

## ARID ZONE RESEARCH INSTITUTE BHAKKAR



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### OVERVIEW

Thal comprises 3.5 mha. area and out of which 2.5 mha. area is cultivated. However, 1.18 mha. area is irrigated, 0.98 mha. area is rainfed. 1.34 mha. area is culture able waste. Thal consists of four districts of Mianwali, Khushab, Bhakkar and Layyah. Low rainfall, high temperature and poor sandy soil are the major characteristics of this area. This area produces 14% wheat, 88% chickpea, 84% mungbean and 95% guar of the Punjab. Arid Zone Research Institute was established in 1991-92. It focuses on development of wheat varieties having durable rust resistance. Occasionally frost is occurred during the month of December and January which causes head sterility while heat and drought stress at grain filling usually causes serious losses of grain weight as it happened during the year 2010-11. Water shortage and high temperature are the major problems. Similarly in chickpea it is focusing on root rot and wilt resistance with special emphasis on drought and frost tolerance, while in mungbean crop the special emphasis is on high yield, insect pest resistance, sowing time and weed control. Therefore, this Institute has reshaped its breeding strategies to meet all these challenges.

### One new chickpea variety released

Arid Zone Research Institute Bhakkar has recently released one chickpea variety Bhakkar- 2011. This variety possesses tolerance against wilt, ascochyta blight, root rot, iron chlorosis and other diseases. It is high yielding, bold seeded, early in maturity with conspicuous stipule length. Its yield potential is 4000 kg/ha.



### 1. Wheat breeding programme **Germplasm**

Four hundred and thirty entries of wheat germplasm were characterized for days to 50% heading (85-120 days), plant height (70-130 cm), 000 grain weight (30-55 gm), av. yield per spike (2-5 gm) and average yield per plant (35gm). One hundred lines were rejected due to poor yield performance, substandard grain quality and severe disease incidence.

### **Bread wheat crossing block**

Two hundred entries of wheat crossing block were planted at two intervals to synchronize flowering of desired parents being utilized in hybridization programme.108

crosses were made among selected parents to impart high yield contributing parameters in genotypes like higher number of grains/spike, shorter plant height, higher 000 grain weight, temperature & drought stress tolerance, lodging and diseases resistance.

### **Filial Generations**

1250 single plant selections/progenies were evaluated for their performance regarding yellow rust, brown rust, stem rust and powdery mildew and yield components. Twenty five uniform lines were selected from F<sub>5</sub> & F<sub>6</sub> for their further evaluation in preliminary yield trials (A-Trials) alongwith parallel screening against biotic and abiotic stress.

### **Preliminary Yield Trials (A-Trials)**

The yield performances of 88 advance lines were tested in four trials in normal planting condition. 40 advance lines out yielded check varieties (Punjab-2011 and Millat-2011). Eighteen entries were selected on the basis of yield response, disease reaction and desirable agronomic attributes.



### **Regular Yield Trials (B-Trials)**

A total of 32 advance lines were tested for yield performance and disease reaction in three regular yield trials including normal and late planting with two check varieties (Punjab-2011 and Millat-2011). Eighteen entries were selected on the basis of yield and disease resistance.

### **International Wheat Yield Trials (CIMMYT)**

Two international yield trials were received from CIMMYT through National Wheat Coordinator, Islamabad. Thirty lines were selected from 170 test entries on the basis yield performance and other desirable attributes for inclusion in A & B-Trials.

### **National Wheat Yield Trials (NUWYT)**

A NUWYT set comprising one each normal and late planting were laid out during mid of November and December 2012, respectively. The trial was consisted of 27 coded entries and nine check varieties. On over all mean basis the entry TW96010 of AZRI, Bhakkar performed better in eight locations of southern Punjab with grain yield 4805 kg/ha.

### **Micro Wheat Yield Trial (MWYT)**

A MWYT set comprising one each normal and late planting were laid out during mid of November and

December, 2012 respectively. The trial comprised 28 coded entries and two check varieties. On over all mean basis TW96018 performed better in six locations of southern Punjab with grain yield 3622 kg/ha.

