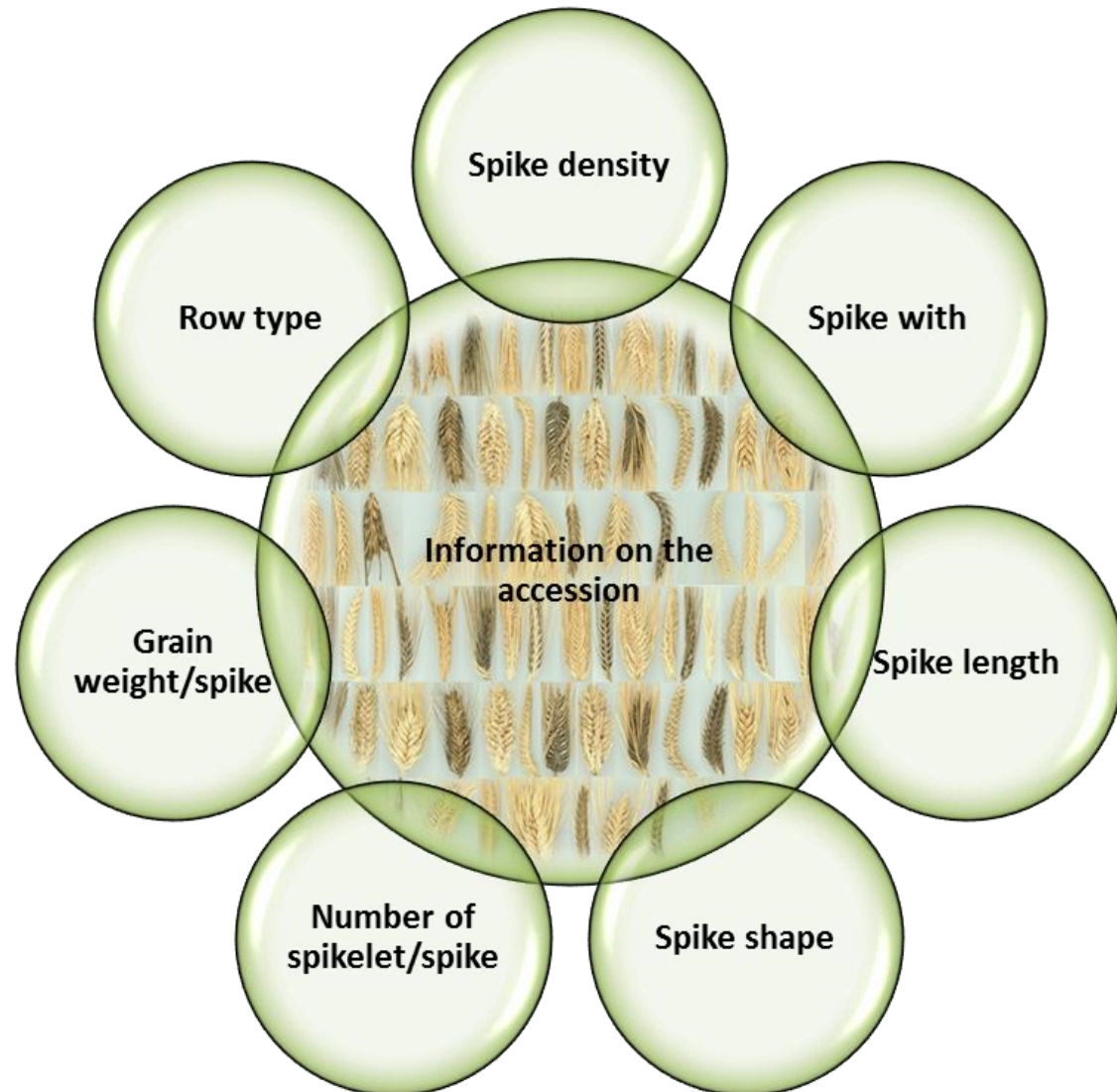
Easy rejuvenation of the accessions effectively with less costs?



