

ANNUAL PROGRAM OF RESEARCH WORK RABI 2014-15



**WHEAT RESEARCH INSTITUTE,
FAISALABAD**

INTRODUCTION

Area under wheat during 2013-14 was 9.039 million hectares showing an increase of 3.98 percent over last year's area of 8.693 million hectares because of the combined efforts of scientists and Government interest to enhance wheat production. The wheat production of 25.286 million tons was gained with per hectare yield of 2797 kg ha⁻¹, an increase of 4.48 percent over the last year's production of 24.2 million tons was observed. Resultantly the country became self-sufficient.

Wheat crop has to face yield limiting factors like terminal or post-anthesis heat, drought, salinity, frost, aphids and changing virulence pattern of diseases. Likewise, to earn the foreign exchange through the competition in the international market, wheat quality has pivotal importance now a days. In the scenario of nutritional deficiencies, biofortified wheat has also gained the attention of the scientists.

Scientists of this institute have made tangible efforts to address the challenges faced by wheat crop due to global warming in the country in interaction with International organizations like CIMMYT Mexico, ICARDA Syria and USDA. About 60 experiments were conducted in the research area of this institute beside NUWYT and MTWV under normal and late sown conditions in different agro-ecological zones of the Punjab province. Different projects like conservation agriculture, harvest plus, global warming, limiting water, salt & aphid tolerance and durable rust resistance are also being implemented by this institute. The scientists of the institute are in a continuous struggle to break the yield barriers. Their efforts are to move from green revolution to the gene revolution. The researchers team of Wheat Research Institute is well aware of the fact that during 2050 the 334.68 million populations will need about 37.14 million tons of wheat grain and the country must meet these requirements for its integrity.

Last year, advanced lines V-12304, V-11098 and V-11138 got 1st, 2nd and 3rd position, respectively in MTWV (normal) as well as on overall basis. While advanced lines V-11138 and V-12304 stood 1st and 2nd, respectively in MTWV (short) as well as on overall basis.

Similarly, Galaxy-13 remained at the top position with 4141 kg ha⁻¹ yield, while V-10110 (4070 kg ha⁻¹) got 3rd position in NUWYT (normal) while in case of NUWYT (short), V-99172 remained at top with 3675 kg ha⁻¹ yield, followed by V-99114 (3618 kg ha⁻¹).

Galaxy-13 was approved and recommendation for cultivation in Punjab/Pakistan.

(Dr. MAKHDOOM HUSSAIN)

Director

Wheat Research Institute

Faisalabad

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BREAD WHEAT (*Triticumaestivum* L.)

1. TITLE	CROSSING BLOCK AND HYBRIDIZATION																																																
OBJECTIVES	<ul style="list-style-type: none"> i. To maintain genotypes/lines with their typical characteristics. ii. To combine high yield, adaptability and tolerance to biotic and abiotic stresses, quality and other desirable characteristics. iii. To incorporate effective rust resistant genes in local germplasm. 																																																
RESEARCH WORKER (S)	Dr. Javed Ahmad, Muhammad Zulkiffal, Saima Gulnaz and Dr. Makhdoom Hussain																																																
PROJECT DURATION	2014-15 (continuous nature)																																																
LOCATION	Wheat Research Institute, Faisalabad.																																																
TREATMENTS & METHODOLOGY	<p>Crossing block comprising ???? entries will be planted twice (during 1st and 3rd week of Nov.). Each entry will be sown in a paired row plot of 2.5 meter length. All the entries will be evaluated for important agronomic, physiological and pathological parameters. Desirable crosses will be attempted to accumulate genes for higher yield, disease resistance and other desirable attributes. About 1000 crosses will be attempted during the coming Rabi season.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Sr. #</th> <th>Germplasm Groups</th> <th>No. of varieties / lines</th> </tr> </thead> <tbody> <tr><td>1</td><td>Current varieties of Pakistan</td><td>39</td></tr> <tr><td>2</td><td>Old varieties</td><td>30</td></tr> <tr><td>3</td><td>Exotic lines</td><td>27</td></tr> <tr><td>4</td><td>Disease resistant</td><td>100</td></tr> <tr><td>5</td><td>Drought tolerant</td><td>29</td></tr> <tr><td>6</td><td>Salt tolerant</td><td>06</td></tr> <tr><td>7</td><td>Heat tolerant</td><td>15</td></tr> <tr><td>8</td><td>Grain quality</td><td>07</td></tr> <tr><td>9</td><td>High grain weight</td><td>02</td></tr> <tr><td>10</td><td>High yielding</td><td>171</td></tr> <tr><td>11</td><td>Harvest plus</td><td>14</td></tr> <tr><td>12</td><td>TriticumPyrum</td><td>05</td></tr> <tr><td>13</td><td>CISCA</td><td>10</td></tr> <tr><td>13</td><td>Miscellaneous</td><td>32</td></tr> <tr> <td></td> <td>Total</td> <td>?????</td> </tr> </tbody> </table>	Sr. #	Germplasm Groups	No. of varieties / lines	1	Current varieties of Pakistan	39	2	Old varieties	30	3	Exotic lines	27	4	Disease resistant	100	5	Drought tolerant	29	6	Salt tolerant	06	7	Heat tolerant	15	8	Grain quality	07	9	High grain weight	02	10	High yielding	171	11	Harvest plus	14	12	TriticumPyrum	05	13	CISCA	10	13	Miscellaneous	32		Total	?????
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PREVIOUS YEAR'S RESULTS	<p>Last year crossing block comprised of 473 entries. It has been reconstituted to face the new challenges on the basis of information derived through a series of studies during last few years. Detail is as under:</p>																																																

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2. TITLE	STUDY OF FILIAL GENERATIONS (F₁-F₇) OF BREAD WHEAT.
OBJECTIVES	<ol style="list-style-type: none"> i. To evaluate the generations under irrigated and stress (heat, drought & rusts) conditions. ii. Selection of single plants resistant to diseases and having good plant type in F₂ - F₄ generations using selected bulk method. iii. Selection of desirable single head progenies in successive generations (F₅ & F₆). iv. Selection of uniform, vigorous advanced lines (single head row progenies) resistant to diseases in F₇ generation for grain yield testing in preliminary yield trials.
RESEARCH WORKER (S)	Muhammad Muzaffar Iqbal , Waseem Sabir, Semab Nasir and Javed Anwar
PROJECT DURATION	2014-15 (continuous nature)
LOCATION	Wheat Research Institute, Faisalabad.
TREATMENTS & METHODOLOGY	F ₁ generation will be planted in irrigated conditions. F ₂ to F ₇ will be exposed to artificial epidemic rusts condition. Epidemic rusts conditions will be created by spreading dust of rusts spores. Plants infected with rusts (in pots) will be kept in spreader rows around the field. Water will also be sprayed for increasing humidity. On spread of rusts, good and resistant plants will be selected and selected bulk method will be used for generation advancement. Uniform maturity of tillers, plant height, lodging resistance and grain diseases will also be considered during selection. Generations of specific crosses i.e., drought and heat will be sown in their respective environmental conditions. The material will be planted with the following specifications during first fortnight of November, 2014 and fertilized @ 120:90:60: N: P: K kg ha ⁻¹ at sowing time.

Generations	No. of crosses	Entries	Plot size
F ₁ single crosses	1122	1122	1 row x 2.5m
F ₂	258	747	12 rows×8m
F ₃	413	413 SHB	3 rows ×3m
F ₄	82	82 SHB	3 rows×3m
F ₅	69	69 SHB	3 rows×3m
F ₆	82	1640 SHR	1 row, 2.5m
F ₇	56	211 SHRP	4 rows ×4m

SHB= Single head bulk, and SHRP=Single head row progeny,
SHR=Single head rows

PREVIOUS YEAR'S RESULTS

Generations	Studied Crosses /SHB	Selected	
		Crosses	Entries
F ₁ single crosses	997	470	470
F ₂	572	413	413 SHB
F ₃	158	82	82 SHB
F ₄	135	69	69 SHB
F ₅	170	82	1640 SHB
F ₆	87/1740	56	211 SHR

In F₇ generation, 244 lines were studied and 90 lines were selected for testing their yield performance in preliminary yield trials
SHB= Single head bulk, and SHRP=Single head row progeny &
SHR=Single head rows

3.TITLE	HYBRID SEED PRODUCTION.
OBJECTIVES	To develop wheat hybrids
RESEARCH WORKER (S)	Saima Gulnaz, Muhammad Zulkiffal and Dr. Javed Ahmad
PROJECT DURATION	2013-14 (continuous nature)
LOCATION	Wheat Research Institute, Faisalabad.
TREATMENTS & METHODOLOGY	<p>CMS lines (A-lines): Thirty three A-lines (CMS lines) along with the same number of B-lines (Maintainers) will be planted in the field. A-lines will be maintained by pollinating with its corresponding B-lines.</p> <p>Fertility restorer Lines (R-lines): Sixteen lines with fertility restorer gene (Rf) will also be maintained.</p>

PREVIOUS YEAR'S RESULTS	Thirty three CMS lines were maintained by crossing with their respective maintainer (B) lines. Sixteen fertility restorers were also maintained by selfing. Three male restorer lines were crossed with ten CMS lines developed in local variety.
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4. TITLE	STUDY OF DROUGHT FILIAL GENERATIONS (DRF₁- DRF₇) OF BREAD WHEAT
OBJECTIVES	<ol style="list-style-type: none"> i. To develop the crosses and evaluate filial generations in drought stress condition. ii. Selection of single plants resistant to diseases, vigorous planttype and physiologically drought stress tolerant plants in DRF₂ - DRF₄ generations using selected bulk method. iii. Selection of desirable single heads and its progenies insuccessive generations (DRF₅ & DRF₆). iv. Selection of uniform, vigorous advanced lines (single head row progenies) resistant to diseases and efficient to drought stress tolerance in DRF₇ generation for grain yield testing in moisture stressed preliminary yield trials.
RESEARCH WORKER (S)	Dr. Muhammad Akbar, Dr. Javed Ahmad and Dr. MakhdoomHussain
PROJECT DURATION	2014-15 (Continuous nature)
LOCATION	Wheat Research Institute, Faisalabad.
TREATMENTS & METHODOLOGY	DRF ₁ generation will be planted in irrigated conditions so that sufficient seed may be produced from F ₁ generation and resistance of each entry against diseases may be precisely observed. DRF ₂ to DRF ₇ will be planted in rainfed condition and these generations will be exposed to artificial epidemic rusts condition also. Epidemic rusts condition will be created by spreading dust of rusts spores.Plants infected with rusts (in pots) will be kept in spreader rows planted around the field. Water will also be sprayed for increasing humidity to favor the germination of spores. On spread of rusts, good and resistant plants will be selected and selected bulk method will be used for generation advancement. Drought tolerant, Uniform maturity of tillers, plant height, lodging resistance, and free from grain diseases will be selected. The material will be planted with the following specifications during first fortnight of November, 2014 and fertilized @120:90:60: N:P:K kg ha ⁻¹ at sowing time.

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5. TITLE	WHEAT BREEDING FOR DURABLE RUST RESISTANCE.
OBJECTIVES	To develop wheat germplasm having durable rust resistance based on minor genes like Sr 2, Lr 34, Lr 46 and other minor genes
RESEARCH WORKER (S)	SadiaAjmal, Sabina Asghar, Faqir Muhammad, Dr. MakhdoomHussain
PROJECT DURATION	2014-15(continuous nature)
LOCATION	Wheat Research Institute, Faisalabad.
TREATMENTS & METHODOLOGY	About 100 fresh crosses will be attempted. F ₁ crosses will be sown in 2.5 meter row. Single heads collected from F ₅ will be sown as head rows in F ₆ generation. F ₆ of durable rust will be sown in a plot size of 1x1.25m. The F ₇ material will be evaluated for yield in a plot size of 4x 4 m.

	<table border="1"> <tr> <th>S.#</th> <th>Generations/ Crosses</th> <th>Crosses/plants</th> </tr> <tr> <td>1</td> <td>Fresh crosses</td> <td>100</td> </tr> <tr> <td>2</td> <td>F₁</td> <td>120</td> </tr> <tr> <td>3</td> <td>F₆</td> <td>54/671</td> </tr> <tr> <td>4</td> <td>F₇</td> <td>27/77</td> </tr> </table> <p>Selection will be done on the basis of plant type visual observation and disease resistance.</p>	S.#	Generations/ Crosses	Crosses/plants	1	Fresh crosses	100	2	F ₁	120	3	F ₆	54/671	4	F ₇	27/77
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6. TITLE	EVALUATION OF ADVANCED LINES/VARIETIES OF WHEAT FOR DROUGHT TOLERANCE
OBJECTIVES	To evaluate advanced lines/varieties suitable for rainfed/water stressed areas.
RESEARCH WORKER (S)	Dr. Muhammad Akbar, Dr. Javed Ahmad and Dr. Makhdoom Hussain
PROJECT DURATION	2014-15 (2 nd year)
LOCATION	Wheat Research Institute, Faisalabad.
TREATMENTS & METHODOLOGY	Ten advanced lines/varieties of bread wheat viz; V-11183, V-08173, V-09082, V-09087, V-08203, Galaxy-13, Chakwal-50, Faisalabad-08, Punjab-11, Millat-11 will be sown in triplicate in three sets during 2 nd week of November, 2014 keeping plot size of (5×1.68) m ² for each entry according to split plot. One set in rainfed, 2 nd in irrigated conditions and 3 rd with one irrigation at reproductive stages on the same date with same agronomic practices except irrigation. Canopy temperature (CT), days to 50% heading, days to 50% maturity, plant height, and chlorophyll content with NDVI, grains per spike, 1000-grain weight and grain yield will be recorded. Finally, lines will be evaluated considering traits recorded.
PREVIOUS YEAR'S RESULT	Ten advanced lines/varieties of bread wheat viz; V-11183, V-08173, V-09082, V-09087, V-08203, Galaxy-13, Chakwal-50, Faisalabad-08, Punjab-11, Millat-11 were assessed in triplicate at three levels of irrigation. Galaxy-13 and V-11183 ranked first in grain yield and 1000 grain weight followed by V-18173. V-18173 ranked 2 nd in lesser flag leaf area, highest number of tillers per plant, maximum in 1000 grain weight and grain yield per hectare.

7.TITLE	STUDY OF ADVANCED LINES OF WHEAT FOR LODGING TOLERANCE AT GRAIN FILLING STAGE.
OBJECTIVES	To evaluate advanced lines/ varieties for lodging tolerance.
RESEARCH WORKER (S)	Dr. Muhammad Akbar, Abdullah, Dr. Javed Ahmad, Dr. MakhdoomHussain and Muhammad Tariq.
PROJECT DURATION	2014-15 (2 nd year)
LOCATION	Wheat Research Institute, Faisalabad.
TREATMENTS & METHODOLOGY	Ten advanced lines/varieties of bread wheat viz; V-11183, V-08173, V-09082, V-09087, V-08203, Galaxy-13, Chakwal-50, Faisalabad-08, Punjab-11, Millat-11 will be sown under two treatments (T1= un-lodged and T2 = lodged) in triplicate 1 st . fortnight of November, 2014 keeping net plot size 5×1.68 m ² for each entry following split plot design. Entries of Treatment-2 will be lodged manually at grain filling stage next day of 3 rd irrigation. Grain yield and 1000- grain weight will be recorded and their reduction % will be calculated to assess drought tolerance.
PREVIOUS YEAR'S RESULTS	Ten advanced lines/varieties of bread wheat viz; V-11183, V-08173, V-09082, V-09087, V-08203, Galaxy-13, CK-50, Faisalabad-08, Punjab-11, Millat-11 were assessed in un-lodged and lodged conditions. Galaxy-13 showed highest potential in mean grain yield (4560 kg ha ⁻¹). V-11183 stood 2 nd in grain yield (4316 kg ha ⁻¹). However, Punjab-11 ranked third in grain yield (3921 kg ha ⁻¹).

8. TITLE	BREEDING FOR HEAT TOLERANCE
OBJECTIVES	To develop crosses and evaluate the generations under heat stress conditions.
RESEARCH WORKER (S)	AneelaAhsan and Dr. MakhdoomHussain
PROJECT DURATION	2014-15
LOCATION	Wheat Research Institute, Faisalabad.
TREATMENTS & METHODOLOGY	About 200 fresh crosses for heat tolerance will be attempted. F ₁ crosses will be sown in 2.5 meter row. F ₂ will be sown as 3.6 x 6m ² , F ₃ , F ₄ & F ₅ as 1.8x6m ² during December. Plot size of F ₆ will be 1 x 2.5m. Observations regarding disease incidence and plant type will be recorded. At maturity, single heads from desirable plants of F ₂ , F ₃ & F ₄ will be bulked to raise next generation. While the desirable heads from F ₅ will be selected to form rows in F ₆ generation. Selected lines from F ₆ will be promoted to F ₇ generation.

	<table border="1"> <thead> <tr> <th>Sr. #</th> <th>Generations/Crosses</th> <th>Entries</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Fresh Crosses</td> <td>200</td> </tr> <tr> <td>2</td> <td>F₁</td> <td>238</td> </tr> <tr> <td>3</td> <td>F₂</td> <td>101</td> </tr> <tr> <td>4</td> <td>F₃</td> <td>67</td> </tr> <tr> <td>5</td> <td>F₄</td> <td>28</td> </tr> <tr> <td>6</td> <td>F₅</td> <td>21</td> </tr> <tr> <td>7</td> <td>F₆</td> <td>20/509 Single head</td> </tr> </tbody> </table>	Sr. #	Generations/Crosses	Entries	1	Fresh Crosses	200	2	F ₁	238	3	F ₂	101	4	F ₃	67	5	F ₄	28	6	F ₅	21	7	F ₆	20/509 Single head				
Sr. #	Generations/Crosses	Entries																											
1	Fresh Crosses	200																											
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PREVIOUS YEAR'S RESULTS	<table border="1"> <thead> <tr> <th>Sr. #</th> <th>Generations/Crosses</th> <th>Entries Studied</th> <th>Entries Selected</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Fresh Crosses</td> <td>238</td> <td>-</td> </tr> <tr> <td>2</td> <td>F₁</td> <td>194</td> <td>101</td> </tr> <tr> <td>3</td> <td>F₂</td> <td>141</td> <td>67</td> </tr> <tr> <td>4</td> <td>F₃</td> <td>64</td> <td>28</td> </tr> <tr> <td>5</td> <td>F₄</td> <td>45</td> <td>21</td> </tr> <tr> <td>6</td> <td>F₅</td> <td>33</td> <td>20/509 Single head</td> </tr> </tbody> </table>	Sr. #	Generations/Crosses	Entries Studied	Entries Selected	1	Fresh Crosses	238	-	2	F ₁	194	101	3	F ₂	141	67	4	F ₃	64	28	5	F ₄	45	21	6	F ₅	33	20/509 Single head
Sr. #	Generations/Crosses	Entries Studied	Entries Selected																										
1	Fresh Crosses	238	-																										
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3	F ₂	141	67																										
4	F ₃	64	28																										
5	F ₄	45	21																										
6	F ₅	33	20/509 Single head																										

9. TITLE	EVALUATION OF BREAD WHEAT GERMPLASM FOR POST-ANTHESIS HEAT STRESS
OBJECTIVES	To evaluate the bread wheat germplasm for yield and yield components under post-anthesis heat stress conditions.
RESEARCH WORKER (S)	AneelaAhsan and Dr. MakhdoomHussain
PROJECT DURATION	2014-15
LOCATION	Wheat Research Institute, Faisalabad.
TREATMENTS & METHODOLOGY	Fifty bread wheat germplasm entries having similar time of anthesis will be sown as two rows of three meter length following RCB design. The material will be sown in and outside the tunnel during the 2 nd week of December. Post anthesis heat shock will be induced by covering the tunnel with the plastic sheet for about three weeks. Data regarding days to heading, canopy temperature, plant height, days to maturity, rust reactions, No. of grains/spike, 1000- grain weight and grain yield/meter row will be recorded.
PREVIOUS YEAR'S RESULTS	Following seven lines performed better on the basis of yield and 1000 grain weight under heat stress conditions:

