ICARDA
Science for Better Livelihoods in Dry Areas

Highlights of major activities carried out in spring bread wheat breading at ICARDA in 2013

CAIGE meeting, 2014

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Updates: Wheat breeding at ICARDA

- We have received all the germplasm from Aleppo
- 2000 simple, top and back crosses have been made at Terbol
- Terbol (Lebanon)-Kulumsa (Ethiopia) shuttle breeding is operational
- Key location yield trials (Marchouch, Sids, Terbol, Kheferdan, Wadmedani) have been carried out
- Three PDFs have joined the program
- Research associates and technicians have been hired for the different stations
- Eight M.Sc. and Ph.D students are working on their thesis research in the program
- The annual wheat improvement training course will be carried out from April 7-25, 2014 in Rabat

Distribution of International Nurseries and Yield Trials

The following International nurseries and yield trials have been distributed from Terbol station, Lebanon to more than 40 countries in the CWANA region and beyond up on request from the NARS (Fig 3).

1. Spring bread wheat observation nursery for CWANA (14th CWANA SBWON)

2. Spring bread wheat observation nursery for heat tolerance (14th SBWON HT)

3. Spring bread wheat yield trial for irrigated environments (14th CWANA ISBWYT)

4. Spring bread wheat yield trial for dry-land environments (14thCWANA DSBWYT)

5. Elite spring bread wheat yield trial (14th ESBWYT)

6. Especial nursery for SSA through the AfDB project support

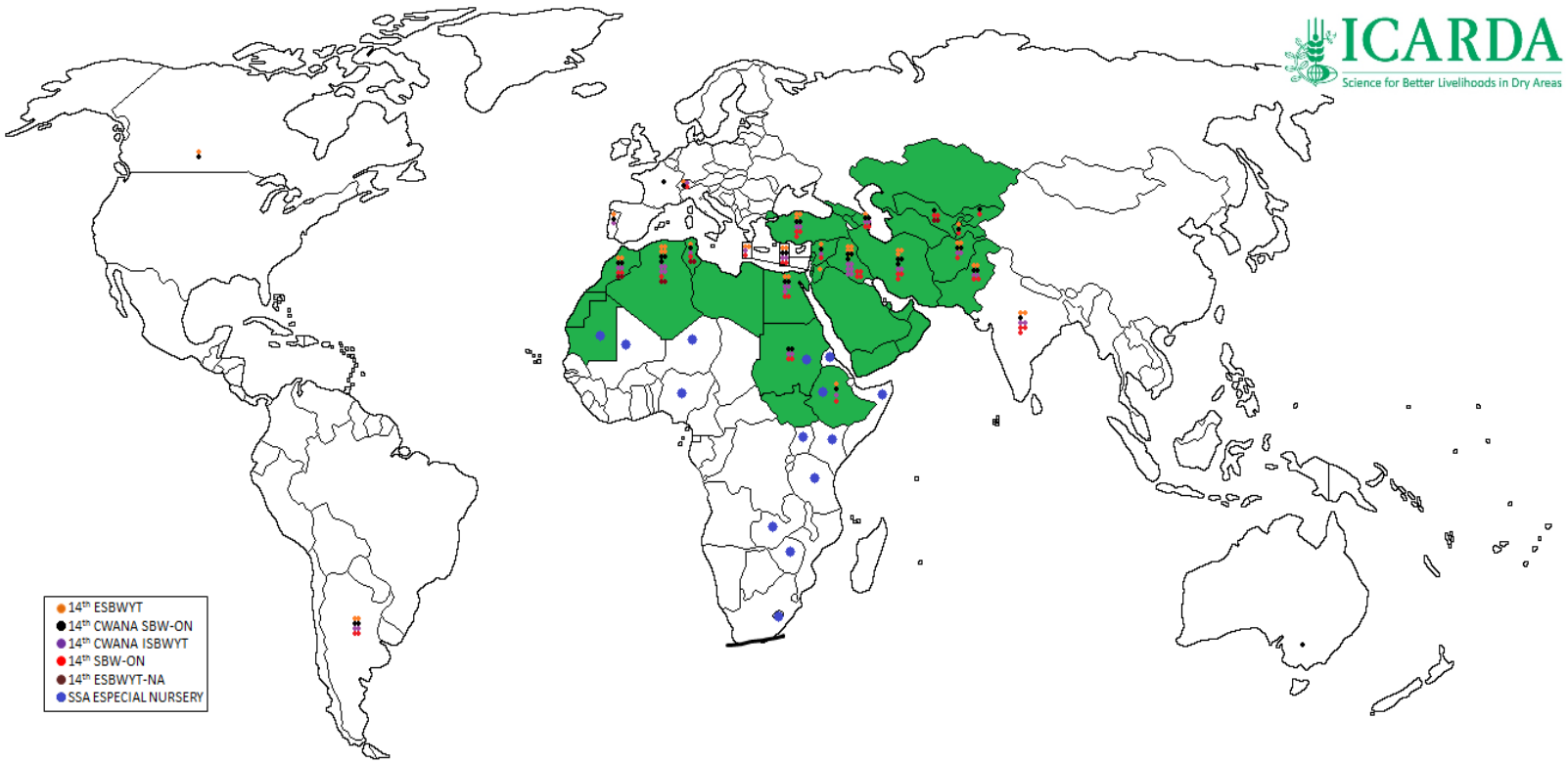