Brainstorming on handling barley accessions

Barley Spikes

- Traditional seed saving in spikes was used for a long time
- Used for pre-basic seed increase in some countries (eg: Algeria) & off-season testing
- Spikes hold significant information on the accession →





Brainstorming on handling barley accessions

- **Step I: Experiment**
- Head planting of 8 best Moroccan varieties replicated three times (inter-heads 1m) at Marchouch experiment station 2012-2013

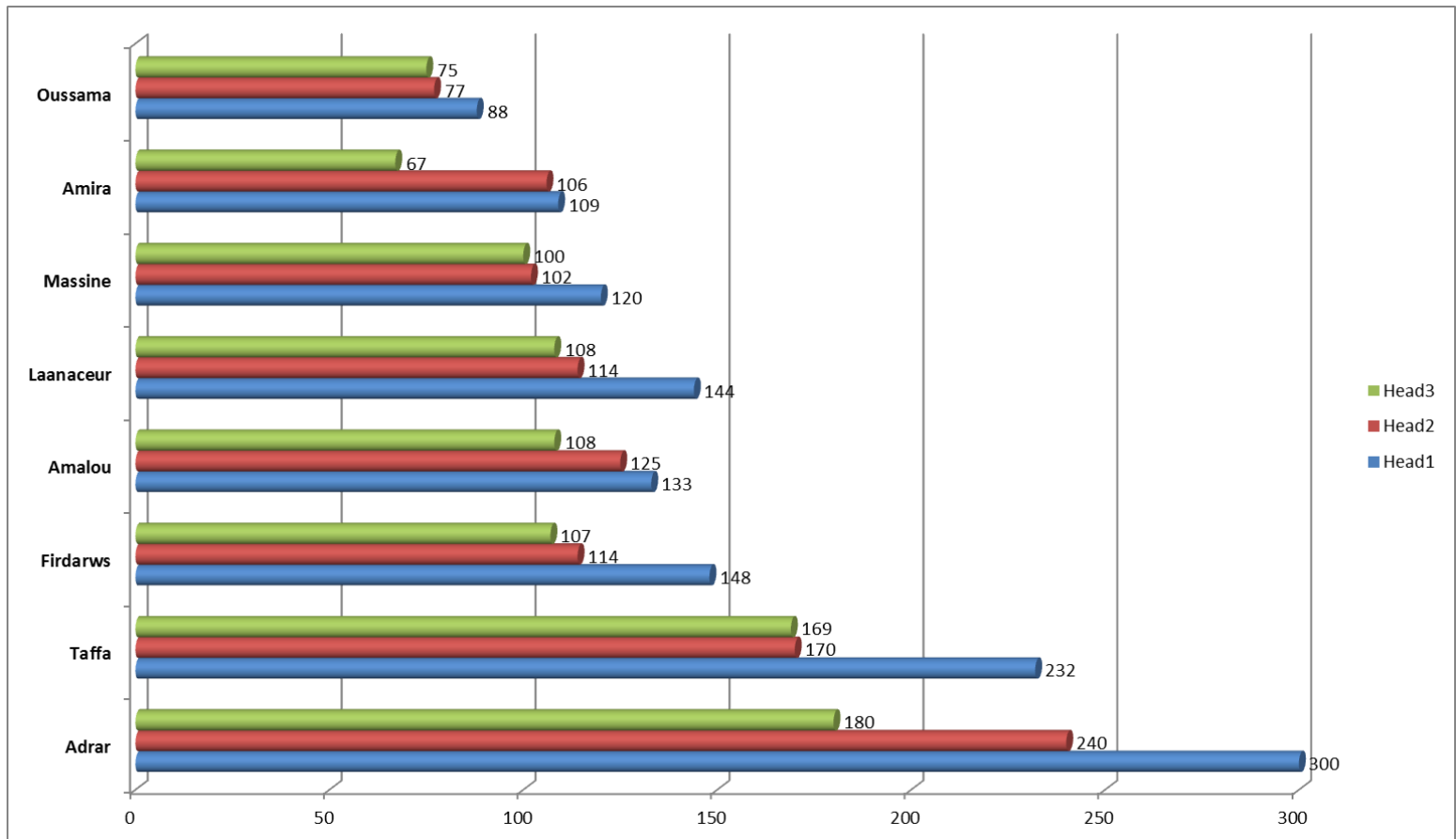


Variety	Row type
Adrar	2 Row barley
Taffa	6 Row barley
Firdaws	6 Row barley
Oussama	6 Row barley
Massine	6 Row barley
Amira	6 Row barley
Amalou	6 Row barley
Laanaceur	6 Row barley