Sr #	Genotype	Yield (kg ha ⁻¹)		1000 Grain weight (g)	
		Normal	Stress	Normal	Stress
1	V-11138	4722	4022	54.2	52.1
2	V-12265	4855	2821	46.5	49.5
3	V-12275	4755	3034	44.2	42.3
4	V-11046	4602	3288	49.7	48.7
5	V-11365	4655	2834	49.7	45.1
6	WHEAR/TUKURU/ /WHEAR	4535	3001	43.8	41.7
7	KIRITATI// SERI/RAYON	4689	2154	47.9	44.1

10.TITLE	SCREENING OF BREAD WHEAT GERMPLASM FOR HEAT TOLERANCE UNDER LATE SOWN CONDITIONS.
OBJECTIVES	Screening and testing of bread wheat lines for heat tolerance
RESEARCH WORKER (S)	AneelaAhsan, MajidNadeem, Dr. Javed Ahmad and Dr. MakhdoomHussain
PROJECT DURATION	2014-15
LOCATION	Wheat Research Institute, Faisalabad.
TREATMENTS & METHODOLOGY	<p>Entries: = 100 lines (National & International sources)</p> <p>Plot size: = 6 rows x 5m</p> <p>Sowing time: = Dec. 2014</p> <p>Design: =Augmented (Five Blocks)</p> <p>Check varieties: Fsd-08, Millat-11, Pb-11, Lasani-08 and Seher-06</p> <p>Days to heading, canopy temperature ,chlorophyll contents, plant height, yield (kg ha⁻¹), days to maturity, 1000-grain weight will be recorded.</p>

PREVIOUS YEAR'S RESULTS

Fifty eight (in normal trial) and ninety eight (in late trial) advanced lines were found high yielding than five checks. The yield performance of top five high yielding lines compared to three check varieties (Normal and late trials) are as under

Normal				
Entry #	Yield (kg ha⁻¹)	% increase over		
		Fsd-08	Millat-11	Punjab-11
43	6401	16.8	40.1	41.7
40	6321	15.3	38.4	39.9
44	6308	15.1	38.1	39.6
164	6018	9.8	31.8	33.2
35	5987	9.2	31.1	32.5

Late				
Entry #	Yield (kg ha⁻¹)	% increase over		
		Fsd-08	Millat-11	Punjab-11
26	4827	14.2	21.8	26.1
54	4697	11.1	18.5	22.7
133	4629	9.5	16.8	21.0
136	4568	8.0	15.3	19.4
38	4537	7.3	14.5	18.6

Range for characters (in normal trials) is given below:

Sr. #	Character	Range
1	Days to heading	89-106
2	Plant height	95-130cm
3	Leaf rust reaction	0- 60 S
4	Yellow rust reaction	0-50 MRMS
5	1000 grain weight	26.6-43.5 g
6	Grain yield	2543-6555 kgha ⁻¹

Range for characters (in late trials) is given below:

Sr. #	Character	Range
1	Days to heading	76-87
2	Plant height	80-109cm
3	Leaf rust reaction	0- 70 S
4	Yellow rust reaction	0-40 MRMS
5	1000 grain weight	22.3-45.3 g
6	Grain yield	2012-4827 kg ha ⁻¹

11.TITLE	RAPID DEVELOPMENT OF CLIMATE RESILIENT WHEAT VARIETIES FOR SOUTH ASIA
OBJECTIVES	To evaluate CIMMYT candidate lines under local climatic conditions.
RESEARCH WORKER (S)	MuhammdZulkiffal, MajidNadeem, Dr. Javed Ahmad, Dr. MakhdoomHussain, Dr. MuhammadImtiaz and Muhammad Noor
PROJECT DURATION	2014-15
LOCATION	Wheat Research Institute, Faisalabad.
TREATMENTS & METHODOLOGY	About 1000 candidate lines are expected to receive from CIMMYT which will be sown according to the instructions supplied by CIMMYT
PREVIOUS YEAR'S RESULTS	One hundred and fifty four (154) promising lines were selected from candidate lines received from CIMMYT for further study.

12.TITLE	YIELD EVALUATION OF CIMMYT MATERIAL IN NORMAL AND LATE SOWN CONDITIONS.																					
OBJECTIVES	To find out material having terminal heat tolerance ability																					
RESEARCH WORKER (S)	MajidNadeem, MuhammadZulkiffal, Dr. Javed Ahmad, Dr. MakhdoomHussain, Dr. Muhammad Imtiaz and Muhammad Noor																					
PROJECT DURATION	2014-15																					
LOCATION	Wheat Research Institute, Faisalabad.																					
TREATMENTS & METHODOLOGY	About four hundred and fifty (450) lines (Nine Yield Trials) are expected to receive from CIMMYT which will be sown according to the instructions supplied by CIMMYT																					
PREVIOUS YEAR'S RESULTS:	In normal trials one hundred and one (101) lines yielded more than 5000 kg ha ⁻¹ and in late trials ninety two (92) lines gave yield more than 4000 kg ha ⁻¹ .Range for characters (in normal trials) is given below: <table border="1"> <thead> <tr> <th>Sr. #</th> <th>Character</th> <th>Range</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Days to heading</td> <td>89-101</td> </tr> <tr> <td>2</td> <td>Plant height</td> <td>88-123cm</td> </tr> <tr> <td>3</td> <td>Leaf rust reaction</td> <td>0- 100 S</td> </tr> <tr> <td>4</td> <td>Yellow rust reaction</td> <td>0-100 S</td> </tr> <tr> <td>5</td> <td>1000 grain weight</td> <td>21.2-50.1 g</td> </tr> <tr> <td>6</td> <td>Grain yield</td> <td>2628-6363 kg ha⁻¹</td> </tr> </tbody> </table>	Sr. #	Character	Range	1	Days to heading	89-101	2	Plant height	88-123cm	3	Leaf rust reaction	0- 100 S	4	Yellow rust reaction	0-100 S	5	1000 grain weight	21.2-50.1 g	6	Grain yield	2628-6363 kg ha ⁻¹
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	Range for characters (in late trials) is given below:		
	Sr. #	Character	Range
	1	Days to heading	72-84
	2	Plant height	77-104cm
	3	Leaf rust reaction	0- 80 S
	4	Yellow rust reaction	0-60 MRMS
	5	1000 grain weight	20.1-49.9 g
	6	Grain yield	2083-5034 kg ha ⁻¹

13.TITLE	EVALUATION OF INTERNATIONAL BREAD WHEAT MATERIAL(CIMMYT / ICARDA).																																																			
OBJECTIVES	To evaluate and select promising lines from CIMMYT / ICARDA materials for strengthening bread wheat germplasm and testing in station yield trials (A and B).																																																			
RESEARCH WORKER (S)	Muhammad Ijaz, Javed Anwar, Dr. Javed Ahmad, Aneela Ahsan, Dr Muhammad Akbar, Faqir Muhammad, Dr. Makhdoom Hussain SherBaz Khan and Muhammad Hammad Tanveer																																																			
PROJECT DURATION	2014-15 (Continuous)																																																			
LOCATION	Wheat Research Institute, Faisalabad.																																																			
TREATMENTS & METHODOLOGY	<p>The following yield trials/nurseries are expected, which will be laid out according to the instructions supplied by the donor agencies (CIMMYT, ICARDA & NARC):</p> <table border="1"> <thead> <tr> <th>Sr. #</th> <th>Trials/ Nurseries</th> <th>Source</th> </tr> </thead> <tbody> <tr><td>1</td><td>35th ESWYT</td><td>CIMMYT</td></tr> <tr><td>2</td><td>22nd SAWYT</td><td>CIMMYT</td></tr> <tr><td>3</td><td>9th EBWYT</td><td>CIMMYT</td></tr> <tr><td>4</td><td>9th HTWSN</td><td>CIMMYT</td></tr> <tr><td>5</td><td>3rd WYCYT</td><td>CIMMYT</td></tr> <tr><td>6</td><td>WPEPYT</td><td>CIMMYT</td></tr> <tr><td>7</td><td>4th HPYT</td><td>CIMMYT</td></tr> <tr><td>8</td><td>4th SATYN</td><td>CIMMYT</td></tr> <tr><td>9</td><td>32nd SAWSN</td><td>CIMMYT</td></tr> <tr><td>10</td><td>6th CSISA</td><td>CIMMYT</td></tr> <tr><td>11</td><td>46th IBWSN</td><td>CIMMYT</td></tr> <tr><td>12</td><td>8th Stem RRSN</td><td>CIMMYT</td></tr> <tr><td>13</td><td>23rd ISPTON</td><td>CIMMYT</td></tr> <tr><td>14</td><td>15th SSR-FA/IR SBWYT</td><td>CIMMYT/ICARDA</td></tr> <tr><td>15</td><td>15th DSBWYT</td><td>CIMMYT/ICARDA</td></tr> <tr><td>16</td><td>NARC HPRYT</td><td>NARC</td></tr> </tbody> </table>	Sr. #	Trials/ Nurseries	Source	1	35 th ESWYT	CIMMYT	2	22 nd SAWYT	CIMMYT	3	9 th EBWYT	CIMMYT	4	9 th HTWSN	CIMMYT	5	3 rd WYCYT	CIMMYT	6	WPEPYT	CIMMYT	7	4 th HPYT	CIMMYT	8	4 th SATYN	CIMMYT	9	32 nd SAWSN	CIMMYT	10	6 th CSISA	CIMMYT	11	46 th IBWSN	CIMMYT	12	8 th Stem RRSN	CIMMYT	13	23 rd ISPTON	CIMMYT	14	15 th SSR-FA/IR SBWYT	CIMMYT/ICARDA	15	15 th DSBWYT	CIMMYT/ICARDA	16	NARC HPRYT	NARC
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16	NARC HPRYT	NARC																																																		

PREVIOUS YEAR'S RESULTS

Out of 1247 promising lines, 180 were selected from International yield trials and nurseries for testing in yield trials and inclusion in pre-breeding nursery. The detail is given below:

Sr. #	Name of Trial	Entries	
		Studied	Selected
1	34 ESWYT	50	22
2	21 SAWYT	50	17
3	8 EBWYT	30	9
4	2 WYCYT	42	7
5	WPEPYT	25	6
6	4 th HPYT	50	6
7	NARC HPRYT	25	6
8	8 th HTWSN	121	12
9	3 rd SATYN	24	03
10	31 st SAWSN	219	35
11	5 th CSISA	30	08
12	46 th IBWSN	329	26
13	8 th Stem RRSN	200	16
14	23 rd ISPTON	52	7
Total		1247	180

14.TITLE	PRELIMINARY WHEAT YIELD TRIALS (A-TRIALS)
OBJECTIVES	To evaluate the genotypes for yield and other agronomic parameters under irrigated and rainfed conditions.
RESEARCH WORKER (S)	Muhammad Owais, MuhammadIjaz, Dr. Javed Ahmadand Dr. MakhdoomHussain
PROJECT DURATION	2014-15 (Continuous)
LOCATION	Wheat Research Institute, Faisalabad.
TREATMENTS & METHODOLOGY	????- bread wheat lines will be tested in preliminary yield trials under irrigated conditions including three check varieties (Faisalabad-08, Punjab-11and Galaxy-13) while fifty bread wheat lines will be tested in rainfed conditions trials including three check varieties (Faisalabad -08, Chakwal-50 and Dharabi-13) Trials will be laid out according to alpha lattice with three replications. The most promising lines will be selected on the basis of desirable economic traits to strengthen the regular yield trials (B-Trials).

PREVIOUS YEAR'S RESULTS

Thirty nine (39) advanced lines (out of 144) of bread wheat were found high yielding than all three check varieties in their respective trials. Eleven advanced lines were found high yielding than all three check varieties in rainfed trials. The results are enlisted below.

Variety Code	Yield (kg ha ⁻¹)	Percentage Increase over check varieties		
A-I				
		Punjab-11	FSD-08	Millat-11
V-13059	4681	32.9	42.7	54.2
V-13074	4676	32.8	42.6	54.1
V-13058	4092	16.2	24.8	34.8
V-13057	4057	15.2	23.7	33.7
V-13072	3970	12.7	21.1	30.8
V-13068	3958	12.4	20.7	30.4
V-13061	3889	10.4	18.6	28.1
LSD (0.05)	225			
CV (%)	3.78			
A-III				
		Millat-11	FSD-08	Punjab-11
V-13113	4851	9.1	15.4	26.5
V-13112	4762	7.1	13.3	24.2
V-13105	4757	7.0	13.2	24.1
V-13104	4744	6.7	12.8	23.7
V-13108	4715	6.1	12.2	22.9
V-13117	4667	5.0	11.0	21.7
V-13101	4605	3.6	9.5	20.1
V-13122	4557	2.5	8.4	18.8
LSD (0.05)	227			
CV (%)	3.32			
A-IV				
		Millat-11	Punjab-11	FSD-08
V-13123	5108	24.3	31.6	40.4
V-13140	4990	21.4	28.5	37.1
V-13144	4769	16.0	22.9	31.1
V-13136	4537	10.4	16.9	24.7
V-13134	4225	2.8	8.8	16.1
V-13137	4191	2.0	8.0	15.2
V-13124	4147	0.9	6.8	14.0
LSD (0.05)	198			
CV (%)	3.12			

A-V				
		Punjab-11	FSD-08	Millat-11
V-13167	5180	9.3	24.4	25.7
V-13158	4975	4.9	19.5	20.8
V-13152	4891	3.2	17.5	18.7
V-13147	4780	0.8	14.8	16.0
V-13164	4758	0.4	14.3	15.5
LSD (0.05)	204			
CV (%)	2.93			
A-VI				
		FSD-08	Millat-11	Punjab-11
V-13192	5691	32.7	33.6	51.7
V-13190	4822	12.4	13.2	28.5
V-13194	4636	8.1	8.9	23.6
LSD (0.05)	220			
CV (%)	3.47			
A-I (Rainfed)				
		FSD-08	CK-50	BARS-09
V-13310	5559	10.58	44.58	38.35
V-13318	5376	6.94	40.58	33.79
V-13311	5231	40.05	36.87	30.18
V-13316	5228	3.99	36.71	30.11
V-13315	5029	.039	31.51	25.16
LSD (0.05)	355.12			
CV (%)	3.84			
A-II Rainfed				
		FSD-08	CK-50	BARS-09
V-13338	5644	7.85	18.34	58.13
V-13325	5540	5.86	16.16	55.66
V-13340	5461	4.35	14.51	53.44
V-13329	5373	2.67	12.66	50.96
V-13324	5238	.095	9.83	47.17
LSD (0.05)	310.82			
CV (%)	3.24			
A-III Rainfed				
		FSD-08	CK-50	BARS-09
V-13348	5400	0.48	27.78	44.50
LSD (0.05)	223.78			
CV (%)	2.93			

15.TITLE	REGULAR WHEAT YIELD TRIALS (B-TRIALS)
OBJECTIVES	To evaluate the promising lines of bread wheat selected from preliminary yield trials for yield and other agronomic parameters under irrigated and rainfed conditions.
RESEARCH WORKER (S)	Dr. Javed Ahmad, Muhammad Owais, Muhammad Ijaz and Dr. Makhdoom Hussain
PROJECT DURATION	2014-15 (Continuous)
LOCATION	Wheat Research Institute, Faisalabad.
TREATMENTS & METHODOLOGY	????- bread wheat lines will be tested in regular yield trials under irrigated conditions including three check varieties (Faisalabad-08, Millat-11 and Galaxy-13). Four advance lines in MTWV (under rainfed condition) will be tested against check varieties (Faisalabad-08, Chakwal-50 and Dharabi-11). Trials will be laid out according to alpha lattice with three replications. The most promising lines will be promoted in MTWV on the basis of desirable economic traits.

PREVIOUS YEAR'S RESULTS

Twenty nine (in normal trials) and twelve (in short duration trials) advanced lines of bread wheat were found high yielding than three checks. Four advanced lines (rainfed condition) were found higher yielding than three checks (Faisalabad-08, Chakwal-50 and BARS-09). The yield performance of high yielding lines compared to three check varieties are as under:

Variety Code	Yield (kg ha ⁻¹)	Percentage Increase over check varieties		
B-I (Normal)				
		Millat-11	Lasani-08	FSD-08
V-12056	5277	28.8	34.3	46.1
V-12057	5154	25.8	31.2	42.7
V-12053	5121	25.0	30.4	41.8
V-12058	5039	23.0	28.2	39.5
V-12022	4841	18.2	23.2	34.1
V-12054	4817	17.6	22.6	33.4
LSD (0.05)	253			
CV (%)	3.67			
B-II (Normal)				
		Lasani-08	Millat-11	FSD-08
V-13244	4470	15.1	15.8	21.6
V-12112	4216	8.5	9.2	14.7
V-13245	4068	4.7	5.4	10.7
V-13252	4063	4.6	5.2	10.6
V-13262	3979	2.4	3.1	8.3
LSD (0.05)	189			
CV (%)	3.29			

Variety Code	Yield (kg ha ⁻¹)	Percentage Increase over check varieties		
B-III				
		Millat-11	FSD-08	Lasani-08
V-12035	5317	28.7	36.2	41.6
V-12027	4883	18.1	25.1	30.1
V-12059	4796	16.0	22.9	27.8
V-12066	4731	14.5	21.2	26.0
V-12037	4712	14.0	20.7	25.5
V-12032	4554	10.2	16.7	21.3
V-12103	4554	10.2	16.6	21.3
LSD (0.05)	226			
CV (%)	3.32			
B-V				
		FSD-08	Millat-11	Lasani-08
V-13273	4660	6.8	26.7	37.1
LSD (0.05)	246			
CV (%)	3.94			
B-I (Short Duration)				
		FSD-08	Lasani-08	Millat-11
V-12130	5581	7.3	12.3	18.9
V-12056	5438	4.5	9.4	15.8
V-12118	5330	2.4	7.3	13.5
V-12022	5235	0.6	5.3	11.5
LSD (0.05)	221			
CV (%)	2.70			
B-II (Short Duration)				
		Lasani-08	FSD-08	Millat-11
V-13244	5704	11.4	12.2	17.9
V-13255	5512	7.7	8.4	14.0
V-13258	5404	5.6	6.3	11.7
V-12112	5401	5.5	6.2	11.7
V-13248	5363	4.8	5.5	10.9
LSD (0.05)	180			
CV (%)	2.22			
B-IRainfed				
		FSD-08	CK-50	BARS-09
V-13371	5954	11.45	50.54	59.45
V-13372	5749	7.61	45.36	53.96
V-12213	5447	1.96	37.72	45.87
V-12234	5372	0.56	35.82	43.86
LSD (0.05)	318.34			
CV (%)	3.20			

16. TITLE	MICRO WHEAT YIELD TRIAL (MWYT).																				
OBJECTIVES	To assess the yield performance and adaptability of promising lines at Govt. farms in different ecological zones of the Punjab.																				
RESEARCH WORKER (S)	Dr.MakhdoomHussain, Dr. Muhammad Munir, Abdullah, MuhammadIjaz and Muhammad Tariq																				
PROJECT DURATION	2014-15 (Continuous)																				
LOCATIONS	Wheat Research Institute, Faisalabad and almost in all districts of the Punjab.																				
TREATMENTS & METHODOLOGY	<p>Two sets of trial i.e. normal and short duration will be conducted at Govt. farms. All the wheat breeders of the Punjab including, University of Agriculture; NIBGE, NIAB, Faisalabad; NARC, CDRP, Islamabad and Private Seed Companies will contribute the promising lines. The trial will be conducted as per details given below.</p> <table border="1"> <thead> <tr> <th>Set of trial</th> <th>No. of trials</th> <th>No. of entries</th> <th>Sowing time</th> </tr> </thead> <tbody> <tr> <td>Normal duration</td> <td>25</td> <td>30</td> <td>2nd week of Nov.</td> </tr> <tr> <td>Short duration</td> <td>25</td> <td>30</td> <td>2nd& 3rd week of Dec.</td> </tr> </tbody> </table> <table border="1"> <tbody> <tr> <td>Layout</td> <td>RCBD</td> </tr> <tr> <td>Plot size</td> <td>1.20 m x 5 m</td> </tr> <tr> <td>Replication</td> <td>03</td> </tr> <tr> <td>Fertilizer</td> <td>120-90-0 NPK kg ha⁻¹</td> </tr> </tbody> </table>	Set of trial	No. of trials	No. of entries	Sowing time	Normal duration	25	30	2 nd week of Nov.	Short duration	25	30	2 nd & 3 rd week of Dec.	Layout	RCBD	Plot size	1.20 m x 5 m	Replication	03	Fertilizer	120-90-0 NPK kg ha ⁻¹
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Plot size	1.20 m x 5 m																				
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PREVIOUS YEAR'S RESULTS

Thirty entries including two check varieties i.e. Punjab-11, Faisalabad-08 and were planted at 21 locations during first fortnight of November, 2013. The varieties/lines with their yield are as under

Normal Duration			
Variety/line	Yield (kg ha⁻¹)	% increase over	
		Punjab-11	Faisalabad-08
V-12304	4183	10.02	4.39
V-11098	4104	7.94	2.42
V-11138	4088	7.52	2.02
V-12266	4050	6.53	1.07

Thirty entries including two check varieties, i.e. Millat-11 and Lasani-08 were planted at 21 locations during first fortnight of December, 2013. The varieties/lines with their yield are as under:

Short Duration			
Variety/line	Yield (kg ha⁻¹)	Percent increase over	
		Millat-11	Lasani-08
V-11138	3789	9.73	7.09
V-12304	3788	9.70	7.07
NR-411	3613	4.63	2.12
V-11046	3564	3.22	0.74

Twenty five entries including two check varieties i.e. CK-50 and Dharabi-11 were planted at six locations under moisture stress conditions. Following varieties of wheat research institute Faisalabad produced higher grain yield:

Variety Code	Yield (kg ha⁻¹)	Percentage Increase over check varieties	
MTWV (Rainfed)			
Variety/line	Yield (kg ha ⁻¹)	Dharabi-11	CK-50
V-12253	4190	3.13	4.93
V-12252	3959	-2.56	-0.85
V-11101	3915	-3.64	-1.95
LSD	332.06		
CV	3.68		

17. TITLE

NATIONAL UNIFORM WHEAT YIELD TRIAL (NUWYT)

OBJECTIVES

To confirm the yield and adaptability of elite lines contributed by wheat breeders of the country.