## **2. Chickpea breeding programme**

### **Germplasm**

Five hundred chickpea genotypes were characterized for days to 50% flowering (92-112 days), plant height (35–81cm), No. of pods/plant (15–137), days to maturity (158-166 days), total dry matter/plot (200-2900gm) & yield (1000-5000 kg/ha.)

### **Crossing block**

Sixteen crosses among desirable parents were made to develop high yielding, good quality and insect pest and disease tolerant varieties. Seed from successful crosses was collected for further evaluation during the next growing season.



### **Filial Generations**

Eleven hundred single plant selections/ progenies and 33 bulk populations were evaluated for

their performance regarding root rot, wilt and other diseases and yield components. Eighteen uniform lines were selected from F<sub>6</sub> & F<sub>7</sub> for their further evaluation in preliminary yield trials (A-Trials) after continuous screening against biotic and abiotic stresses.

### **Preliminary Yield Trials (A-Trials)**

The yield performance of 48 advance lines was tested in eight trials in irrigated and rainfed conditions. Thirty advance lines out yielded check varieties (Bhakkar-2011 & Punjab-2008). Twenty two entries were selected on the basis of yield performance, disease reaction & desirable agronomic traits.

### **Regular Yield Trials (B-Trials)**

A total of 24 advance lines were evaluated under irrigated and rainfed conditions in four trials for yield performance and disease reaction alongwith two check varieties (Bhakkar-2011 & Punjab-2008). Eleven entries were selected on the basis of yield and disease resistance.

### **International Chickpea Yield Trials (ICARDA)**

Seven international yield trials were received from ICARDA through National Pulses Coordinator, Islamabad. Fifty

entries/lines were selected from 200 entries for further evaluation under drought conditions.

### **National Chickpea Yield Trials (CNUYT)**

Chickpea National Uniform Yield Trial (Desi) comprising fifteen entries and National Uniform Yield Trial (Kabuli) comprising 10 coded entries were laid out during the mid of October, 2012. On over all mean basis CM156/05 (Desi) and NCS-0709 (Kabuli) performed better at this Institute with grain yield 2100 and 1943 kg/ha, respectively.

### **Chickpea Coordinated Yield Trial**

Two trials comprising one each desi and kabuli gram were laid out during mid October, 2012. The desi gram trial comprised 18 coded entries and kabuli gram trial comprised 16 coded entries. On over all mean basis, entry 08025 of desi gram trial performed better and entry CM2008 of kabuli chickpea trial performed better with grain yield value of 1898 and 2172 kg/ha respectively.

### **PARB Funded Project**

Under PARB Project, 118 chickpea entries were tested in drought stress. Chickpea Line D0097-10 gave maximum production of 3274 kg ha<sup>-1</sup> against check Bhakkar-2011, with yield

value of 3239 kg ha<sup>-1</sup>. However, 100 grain weight was recorded 37.53 gm. Thirty two entries out yielded the check varieties.

### **3. Mungbean breeding programme**

#### **Germplasm**

One hundred and fifty lines were evaluated and characterized for different parameters. Fifteen entries were selected for testing in preliminary yield trial (A-trial).

#### **Filial Generations**

195 single plants with desirable traits were selected from F<sub>2</sub> - F<sub>7</sub>. Ten uniform lines were earmarked for their further evaluation in preliminary yield trials (A-Trials) alongwith parallel screening against biotic and abiotic stresses.

#### **Preliminary Yield Trials (A-Trials)**

The yield performances of 18 advance lines were tested against check AZRI MUNG 2006. Eleven entries were selected on the basis of yield response, disease resistance and desirable agronomic traits.

#### **Regular Yield Trials (B-Trials)**

Twenty two advance lines were tested in two trials for yield performance and disease reaction with check variety AZRI MUNG 2006. Nine entries out yielded the standard check.



## **Mungbean National Uniform Yield Trials**

A Mungbean National Uniform Yield Trial comprising ten entries was laid out during the June 2012. On over all mean basis Mung 303-S performed better at this Institute with grain yield 1297 kg/ha.