Fig 3. Geographic distribution of ICARDA s' spring bread wheat international nurseries, 2013

Research high lights at the Key Locations in 2013

Terbol: Adaptation, yield potential, rusts

Sids: Yield potential

Marchuch: Drought tolerance, insect resistance

Kulumsa: Stem rust, yellow rust, septoria, fusarium

Wadmedani: Heat tolerance

Tel Hadya: Yellow rust, drought tolerance, Yield potential

High yielding , drought tolerant and Hessian fly resistant spring bread wheat genotypes, Marchuch, 2013

Genotype	Yield (t/ha)	% of Arrehane
KAUZ/PASTOR/3/ALTAR 84/AEGILOPS SQUARROSA (TAUS)//OPATA	6.93	131
TINAMOU-3/BANA-4	6.59	125
NESSER/SERI/3/SHUHA-2//NS732/HER	6.51	123
MUNIA//CHEN/ALTAR 84/3/CHEN/AEGILOPS SQUARROSA (TAUS)//BCN/4/MARCHOUCH-8	6.37	121
NESSER/SERI//TEVEE-1/SHUHA-6	6.33	120
KAUZ/PASTOR/3/ALTAR 84/AEGILOPS SQUARROSA (TAUS)//OPATA	6.32	120
YEBROUD'S'//DOVE'S'/SERI/3/SAFI-1	6.17	117
SHUHA-4/FLORKWA-4//HUBARA-3	6.07	115
KAUZ/PASTOR/3/ALTAR 84/AEGILOPS SQUARROSA (TAUS)//OPATA	6.05	115
TEVEE-1/SHUHA-6//MASSIRA	5.99	114
CHILERO-1/STAR'S'//SHUHA-2/FOW-2	5.93	112
NESSER/SERI/3/SHUHA-2//NS732/HER	5.92	112
NESSER/SERI//TEVEE-1/SHUHA-6	5.92	112
MUNIA//CHEN/ALTAR 84/3/CHEN/AEGILOPS SQUARROSA (TAUS)//BCN/4/MARCHOUCH-8	5.87	111
KAUZ/PASTOR/3/ALTAR 84/AEGILOPS SQUARROSA (TAUS)//OPATA	5.70	108
QIMMA-12/PASTOR-6//QIMMA-12	5.65	107
KARAWAN-1/TALLO 3//REGRAG-1	5.64	107
ALTAR 84/AE.SQUARROSA (219)//SERI/3/MASSIRA	5.63	107
ALTAR 84/AE.SQUARROSA (219)//SERI/3/MASSIRA	5.62	107
KARAWAN-1/TALLO 3//JADIDA-2	5.58	106
Arrehane (check)	5.27	100