RESEARCH WORKER (S)	Dr.MakhdoomHussain, Dr. Muhammad Munir, Muhammad Saleem, Muhammad Ijaz, Muhammad Tariq and SherBazKhan																			
PROJECT DURATION	2014-15 (Continuous)																			
LOCATION	Wheat Research Institute, Faisalabad, Govt. Farms and farmer's fields in all districts of the Punjab. National Wheat coordinator, NARC, Islamabad will design the trial. The entries under coded names will be supplied to Director Wheat for planting and harvesting on the selected sites in the Punjab. The trial will be conducted under normal and late sown conditions to evaluate the yield performance.																			
TREATMENTS & METHODOLOGY	<table border="1"> <thead> <tr> <th>Name of trial</th> <th>Entries</th> <th>Date of sowing</th> </tr> </thead> <tbody> <tr> <td>NUWYT (Normal)</td> <td>40</td> <td>2nd & 3rd week of Nov.</td> </tr> <tr> <td>NUWYT (Short)</td> <td>40</td> <td>2nd & 3rd week of Dec.</td> </tr> </tbody> </table> <table border="1"> <tbody> <tr> <td>Varieties</td> <td>Seven (5 for normal and 2 for rainfed) advanced lines will be contributed by WR I,Fsd</td> </tr> <tr> <td>Layout</td> <td>RCBD</td> </tr> <tr> <td>Plot size</td> <td>1.80 m x05 m</td> </tr> <tr> <td>Reps</td> <td>04</td> </tr> <tr> <td>Fertilizer</td> <td>120-90-0 NPK kg ha⁻¹</td> </tr> </tbody> </table>	Name of trial	Entries	Date of sowing	NUWYT (Normal)	40	2 nd & 3 rd week of Nov.	NUWYT (Short)	40	2 nd & 3 rd week of Dec.	Varieties	Seven (5 for normal and 2 for rainfed) advanced lines will be contributed by WR I,Fsd	Layout	RCBD	Plot size	1.80 m x05 m	Reps	04	Fertilizer	120-90-0 NPK kg ha ⁻¹
Name of trial	Entries	Date of sowing																		
NUWYT (Normal)	40	2 nd & 3 rd week of Nov.																		
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Reps	04																			
Fertilizer	120-90-0 NPK kg ha ⁻¹																			

PREVIOUS YEAR'S RESULTS

On overall mean basis,(12 locations)Galaxy-13 remained at the top position with 4141 kg ha⁻¹ yield, followed by Pirsabak-13 (4093 kg ha⁻¹) and V-10110 (4070 kg ha⁻¹) while the yield of local check variety was 3859 kg ha⁻¹in normal trials while in case of short trials, V-99172 remained at top with 3675 kg ha⁻¹ yield, followed by V-99114(3618 kg ha⁻¹) and DN-93 (3597kg ha⁻¹) while local check variety gave 3437 kg ha⁻¹ yield.

Twenty four entries including two check varieties i.e.local check and Dharabi-11 were planted at different locations in Punjab under moisture stress conditions. Following varieties of wheat research institute Faisalabad produced higher grain yield:

Variety Code	Yield (kg ha ⁻¹)	Percentage Increase over check varieties	
		Local Check	Dharabi-11
NUWYT (Rainfed)			
Variety/line	Yield (kg ha ⁻¹)	Local Check	Dharabi-11
V-11183	3711	0.95	-5.21
V-12001	3730	1.47	-4.72
V-07096	4069	10.69	3.93
LSD	250.01		
CV	12.1		

DURUM WHEAT (*Triticum durum*) AND TRITICALE (*Triticosecale*)

18. TITLE	MAINTENANCE OF DURUM AND TRITICALE GERMPASM.																														
OBJECTIVES	Enhancement of genetic variability in durum and triticales germplasm																														
RESEARCH WORKER(S)	Dr.MakhdoomHussain, Dr. Muhammad Munir and MajidNadeem																														
PROJECT DURATION	2014-15 (continuous nature)																														
LOCATION	Wheat Research Institute, Faisalabad.																														
TREATMENTS & METHODOLOGY	<table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td style="padding: 2px;">No. of entries</td> <td style="padding: 2px;">Durum (161) and Triticale (79)</td> </tr> <tr> <td style="padding: 2px;">Plot size</td> <td style="padding: 2px;">2 rows x 2.5 m.</td> </tr> <tr> <td style="padding: 2px;">Sowing time</td> <td style="padding: 2px;">2nd week of November</td> </tr> </table> <p style="margin-left: 40px;">Desirable lines will be utilized in hybridization program.</p>	No. of entries	Durum (161) and Triticale (79)	Plot size	2 rows x 2.5 m.	Sowing time	2 nd week of November																								
No. of entries	Durum (161) and Triticale (79)																														
Plot size	2 rows x 2.5 m.																														
Sowing time	2 nd week of November																														
PREVIOUS YEAR'S RESULT	<p>One hundred and fifty eight (158) entries of durum and 79 entries of Triticale were maintained.</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2" style="padding: 2px;">Sr.#</th> <th rowspan="2" style="padding: 2px;">Traits</th> <th colspan="2" style="padding: 2px;">Variability Range</th> </tr> <tr> <th style="padding: 2px;">Durum</th> <th style="padding: 2px;">Triticale</th> </tr> </thead> <tbody> <tr> <td style="padding: 2px;">1</td> <td style="padding: 2px;">Days to heading</td> <td style="padding: 2px;">91-128</td> <td style="padding: 2px;">90-116</td> </tr> <tr> <td style="padding: 2px;">2</td> <td style="padding: 2px;">Days to maturity</td> <td style="padding: 2px;">151-164</td> <td style="padding: 2px;">156-167</td> </tr> <tr> <td style="padding: 2px;">3</td> <td style="padding: 2px;">Plant height (cm)</td> <td style="padding: 2px;">90-144</td> <td style="padding: 2px;">113-172</td> </tr> <tr> <td style="padding: 2px;">4</td> <td style="padding: 2px;">1000-grain weight (g)</td> <td style="padding: 2px;">33.12-50.74</td> <td style="padding: 2px;">-</td> </tr> <tr> <td style="padding: 2px;">5</td> <td style="padding: 2px;">Rust reaction (LR)</td> <td style="padding: 2px;">0-30 S</td> <td style="padding: 2px;">0-20 MSS</td> </tr> <tr> <td style="padding: 2px;">6</td> <td style="padding: 2px;">Rust reaction (YR)</td> <td style="padding: 2px;">0-40 MSS</td> <td style="padding: 2px;">0-10 MS</td> </tr> </tbody> </table>	Sr.#	Traits	Variability Range		Durum	Triticale	1	Days to heading	91-128	90-116	2	Days to maturity	151-164	156-167	3	Plant height (cm)	90-144	113-172	4	1000-grain weight (g)	33.12-50.74	-	5	Rust reaction (LR)	0-30 S	0-20 MSS	6	Rust reaction (YR)	0-40 MSS	0-10 MS
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6	Rust reaction (YR)	0-40 MSS	0-10 MS																												

19. TITLE	CROSSING DURUM WHEAT WITH BREAD WHEAT
OBJECTIVES	Introgression of genes for biotic and abiotic stresses in bread wheat
RESEARCH WORKER(S)	Dr.MakhdoomHussain, Dr. Muhammad Munir and MajidNadeem
PROJECT DURATION	2014-15 (continuous nature)
LOCATION	Wheat Research Institute, Faisalabad.
TREATMENTS	Stable wheat lines/varieties will be crossed with durum

&METHODOLOGY	germplasm.Fifty crosses/back crosses will be attempted.
PREVIOUS YEAR'S RESULT	Fifty one crosses were attempted out of these41 crosses were harvested.

20. TITLE	STUDY OF BREEDING MATERIAL (F₁-F₇).																																		
OBJECTIVES	<ul style="list-style-type: none"> i. To advance the generations. ii. To select the vigorous and disease resistant plants from segregating generations F₂-F₇. iii. To select the homozygous and uniform lines for yield testing. 																																		
RESEARCH WORKER(S)	Dr.MakhdoomHussain, Dr. Muhammad Munir and MajidNadeem																																		
PROJECT DURATION	2014-15 (Continuous nature)																																		
LOCATION	Wheat Research Institute, Faisalabad.																																		
TREATMENTS & METHODOLOGY	<p>Selection in filial generations</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Sr.#</th> <th>Generations</th> <th>No. of entries</th> <th>Plot size</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>DF₁</td> <td>41</td> <td>1 row x 2.5m</td> </tr> <tr> <td>2</td> <td>DF₂</td> <td>31</td> <td>12 rows x 9.0m</td> </tr> <tr> <td>3</td> <td>DF₃</td> <td>19</td> <td>3 rows x 3.0m</td> </tr> <tr> <td>4</td> <td>DF₄</td> <td>13</td> <td>3 rows x 3.0m</td> </tr> <tr> <td>5</td> <td>DF₅</td> <td>15</td> <td>3 rows x 3.0m</td> </tr> <tr> <td>6</td> <td>DF₆</td> <td>260 S.H (13 Crosses)</td> <td>1 row x 2.5m</td> </tr> <tr> <td>7</td> <td>DF₇</td> <td>67 SHRP</td> <td>4 rows x 3.0m</td> </tr> </tbody> </table>	Sr.#	Generations	No. of entries	Plot size	1	DF ₁	41	1 row x 2.5m	2	DF ₂	31	12 rows x 9.0m	3	DF ₃	19	3 rows x 3.0m	4	DF ₄	13	3 rows x 3.0m	5	DF ₅	15	3 rows x 3.0m	6	DF ₆	260 S.H (13 Crosses)	1 row x 2.5m	7	DF ₇	67 SHRP	4 rows x 3.0m		
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21. TITLE	PRELIMINARY DURUM WHEAT YIELD TRIALS (DA-TRIALS)																																																									
OBJECTIVES	To evaluate the genotypes for yield and other agronomic parameters under irrigated conditions.																																																									
RESEARCH WORKER (S)	Dr. Muhammad Munir, MajidNadeem, Muhammad Owais and Dr. MakhdoomHussain																																																									
PROJECT DURATION	2014-15 (Continuous)																																																									
LOCATION	Wheat Research Institute, Faisalabad.																																																									
TREATMENTS & METHODOLOGY	????- durum wheat lines will be tested in preliminary yield trials under irrigated conditions including three check varieties (Durum-97, ----- and Galaxy-13) Trials will be laid out according to alpha lattice with three replications. The most promising lines will be selected on the basis of desirable economic traits to strengthen the regular yield trials (DB-Trials).																																																									
PREVIOUS YEAR'S RESULTS	<p>Twenty two (22) advanced lines (out of 46) of durum wheat were found high yielding than check variety Durum-97 in their respective trials. The results are as under:</p> <table border="1"> <thead> <tr> <th>Variety Code</th> <th>Yield (kg ha⁻¹)</th> <th>% Increase over Durum-97 (check)</th> </tr> </thead> <tbody> <tr> <td colspan="3">A-VII (Durum)</td> </tr> <tr> <td>D-13210</td> <td>5201</td> <td>12.8</td> </tr> <tr> <td>D-13205</td> <td>5060</td> <td>9.7</td> </tr> <tr> <td>D-13201</td> <td>4749</td> <td>3.0</td> </tr> <tr> <td>D-13198</td> <td>4715</td> <td>2.3</td> </tr> <tr> <td>D-13214</td> <td>4637</td> <td>0.6</td> </tr> <tr> <td>D-13199</td> <td>4618</td> <td>0.2</td> </tr> <tr> <td>LSD (0.05)</td> <td>172</td> <td></td> </tr> <tr> <td>CV (%)</td> <td>2.39</td> <td></td> </tr> <tr> <td colspan="3">A-VIII (Durum)</td> </tr> <tr> <td>D-13234</td> <td>5048</td> <td>23.5</td> </tr> <tr> <td>D-13240</td> <td>4961</td> <td>21.4</td> </tr> <tr> <td>D-13238</td> <td>4952</td> <td>21.2</td> </tr> <tr> <td>D-13239</td> <td>4590</td> <td>12.3</td> </tr> <tr> <td>D-13218</td> <td>4533</td> <td>10.9</td> </tr> <tr> <td>D-13219</td> <td>4516</td> <td>10.5</td> </tr> <tr> <td>LSD (0.05)</td> <td>195</td> <td></td> </tr> <tr> <td>CV (%)</td> <td>2.83</td> <td></td> </tr> </tbody> </table>	Variety Code	Yield (kg ha ⁻¹)	% Increase over Durum-97 (check)	A-VII (Durum)			D-13210	5201	12.8	D-13205	5060	9.7	D-13201	4749	3.0	D-13198	4715	2.3	D-13214	4637	0.6	D-13199	4618	0.2	LSD (0.05)	172		CV (%)	2.39		A-VIII (Durum)			D-13234	5048	23.5	D-13240	4961	21.4	D-13238	4952	21.2	D-13239	4590	12.3	D-13218	4533	10.9	D-13219	4516	10.5	LSD (0.05)	195		CV (%)	2.83	
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22. TITLE	REGULAR DURUM WHEAT YIELD TRIAL (DB-TRIAL)															
OBJECTIVES	To evaluate the promising lines of durum wheat selected from preliminary yield trials for yield and other agronomic parameters under irrigated conditions.															
RESEARCH WORKER (S)	Dr. Muhammad Munir, MajidNadeem, Muhammad Owais and Dr. MakhdoomHussain															
PROJECT DURATION	2014-15 (Continuous)															
LOCATION	Wheat Research Institute, Faisalabad.															
TREATMENTS & METHODOLOGY	24 durum wheat lines will be tested in regular yield trials under irrigated conditions including three check varieties (Durum-97, ----- and Galaxy-13). Trial will be laid out according to alpha lattice with three replications. The most promising lines will be promoted in MTWV on the basis of desirable economic traits.															
PREVIOUS YEAR'S RESULTS	One advanced line of durum wheat was found high yielding than check variety Durum-97. <table border="1"> <thead> <tr> <th>Variety Code</th> <th>Yield (kg ha⁻¹)</th> <th>% Increase over Durum-97 (check)</th> </tr> </thead> <tbody> <tr> <td colspan="3">B Trial (Durum)</td> </tr> <tr> <td>D-12306</td> <td>5424</td> <td>17.6</td> </tr> <tr> <td>LSD (0.05)</td> <td>172</td> <td></td> </tr> <tr> <td>CV (%)</td> <td>2.39</td> <td></td> </tr> </tbody> </table>	Variety Code	Yield (kg ha ⁻¹)	% Increase over Durum-97 (check)	B Trial (Durum)			D-12306	5424	17.6	LSD (0.05)	172		CV (%)	2.39	
Variety Code	Yield (kg ha ⁻¹)	% Increase over Durum-97 (check)														
B Trial (Durum)																
D-12306	5424	17.6														
LSD (0.05)	172															
CV (%)	2.39															

23. TITLE	EVALUATION OF INTERNATIONAL YIELD TRIALS (CIMMYT) OF DURUM WHEAT
OBJECTIVES	To evaluate the CIMMYT material for incorporation in yield trials
RESEARCH WORKER (S)	Dr.MakhdoomHussain, Dr. Muhammad Munir and MajidNadeem
PROJECT DURATION	2014-15
LOCATION	Wheat Research Institute, Faisalabad.
TREATMENTS & METHODOLOGY	46 th International Durum Screening Nursery (IDSN) is expected, which will be laid out according to the instructions supplied by the CIMMYT.

PREVIOUS YEAR'S RESULTS

Twenty seven lines out of 164 lines of 45th International Durum Screening Nursery were selected on the basis of their performance against diseases. Line E-7110 had the highest 1000-grain weight (52.86 g) followed by E-7136 (51.32 g) and E-7114 (48.90 g).

BARLEY (*Hordeumvulgare*)

24.TITLE	MAINTENANCE OF BARLEY GERMPLASM AND HYBRIDIZATION
OBJECTIVES	<ul style="list-style-type: none"> i. To combine high yield, tolerance to biotic & abiotic stresses, quality and other desirable characteristics. ii. To conserve existing genetic variability and broaden the base of genetic diversity
RESEARCH WORKER (S)	Dr. GhulamMahboobSubhani, Dr. MakhdoomHussain, and Abdullah
PROJECT DURATION	2014-15
LOCATION	Wheat Research Institute, Faisalabad.
TREATMENTS & METHODOLOGY	Seventy two entries of germplasm will be planted. Each entry will be sown in two rows of 2.5 meter length during 1 st week of November. New entries selected from the local material and international trials/nurseries on the basis of superiority, agronomic characters and resistance to biotic and abiotic stresses will be added. Thirty crosses will be attempted.
PREVIOUS YEAR'S RESULTS	Seventy genotypes were maintained. Five successful fresh crosses threshed for generation advancement.