Brainstorming on handling barley accessions

Results:



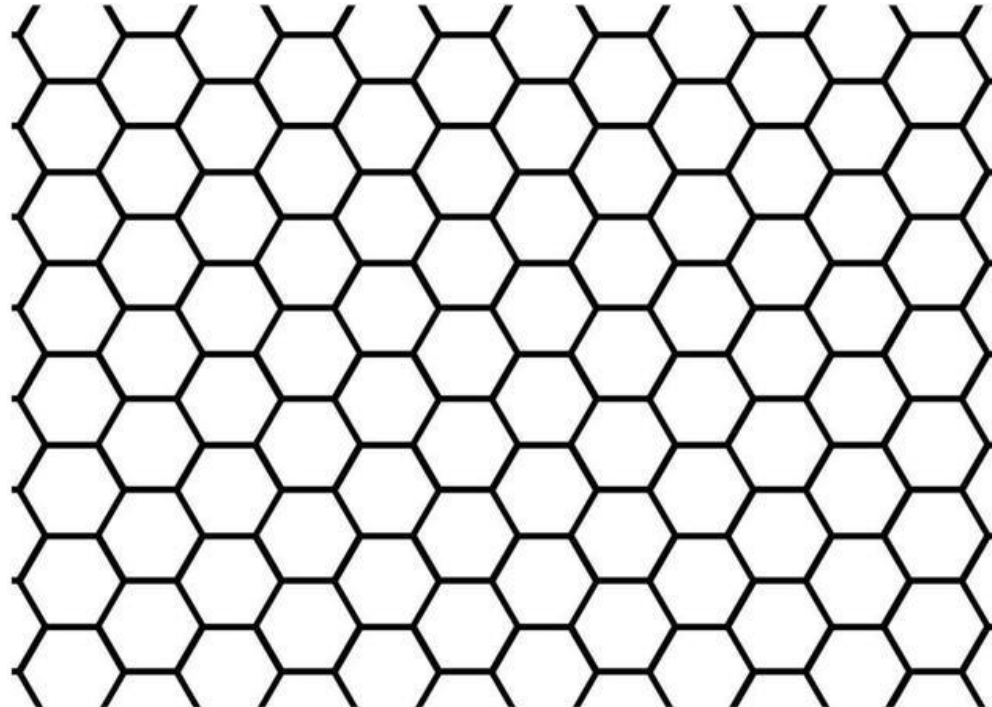
The variety adrar (2 row) has indeed more tillers (spikes than the other varieties)
Head planting provides information on yield via spikes' number/bouquet



Brainstorming on handling barley accessions

Step2: Honeycomb design

- 1) Evaluation in the absence of interplant competition
- 2) Comparing the middle plant to the encircled ones
- 3) In the absence of competition, whole genome phenotype analysis is accomplished by dividing the crop yield potential into three components: the plant yield potential, the tolerance to stresses and the responsiveness to inputs (Fasoula and Tokatlidis, 2012)





Brainstorming on handling barley accessions

Step3: Honeycomb design with head planting



Brainstorming on handling barley accessions

Step3: Honeycomb design with head planting

Advantages:

- Large number of accession can be evaluated(10000 accession/hectare)
- Presence of Intra-plants competition
- Easy for disease & pest testing (artificial inoculation)
- Easy screening for abiotic stresses (drought, salinity, cold...)
- Easy scoring for biotic & abiotic stresses
- Avoiding mixtures (no need for rouging)
- Easy way to rejuvenate accession in a small space
- Better method for naked barley (avoid broken embryos while threshing)
- Easy making copies of the accessions (storing spikes)
- No effort in threshing
- Easy planting & harvesting
- Avoid seed loss while threshing
- Time, money & space saving