Mean grain yield level (t/ha) of selected elite genotypes at Sids, 2013

NAME	PEDIGREE	Yield (t/ha)
ATTILA/3*BCN//FLAG-2	ICW06-00784-21AP/0KUL-0DZ/0AP-0DZ/0AP-5AP-0AP	11.1
FLAG-3/ICARDA-SRRL-5	ICW06-00858-7AP/0KUL-0DZ/0AP-0DZ/0AP-5AP-0AP	10.6
FLAG-6/ICARDA-SRRL-6	ICW06-00859-19AP/0KUL-0DZ/0AP-0DZ/0AP-2AP-0AP	10.3
SERI 82/SHUHA'S'//GRU90-204782/3/MUNIA/CHTO//MILAN	AISBW05-0252-1AP-0AP-0AP-1AP -0SD	10.19
KAUZ'S'/SERI/4/CHEN/AEGILOPS SQUARROSA (TAUS)//FCT/3/STAR	AISBW05-0259-11AP-0AP-0AP-4AP -0SD	10.0
KATILA-15//MNCH/3*BCN	ICW05-0481-2AP-0AP-0AP-1AP -0SD	9.9
SERI 82/SHUHA'S'//GRU90-204782/3/MUNIA/CHTO//MILAN	AISBW05-0252-1AP-0AP-0AP-3AP-0AP	9.9
SERI.1B*2/3/KAUZ*2/BOW//KAUZ/4/KAUZ/FLORKWA-1	AISBW05-0390-7AP-0AP-0AP-1AP -0SD	9.8
KAUZ'S'/SERI/4/CHEN/AEGILOPS SQUARROSA (TAUS)//FCT/3/STAR	AISBW05-0259-4AP-0AP-0AP-1AP -0SD	9.8
KAUZ'S'/SERI/3/KAUZ//KAUZ/STAR	AISBW05-0088-1AP-0AP-0AP-3AP -0SD	9.6
ATTILA 50Y//ATTILA/BCN/3/STAR*3/MUSK-3	AISBW05-0043-10AP-0AP-0AP-7AP-0AP	9.6
DEBEIRA/4/KAUZ//ALTAR 84/AOS/3/KAUZ	ICW05-0597-2AP-0AP-0AP-4AP-0AP	9.5
KASYON/GENARO 81//TEVEE-1/../4/CHEN/AEGILOPS SQUARROSA (TAUS)//BCN/3/KAUZ	AISBW05-0112-12AP-0AP-0AP-2AP -0SD	9.5
DEBEIRA/4/KAUZ//ALTAR 84/AOS/3/KAUZ	ICW05-0597-8AP-0AP-0AP-1AP -0SD	9.5
KAUZ/AA//KAUZ/3/KAPSW/SHUHA-17	AISBW05-0321-4AP-0AP-0AP-1AP -0SD	9.4
BOUSHODA-1/4/SHUHA-2/3/BOW'S'/NKT'S'//TEVEE'S'	ICW05-0521-3AP-0AP-0AP-2AP -0SD	9.4
KAUZ//MON/CROW?S?/4/SERI.1B//KAUZ/HEVO/3/AMAD	ICW05-0534-22AP-0AP-0AP-1AP -0SD	9.4
ATTILA 50Y//ATTILA/BCN/3/STAR*3/MUSK-3	AISBW05-0043-10AP-0AP-0AP-5AP-0AP	9.3
KAUZ//MON/CROW?S?/3/VEE/PJN//2*KAUZ	ICW05-0512-20AP-0AP-0AP-1AP -0SD	9.3
DEBIRA		9.3
MISR-1		9.7
SIDS-12		9.3

Grain yield performance of elite spring bread wheat genotypes at Khafardan (rainfed) and Terbol (irrigated) environments, 2013

- At Terbol, grain yield performance of the genotypes ranged from 2.5-7.6 t/ha while at Kheferdan, the yield level ranged from 1.5 t/ha to 5 t/ha
- Genotypes such as #10 (HAALA-34), #43 (MOUKA-4/RAYON), and #60 (QAFZAH-33*2/SALSAL-2) are among the best high yielding genotypes both at Terbol and Kheferdan locations indicating that they do have both drought tolerance and high yield potential.