25.TITLE	STUDY OF FILIALGENERATIONS (F₁, F₂, F₃, F₆ andF₇) OF BARLEY
OBJECTIVES	To advance the generation for developing homozygous line with desirable traits.
LOCATION	Wheat Research Institute, Faisalabad.
RESEARCH WORKER(S)	Dr. GhulamMahboobSubhani and Mr. Abdullah
PROJECT DURATION	2014-15
TREATMENTS & METHODOLOGY	Disease resistantand good plants will be selected and advanced through selected bulk methods. Uniform maturity, plant height, lodging resistance, grain quality and diseases willbe considered during selection. The material will be planted with the following specifications:

	<table border="1"> <thead> <tr> <th>Generations</th> <th>Crosses</th> <th>Entries</th> <th>Plot Size</th> </tr> </thead> <tbody> <tr> <td>F₁</td> <td>05</td> <td>05</td> <td>1row x 2.5 m</td> </tr> <tr> <td>F₂</td> <td>17</td> <td>17</td> <td>1row x 2.5 m</td> </tr> <tr> <td>F₃</td> <td>09</td> <td>09</td> <td>4 row x 2.5 m</td> </tr> <tr> <td>F₄</td> <td>17</td> <td>17</td> <td>4 row x 2.5 m</td> </tr> <tr> <td>F₇</td> <td>17</td> <td>17</td> <td>4 row x 2.5 m</td> </tr> </tbody> </table>	Generations	Crosses	Entries	Plot Size	F ₁	05	05	1row x 2.5 m	F ₂	17	17	1row x 2.5 m	F ₃	09	09	4 row x 2.5 m	F ₄	17	17	4 row x 2.5 m	F ₇	17	17	4 row x 2.5 m
Generations	Crosses	Entries	Plot Size																						
F ₁	05	05	1row x 2.5 m																						
F ₂	17	17	1row x 2.5 m																						
F ₃	09	09	4 row x 2.5 m																						
F ₄	17	17	4 row x 2.5 m																						
F ₇	17	17	4 row x 2.5 m																						
PREVIOUS YEAR'S RESULT	Five successful crosses were threshed. Seventeen entries from F ₁ , 09 entries from F ₂ , 17 entries from F ₃ and 17 entries from F ₆ were selected for generation advancement.																								

26.TITLE	PRELIMINARY BARLEY YIELD TRIAL														
OBJECTIVES	To test different lines/varieties of barley for yield and other desirable traits.														
RESEARCH WORKER (S)	Dr. GhulamMahboobSubhani and Abdullah														
PROJECT DURATION	2014-15														
LOCATION	Wheat Research Institute, Faisalabad														
TREATMENTS & METHODOLOGY	<table border="1"> <tbody> <tr> <td>Varieties/lines</td> <td>22</td> </tr> <tr> <td>No. of trials</td> <td>2 (A1 & A2) 11 lines + 1 check variety</td> </tr> <tr> <td>Layout</td> <td>RCBD</td> </tr> <tr> <td>Rep</td> <td>03</td> </tr> <tr> <td>Plot size</td> <td>1.8 m x 5.0 m</td> </tr> <tr> <td>Fertilizer NPK (kg_{ha}⁻¹)</td> <td>50-50-0</td> </tr> <tr> <td>Sowing date</td> <td>1st fortnight of Nov.</td> </tr> </tbody> </table>	Varieties/lines	22	No. of trials	2 (A1 & A2) 11 lines + 1 check variety	Layout	RCBD	Rep	03	Plot size	1.8 m x 5.0 m	Fertilizer NPK (kg _{ha} ⁻¹)	50-50-0	Sowing date	1 st fortnight of Nov.
Varieties/lines	22														
No. of trials	2 (A1 & A2) 11 lines + 1 check variety														
Layout	RCBD														
Rep	03														
Plot size	1.8 m x 5.0 m														
Fertilizer NPK (kg _{ha} ⁻¹)	50-50-0														
Sowing date	1 st fortnight of Nov.														
PREVIOUS YEAR'S RESULTS	Trial was not conducted														

27.TITLE	REGULAR BARLEY YIELD TRIAL
OBJECTIVES	To test different lines/varieties of barley for yield potential and other desirable traits.
RESEARCH WORKER (S)	Dr. GhulamMahboobSubhani and Abdullah
PROJECT DURATION	2014-15
LOCATION	Wheat Research Institute, Faisalabad.

TREATMENTS & METHODOLOGY	Varieties/lines	22																																										
	No. of trials	2 (B1 & B2) 11 lines + 1 check variety																																										
	Layout	RCBD																																										
	Rep	03																																										
	Plot size	1.8 m x 5.0 m																																										
	Fertilizer NPK (kg ha ⁻¹)	50 – 50 – 0																																										
	Sowing date	1 st . fortnight of November																																										
PREVIOUS YEAR'S RESULTS	<p>Twenty two advanced lines of barley alongwith check variety Haider-93 were tested in advance yield trials (B1 and B2 trials). Among these seven varieties performed better in each trial than check variety Haider 93 as follows,</p> <table border="1"> <thead> <tr> <th colspan="3">B1</th> <th colspan="3">B2</th> </tr> <tr> <th>Rank</th> <th>Line/Var.</th> <th>Yield (Kg ha⁻¹)</th> <th>Rank</th> <th>Line/Var.</th> <th>Yield (Kg ha⁻¹)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>B-12025</td> <td>2954</td> <td>1</td> <td>B-12032</td> <td>3077</td> </tr> <tr> <td>2</td> <td>B-12013</td> <td>2521</td> <td>2</td> <td>B-12030</td> <td>2750</td> </tr> <tr> <td>3</td> <td>B-12024</td> <td>2470</td> <td>3</td> <td>B-12027</td> <td>2696</td> </tr> <tr> <td></td> <td>Haider-93</td> <td>2124</td> <td></td> <td>Haider-93</td> <td>2046</td> </tr> <tr> <td></td> <td>LSD (0.05)</td> <td>306.9</td> <td></td> <td>LSD (0.05)</td> <td>308.8</td> </tr> </tbody> </table> <p>It is clear from above table that in B1 trial the advanced line B-12025 produced maximum grain yield (2954 kg ha⁻¹) followed by B-12013 (2521 kg ha⁻¹) while in B2 trial the advance line B-12032 produced maximum grain yield (3077 kg ha⁻¹) followed by B-12030 (2750 kg ha⁻¹) and B-12027 (2696 kg ha⁻¹).</p>		B1			B2			Rank	Line/Var.	Yield (Kg ha ⁻¹)	Rank	Line/Var.	Yield (Kg ha ⁻¹)	1	B-12025	2954	1	B-12032	3077	2	B-12013	2521	2	B-12030	2750	3	B-12024	2470	3	B-12027	2696		Haider-93	2124		Haider-93	2046		LSD (0.05)	306.9		LSD (0.05)	308.8
B1			B2																																									
Rank	Line/Var.	Yield (Kg ha ⁻¹)	Rank	Line/Var.	Yield (Kg ha ⁻¹)																																							
1	B-12025	2954	1	B-12032	3077																																							
2	B-12013	2521	2	B-12030	2750																																							
3	B-12024	2470	3	B-12027	2696																																							
	Haider-93	2124		Haider-93	2046																																							
	LSD (0.05)	306.9		LSD (0.05)	308.8																																							

28.TITLE	MICRO YIELD TRIAL OF BARLEY VARIETIES
OBJECTIVES	To assess yield potential of advanced lines against check variety under different agro-climatic conditions.
RESEARCH WORKER (S)	Abdullah, Dr. GhulamMahboobSubhani and Dr. MakhdoomHussain
PROJECT DURATION	2014-15
LOCATION	Punjab Province

TREATMENTS & METHODOLOGY	Varieties/lines	11 + 01 Haider-93 (Check)
	Layout	RCBD
	Rep	03
	Plot size	1.8 m × 5 m
	Fertilizer NPK (Kg ha ⁻¹)	50 – 50 – 0
	Sowing date	Mid of November
PREVIOUS YEAR'S RESULTS	On overall mean basis fourteen advanced lines performed better than check variety Haider-93 (1940 Kg ha ⁻¹). The advanced line B-100007 produced maximum grain yield of 2883 Kg ha ⁻¹ followed by B-09006 (2681 Kg ha ⁻¹), B-09031 (2463 Kg ha ⁻¹) and B-05011 (2395 Kg ha ⁻¹).	

29.TITLE	INTERNATIONAL NURSERY/ YIELD TRIALS
OBJECTIVES	To test different lines/varieties of barley for yield potential and other desirable traits.
RESEARCH WORKER (S)	Dr. GhulamMahboobSubhani and Abdullah
PROJECT DURATION	2014-15
LOCATION	Wheat Research Institute, Faisalabad
TREATMENTS & METHODOLOGY	New International nurseries / Yield Trials received shall be planted and maintained as per instructions
PREVIOUS YEAR'S RESULTS	Sixty five advanced lines of Barley were tested in Barley observatory nursery (INBON-13-14) with check variety Haider-93 in which eleven lines were selected to be promoted to next trial, while 101 advanced lines of barley were tested for their yield performance in different Barley Yield Trials (GBYT 2012-13, IBYT 2012-13, INBYT 2012-13, INBYT 2013-14) with check variety Haider-93 in which 67 advanced lines performed better than check variety Haider-93.

30.TITLE	SOWING DATE TRIAL OF BARLEY
OBJECTIVES	To find out best sowing time of barley advanced line.
RESEARCH WORKER (S)	Dr. GhulamMahboobSubhani, Dr. MakhdoomHussain and Abdullah
PROJECT DURATION	2014-15
LOCATION	Wheat Research Institute, Faisalabad.

TREATMENTS & METHODOLOGY	<p>Varieties. = 11 + 01 (Check variety) Layout = RCBD Rep. = 03 Plot size = 5 m × 6 rows Fertilizer = 50-50-0 NPK (kg ha⁻¹) Date of Sowings = 3 D₁ = 5th November, D₂ = 20th November & D₃ = 5th December</p>																																																											
PREVIOUS YEAR'S RESULTS	<p>Eleven advanced lines of barley along with check variety (Haider 93) were tested at two sowing dates and results are as under:</p> <table border="1"> <thead> <tr> <th rowspan="2">Entry</th> <th colspan="3">Yield (kg ha⁻¹)</th> </tr> <tr> <th>D1</th> <th>D2</th> <th>Rainfed</th> </tr> </thead> <tbody> <tr><td>B-12035</td><td>2756</td><td>2964</td><td>2778</td></tr> <tr><td>B-12036</td><td>2394</td><td>2833</td><td>2027</td></tr> <tr><td>B-12039</td><td>3222</td><td>2733</td><td>1964</td></tr> <tr><td>B-12042</td><td>2858</td><td>2247</td><td>2161</td></tr> <tr><td>B-12044</td><td>2911</td><td>2878</td><td>2633</td></tr> <tr><td>B-12045</td><td>2972</td><td>3014</td><td>3431</td></tr> <tr><td>B-12046</td><td>3011</td><td>2725</td><td>2872</td></tr> <tr><td>B-12048</td><td>3539</td><td>3231</td><td>2269</td></tr> <tr><td>B-12050</td><td>2906</td><td>2644</td><td>2717</td></tr> <tr><td>B-12051</td><td>3286</td><td>2517</td><td>2508</td></tr> <tr><td>B-12053</td><td>3339</td><td>2519</td><td>2439</td></tr> <tr><td>Haider-93</td><td>2497</td><td>2783</td><td>1917</td></tr> <tr><td>LSD</td><td>404.38</td><td>377.35</td><td>407.34</td></tr> </tbody> </table> <p>Advanced line B-12048 gave maximum grain yield 3539 kg ha⁻¹ at first planting (13th November). On overall mean basis of sowing dates, the advanced line B-12048 produced maximum grains (3385 kg ha⁻¹) followed by B-12045 (2993 kg ha⁻¹), B-12039 (2978 kg ha⁻¹) and B-12053 (2929 kg ha⁻¹). Nine advanced lines performed better than check variety Haider-93 and among them top five entries were selected for testing their yield performance in different agro-ecological zones</p>	Entry	Yield (kg ha ⁻¹)			D1	D2	Rainfed	B-12035	2756	2964	2778	B-12036	2394	2833	2027	B-12039	3222	2733	1964	B-12042	2858	2247	2161	B-12044	2911	2878	2633	B-12045	2972	3014	3431	B-12046	3011	2725	2872	B-12048	3539	3231	2269	B-12050	2906	2644	2717	B-12051	3286	2517	2508	B-12053	3339	2519	2439	Haider-93	2497	2783	1917	LSD	404.38	377.35	407.34
Entry	Yield (kg ha ⁻¹)																																																											
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31.TITLE	SEED PRODUCTION OF BARLEY VARIETIES AND ADVANCED LINES.
OBJECTIVES	To produce pure seed of barley/lines for experimental use and farmers
RESEARCH WORKER(S)	Dr. GhulamMahboobSubhani and Abdullah
DURATION	2014-15 (continuous nature)
LOCATION	Wheat Research Institute, Faisalabad.
TREATMENTS & METHODOLOGY	One kanal to one acre of barley varieties and advanced lines will be sown

PREVIOUS YEAR' S RESULTS:	The following quantity of seed was produced:		
	Sr #	Varieties/lines	Quantity (kg)
	1	B-09005	22
	2	B-09031	10
	3	B-10003	11
	4	B-10006	15
	5	B-10009	14
	6	B-10014	10
	7	B-11011	19
	8	B-11016	30
	9	B-12035	25
	10	B-12039	16
	11	B-12042	8
	12	B-12044	13
	13	B-12045	9
	14	B-12046	15
	15	B-12050	8
	16	B-12051	13
	17	B-12053	11
	18	B-11001	40
	19	B-09006	110
	20	B-09008	105
	21	B-05011	86
	22	Haider-93	220
	23	Jau-83	25
24	Jau-87	32	

WHEAT PATHOLOGY

32.TITLE	RUST TRAP NURSERIES
OBJECTIVES	<ul style="list-style-type: none"> i. To trap the early landed rust inoculums and its multiplications on border rows of morocco as well as on different varieties ii. To monitor the rust virulence pattern at different locations
RESEARCH WORKER (S)	Faqir Muhammad, Dr. ArshadMehmood and Muhammad MakkyJavaid
PROJECT DURATION	2014-15 (Continuous Nature)

LOCATION	Wheat Research Institute, Faisalabad and seven locations of LDSN	
TREATMENTS & METHODOLOGY	No. of entries	LR Genes Differential sets = 40 YR Genes Differential sets = 28 SR Genes Differential sets = 16 Commercial Varieties/lines = 100
	Susceptible Check	Morocco at border and every 10 th entry
	Sowing Date	At Faisalabad: 4 th week of September (1 st Trap) 2 nd week of November (2 nd Trap) 3 rd week of December (3 rd Trap) Other Locations: Mid November
	Plot Size	Two rows of two meter length
	Assessment Scale	Rust data will be recorded according to Modified Cobb Scale (Peterson et al., 1948).
	Harvesting Date	Mid April to Mid May
	The trial will be sown in two sets, in 1 st set, three (1 st , 2 nd & 3 rd) rust trap nurseries will be sown with one month intervals at WRI, Faisalabad while 2 nd set entries will be sown at multi locations i.e. Bahwalpur, Khanewal, Islamabad, Fateh Jhang, Pirsabakand Peshawar and rust data will be recorded	
PREVIOUS YEAR'S RESULTS	The results indicate that the leaf rust was trapped on 24-11-2013 while yellow rust on 03-02-2014 in 1 st trap nursery. The results regarding virulence pattern indicated that the isogenic lines for leaf rust including Lr 19, Lr 25, Lr 27 +31, Lr 28, Lr 32, Lr 36, Lr37 and Lr 23+Gaza as well as the isogenic lines for yellow rust including Yr 1, Yr3, Yr5, Yr 10, Yr 15, Yr 17, Yr18, Yr 24, Yr 26, Yr 28, YrCv and Yrsp were found resistant. However, none of the tested entries showed the symptoms of stem rust during 2013-14.	

33. TITLE	ESTIMATION OF YIELD LOSSES DUE TO LEAF AND YELLOW RUSTS
OBJECTIVES	To estimate yield losses due to leaf and yellow rusts.
RESEARCH WORKER (S)	Muhammad Makky Javaid, Faqir Muhammad and Dr. Arshad Mehmood
PROJECT DURATION	2013-15
LOCATION	Wheat Research Institute, Faisalabad

TREATMENTS & METHODOLOGY	Varieties	LR	1. Morocco 2. Seher-06 3. V-08203
		YR	1. Morocco 2. Inqilab 91 3. V-08203
	Treatments	T0= Control T1=Propiconazole T2=Tebuconazole	
	Sowing Date	YR	15 th November, 2014
		LR	25 th December.,2014
	Design	Split plot with three replications	
	Plot Size	Three rows with 5 meter length per treatment combination	
	Rust Assessment Scale	Rust data will base on the Modified Cobb Scale (Peterson et al., 1948).	
	Rust Assessment Stage	Pre-treatment	Before application of rusticides
		Post - treatment	three and seven days after application of rusticides
	Estimation of yield losses	Will base on 1000-grain weight and grain yield of treated and untreated plots	
PREVIOUS YEAR'S RESULTS	The yield losses due to leaf and yellow rust were determined under protected and unprotected conditions. The rust severity and response was recorded by the modified cobb's scale described by Peterson <i>et al.</i> (1948). The results regarding yield data are given in Fig.1 & Fig. 2		

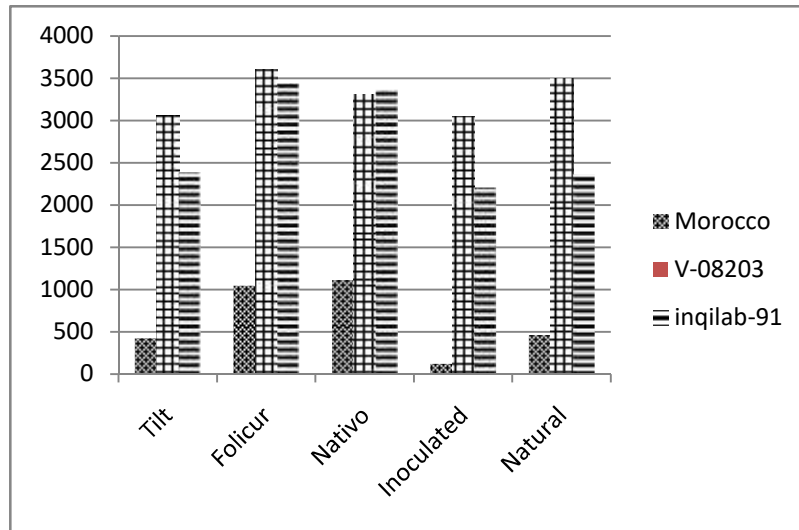


Fig.1 Yield losses data due to yellow rust

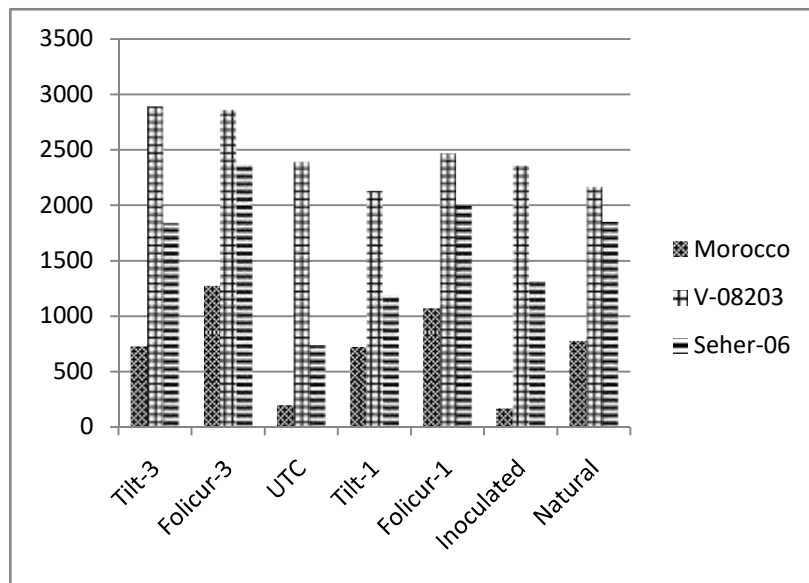


Fig.2 Yield losses data due to brown rust

34.TITLE	SCREENING OF WHEAT AND BARLEY ADVANCED LINES/VARIETIES AGAINST RUSTS AT DIFFERENT LOCATIONS
OBJECTIVES	<ul style="list-style-type: none"> i. To screen advanced lines of bread wheat and barley against leaf, stem and yellow rusts at adult stage under different disease development conditions/different agro-ecological conditions. ii. Elimination of susceptible lines from breeding program (drought, heat, salt, yield etc)

RESEARCH WORKER (S)	Faqir Muhammad, Muhammad MakkyJavaid and Dr. ArshadMehmood												
PROJECT DURATION	2014-15 (Continuous Nature)												
LOCATION	i. WRI, Faisalabad & RARI, Bahawalpur (Artificial Screening) ii. Khanewal, Islamabad, Pirsabak& Peshawar (Natural)												
TREATMENTS & METHODOLOGY	<table border="1"> <tr> <td>No. of entries:</td> <td>290</td> </tr> <tr> <td>Susceptible Check:</td> <td>Morocco at boarder & at every 10th entry</td> </tr> <tr> <td>Sowing Date:</td> <td>At Faisalabad: 1st week of November Other Locations: Last week of November</td> </tr> <tr> <td>Plot Size:</td> <td>Single row of two meter length</td> </tr> <tr> <td>Rust Assessment Scale:</td> <td>Rust data will base on the modified Cobb scale (Peterson et al., 1948).</td> </tr> <tr> <td>Rust Assessment date (s)</td> <td>) At adult plant stage) 2nd and 4th week of March</td> </tr> </table>	No. of entries:	290	Susceptible Check:	Morocco at boarder & at every 10 th entry	Sowing Date:	At Faisalabad: 1 st week of November Other Locations: Last week of November	Plot Size:	Single row of two meter length	Rust Assessment Scale:	Rust data will base on the modified Cobb scale (Peterson et al., 1948).	Rust Assessment date (s)) At adult plant stage) 2 nd and 4 th week of March
No. of entries:	290												
Susceptible Check:	Morocco at boarder & at every 10 th entry												
Sowing Date:	At Faisalabad: 1 st week of November Other Locations: Last week of November												
Plot Size:	Single row of two meter length												
Rust Assessment Scale:	Rust data will base on the modified Cobb scale (Peterson et al., 1948).												
Rust Assessment date (s)) At adult plant stage) 2 nd and 4 th week of March												
PREVIOUS YEAR'S RESULTS	All the entries were found free from stem rust, however among tested entries; twenty eight entries showed susceptible reaction to yellow rust, twenty three entries showed susceptibility to leaf rust while forty one entries showed susceptibility to both rusts (YR &LR). Moreover, the entries showing rust rating 0 to 30 MRMS under stress conditions were promoted / selected for next study as under natural conditions such reaction types proved fairly resistant.												