## **4. Entomological Studies**

### **Insect prediction studies**

A trial was laid out to estimate moths population to formulate economic threshold level for their control. An electric light trap was installed at AZRI Farm Area by using one hundred watt milky bulb to manage the insect pest of Kharif Crops. Insect population was recorded daily. Armyworm population was severe during August (7.0), September (9.5) and October (8.0) and Spotted B.W. population was maximum during September (3.5). Sugarcane borer population was maximum during August (8.0)

### **Screening of mungbean lines against insect pest complex**

Thirty lines of mungbean were screened against insect pests. On the appearance of insect pest infestation data were recorded. The mungbean lines BRM-302 and C6/95-3-31 performance was better against Thrips while, 11TM-1 proved resistant against white fly attack. Attack of Jassid was observed in the test lines.

### **Screening of chickpea lines against gram pod borer**

Fifteen lines of A-trial were screened against pod borer Infestation under irrigated conditions. Infestation population data was recorded from all lines. Minimum damage pods was observed in nine advance lines. It was less than 6 as compared to check variety Bhakkar-2011(6.67) which is indication of having resistance against pod borer. Fifteen lines of B-trial were screened for pod borer Infestation under irrigated conditions. Infestation population data were recorded from all lines. Less damage pods were observed in four advance lines. It was less than 6 against check variety Pb-2008 (9) which is indication of having resistance against pod borer.

### **Determination of losses caused by aphid on wheat crop**

Five varieties viz. Millat-2011, AARI-2011, Punjab-2011, Shafaq-2006 and Faisalabad-2008 were sown in two sets (Non-sprayed & Sprayed). Amidacloprid 200SL was applied in sprayed for the control of aphids. Varietal difference was found to be significant at post treatment. The aphid population was less than 1/tiller in sprayed plots and less than 15/tiller in non-sprayed plots on all the varieties of wheat. 1000 grain weight ranged from 37.7 to 43.1gm of Shafq-2006 and Faisalabad-08 in non-sprayed plots and 44.5 to 49.9 gm on Shafaq-06 and Millat-2011 in sprayed plots. Maximum grain weight loss was 19.87% of Millat-2011 whereas minimum reduction (7.51%) in Faisalabad-08.

### **Screening of wheat lines against aphid infestation**

Thirty lines of wheat were screened against aphid infestation in both A and B trial. Aphid population data were recorded from start of March to first week of April. Four promising strains in A-trial and five promising strains in B-trial proved tolerant during peak period of aphid attack (March 2013) and found less than 10 aphids per tiller which was indication of having resistance against aphid.

### **5. Agronomic studies**

#### **Response of wheat strains to different sowing dates in arid agro climate.**

Three genotypes TW-96010, Punjab-2011 and AARI-2011 were sown at seven different sowing dates with an interval of ten days commencing from 01-11-2012. Wheat genotypes Punjab-2011, AARI-2011 and TW-96010 planted on 11-11.2012 gave maximum grain yield 5884 kg/ha, 5123 kg/ha and 5493 kg/ha, respectively followed by 21.11.2012 sowing. Wheat planted on 01-01.2013 resulted in minimum grain yield 2016 kg/ha. This demonstrated that 2<sup>nd</sup> week of November was the best sowing time for planting of wheat in hot irrigated dry climate of arid zone (Thal).

#### **Impact of sowing dates and planting geometry on yield of chickpea.**

The experiment consist of four sowing dates with an interval of ten days commencing from 10.10.2012 and five planting geometries (30cm, 45cm, 15/30cm, 15/45cm and 60cm apart). The gram variety Thal-2006 was planted on 20.10.2012 gave the maximum grain yield 2259 kg/ha while minimum grain yield 922 kg/ha was obtained from 10.11.2012. Gram crop planted at 45cm apart rows in irrigated condition gave maximum yield

2259 kg/ha followed by 2222 kg/ha grain yield planted on same planting pattern.

### **Effect of irrigation schedule and planting techniques on wheat yield.**

Experiment consist of two planting techniques (drill sowing and ridge sowing) and six irrigation levels. Wheat planted by ridge sowing showed highest grain yield 5623 kg/ha followed by drill sowing (5420 kg/ha). Wheat crop supplied with six irrigations produced the highest grain yield 5623 kg/ha. The grain yield 4933 kg/ha and 4916 kg/ha was at par in both drill and ridge sowing respectively. Wheat crop sown on ridges and supplied with single irrigation gave the lowest grain yield 2760 kg/ha.

