

### 2.5.1.2: Regular updating of the crossing block with new barley varieties for conducting the crossing program of winter barley for different breeding objectives.

The new sources of abiotic and biotic stresses have also been identified after evaluation through collaboration with NARS for phenotyping at diverse environments. Crossing blocks (CB) of barley 480 germplasm for spring barley breeding programs has been established in Morocco and Lebanon platform in 2016. The crossing block includes advanced breeding lines and improved barley genotypes, barley differential lines for disease resistance (net blotch and spot blotch differentials), tolerance to abiotic and biotic stresses. Most recently, the CB is updated with salinity, leaf rust tolerant barley lines identified in 2015-16 in multilocation evaluation/phenotyping and new sources of beta glucan obtained from USDA and UC Davis, California.

Table 2.9 provides the details of the evaluation organized in different countries/ locations for a number of traits. The exercise has resulted in generating useful information on the diverse sources for abiotic and biotic stresses scored over many environments with NARS partners. Several abstracts based on this information have been presented in the 12<sup>th</sup> International Barley Genetics Symposium held at Minneapolis, USA during 26-30 June, 2016, where 4 persons from ICARDA (three scientists and one student participated. This information has been presented in the 12<sup>th</sup> International Barley Genetics Symposium (28-30 June), Minneapolis, USA. (See list of publications in the end of the document).

**Table 2.9: Phenotyping of barley germplasm (AM-16) through NARS network in 2016 for Genome wide association studies (GWAS)**

Traits	Design	Country	Locations	Sets
Agronomy, drought	$\alpha$ -lattice, 2 reps	ICARDA Morocco, INTA-T Tunisia	MCH (Normal planting) Kef Tunisa (early and late planting)	3
Heat tolerance	Augmented	ICARDA Morocco	MCH (Late planting, Irrigated)	2
Spot blotch	$\alpha$ -lattice, 2 reps	BHU, NDU&T, India	Varanasi and Faizabad	2
Foliar diseases	$\alpha$ -lattice, 2 reps	Morocco	JS, Sidi Aidi, Allal Tazi	3
Yellow rust	Augmented	IWBR & RARI, India	Durgapura, Karnal	2
Yellow rust, spot blotch	Augmented	Nepal	Kabre and Salyan (PhD student)	2
Leaf scald	Augmented	Ethiopia	Bekoji, Holetta, Kulumsa	3
BYDV two strains	Augmented	Ethiopia	Greenhouse and field	3
Salinity tolerance	$\alpha$ -lattice, 2 reps	India	IWBR Hisar and Dalipnagar	2
Zn, Fe, spot blotch	$\alpha$ -lattice, 2 reps	HCRP/UAF Nepal	Rampur (PhD student)	1
Leaf rust	Augmented	Dr. D. Singh Australia	Australian pathotypes of <i>Puccinia hordei</i>	1
micro nutrients	Augmented	Prof. M.L. Otte USA	NDSU, Fargo, ND USA	1
Zn, Fe, $\beta$ -Glucan, Starch, Protein	Augmented	Dr. Jilal Morocco	INRA-Morocco	1
Forage traits	Augmented	Dr. Jane & Barbara ICARDA	ICARDA, Regional Office at Ethiopia, Adis Ababa	1

More than 1800 new crosses were made in 2016 at Lebanon and Morocco, while 101 crosses were made in Mexico). All F<sub>1</sub> were advanced to F<sub>2</sub> in off season in Terbol Lebanon. The F<sub>2</sub> generation has been grown in Lebanon (for low input evaluation) and Morocco (high input program) during 2016-17 crop season.

## Publications:

2. R.P.S. Verma, R. Selvakumar, P.S. Shekhawat, O. P. Gangwar, S.C. Bhardwaj, S. Rehman, and S. Gyawali. 2016. Novel sources of resistance to stripe rust in ICARDA barley germplasm. Abstract: 12<sup>th</sup> International Barley Genetic Symposium, 2016. Minneapolis, MN, USA.
  
3. S. Gyawali, S.S. Vaish, P.K Singh, A.S. Kharub, S.R. Vishwakarma, R. Selvakumar, S. Chao, S. Rahman, and R.P.S. Verma. Genome wide association study (GWAS) of resistance to barley spot blotch in South Asia. Abstract: 12<sup>th</sup> International Barley Genetic Symposium, 2016. Minneapolis, MN, USA.