35.TITLE	EVALUATION OF ADVANCED LINES/VARIEITIES FOR SEEDLING AND ADULT PLANT RESISTANCE TO LEAF RUST
OBJECTIVES	To identify rust resistant genes in advanced lines/varieties of wheat.
RESEARCH WORKER (S)	Muhammad MakkyJavaid, Faqir Muhammad, Dr.ArshadMehmood, Dr.MakhdoomHussain,HumaSaffdar, Sabina Asghar, Dr. SajidurRehman and Dr. Muhammad ZaffarIqbal
PROJECT DURATION	2014-15
LOCATION	Wheat Research Institute, Faisalabad and Wheat Research Sub-Station, Murree
TREATMENTS & METHODOLOGY	For Seedling Study <ol style="list-style-type: none"> i. The seed of different lines/varieties will be sown in pots. ii. After seven days of germination the plants will be inoculated with leaf rust inoculum. iii. Then thesepots will be kept in dew chamber at 15-22 °C and 100 % relative humidity for 8 to 12 hours.

	<p>iv. After these pots will be shifted into the growth chamber for six days at 15 to 22°C, with 16 hours photoperiod and 8 hours dark period.</p> <p>v. After six days pots will be transferred into glass house and rust data will be recorded after 14-16 days of inoculation.</p> <p>For Adult Plant Study Artificial rust epidemic conditions will be created in field and data will be recorded twice at adult plant stage.</p> <p>For Molecular Study Molecular markers will be applied for gene identification.</p>
PREVIOUS YEAR'S RESULTS	The rust infection type data at seedling stage indicate that the eleven entries including V-10355, V-12266, V-12284, V-11098, V-11061, V-NN-GAN-3, V-NR-411, V-12265, V-11041 and V-12304 showed low infection type. While the remaining tests entries showed high infection types against mixture of leaf rust inoculums. While the same entries were tested at adult plant stage for the identification of APR sources and its conformation through molecular markers application.

36.TITLE	SCREENING OF ADVANCED WHEAT MATERIAL AGAINST KARNAL BUNT (<i>Tilletiaindica</i>)
OBJECTIVES	To identify karnal bunt resistant material for utilization in hybridization program.
RESEARCH WORKER (S)	Dr.ArshadMehmood, Faqir Muhammad, Muhammad MakkyJavaid& Muhammad Burhan.
PROJECT DURATION	2014-15 (continuous nature).
LOCATIONS	Plant Pathology Section, Faisalabad and CCRI, Pirsabak
TREATMENTS & METHOD OLOGY	Advanced lines selected for MWYT & NUWYT, 2014-15 as well as commercial varieties of bread wheat will be tested under inoculated condition in the field at Faisalabad and CCRI, Pirsabak. Each entry will be sown in plot size of 2x0.30 m ² . Susceptible varieties i.e., AS-2002, PAK-81 and WL-711 will be sown alternatively at every 10 th entry. The spore suspension will be injected by Syringe method to the 10 heads of each variety at boot stage. Disease incidence and severity of each spike will be recorded according to the scale of Augilatel.,(1989), where 0 is (Highly resistant), 0.1-1.0 (Resistant), 1.1-2.0 (Moderately resistant), 2.1-5.0 (Moderately susceptible), 5.1.10.0 (Susceptible) 10.0 and above (Highly susceptible).
PREVIOUS YEAR'S RESULTS	During cropping season, wheat advanced lines included in MWYT & NUWYT, 2013-14 and 15 commercial varieties were studied. Among tested entries, 28 lines/varieties found highly resistant, 03 resistant, 06 moderately resistant,07 moderately susceptible, 06 susceptible and 01 highly susceptible.

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37.TITLE	SURVEY OF KARNAL BUNT AND BLACK POINT OF WHEAT																																																																																												
OBJECTIVES	To find out the prevalence of karnal bunt and black point diseases of wheat in Punjab.																																																																																												
RESEARCH WORKER (S)	Dr. Arshad Mehmood, Faqir Muhammad, M. Makky Javaid, and Muhammad Saleem																																																																																												
PROJECT DURATION	2014-15 continuous nature.																																																																																												
LOCATION	Punjab Districts (all locations of Micro trials)																																																																																												
TREATMENTS & METHOD OLOGY	Samples (250 grams each) will be collected from Micro trials throughout the Punjab. These samples would be analyzed in Wheat Pathology Lab. to record the percentage incidence of karnalbunt and black point in wheat.																																																																																												
PREVIOUS YEAR'S RESULTS	<p>The results of karnal bunt and black point infestation and disease prevalence (%) in seed samples of NUWYT & MWYT (2013-14) received from fourteen locations of Punjab are as under,</p> <table border="1"> <thead> <tr> <th rowspan="3">Sr. #</th> <th rowspan="3">Locations</th> <th colspan="4">No of infected Samples (out of 70)</th> </tr> <tr> <th colspan="2">KB</th> <th colspan="2">BP</th> </tr> <tr> <th>N</th> <th>S</th> <th>N</th> <th>S</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Kala Shah Kaku</td> <td>05</td> <td>04</td> <td>48</td> <td>38</td> </tr> <tr> <td>2</td> <td>KotNaina</td> <td>28</td> <td>13</td> <td>33</td> <td>26</td> </tr> <tr> <td>3</td> <td>Gujranwala</td> <td>02</td> <td>10</td> <td>16</td> <td>18</td> </tr> <tr> <td>4</td> <td>Yousafwala</td> <td>0</td> <td>02</td> <td>22</td> <td>23</td> </tr> <tr> <td>5</td> <td>Dhakar Seed Farm</td> <td>07</td> <td>15</td> <td>33</td> <td>18</td> </tr> <tr> <td>6</td> <td>Bahawal Nagar</td> <td>0</td> <td>05</td> <td>22</td> <td>24</td> </tr> <tr> <td>7</td> <td>Vehari</td> <td>02</td> <td>01</td> <td>19</td> <td>13</td> </tr> <tr> <td>8</td> <td>Multan</td> <td>04</td> <td>01</td> <td>25</td> <td>24</td> </tr> <tr> <td>9</td> <td>Khanewal</td> <td>03</td> <td>02</td> <td>22</td> <td>08</td> </tr> <tr> <td>10</td> <td>Karor</td> <td>0</td> <td>03</td> <td>37</td> <td>32</td> </tr> <tr> <td>11</td> <td>Piplan</td> <td>0</td> <td>04</td> <td>19</td> <td>15</td> </tr> <tr> <td>12</td> <td>Sargodha</td> <td>01</td> <td>05</td> <td>18</td> <td>20</td> </tr> <tr> <td></td> <td>Total</td> <td>52</td> <td>65</td> <td>314</td> <td>259</td> </tr> </tbody> </table> <p>*KB = Karnal Bunt, BP = Black Point, N=Normal, S=Short</p>	Sr. #	Locations	No of infected Samples (out of 70)				KB		BP		N	S	N	S	1	Kala Shah Kaku	05	04	48	38	2	KotNaina	28	13	33	26	3	Gujranwala	02	10	16	18	4	Yousafwala	0	02	22	23	5	Dhakar Seed Farm	07	15	33	18	6	Bahawal Nagar	0	05	22	24	7	Vehari	02	01	19	13	8	Multan	04	01	25	24	9	Khanewal	03	02	22	08	10	Karor	0	03	37	32	11	Piplan	0	04	19	15	12	Sargodha	01	05	18	20		Total	52	65	314	259
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Sr. #	Locations	Disease Prevalence (%)			
		KB		BP	
		N	S	N	S
1	Kala Shah Kaku	7.5	6.0	72.7	57.5
2	KotNaina	42.4	19.6	50.0	39.3
3	Gujranwala	3.0	15.1	24.2	27.2
4	Yousafwala	0	3.0	33.3	34.8
5	Dhakar Seed Farm	10.6	22.7	50.0	27.2
6	Bahawal Nagar	0	7.5	33.3	36.3
7	Vehari	3.0	1.5	28.7	19.6
8	Multan	6.0	1.5	37.8	36.3
9	Khanewal	4.5	3.0	33.3	12.1
10	Karor	0	4.5	56.0	48.4
11	Piplan	0	6.0	28.7	22.7
12	Sargodha	1.5	7.5	27.2	30.3
	Total		-	-	

*KB = Karnal Bunt, BP = Black Point, N=Normal, S=Short
Disease Prevalence (%age) = No. of infected samples/total X 100

AGRONOMY

38.TITLE	EFFECT OF CLIMATE CHANGE ON SOWING TIME OF WHEAT CROP																																														
OBJECTIVES	<ul style="list-style-type: none"> i. To determine the shift in sowing time of wheat under changing climatic scenario. ii. To explore optimum sowing time of promising lines of wheat. 																																														
RESEARCH WORKER(S)	Dr. MakhdoomHussain, Dr.GhulamMahboobSubhani and YasirRamzan																																														
PROJECT DURATION	2014-15 (Continuous)																																														
LOCATION	Wheat Research Institute, Faisalabad.																																														
TREATMENTS & METHODOLOGY	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td colspan="2">A) Date of sowing = 7</td> </tr> <tr> <td>D₁ = 1st November</td> <td>D₂ = 10th November</td> </tr> <tr> <td>D₃ = 20th November</td> <td>D₄ = 30th November</td> </tr> <tr> <td>D₅ = 10th December</td> <td>D₆ = 20th December</td> </tr> <tr> <td>D₇ = 30th December</td> <td></td> </tr> </table> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td colspan="2">B) Varieties/Advance lines = 14</td> </tr> <tr> <td>V₁= Faisalabad 08</td> <td>V₈= V-10104</td> </tr> <tr> <td>V₂= Lasani-08</td> <td>V₉= V-10110</td> </tr> <tr> <td>V₃= Punjab-11</td> <td>V₁₀= V-10355</td> </tr> <tr> <td>V₄= Millat-11</td> <td>V₁₁= V-11160</td> </tr> <tr> <td>V₅= 07096 (Galaxy 2013)</td> <td>V₁₂=NR-397</td> </tr> <tr> <td>V₆= V-09082</td> <td>V₁₃= V-12001 (RF)</td> </tr> <tr> <td>V₇= V-09087</td> <td>V₁₄=V-11183(RF)</td> </tr> </table> <p>Fertilizer = 120-90-60 NPK kg ha⁻¹ Seed Rate: 100 kg ha⁻¹. Layout Design: Randomized complete block in-triplicate keeping plot size of 1.8 m x 6 m. All other agronomic practices will be kept uniform. The following observations will be recorded:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>1.</td> <td>Plant count per m²</td> <td>2.</td> <td>Productive tillers/m²</td> </tr> <tr> <td>3.</td> <td>Days to heading</td> <td>4.</td> <td>Physiological maturity</td> </tr> <tr> <td>5.</td> <td>Plant height (cm)</td> <td>6.</td> <td>Lodging % age</td> </tr> <tr> <td>7.</td> <td>No. of grains/spike.</td> <td>8.</td> <td>1000-grain weight (g)</td> </tr> <tr> <td>9.</td> <td>Grain yield (kg ha⁻¹).</td> <td></td> <td></td> </tr> </table>	A) Date of sowing = 7		D ₁ = 1 st November	D ₂ = 10 th November	D ₃ = 20 th November	D ₄ = 30 th November	D ₅ = 10 th December	D ₆ = 20 th December	D ₇ = 30 th December		B) Varieties/Advance lines = 14		V ₁ = Faisalabad 08	V ₈ = V-10104	V ₂ = Lasani-08	V ₉ = V-10110	V ₃ = Punjab-11	V ₁₀ = V-10355	V ₄ = Millat-11	V ₁₁ = V-11160	V ₅ = 07096 (Galaxy 2013)	V ₁₂ =NR-397	V ₆ = V-09082	V ₁₃ = V-12001 (RF)	V ₇ = V-09087	V ₁₄ =V-11183(RF)	1.	Plant count per m ²	2.	Productive tillers/m ²	3.	Days to heading	4.	Physiological maturity	5.	Plant height (cm)	6.	Lodging % age	7.	No. of grains/spike.	8.	1000-grain weight (g)	9.	Grain yield (kg ha ⁻¹).		
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PREVIOUS YEAR RESULTS

Advanced lines/ Varieties	Ist Nov.	10 th Nov.*	20 th Nov.*	30 th Nov.	10 th Dec.	20 th Dec.	30 th Dec.	Mean
FSD-08	5903	5446	4910	4831	5164	4614	4469	5048 a
Lasani-08	5897	4560	4475	5429	5225	4537	3756	4840 b
Punjab-11	5950	4595	4654	4492	4696	4505	3988	4697 cd
Millat-11	5401	4753	4378	4870	5155	4935	4137	4804 bc
Galaxy-13	5782	4630	5055	5720	5298	5178	4034	5100 a
V-09082	4746	3743	4516	3968	3197	3741	3274	3884 g
V-08203	5589	4462	5062	5624	5150	5199	4321	5058 a
V-10104	4479	4170	4560	3925	4169	3659	3313	4039 f
V-10110	5710	3601	4217	4650	4647	4750	4226	4543 e
V-10355	5538	3669	4206	4739	4482	4438	4287	4480 e
V-11160	5806	3741	4579	5559	5010	4503	4324	4789 bc
NR-397	5897	3786	4433	5676	5116	4318	4307	4790 bc
V-12001	5631	3825	4110	4342	4594	4857	4661	4574 de
V-11183	5830	4564	4021	5909	5508	5470	4736	5148 a
Mean	5583 a	4253 f	4513 e	4981 b	4815 c	4622 d	4131 g	

LSD (0.05) for sowing dates=128.4, varieties= 90.82, interaction=3 40

*wheat experiments (D2 And D3) were badly lodged (90-100%) due to periodic rains and wind. Therefore, grain formation stage of these experiemnts were adversely affected which reduced the yield significantly.

39.TITLE	RESPONSE OF SEED RATE ON GRAIN YIELD OF ADVANCED WHEAT LINES
OBJECTIVES	To determined optimum seed rate of different advanced lines
RESEARCH WORKER(S)	YasirRamzan and Dr.GhulamMahboobSubhani
PROJECT DURATION	2014-15
LOCATION	Wheat Research Institute, Faisalabad.

TREATMENTS & METHODOLOGY(A) Varieties/advanced lines=08 (B) Seed rate kg ha⁻¹=05

Sowing dates = 02	10 th November and 10 th December.
Plot size	1.62 m x 6 m
Line spacing	27 cm apart rows with 6 rows power planter.
Layout	Experiment will be conducted in split plot arrangement with randomized complete block. Varieties will be kept in main plots & seed rates in sub-plots
Repeats	03
Fertilizer	120-90-60 NPK kg ha ⁻¹

V ₁ = Faisalabad 08	S ₁ = 75
V ₂ = Punjab 11	S ₂ = 100
V ₃ = V-09082	S ₃ = 125
V ₄ =V-09087	S ₄ = 150
V ₅ = V-11183	
V ₆ = V-10104	
V ₇ = V-10110	
V ₈ =V-10355	
V ₉ = V-11160	
V ₁₀ = V-12001	
V ₁₁ = Lasani 08	
V ₁₂ = AARI-11	

All other agronomic practices will be kept constant and characters likes seedling count/ m², plant height (cm), productive tillers/m², No. of grain/spike, 1000-grain weight (g) and grain yield (kg ha⁻¹) will be recorded.