### **Effect of different sowing dates on yield of mungbean in arid condition.**

Mungbean trial comprising one variety AZRI-2006 and eight sowing dates viz; 05-05-2012 to 15.7.2012 with ten days interval was laid out. Crop sown on 5.6.2012 gave the highest yield 1228 kg/ha while the trail sown on 15.07.2012 gave the lowest yield (93 kg / ha).

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2. Hussain, N., M. Aslam, A. Ghaffar, K. Hussain and Naeem-ud-Din. 2013. Assessment of genetic variation and mode of inheritance for some quantitative traits in chickpea (*Cicer arietinum* L). JAR, (submitted for publication).
3. Irshad, M., I. Khaliq, J. Iqbal, N. Hussain, M. Aslam, K. Hussain and Naeem-ud-Din. 2013. Genetics of some polygenic traits in hexaploid bread wheat in high temperature stress. JAPS, (submitted for publication).
4. Aslam, M., A. G. Sagoo, A. Hussain, M. Irshad, E. Ahmad, K. Hussain, N. Hussain, A. Ghaffar, M. Nadeem, A. Mehmood, Naeem-ud-Din and M. Khaliq. 2013. Impact of canopy management on bio economic efficiency of chickpea under arid conditions. JAR, (submitted for publication).
5. S. M. F. Hassan, M. S. Iqbal, G. Rabbani, Naeem-ud-Din, G. Shabbir, M. Riaz and I. R. Noorka. 2013. Correlation and path analysis for yield and yield components in sunflower (*Helianthus annuus* L). African Journal of Biotechnology. 12(16):1968-1971.
6. Naeem-ud-Din, G. Rabbani, M. Tariq, M. S. Iqbal and M. K. Naeem. 2013. Character association and path analysis of yield and yield components in mungbean (*Vigna radiata*). J. Agri. Res. (Accepted for publication)
7. Naeem-ud-Din, M. Tariq, M. K. Naeem, M. F. Hassan, G. Rabbani, A. Mahmood and M. S. Iqbal. 2012. Development of BARI-2011: a high yielding, drought tolerant variety of groundnut (*Arachis hypogaea* L.) with 3-4 seeded pods. J. Animal and Plant Science. 22(1):120-125.
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9. Irshad, M., I. Khaliq, A. Salam., and A. Ali. 2012. Genetic Studies for Some Agronomic Traits in Spring Wheat under Heat Stress. pak. j. Agri. Sci., 49(1), 11-20.



## **ABSTRACTS OF PAPERS**

1. Aslam, M., A. G. Sagoo, A. Hussain, M. Irshad, E. Ahmad, K. Hussain, N. Hussain, A. Ghaffar, M. Nadeem, A. Mehmood, Naeem-ud-Din and M. Khaliq. 2013. Impact of canopy management on bio economic efficiency of chickpea under arid conditions. JAR, (submitted for publication).
2. Hanif R., Naeem-ud-Din, G. Rabbani, M. Tariq and A. Subhani. 2012. Performance and evaluation of mung bean (*Vigna radiata* L.) under rainfed conditions. Presented 14<sup>th</sup> congress of soil science (12-15 March, 2012) Lahore, Pakistan.
3. Naeem-ud-Din, G. Rabbani, M. Shahid Iqbal and M. Tariq. 2012. Interrelationship of yield and yield related traits in mung bean (*Vigna radiata* L.). Presented in National Science conference on “ Agriculture and food security issues in global environmental prospective”. 11-13 July, 2012). The University of Poonch, Rawalakot, AJK.

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No. 3365 / C-22  
Dated Bhakkar, the  
02.12.2013

To

The Director General Agri. (Research),  
Ayub Agricultural Research Institute,  
Faisalabad.

Subject: - **ANNUAL ABRIDGE REPORT 2012-13**

Reference:- Your office letter No. 2674/Tech/PA dated 25.11.2013

Kindly find enclose herewith the Annual Abridge Report 2012-13 pertaining to this institute as desired vide your letter under reference for further necessary action.



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