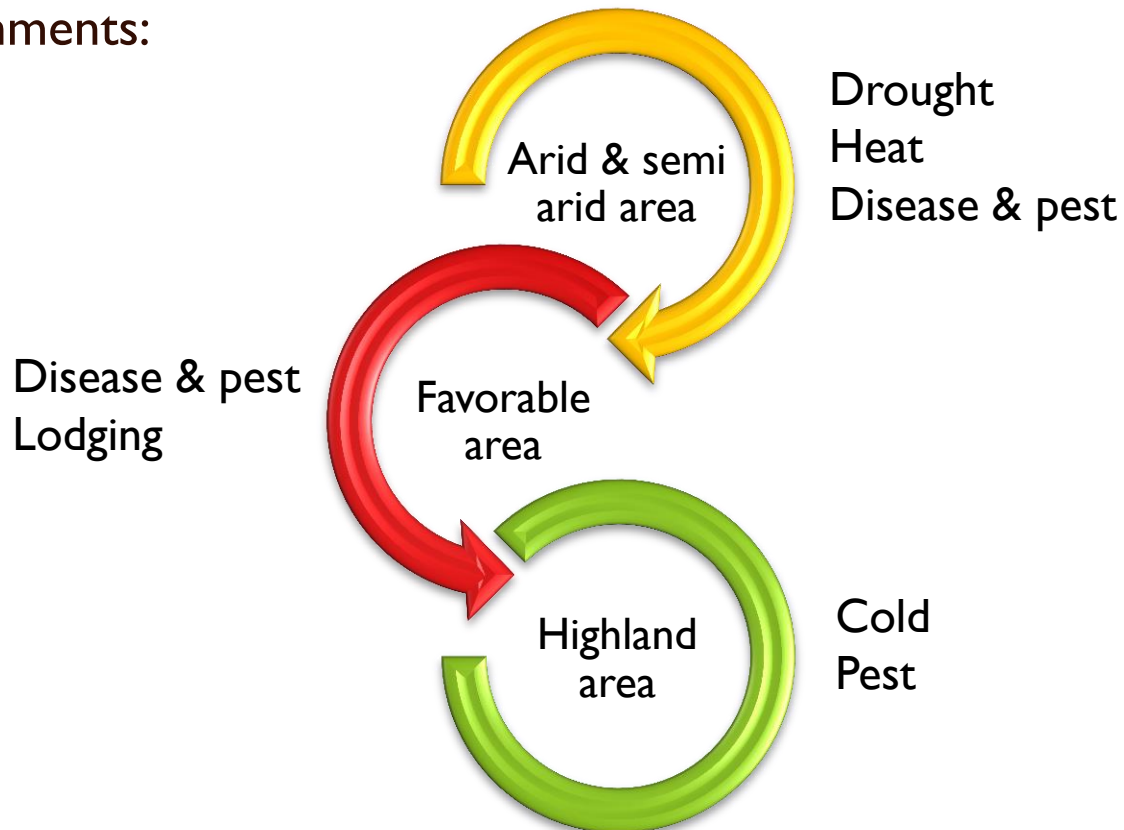


Brainstorming on handling barley accessions

Honeycomb design with head planting

Ongoing work:

- Evaluating the Moroccan barley collection in the three contrasting environments:



Conclusion

Honeycomb design with head planting:

- Could be an alternative method for handling a large number of accession
- Could be used for developing core collection & FIGs subset
- Might give information on the yield based on spikes' number by bunch



Thanks for your attention

Shai'r (Arabic)

Barley (English)

Orzo (Italian)

Cevada (Portugal)

Kritari (Greece)

Läua Mach (Vietnam)

Gebse (Amaric)

Orge (French)

Gerste (German)

Cebada (Spanish)

Yachmen' (Russian)

Jau (Inde, Iran, Pakistan, Afghanistan)

Kao (Thailand)

Segem (Tigrigna)