PREVIOUS YEAR'S RESULTS

Grain yield (kg ha⁻¹) (Normal Sown)

Advanced lines/ Varieties	Seed rate (kg ha ⁻¹)				Mean
	75	100	125	150	
Fsd-08	4585	6025	5720	4623	5238 b
Punjab-11	4805	5754	5034	5082	5169 bc
V-09082	4324	4547	4424	4390	4421 h
V-09087	4324	4674	4609	4393	4500 gh
V-11183	5021	6115	5964	5418	5629 a
V-10104	4544	5436	4757	4719	4864 e
V-10110	4588	5933	5058	4863	5111 c
V-10355	3992	4997	4657	4492	4534 g
V-11160	4554	5065	4612	4595	4707 f
V-12001	4036	5298	5113	4973	4855 e
Lasani-08	5058	5161	4955	4784	4990 d
AARI-11	5079	5024	4794	4712	4902 de
Mean	4576d	5336a	4975b	4754c	
LSD (0.05) for varieties = 95.14, seed rates= 37.10, V ×S = 128.5					

Grain yield (kg ha⁻¹) (Late Sown)

Advanced lines/ Varieties	Seed rate (kgha ⁻¹)				Mean
	75	100	125	150	
Fsd-08	3868	5065	5099	4955	4747 c
Punjab-11	4383	5075	5206	4640	4826 b
V-09082	3652	4167	4280	4150	4062 f
V-09087	3625	3961	4081	3741	3852 g
V-11183	4887	5322	5171	4691	5018 a
V-10104	4150	4242	4057	3831	4070 f
V-10110	3933	4702	4849	4184	4417 d
V-10355	3981	4462	4537	4235	4304 e
V-11160	4712	5175	5192	4825	4976 a
V-12001	4318	4678	4688	4270	4488 d
Lasani-08	4890	5079	4976	4640	4896 b
AARI-11	5041	5247	5021	4674	4996 a
Mean	4287 c	4765 a	4763 a	4403 b	
LSD (0.05) for varieties = 74.92, seed rates = 45.24, V ×S = 156.7					

40.TITLE	EFFECT OF DIFFERENT LEVELS OF FERTILIZER ON GRAIN YIELD OF WHEAT.																																
OBJECTIVES	To explore optimum fertilizer requirement of advanced lines of wheat																																
RESEARCH WORKER(S)	Dr.GhulamMahboobSubhani and YasirRamzan																																
PROJECT DURATION	2014-15 (Continuous)																																
LOCATION	Wheat Research Institute Faisalabad.																																
TREATMENTS & METHODOLOGY	<p>(a) Varieties/advance lines = 08 (b) Fertilizer level NPK (kg ha⁻¹)</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>V₁=Faisalabad 08</td><td>F₁= 0 – 0 – 0</td></tr> <tr><td>V₂= Millat 11</td><td>F₂= 80 – 60 – 60</td></tr> <tr><td>V₃= V-09082</td><td>F₃= 120 – 90 – 60</td></tr> <tr><td>V₄= V-09087</td><td>F₄= 160 – 120 – 60</td></tr> <tr><td>V₅= V-11183</td><td></td></tr> <tr><td>V₆= V-10104</td><td></td></tr> <tr><td>V₇= V-10110</td><td></td></tr> <tr><td>V₈= V-10355</td><td></td></tr> <tr><td>V₉= V-11160</td><td></td></tr> <tr><td>V₁₀= V-12001</td><td></td></tr> </table> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>Sowing date = 2</td><td>10th November and 10th December.</td></tr> <tr><td>Plot size</td><td>1.62 m x 5 m</td></tr> <tr><td>Line spacing</td><td>27 cm apart rows with 6 rows power planter.</td></tr> <tr><td>Layout</td><td>Experiment will be Strip Plot arrangement with randomized complete block.</td></tr> <tr><td>Repeats</td><td>03</td></tr> <tr><td>Seed rate</td><td>100 kg ha⁻¹</td></tr> </table> <p>All other agronomic practices will be kept constant. The pre and post soil analysis will be done.Plant count/ m², plant height (cm), productive tillers/m², No. of grain/spike, 1000-grain weight (g) and grain yield (kg ha⁻¹) will be recorded.</p>	V ₁ =Faisalabad 08	F ₁ = 0 – 0 – 0	V ₂ = Millat 11	F ₂ = 80 – 60 – 60	V ₃ = V-09082	F ₃ = 120 – 90 – 60	V ₄ = V-09087	F ₄ = 160 – 120 – 60	V ₅ = V-11183		V ₆ = V-10104		V ₇ = V-10110		V ₈ = V-10355		V ₉ = V-11160		V ₁₀ = V-12001		Sowing date = 2	10 th November and 10 th December.	Plot size	1.62 m x 5 m	Line spacing	27 cm apart rows with 6 rows power planter.	Layout	Experiment will be Strip Plot arrangement with randomized complete block.	Repeats	03	Seed rate	100 kg ha ⁻¹
V ₁ =Faisalabad 08	F ₁ = 0 – 0 – 0																																
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PREVIOUS YEAR'S RESULTS

Grain yield (kg ha⁻¹) Normal Sown.

Advanced lines/ Varieties	Fertilizer levels NPK (kg ha ⁻¹)				Mean
	F1 0-0-0	F2 80-60-60	F3 120-90-60	F4 160-120-60	
Fsd-08	3530	5432	6154	5909	5256 b
Millat-11	3234	4208	5298	5209	4487 f
V-09082	3714	4746	5511	5340	4828 de
V-09087	3515	4921	6008	5604	5012 c
V-11183	4081	5562	6409	6269	5580 a
V-10104	3693	5259	6111	5936	5250 b
V-10110	3604	4246	5561	5360	4693 e
V-10355	3543	4263	5782	5885	4868 cd
V-11160	3440	4492	5748	5494	4793 de
V-12001	3940	4612	5268	5425	4811 de
Mean	3629 d	4774 c	5785 a	5643 b	

LSD (0.05) for varieties = 167.8, Fertilizer rates =83.77, V ×F= 264.9

Grain yield (kg ha⁻¹) Late Sown.

Advanced lines/ Varieties	Fertilizer levels NPK (kg ha ⁻¹)				Mean
	F1 0-0-0	F2 80-60-60	F3 120-90-60	F4 160-120-60	
Fsd-08	3220	4393	5178	4835	4407 cd
Millat-11	3587	4252	5185	4976	4500 bc
V-09082	3543	4390	4571	4527	4258 ef
V-09087	3316	4420	4561	4201	4125 g
V-11183	4393	4691	5300	5302	4922 a
V-10104	3265	4287	4853	4757	4290 de
V-10110	3597	4300	5202	5099	4550 b
V-10355	3165	4276	5027	5089	4390 cd
V-11160	3323	4503	5134	5058	4495 bc
V-12001	3261	4112	4705	4527	4151 fg
Mean	3464 d	4362 c	4972 a	4837 b	

LSD(0.05)for varieties= 128, Fertilizer rates =81.98, V ×F= 259.2

41.TITLE

EFFECT OF SPLIT APPLICATION OF NITROGEN ON GRAIN YIELD OF WHEAT

OBJECTIVES

To find out the suitable time of split application of nitrogen

RESEARCH WORKER(S)

YasirRamzan, Dr.GhulamMahboobSubhani and Dr. MakhdoomHussain

PROJECT DURATION

2014-15

LOCATION

Wheat Research Institute, Faisalabad

TREATMENTS & METHODOLOGY

Fertilizer levels N-P-K(kg ha⁻¹)

	F ₁ = 0 - 90- 60 (no nitrogen)
	F ₂ = 120 - 90- 60 (All N at sowing)
	F ₃ = 120 - 90- 60 (½ N at sowing and ½ N at tillering)
	F ₄ = 120 - 90- 60 (½ N at sowing and ½ N at booting)
	F ₅ = 120-90- 60 (½ N at tillering and ½ N at booting)
	F ₆ = 120-90- 60 (⅓ N at sowing, ⅓ N at tillering and ⅓ at booting)
	F ₇ = 150 - 90- 60 (All N at sowing)
	F ₈ =150 - 90- 60 (½ N at sowing and ½ N at tillering)
	F ₉ = 150 - 90- 60 (½ N at sowing and ½ N at booting)
	F ₁₀ = 150 - 90- 60 (½ N at tillering and ½ N at booting)
	F ₁₁ = 150 - 90- 60 (⅓ N at sowing, ⅓ N at tillering and ⅓ N at booting)
<p>Variety = Punjab 2011 Sowing time = 1st fortnight of November Lay out = Experiment will be sown in randomized complete block with 3 replications keeping plot size 1.80 m x 7m. Nitrogen will be applied according to the treatments while P and K will be applied at the time of sowing. All other agronomic practices will be kept constant. The pre and post soil analysis will be done.</p>	

PREVIOUS YEAR'S RESULT	Fertilizer levels ((kg ha⁻¹))		
	N-P-K	2012-13	2013-14
	F ₁ = 0 - 90- 60 (no nitrogen)	2726 e	3337 h
	F ₂ = 120 - 90- 60 (All N at sowing)	4750 d	4455 g
	F ₃ = 120 - 90- 60 (½ N at sowing and ½ N at tillering)	5075 b	5703 c
	F ₄ = 120 - 90- 60 (½ N at sowing and ½ N at booting)	5470 a	6430 a
	F ₅ = 120-90- 60 (½ N at tillering and ½ N at booting)	4972 bc	5051 e
	F ₆ = 120-90- 60 (1/3 N at sowing, 1/3 N at tillering and 1/3 at booting)	4921 bc	5281 d
	F ₇ = 150 - 90- 60 (All N at sowing)	4733 d	4633 f
	F ₈ =150 - 90- 60 (½ N at sowing and ½ N at tillering)	4955 bc	5679 c
	F ₉ = 150 - 90- 60 (½ N at sowing and ½ N at booting)	5007 bc	6087 b
	F ₁₀ = 150 - 90- 60 (½ N at tillering and ½ N at booting)	5007 bc	5967 b
	F ₁₁ = 150 - 90- 60 (1/3 N at sowing, 1/3 N at tillering and 1/3 N at booting)	4887 cd	5288 d
LSD (0.05)	164	142	

42.TITLE	WATER REQUIREMENT AND ITS TIME OF APPLICATION TO FETCH MAXIMUM WHEAT GRAIN YIELD
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OBJECTIVES	To determine the proper stage of crop and optimum requirement of water for yield enhancement.																																								
RESEARCH WORKER(S)	Dr.GhulamMahboobSubhani, YasirRamzan and Dr. MakhdoomHussain																																								
PROJECT DURATION	2014-15																																								
LOCATION	Wheat Research Institute, Faisalabad; C & P, AARI, Faisalabad																																								
TREATMENTS & METHODOLOGY	<table border="1"> <tr> <td>Treatment</td> </tr> <tr> <td>T₁ = no irrigation</td> </tr> <tr> <td>T₂ = 1 irrigation (at crown root stage)</td> </tr> <tr> <td>T₃ = 2 irrigations (1st at crown root and 2nd at booting)</td> </tr> <tr> <td>T₄ = 2 irrigations (1st at crown root and 2nd at heading)</td> </tr> <tr> <td>T₅ = 3 irrigations (1st at crown root, 2nd at booting and 3rd at heading)</td> </tr> <tr> <td>T₆ = 4 irrigations (1st at crown root , 2nd at booting, 3rd at heading and 4th at grain filling)</td> </tr> <tr> <td>T₇ = 5 irrigations (1st at crown root , 2nd at stem elongation, 3rd at booting, 4th at heading and 5th at grain filling)</td> </tr> </table> <p>Variety: Millat-11 Sowing time = 1st fortnight of November Seed Rate: 100 kg ha⁻¹ Lay out = Experiment will be sown in randomized complete block design with three replications keeping plot size of 4.86m x 8m. Fertilizer @ 120-90-60 NPK kg ha⁻¹ will be applied. All other agronomic practices will be kept constant.</p>			Treatment	T ₁ = no irrigation	T ₂ = 1 irrigation (at crown root stage)	T ₃ = 2 irrigations (1 st at crown root and 2 nd at booting)	T ₄ = 2 irrigations (1 st at crown root and 2 nd at heading)	T ₅ = 3 irrigations (1 st at crown root, 2 nd at booting and 3 rd at heading)	T ₆ = 4 irrigations (1 st at crown root , 2 nd at booting, 3 rd at heading and 4 th at grain filling)	T ₇ = 5 irrigations (1 st at crown root , 2 nd at stem elongation, 3 rd at booting, 4 th at heading and 5 th at grain filling)																														
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WHEAT ENTOMOLOGY

43.TITLE	VARIETAL SCREENING OF WHEAT AGAINST APHIDS AND THEIR INTERACTION WITH PREDATORS.
OBJECTIVES	<ul style="list-style-type: none"> i. To evaluate the wheat varieties /advanced lines against aphids. ii. To determine correlation between aphid and predators.
RESEARCH WORKER(S)	Muhammad Saleem,Dr. MakhdoomHussain Wheat Research Institute, Muhammad Latif, Entomological Research Institute,Faisalabad
PROJECT DURATION	2014-15 (Continuous nature)
LOCATION	Wheat Research Institute, Faisalabad.
TREATMENTS & METHODOLOGY	The trial will be conducted in RCB Design having 3 repeats with plot size 5m x 1.8m. The data regarding aphids, <i>Coccinellids</i> , <i>chrysoperla</i> and <i>syrphid</i> fly will be recorded during the month of march, 2015 till

	crop maturity at 10 day interval per tiller and plant basis for aphid and predators, respectively by selecting 10 tiller/ plants per plot. Varieties/ lines will be screened by taking average aphid population throughout the season.																																																								
PREVIOUS YEAR'S RESULTS	<p>Average population of aphid & predators (coccinellids) per tiller and plant in wheat crop is as under:</p> <table border="1"> <thead> <tr> <th>Sr#</th> <th>Varieties</th> <th>Average aphid population per tiller</th> <th>Predators (<i>Coccinellids</i> beetle) /plant</th> </tr> </thead> <tbody> <tr><td>1</td><td>FSD-08</td><td>7.10ef</td><td>0.30 ef</td></tr> <tr><td>2</td><td>Millat-11</td><td>6.40 f</td><td>0.333 ef</td></tr> <tr><td>3</td><td>Galaxy-13</td><td>8.70bcdef</td><td>0.40 def</td></tr> <tr><td>4</td><td>V-08203</td><td>10.433 abcd</td><td>0.733 abc</td></tr> <tr><td>5</td><td>V-09087</td><td>8.367 cdef</td><td>0.5667 bcde</td></tr> <tr><td>6</td><td>V-10104</td><td>11.633ab</td><td>0.50 cde</td></tr> <tr><td>7</td><td>V-10110</td><td>11.433abc</td><td>0.867 a</td></tr> <tr><td>8</td><td>V-10355</td><td>8.6 bcdef</td><td>0.3667 ef</td></tr> <tr><td>9</td><td>V-11160</td><td>8.50cdef</td><td>0.433 def</td></tr> <tr><td>10</td><td>NR-397</td><td>9.533 bcde</td><td>0.667 abcd</td></tr> <tr><td>11</td><td>V-12001</td><td>13.333 a</td><td>0.8333 ab</td></tr> <tr><td>12</td><td>V-11183</td><td>6.667 ef</td><td>0.1667 f</td></tr> <tr><td colspan="2">LSD Value</td><td>3.1143</td><td>0.2798</td></tr> </tbody> </table>	Sr#	Varieties	Average aphid population per tiller	Predators (<i>Coccinellids</i> beetle) /plant	1	FSD-08	7.10ef	0.30 ef	2	Millat-11	6.40 f	0.333 ef	3	Galaxy-13	8.70bcdef	0.40 def	4	V-08203	10.433 abcd	0.733 abc	5	V-09087	8.367 cdef	0.5667 bcde	6	V-10104	11.633ab	0.50 cde	7	V-10110	11.433abc	0.867 a	8	V-10355	8.6 bcdef	0.3667 ef	9	V-11160	8.50cdef	0.433 def	10	NR-397	9.533 bcde	0.667 abcd	11	V-12001	13.333 a	0.8333 ab	12	V-11183	6.667 ef	0.1667 f	LSD Value		3.1143	0.2798
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44.TITLE	SCREENING OF WHEAT GERMPLASM AGAINST APHIDS
OBJECTIVES	To find out resistant/ tolerant varieties/lines against aphid attack.
RESEARCH WORKER(S)	Muhammad Saleem and Dr. MakhdoomHussain
PROJECT DURATION	2014-15 (Continuous nature)
LOCATION	Wheat Research Institute, Faisalabad.
TREATMENTS & METHODOLOGY	The data will be recorded on 10 days interval from 10 randomly selected tillers on each lines/variety especially during the month of March,2015.

PREVIOUS YEAR'S RESULTS	Average aphid population per tiller on wheat germplasm.						
	Material	Total Entries	Average aphid population per tiller on each variety/line (Mean values)				
	Crossing block 13-14	468	0-5	5.1-25	25-35	35-45	45.1-100
			04*	186	92	83	83
Reactions		T	MT	MS	S	HS	
<p>T=Tolerant, MT=Moderate Tolerant, MS= Moderate Susceptible, S= Susceptible, HS= Highly Susceptible *Kohistan-97, Maxi Pak-65, MH-97 and SA-75</p>							

45.TITLE	SURVEY OF APHID POPULATION ON WHEAT CROP
OBJECTIVES	To find out the occurrence and fluctuation of aphids population on wheat crop in different ecological zones of the Punjab
RESEARCH WORKER(S)	Muhammad Saleem and Dr. Makhdoom Hussain
PROJECT DURATION	2014-15 (Continuous nature)
LOCATION	Faisalabad, Jhang, Sialkot, Bahawalnagar, Sarghoda ,Khanawal, Vehari, Sahiwal, Narowal, Seikhupura etc.
TREATMENTS & METHODOLOGY	Aphid population and their predators will be recorded from different wheat varieties sown in different ecological zones per tiller per plant basis, respectively. The data will be recorded during the month of February and March, 2015.
PREVIOUS YEAR'S RESULTS	The results showed that aphid and coccinellid population in the different areas of the Punjab was found in the range 3.0 to 29.0/tiller and 0.0 to 0.98 per plant, respectively on different wheat varieties in different areas. While regarding wheat varietal behavior aphid and coccinellid population remained in the range 6-26, 5-16, 5-14, 3-6, 7-13, 6-13, 9-13, 9-29, 5-17 and 8-12 per tiller and 0-0.98, 0- 0.82, 0-0.83, 0.05-0.52, 0.22-0.73, 0.1-0.91, 0.12-0.82, 0.19-0.63, 0-0.67 and 0.12-0.68 per plant, respectively on Seher-06, Fsd-08, Lasani-08, Galaxy-13, Inqlab-91, Punjab-11, AAS-13, Bhakar 2000, Millat-11 and Wattan. So aphid population was recorded more in Lahore area followed by Kasure, Okara and Faisalabad, than the other areas. Similarly coccinellid beetles were found more where aphid population was more. Wheat variety Galaxy-13 showed least preference to aphid than others.

SEED PRODUCTION

46.TITLE	PRODUCTION OF BREEDERS NUCLEUS SEED OF WHEAT ADVANCED LINES AND VARIETIES.
OBJECTIVES	<ul style="list-style-type: none">i. To maintain the true to type seed of bread/durum wheat varieties.ii. To obtain the phenotypic stability of advanced wheat lines.
RESEARCH WORKER(S)	Javed Anwar and Muhammad HammadTanveer
PROJECT DURATION	2014-15 (continuous)
LOCATION	Wheat Research Institute, Faisalabad.

TREATMENTS & METHODOLOGY

40-200 single heads of all commercial varieties and elite lines will be planted in 2.5 meters long row. Head rows of each commercial variety will be observed at different stages of plant development. Head rows deviating from the original variety will be discarded. Uniform vigorous head rows will be harvested and threshed separately for further study as head rows progenies.