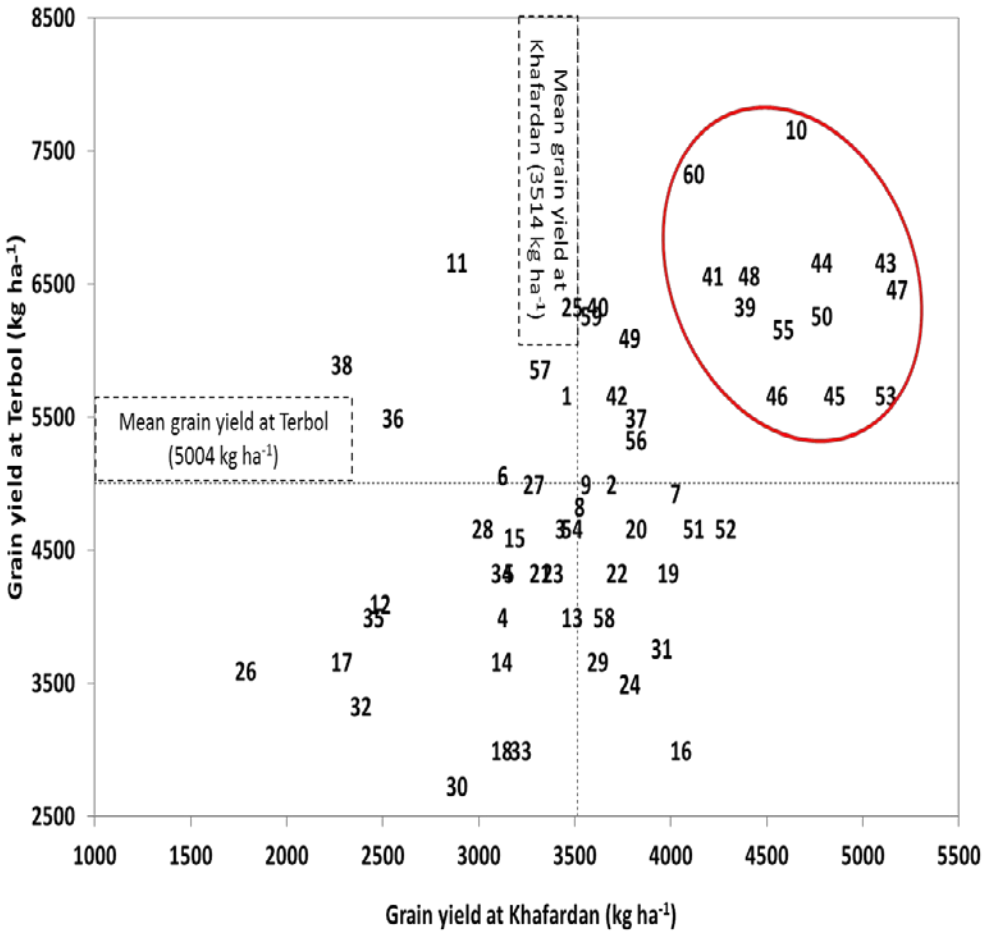

Fig.1

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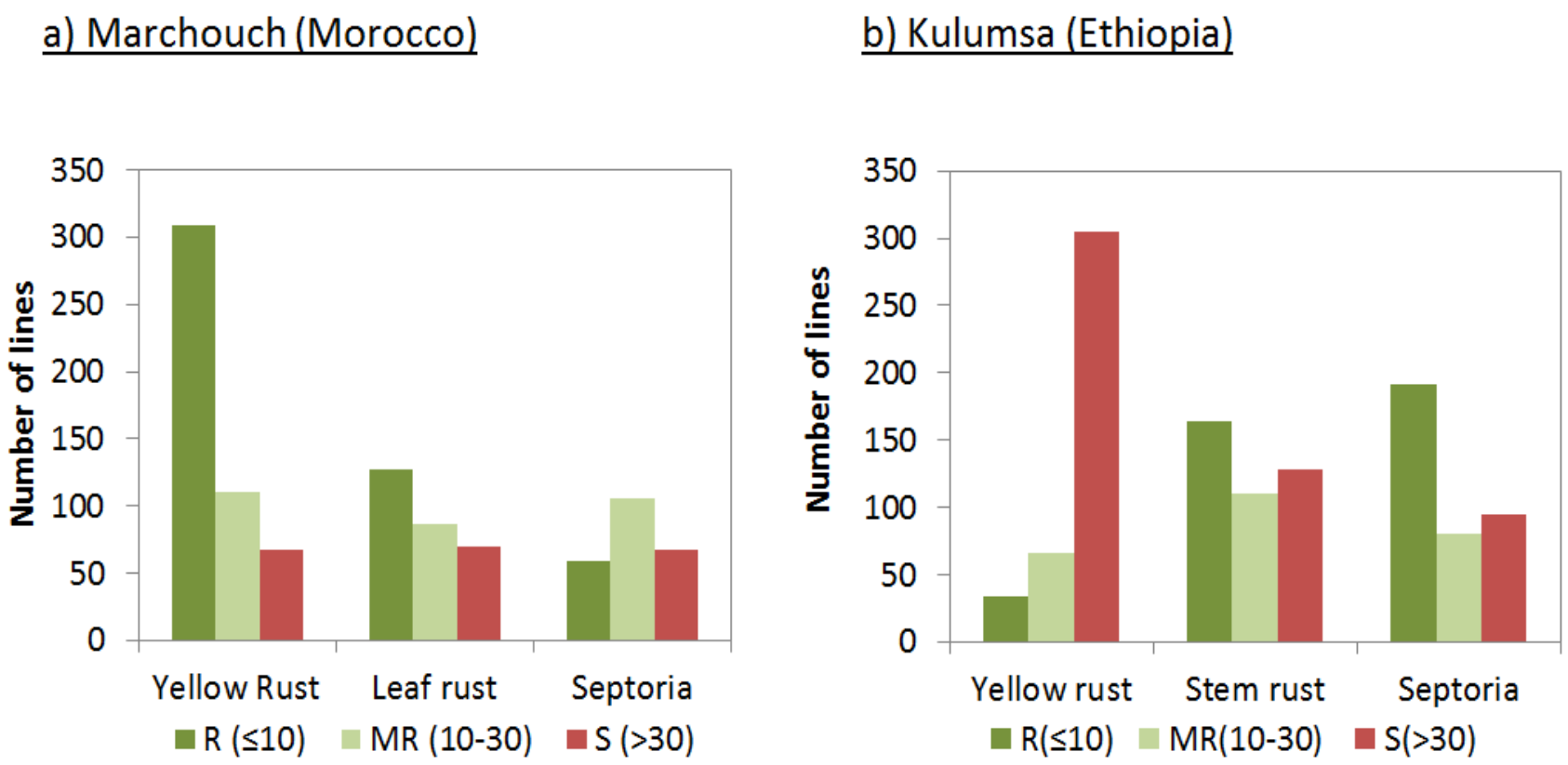
Evaluation of genotypes for disease resistance

- Genotypes have been evaluated for yellow rust, stem rust, and septoria diseases at Marchuch (Morocco) and Kulumsa (Ethiopia) stations.
- The responses of the genotypes are indicated in Fig 2a and b, respectively.
- The disease severity for both stem and yellow rust during the season at Kulumsa station was very high due to the prevalence of favorable conditions (Fig 2b).
- At Debrezeit station of Ethiopia, only few genotypes (1%) showed resistance to stem rust (data not shown).
- Epidemics of stem rust have been also reported in the Bale zone of Ethiopia during the 2013 season affecting the newly released varieties such as Digelo.

Fig 2. Response of elite spring bread wheat genotypes for rusts and septoria at a. Marchouch; b. Kulumsa stations, 2013



Response of spring bread wheat genotypes to stem rust at Kulumsa, 2013

Severity of Stem rust at Kulumsa, 2013

Performance of wheat genotypes at Debrezeit, Ethiopia,Nov. 8, 2013

Australian genotypes response for stem rust at Debrezeit, Nov 2013

Why most of the germplasm at Debrezeit, Ethiopia became susceptible in 2013

Though previously evaluated and selected from Njoro, Kenya, most of the wheat germplasm were susceptible to stem rust at Debrezeit, Ethiopia in 2013.

- Is it because of the variation in race, or the increase in inoculum pressure or both?
- Do we know in which environment, in which season and at what level of inoculum pressure will APR remain effective?

Gene pyramiding using MAS: The probability of 2-3 genes to mutate at the same time is rare and hence if we can pyramid 2-3 major genes with minor gene combinations, resistance could be durable. We have developed many lines (in pipe line) using this approach.

Updates on GRDC project

- 150 elite spring bread wheat genotypes have been composed and sent to Australia with data in October 2013
- Project final report have been submitted and approved
- Phenotypic and molecular data base shared
- IP registry form have been submitted
- The new GRDC funded project on: Wheat improvement for heat tolerance is approved

Performance of ICARDA's germplasm in Australia, Oct 17, 2013

Thanks, and hope to see you next time!