Sr. #	Varieties	Sr. #	Varieties
1.	Punjab-11	10	V-11183
2.	Millat-11	11	
3.	AARI-11	12	
4.	Faisalabad-08	13	
5.	Lasani-08	14	
6.	Pasban-90	15	
7.	Uqab-2000	16	
8.	Galaxy-13	17	
9	V-08203	18	

In addition, the seed of entries contributed to MICRO Wheat Yield Trial and National Uniform Wheat Yield Trial will be multiplied

PREVIOUS YEAR' S RESULTS

Head rows of eight commercial varieties and 24 advanced lines were studied. 40 to 200 head rows of each commercial cultivars and advance lines were kept for head row progeny studies. The detail is as under,

Sr. #	Varieties/ lines	No. of heads	Sr. #	Varieties/ lines	No. of heads
1.	Punjab-11	160	19.	V-11047	10
2.	Millat-11	160	20.	V-11138	10
3.	AARI-11	40	21.	V-11143	10
4.	Faisalabad-08	80	22.	V-12284	10
5.	Lasani-08	40	23.	V-12275	10
6.	Pasban-90	40	24.	V-12257	10
7.	Uqab-2000	40	25.	V-12266	10
8.	Galaxy-13	160	26.	V-12265	10
9.	V-08203	160	27.	V-12304	10
10.	V-09082	10	28.	V-12252	10
11.	V-09087	10	29.	V-12253	10
12.	V-11022	10	30.	V-12292	10
13.	V-11032	10	31.	V-11001	10
14.	V-11046	10	32.	V-11181	10

	<table border="1"> <tr> <td>15.</td> <td>V-11091</td> <td>10</td> <td>33.</td> <td></td> <td></td> </tr> <tr> <td>16.</td> <td>V-11098</td> <td>10</td> <td>34.</td> <td></td> <td></td> </tr> <tr> <td>17.</td> <td>V-11137</td> <td>10</td> <td>35.</td> <td></td> <td></td> </tr> <tr> <td>18.</td> <td>V-11061</td> <td>10</td> <td>36.</td> <td></td> <td></td> </tr> </table>	15.	V-11091	10	33.			16.	V-11098	10	34.			17.	V-11137	10	35.			18.	V-11061	10	36.														
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47.TITLE	PRE-BASIC SEED PRODUCTION OF BREAD AND DURUM WHEAT CULTIVARS & ADVANCED LINES.																																				
OBJECTIVES	To produce pure seed of commercial wheat cultivars/ lines for supplying to the Punjab Seed Corporation and Private Seed Companies.																																				
RESEARCH WORKER(S)	Javed Anwar and Muhammad HammadTanveer																																				
PROJECT DURATION	2014-15 (continuous nature)																																				
LOCATION	Wheat Research Institute, Faisalabad.																																				
TREATMENTS & METHODOLOGY	<p>Two to four kanals of the following cultivars/lines will be sown using seeds of selected head rows for head row progeny. Each single head row progeny will be planted 24m x 1.65m and field will be inspected at different stages of plant growth.</p> <table border="1"> <thead> <tr> <th>S. No.</th> <th>Varieties</th> <th>S. No.</th> <th>Varieties</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Punjab-11</td> <td>8.</td> <td>Galaxy-13</td> </tr> <tr> <td>2.</td> <td>Millat-11</td> <td>9.</td> <td>V-08203</td> </tr> <tr> <td>3.</td> <td>AARI-11</td> <td>10.</td> <td></td> </tr> <tr> <td>4.</td> <td>Faisalabad-08</td> <td>11.</td> <td></td> </tr> <tr> <td>5.</td> <td>Lasani-08</td> <td>12.</td> <td></td> </tr> <tr> <td>6.</td> <td>Uqab-2000</td> <td>13.</td> <td></td> </tr> <tr> <td>7.</td> <td>Pasban-90</td> <td>14.</td> <td></td> </tr> </tbody> </table>	S. No.	Varieties	S. No.	Varieties	1.	Punjab-11	8.	Galaxy-13	2.	Millat-11	9.	V-08203	3.	AARI-11	10.		4.	Faisalabad-08	11.		5.	Lasani-08	12.		6.	Uqab-2000	13.		7.	Pasban-90	14.					
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PREVIOUS YEAR' S RESULTS	<p>The seed of following varieties/lines was produced</p> <table border="1"> <thead> <tr> <th>Sr. #</th> <th>Varieties</th> <th>Kg</th> <th>Sr. #</th> <th>Varieties</th> <th>Kg</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Faisalabad-08</td> <td>495</td> <td>6.</td> <td>Punjab-11</td> <td>695</td> </tr> <tr> <td>2.</td> <td>Lasani-08</td> <td>270</td> <td>7.</td> <td>Galaxy-13</td> <td>700</td> </tr> <tr> <td>3.</td> <td>AARI-11</td> <td>200</td> <td>8.</td> <td>V-11183</td> <td>500</td> </tr> <tr> <td>4.</td> <td>Pasban-90</td> <td>260</td> <td>9.</td> <td>V-08203</td> <td>700</td> </tr> <tr> <td>5.</td> <td>Millat-11</td> <td>500</td> <td>10.</td> <td></td> <td></td> </tr> </tbody> </table>	Sr. #	Varieties	Kg	Sr. #	Varieties	Kg	1.	Faisalabad-08	495	6.	Punjab-11	695	2.	Lasani-08	270	7.	Galaxy-13	700	3.	AARI-11	200	8.	V-11183	500	4.	Pasban-90	260	9.	V-08203	700	5.	Millat-11	500	10.		
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48.TITLE	SEED PRODUCTION OF BREAD AND DURUM WHEAT CULTIVARS AND ADVANCED LINES.
OBJECTIVES	To produce pure seed of commercial wheat cultivars/lines for farmers
RESEARCH	Dr. Muhammad Munir, Javed Anwar and Muhammad

WORKER(S)	HammadTanveer																																				
PROJECT DURATION	2014-15 (continuous nature)																																				
LOCATION	Wheat Research Institute, Faisalabad.																																				
TREATMENTS & METHODOLOGY	<p>One to four acres of the following cultivars will be sown:</p> <table border="1"> <thead> <tr> <th>Sr. #.</th> <th>Varieties</th> <th>Sr. #</th> <th>Varieties</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Punjab-11</td> <td>7.</td> <td>Pasban-90</td> </tr> <tr> <td>2.</td> <td>Millat-11</td> <td>8.</td> <td>Galaxy-13</td> </tr> <tr> <td>3.</td> <td>AARI-11</td> <td>9.</td> <td>V-08203</td> </tr> <tr> <td>4.</td> <td>Faisalabad-08</td> <td>10.</td> <td></td> </tr> <tr> <td>5.</td> <td>Lasani-08</td> <td>11</td> <td></td> </tr> <tr> <td>6.</td> <td>Uqab -2000</td> <td>12</td> <td></td> </tr> </tbody> </table>	Sr. #.	Varieties	Sr. #	Varieties	1.	Punjab-11	7.	Pasban-90	2.	Millat-11	8.	Galaxy-13	3.	AARI-11	9.	V-08203	4.	Faisalabad-08	10.		5.	Lasani-08	11		6.	Uqab -2000	12									
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PREVIOUS YEAR' S RESULTS	<p>The seed of following varieties/lines was produced:</p> <table border="1"> <thead> <tr> <th>Sr. #</th> <th>Varieties</th> <th>Kg</th> <th>Sr. #</th> <th>Varieties</th> <th>Kg</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Faisalabad-08</td> <td>3700</td> <td>6.</td> <td>AARI-11</td> <td>1000</td> </tr> <tr> <td>2.</td> <td>Lasani-08</td> <td>2400</td> <td>7.</td> <td>Galaxy-13</td> <td>15000</td> </tr> <tr> <td>3.</td> <td>Punjab-11</td> <td>3800</td> <td>8.</td> <td>V-08203</td> <td>2500</td> </tr> <tr> <td>4.</td> <td>Millat-11</td> <td>4200</td> <td>9.</td> <td>V-11183</td> <td>1200</td> </tr> <tr> <td>5.</td> <td>Pasban-90</td> <td>1300</td> <td>10.</td> <td></td> <td></td> </tr> </tbody> </table>	Sr. #	Varieties	Kg	Sr. #	Varieties	Kg	1.	Faisalabad-08	3700	6.	AARI-11	1000	2.	Lasani-08	2400	7.	Galaxy-13	15000	3.	Punjab-11	3800	8.	V-08203	2500	4.	Millat-11	4200	9.	V-11183	1200	5.	Pasban-90	1300	10.		
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CEREAL TECHNOLOGY

49. TITLE	EFFECT OF ZINC FORTIFICATION ON PHYSICO-CHEMICAL PROPERTIES OF WHOLE WHEAT FLOUR
OBJECTIVES	To determine the effect of Zinc fortification on properties of whole wheat flour.
RESEARCH WORKERS	Dr. Muhammad Abrar and Dr. Makhdoom Hussain
PROJECT DURATION	2012-14
LOCATION	Wheat Research Institute, Faisalabad.
TREATMENTS & METHODOLOGY	ZnSO ₄ @5, 10, 15 and 20mg kg ⁻¹ will be added in whole wheat flour made from Millat-11 along with control and stored at ambient temperature for 60 days Flour quality parameters i.e. crude protein (through kjeltech), ash (through muffle furnace), color (through colorimeter), Zinc content, Alpha amylase activity (through falling no. apparatus), gluten content (through glutamatic) and chapatti quality will be evaluated at 0, 15, 30, 45 and 60 days of storage.
PREVIOUS YEAR'S RESULTS	ZnSO ₄ was added in flour of wheat variety Millat-11 @ 5,10,15 and 20 mg kg ⁻¹ flour and stored at ambient temperature. Fortified flour was subjected to various quality parameters such as crude protein (14.8-13.5%), ash (1.23-1.25%), colour (white), Zinc content (36-38 mg kg ⁻¹), alpha amylase activity (615-470), and gluten content (31-29%) as compared to control showing crude protein (14.8-12.9%), ash (1.20-1.22%), colour (white), Zinc content (22-25 mgkg ⁻¹), alpha amylase activity (615-512), and gluten content (31-28%). Quality evaluation of chapatti prepared using fortified flour was also carried out after 15 days interval for two months. Chapattis prepared from flour with fortification of 10 mg ZnSO ₄ scored best regarding quality parameters upto 45 days storage period followed by 5 , 15 , and 20 mg ZnSO ₄ whereas chapatti from control remained acceptable for 30 days.

50. TITLE	EFFECT OF VITAMIN A FORTIFICANT ON WHEAT FLOUR QUALITY DURING STORAGE
OBJECTIVES	To determine the effect of Vitamin A fortificant on storage of wheat flour
RESEARCH WORKERS	Dr. Muhammad Abrar and Anjum Javed

PROJECT DURATION	2012-14
LOCATION	Wheat Research Institute, Faisalabad.
TREATMENTS & METHODOLOGY	<p>Quantity of 10,20, 30, 40 and 50 percent of recommended daily allowance (RDA) of Vitamin A fortificant (retinyl acetate) will be added in flour made from Millat-11 along with control and stored at ambient temperature for 60 days.</p> <p>Flour quality parameters i.e. Crude protein (through kjeltech), ash (through muffle furnace), color (through colorimeter), Vitamin A content, Alpha amylase activity (through falling no. apparatus), gluten content (through glutamic) and biscuit quality will be evaluated fortnightly.</p>
PREVIOUS YEAR'S RESULTS	<p>10%,20%, 30%, 40% and 50% of recommended daily allowance (RDA) of Vitamin A fortificant (retinyl acetate) was added in flour made from Millat-11 along with control and stored at ambient temperature for 60 days.</p> <p>Fortified flour was analysed for quality parameters i.e. crude protein (14.7-12.98%), ash (0.22-0.24%), color (white), vitamin A content (215-190 ug), Alpha amylase activity (602-576), gluten content (30-27) as compared to control with crude protein (14.7-13.0%), ash (0.22-0.24%), color (white), vitamin A content (10-07 ug), Alpha amylase activity (602-590), gluten content (30-28).</p> <p>Biscuits were also prepared using the flour fortified with different ratios of vitamin A fortificant (Retinylacetate) after an interval of 15 days and evaluated organoleptically. The data revealed that biscuits from flours fortified upto 40% retinyl acetate got better quality scores upto storage period of 30 days.</p>

51. TITLE	EFFECT OF DIFFERENT RATIOS OF WHEAT, BARLEY, MAIZE AND SORGHUM COMPOSITE FLOURS ON QUALITY CHARACTERISTICS OF CHAPATTI
OBJECTIVES	To determine the best ratio of wheat and barley, maize and sorghum flours for value addition
RESEARCH WORKERS	Anjum Javed, Dr. Muhammad Abrar and Dr. Makhdoom Hussain
PROJECT DURATION	2013-14
LOCATION	Wheat Research Institute, Faisalabad.

TREATMENTS & METHODOLOGY	<p>Whole barley, maize and sorghum flours will be added in whole wheat flour of Punjab-11@ 10%, 20% and 30% separately along with control for the preparation of Chapattis and stored at ambient temperature for 60 days.</p> <p>Composite flours will be studied for gluten content (through glutomatic apparatus), protein content (through kernelyzer/kjeltech), ash content (through muffle furnace), alpha amylase activity (through falling number apparatus), fat and fiber content.</p> <p>The prepared chapattis will be evaluated for various quality characteristics and the best treatment will be selected as value added product.</p>
PREVIOUS YEAR'S RESULTS	<p>Whole barley, maize and sorghum flours were added in whole wheat flour of Punjab-11@ 10%, 20% and 30% separately along with control for the preparation of Chapattis and stored at ambient temperature for 60 days.</p> <p>Composite flours was studied for gluten content (28-22%), protein content (15-12%), ash content (1.30-1.39%), alpha amylase activity (576-350), fat (3.25-2.72%) and fiber content(2.96-3.10 %) as compared to control treatment showing crude protein (12.9-11.8%), ash (1.20-1.22%), alpha amylase activity (615-512), fat (2.5-2.0), fiber (1.90-1.70) and gluten content (31-28%).</p> <p>Chapattis were prepared and evaluated for various quality characteristics. Chapattis prepared from composite flours containing 20% barley (upto 45 days), 20 % maize (upto 30 days) and 10 % sorghum (upto 45 days) got better scores regarding different quality parameters.</p>

52. TITLE	QUALITY EVALUATION OF ADVANCED BREAD WHEAT LINES/VARIETIES GROWN IN DIFFERENT AGRO-ECOLOGICAL ZONES
OBJECTIVES	To screen advanced lines for different quality traits
RESEARCH WORKERS	AnjumJaved, SadafShamim and HiraShair
PROJECT DURATION	2013-14 (Continuous nature)
LOCATION	Wheat Research Institute, Faisalabad
TREATMENTS & METHODOLOGY	<p>All the advanced wheat lines included in National UniformWheatYield Trials and Micro Wheat Yield trials for the year 2013-14 grown in different agro-ecological zones will be tested for comprehensive quality parameters especially grain weight (seed counter & balance), test weight (through test weight/bushel weight apparatus), protein, starch and gluten content (through kernelyzer), bread making (through dough pin mixer, baking oven and fermentation cabinet) and chapatti quality (through mixer and hot plate).</p>

PREVIOUS YEAR'S RESULTS	Three hundred and ninety six wheat samples from NUWYT and MWYT were analysed for their physico-chemical and quality traits.																													
	<table border="1"> <thead> <tr> <th>Trial</th> <th>1000-grain weight. (g)</th> <th>Test Weight (kg hL⁻¹)</th> <th>Protein (%)</th> <th>Starch (%)</th> <th>Gluten (%)</th> </tr> </thead> <tbody> <tr> <td>NUWYT (N)</td> <td>26.5-44.2</td> <td>72.3-79.7</td> <td>10.7-15.3</td> <td>54.1-56.5</td> <td>15.5-32.0</td> </tr> <tr> <td>NUWYT (S)</td> <td>25.3-37.5</td> <td>68.4-77.8</td> <td>11.6-14.8</td> <td>54.0-56.8</td> <td>19.0-29.3</td> </tr> <tr> <td>MWYT (N)</td> <td>32.7-42.3</td> <td>71.8-77.1</td> <td>11.1-15.1</td> <td>54.3-56.8</td> <td>20.0-29.0</td> </tr> <tr> <td>MWYT (S)</td> <td>29.1-37.6</td> <td>71.2-75.7</td> <td>12.6-15.3</td> <td>54.2-56.6</td> <td>22.0-28.7</td> </tr> </tbody> </table> <p>Three hundred and ninety six (396) wheat samples of NUWYT and MWYT were analyzed for physico-chemical and quality traits. Above 14 percent protein and 28 percent gluten were found in wheat lines/varieties viz. V-109384, DN-84, DN-93, V-08203, WRIS-12, SD-998 and Faisalabad-08 from NUWYT (N) and WL-8169, V-076346, DN-93, NR-421, NR-408, V-7/2011, FakhreSarhad, Pirsabak-08 and local check from NUWYT(S). V-076346, V-076422(N1), NR-421, NR-409, NR-399, Nr-400, V-7/2011, NARC-2011, V-07096, Seher-06 and AAS-2011 showed above 38 g 1000-grain weight.</p> <p>Wheat lines NR 399, 9452, 4/43, V-11160, 09BT043, V-10217, KANZU were screened out as best varieties regarding protein and gluten content exceeding 14% and 28 %, respectively in MWYT (N) and MWYT(S). Whereas NR 399, V-11156, V-11160, 09B2003, V-10355, 09B9172, V-10193, V-10031, & V-11166 are screened out best regarding 1000-grain weight exceeding 38 g. Chapatti and bread quality scores were also within desirable range.</p>	Trial	1000-grain weight. (g)	Test Weight (kg hL ⁻¹)	Protein (%)	Starch (%)	Gluten (%)	NUWYT (N)	26.5-44.2	72.3-79.7	10.7-15.3	54.1-56.5	15.5-32.0	NUWYT (S)	25.3-37.5	68.4-77.8	11.6-14.8	54.0-56.8	19.0-29.3	MWYT (N)	32.7-42.3	71.8-77.1	11.1-15.1	54.3-56.8	20.0-29.0	MWYT (S)	29.1-37.6	71.2-75.7	12.6-15.3	54.2-56.6
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53.TITLE	EFFECT OF PLANTING TIME ON GRAIN QUALITY TRAITS							
OBJECTIVES	To study the effect of planting time on gran quality traits							
RESEARCH WORKERS	SadafShamim and Dr.MakhdoomHussain							
PROJECT DURATION	2013-14 (Continuous nature)							
LOCATION	Wheat Research Institute, Faisalabad							
TREATMENTS & METHODOLOGY	All the advanced wheat lines included in Date of Sowing Trials for the year 2013-14 will be tested for comprehensive quality parameters especially grain weight (seed counter &balance), test weight (through test weight/bushel weight apparatus), starch content, gluten and protein content (through kernelyzer).							
PREVIOUS YEAR'S RESULTS	Parameters	D1	D2	D3	D4	D5	D6	D7
	1000-grain weight (g)	33.5-37.6	31.9-38.8	31.2-35.1	31.0-36.7	29.5-35.3	26.8-32.7	27.3-32.3
	Test weight (kg hL ⁻¹)	75.3-79.3	73.0-80.3	74.0-79.8	71.6-77.7	69.7-77.0	69.4-75.0	69.4-75.2
	Gluten (%)	23.7-29.3	25.7-32.3	25.0-31.7	21.7-29.3	23.3-31.3	25.3-33.0	24.0-30.3

Protein (%)	13.0-15.0	14.0-16.0	13.8-15.8	12.9-15.5	13.4-15.7	13.8-16.0	13.5-15.4
Starch (%)	53.4-55.5	53.0-54.8	52.9-55.0	53.6-55.8	53.5-55.6	52.9-55.4	52.5-55.5

Twelve advanced lines/varieties were selected to study the effect of planting time on grain quality. Regarding thousand grain weight V-07096 showed highest value in D2 (10th November) i.e. 38.8 g. whereas V-11183 and Millat-11 were the toppers regarding test weight i.e exceeding up to 80.3 kghL⁻¹. The general trend for planting time's impact on grain quality showed that protein and gluten contents increased with delayed sowing but yield controlling parameters showed their best values in first three planting dates.

54. TITLE	EFFECT OF DIFFERENT FERTILIZER TREATMENTS ON WHEAT QUALITY																		
OBJECTIVES	To study the effect of fertilizer combination and time of its application on physico-chemical quality parameters in advanced wheat lines/varieties.																		
RESEARCH WORKERS	HiraShair, AnjumJaved and Dr. Muhammad Abrar																		
PROJECT DURATION	2013-14 (Continuous nature)																		
LOCATION	Wheat Research Institute, Faisalabad.																		
TREATMENTS & METHODOLOGY	All the advanced wheat lines included in fertilizer trials for the year 2013-14 will be tested for comprehensive quality parameters especially grain weight (seed counter & balance), test weight (through test weight/bushel weight apparatus), starch, gluten protein, content (through kernelyzer) and Chapatti quality.																		
PREVIOUS YEAR'S RESULTS	<table border="1"> <thead> <tr> <th>Trials</th> <th>1000-grain weight(g)</th> <th>Test wt. (kghL⁻¹)</th> <th>Protein (%)</th> <th>Starch (%)</th> <th>Gluten (%)</th> </tr> </thead> <tbody> <tr> <td>Normal</td> <td>35.3-40.9</td> <td>72.2-79.2</td> <td>8.8-14.1</td> <td>54.6-57.2</td> <td>10.0-26.7</td> </tr> <tr> <td>Late</td> <td>31.7-39.9</td> <td>72.4-77.6</td> <td>10.0-15.3</td> <td>53.4-57.0</td> <td>11.3-28.0</td> </tr> </tbody> </table> <p>One hundred and ninety-two (192) samples of fertilizer trial (Normal and late) I were analyzed for grain quality with four fertilizer treatments and the results revealed that, Millat-11 showed the best results regarding test weight, protein, gluten and starch content with maximum values at the F₄ treatment (160-120-60NPKkg ha⁻¹). Highest 1000 grain weight was recorded for V-11183 i.e. 40.9 g with the application of F₂ treatment (80-60-60NPKkg ha⁻¹) at normal</p>	Trials	1000-grain weight(g)	Test wt. (kghL⁻¹)	Protein (%)	Starch (%)	Gluten (%)	Normal	35.3-40.9	72.2-79.2	8.8-14.1	54.6-57.2	10.0-26.7	Late	31.7-39.9	72.4-77.6	10.0-15.3	53.4-57.0	11.3-28.0
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Normal	35.3-40.9	72.2-79.2	8.8-14.1	54.6-57.2	10.0-26.7														
Late	31.7-39.9	72.4-77.6	10.0-15.3	53.4-57.0	11.3-28.0														

	planting. Similarly, in the late planting, FSD-08 made the highest score in 1000 grain weight at the F ₁ treatment (0-0-0 NPK kg ha ⁻¹) i.e. 39.9 g. Among the fertilizer treatments, F ₄ (160-120-60NPKkg ha ⁻¹) and F ₂ (80-60-60NPKkg ha ⁻¹) revealed, promising results, regarding protein and gluten and 1000 grain weight, respectively.
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55. TITLE	EFFECT OF SPLIT APPLICATION OF NITROGEN ON GRAIN YIELD OF WHEAT
OBJECTIVES	To study the effect of split nitrogen application on various growth stages of wheat crop by analyzing the impact of the treatments on different physico-chemical quality parameters.
RESEARCH WORKERS	HiraShair and SadafShamim
PROJECT DURATION	2013-14 (Continuous nature)
LOCATION	Wheat Research Institute, Faisalabad.
TREATMENTS & METHODOLOGY	Wheat variety Punjab-11 will be tested for comprehensive quality parameters especially, 1000 grain weight (using seed counter), test weight (using bushel weight apparatus), protein, gluten, and starch.
PREVIOUS YEAR'S RESULTS	F ₁ (0-90-60 NPK kg ha ⁻¹ all applied at sowing) scored the highest in grain wt. with 39.30 g and starch with 56.5%, followed by F ₆ (120-90-60 NPK kg ha ⁻¹ when applied 1/3 N at sowing+ 1/3 N at tillering+ 1/3 N at booting) with acceptable grain weight and test wt. F ₉ (150-90-60 NPK kg ha ⁻¹ when applied ½ N at sowing+ ½ N at booting) scored maximum with 12.6 % protein and 21 % gluten content. But F ₈ (150-90-60 NPK kg ha ⁻¹ when applied ½ N at sowing+ ½ N at tillering) excelled not only in test wt. and grain wt. but also in protein and gluten content with minor differences from the highest stood treatments, followed by F ₉ treatment to be on good grounds on the same quality parameters.

56. TITLE	SUITABILITY OF NEW SPRING WHEAT VARIETIES FOR THE PREPARATION OF VALUE ADDED PRODUCTS
OBJECTIVES	To determine the suitability of new varieties for making different value added products
RESEARCH WORKERS	SadafShamim, HiraShair and Dr. Muhammad Abrar
PROJECT DURATION	2012-14 (Continuous nature)
LOCATION	Wheat Research Institute, Faisalabad.

TREATMENTS & METHODOLOGY	The new spring wheat varieties AARI-11, Punjab-11, Millat-11, Lasani-08 will be tested protein contents, starch content, gluten, water absorption, dough development time, dough stability, gluten quality / elasticity and dough softening. Value added products i.e. Chapatti, bread, biscuit, cake, nan and pizza will be prepared and evaluated to assess varietal difference.
PREVIOUS YEAR'S RESULTS	Three latest spring wheat varieties, AARI-11, Punjab-11 and Millat-11 along with Lasani-08 were tested for their value addition and products were analyzed through sensory evaluation, rheological testing and texture analyzing. All of four varieties were good for chapatti whereas Punjab-11 was best suited for cake, pizza & Lasani-08, Millat-11 for biscuit preparation.

57. TITLE	QUALITY DETERMINATION OF ADVANCED LINES OF BARLEY																										
OBJECTIVES	To screen high yielding barley lines for different quality traits																										
RESEARCH WORKERS	HiraShairand Dr. MakhdoomHussain																										
PROJECT DURATION	2013-14 (Continuous nature)																										
LOCATION	Wheat Research Institute, Faisalabad.																										
TREATMENTS & METHODOLOGY	High yielding lines of barley will be evaluated for 1000 kernel weight (seed counter & balance), test weight (through test weight/bushel weight apparatus) and protein content (through kernelyzer)																										
PREVIOUS YEAR'S RESULTS	<table border="1"> <thead> <tr> <th>Trial</th> <th>1000-grain weight (g)</th> <th>Test Wt. (kghL⁻¹)</th> <th>Protein (%)</th> </tr> </thead> <tbody> <tr> <td>D1</td> <td>35.2-41.8</td> <td>50.1-67.6</td> <td>10.3-12.7</td> </tr> <tr> <td>D2</td> <td>37.5-46.3</td> <td>51.2-67.7</td> <td>10.3-13.2</td> </tr> <tr> <td>D3</td> <td>31.7-37.8</td> <td>40.6-55.9</td> <td>13.0-14.6</td> </tr> <tr> <td>Barani</td> <td>36.0-44.0</td> <td>50.7-72.0</td> <td>12.3-14.8</td> </tr> <tr> <td>MICRO</td> <td>31.7-41.5</td> <td>54.4-62.7</td> <td>11.0-12.8</td> </tr> </tbody> </table> <p>Two hundred and twenty two samples were analyzed for grain quality and the results revealed that in the date of sowing trials, the yield parameters and protein showed contrasting results. D₂ and Barani yielded excellent results in grain wt. and test weight whereas D₃ showed good protein results. B-10007 and B-11002 were the highest scoring varieties regarding 1000 grain wt. and test wt. revealing maximum values of 46.2 g and 72.0 kghL⁻¹, respectively, and B-11002 gave the highest percentage of protein i.e 14.8 percent.</p> <p>On the other hand, Micro trial presented maximum 1000 grain wt. for B-09008 i.e. 41.5 g and highest test wt. for B-09028 i.e. 62.7 kghL⁻¹. B-05011 gave the maximum value of protein.</p>			Trial	1000-grain weight (g)	Test Wt. (kghL⁻¹)	Protein (%)	D1	35.2-41.8	50.1-67.6	10.3-12.7	D2	37.5-46.3	51.2-67.7	10.3-13.2	D3	31.7-37.8	40.6-55.9	13.0-14.6	Barani	36.0-44.0	50.7-72.0	12.3-14.8	MICRO	31.7-41.5	54.4-62.7	11.0-12.8
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Barani	36.0-44.0	50.7-72.0	12.3-14.8																								
MICRO	31.7-41.5	54.4-62.7	11.0-12.8																								

58. TITLE	EFFECT OF DIFFERENT TEMPERING CONDITIONS ON THE MILLING YIELD OF CURRENT WHEAT VARIETIES
OBJECTIVES	To determine the suitable amount of moisture and time required for proper tempering of commercial wheat varieties.
RESEARCH WORKERS	SadafShamim, HiraShair and Dr. Muhammad Abrar
PROJECT DURATION	2013-14 (Continuous nature)
LOCATION	Wheat Research Institute, Faisalabad.
TREATMENTS & METHODOLOGY	Three varieties viz. AARI-11, Punjab-11 and Millat-11 will be studied for determination of suitable tempering conditions. Each wheat variety will be tempered at moisture contents of 14.5, 15.0, 15.5 and 16% for time intervals of 16, 24, 32 and 48 hours. Milling will be carried out through Buhler mill and data for flour yield will be recorded to appraise the suitable tempering moisture content and time for maximum flour recovery
PREVIOUS YEAR'S RESULTS	Three wheat varieties i.e. AARI-11, Punjab-11 and Millat-11 were selected for tempering study. Maximum flour recovery was shown by Punjab-11 i.e. 70% at 15% moisture level when it was tempered for 24 hours

SHUTTLE BREEDING PROGRAMME

59.TITLE	RACE ANALYSIS OF YELLOW, LEAF AND STEM RUST																		
OBJECTIVES	To identify rust races prevailing in the fields during 2014-15																		
RESEARCH WORKER (S)	HumaSaffdar and Rabia Sultan																		
PROJECT DURATION	2014-15																		
LOCATION	Wheat Research Sub Station, Murree																		
TREATMENTS & METHODOLOGY	Rust samples from different field locations will be obtained and increased on morocco. After increase these samples will be inoculated individually on differential sets for each of the stem, leaf and yellow rust. The data obtained from these differential sets will reveal the information about the races prevailing in the fields during the season.																		
PREVIOUS YEAR'S RESULT	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Sr. #</th> <th style="text-align: center;">Number of Samples processed</th> <th style="text-align: center;">Rust Type</th> <th style="text-align: center;">Race Identified</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">05</td> <td style="text-align: center;">Stem Rust</td> <td style="text-align: center;">RRTTF</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">15</td> <td style="text-align: center;">Stripe Rust</td> <td style="text-align: center;">574232</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">15</td> <td style="text-align: center;">Leaf Rust</td> <td style="text-align: center;">Differential set not available</td> </tr> </tbody> </table>			Sr. #	Number of Samples processed	Rust Type	Race Identified	1	05	Stem Rust	RRTTF	2	15	Stripe Rust	574232	3	15	Leaf Rust	Differential set not available
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2	15	Stripe Rust	574232																
3	15	Leaf Rust	Differential set not available																

60.TITLE	SEED INCREASE OF RUST DIFFERENTIAL SETS (NEAR ISOGENIC LINES)		
OBJECTIVES	To produce sufficient quantity of differentials seed for their use in rust race analysis		
RESEARCH WORKER (S)	HumaSaffdar and Rabia Sultan		
PROJECT DURATION	2014-15		
LOCATION	Wheat Research Sub Station, Sunny Bank, Murree		
TREATMENTS & METHODOLOGY	Near isogenic lines representing the differential sets for each type of rust disease will be sown in field plots during March-April 2014. Spikes will be harvested at maturity and seed will be saved for use in next analysis.		

PREVIOUS YEAR'S RESULT	Sr #	Seed Type	Produce
	1	Lr Differential	Crop still in field
	2	SR Differential	Crop still in field
	3	Yr differential	Crop still in field

61.TITLE	SCREENING OF WHEAT GERMPLASM AGAINST STRIPE RUSTS																																																																																				
OBJECTIVES	To find out rust resistant varieties from the available germplasm for their use in resistant breeding																																																																																				
RESEARCH WORKER (S)	HumaSaffdar and Rabia Sultan																																																																																				
PROJECT DURATION	2013-14																																																																																				
LOCATION	Wheat Research Sub Station, Sunny Bank, Murree																																																																																				
TREATMENTS & METHODOLOGY	A set of 20 wheat advance lines were sown in trays of peat moss as a medium. At 2 leaf stages the germplasm was inoculated with Stripe rust culture. The isolate number 13yppk42 which is race 574232. Out of 20 lines 5 were resistant, 8 were moderately resistant and 5 were susceptible.																																																																																				
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62.TITLE	STUDY OF LATENCY PERIOD IN SELECTED WHEAT CULTIVARS																																																																																				
OBJECTIVES	To identify partially resistant wheat cultivars																																																																																				
RESEARCH WORKER (S)	HumaSaffdar and Rabia Sultan																																																																																				
PROJECT DURATION	2013-14																																																																																				
LOCATION	Wheat Research Sub Station, Murree																																																																																				
TREATMENTS & METHODOLOGY	The latency period is the minimum duration in which the symptoms start to appear after inoculation. In this experiment we tested the germplasm against stripe rust isolate 13yppk42 race 574232. This inoculum was obtained from CDRI Murree. The genes conferring partial resistant are associated with longer latency period and reduced infection frequency. It was observed that line showing Resistant and susceptible response had latency period of 15 days i.e first symptoms were observed on day 15 th after inoculation. The line showing moderately resistance response to moderately susceptible response had a little bit longer latency period. i.e. first symptoms were observed on day 18 th after inoculation.																																																																																				
PREVIOUS YEAR'S RESULT	<table border="1"> <thead> <tr> <th>Sr #</th> <th>Entry #</th> <th>Latency period</th> <th>Remarks</th> </tr> </thead> <tbody> <tr><td>1</td><td>V7096</td><td>18 days</td><td>MR</td></tr> <tr><td>2</td><td>V08082</td><td>15 day</td><td>S</td></tr> <tr><td>3</td><td>V08171</td><td>15days</td><td>S</td></tr> <tr><td>4</td><td>V08173</td><td>18 days</td><td>MR</td></tr> <tr><td>5</td><td>V08203</td><td>18 days</td><td>MSS</td></tr> <tr><td>6</td><td>V08314</td><td>18 days</td><td>MR</td></tr> <tr><td>7</td><td>V10031</td><td>15 days</td><td>R</td></tr> <tr><td>8</td><td>V10110</td><td>15 days</td><td>R</td></tr> <tr><td>9</td><td>V10217</td><td>15 days</td><td>S</td></tr> <tr><td>10</td><td>V10202</td><td>15 days</td><td>R</td></tr> <tr><td>11</td><td>V10287</td><td>15 days</td><td>S</td></tr> <tr><td>12</td><td>V11168</td><td>15 days</td><td>R</td></tr> <tr><td>13</td><td>V11172</td><td>15 days</td><td>R</td></tr> <tr><td>14</td><td>V11183</td><td>18 days</td><td>MR</td></tr> <tr><td>15</td><td>V10306</td><td>18 days</td><td>MR</td></tr> <tr><td>16</td><td>V09136</td><td>18 days</td><td>MR-MS</td></tr> <tr><td>17</td><td>V09082</td><td>18 days</td><td>MR</td></tr> <tr><td>18</td><td>V09087</td><td>18 days</td><td>MSS</td></tr> <tr><td>19</td><td>V04179</td><td>18 days</td><td>MR-MS</td></tr> <tr><td>20</td><td>V03079</td><td>15 days</td><td>S</td></tr> </tbody> </table>	Sr #	Entry #	Latency period	Remarks	1	V7096	18 days	MR	2	V08082	15 day	S	3	V08171	15days	S	4	V08173	18 days	MR	5	V08203	18 days	MSS	6	V08314	18 days	MR	7	V10031	15 days	R	8	V10110	15 days	R	9	V10217	15 days	S	10	V10202	15 days	R	11	V10287	15 days	S	12	V11168	15 days	R	13	V11172	15 days	R	14	V11183	18 days	MR	15	V10306	18 days	MR	16	V09136	18 days	MR-MS	17	V09082	18 days	MR	18	V09087	18 days	MSS	19	V04179	18 days	MR-MS	20	V03079	15 days	S
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63.TITLE	SCREENING OF WHEAT ADVANCED LINES AGAINST POWEDRY MILDEW (<i>Blumeriagraminisf.sp. tritici</i>)																												
OBJECTIVES	To find out powdery mildew resistant lines																												
RESEARCH WORKER (S)	Dr. ArshadMehmood, Faqir Muhammad, Muhammad MakkyJavaid, HumaSaffdar and Rabia Sultan																												
PROJECT DURATION	2014-15 (continuous nature).																												
LOCATION	Wheat Research Sub-Station, Murree																												
TREATMENTS & METHOD OLOGY	One hundred and eighty (180) lines/varieties of bread wheat will be planted under field condition at Summer Agricultural Research Station, Kaghan. Each entry will be sown in single row of one meter and 0.30 meter apart. Data will be recorded during 2 nd week of August according to the scale (0-9) as given by Mayee and Dathar 1986.																												
PREVIOUS YEAR'S RESULTS	Following powdery mildew infestation reactions were noted at Kaghan during 2013-14. <table border="1"> <thead> <tr> <th>Scale</th> <th>Field response</th> <th>Severity (%)</th> <th>No. of lines</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>HR</td> <td>0</td> <td>115</td> </tr> <tr> <td>1</td> <td>R</td> <td>0.1 -1.0</td> <td>192</td> </tr> <tr> <td>3</td> <td>MR</td> <td>11.1 – 10</td> <td>189</td> </tr> <tr> <td>5</td> <td>MS</td> <td>10.1 – 30</td> <td>112</td> </tr> <tr> <td>7</td> <td>S</td> <td>30.1-50</td> <td>47</td> </tr> <tr> <td>9</td> <td>HS</td> <td>50.1 & above</td> <td>05</td> </tr> </tbody> </table>	Scale	Field response	Severity (%)	No. of lines	0	HR	0	115	1	R	0.1 -1.0	192	3	MR	11.1 – 10	189	5	MS	10.1 – 30	112	7	S	30.1-50	47	9	HS	50.1 & above	05
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7	S	30.1-50	47																										
9	HS	50.1 & above	05																										

64.TITLE	SUMMER WHEAT SCREENING NURSERY KAGHAN
OBJECTIVES	<ul style="list-style-type: none"> i. To screen the wheat germplasm against rusts and powdery mildew. ii. To incorporate effective rust resistant genes in local germplasm. iii. To select the resistant material for further studies. iv. To advance the generations for speedy variety development.
RESEARCH WORKER (S)	Dr. GhulamMahboobSubhani, Dr. MakhdoomHussainand Dr. Muhammad Arshad
PROJECT DURATION	2014-15

LOCATION	Summer Agricultural Research Station, Kaghan
TREATMENTS & METHODOLOGY	About 1200 entries will be planted during last week of May, 2015 in paired rows of 2 meter length. Around the planted material susceptible wheat variety (Morocco) will also be planted. Rusts and powdery mildew data will be recorded in August. Hybridization work will be carried out. Harvesting of fresh crosses and selected material will be done during the month of September, 2014 for evaluation at WRI, Faisalabad.
PREVIOUS YEAR'S RESULT	Thirty six entries showed susceptible reaction to Lr while all other entries showed tolerance from Yr and Sr.

65.TITLE	STEM RUST SCREENING NURSERY KENYA
OBJECTIVES	To screen the promising wheat genotypes against stem rust especially Ug-99 race
RESEARCH WORKER (S)	Dr. MakhdoomHussainand Dr. Muhammad Arshad
PROJECT DURATION	2014-15
LOCATION	KARI., Kenya
TREATMENTS & METHODOLOGY	Sixty promising genotypes will be send to KARI., Kenya with the coordination of National Wheat Coordinator, NARC., Islamabad and CIMMYT Pakistan for screening against stem rust especially Ug-99 race during 1 st . week of May, 2015. Stem rust data will be recorded in collaboration with the international breeders and pathologist. Recorded data will be provided by the organizers to collaborators.
PREVIOUS YEAR'S RESULT	Among tested entries, two entries(////)showed resistant to moderately resistant response

66.TITLE	DEVELOPMENT OF HIGH YIELDING AND DISEASE RESISTANT WHEAT VARIETY FOR RICE ZONE																																																															
OBJECTIVES	<ul style="list-style-type: none"> i. To screen wheat germplasm for specific micro climatic conditions under present changing climatic scenario. ii. To screen wheat germplasm against rusts. iii. To develop high yielding, disease resistant and well adapted wheat varieties for rice zone. 																																																															
RESEARCH WORKER (S)	Dr. MakhdoomHussain, Dr. GhulamMahboobSubhani, Muhammad Saleem, Dr. Muhammad Arshad and Muhammad MuzaffarIqbal																																																															
PROJECT DURATION	2014-15 (Continuous nature)																																																															
LOCATION	Rice Research Institute, Kala Shah Kaku																																																															
TREATMENTS & METHODOLOGY	<p>Following material will be planted:</p> <ul style="list-style-type: none"> i. Track record of wheat varieties ii. Segregating generations iii. Commercial varieties and advanced wheat lines (MICRO, NUWYT, B-Trials). iv. Local Disease screening nursery (LDSN) 																																																															
PREVIOUS YEAR'S RESULT	<p>Selected varieties/lines in track record of wheat varieties</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Varieties</th> <th colspan="2">Disease reaction</th> <th rowspan="2">Varieties</th> <th colspan="2">Disease reaction</th> </tr> <tr> <th>Lr</th> <th>Yr</th> <th>Lr</th> <th>Yr</th> </tr> </thead> <tbody> <tr> <td>Fsd.85</td> <td>0</td> <td>TMS</td> <td>Lasani.08</td> <td>0</td> <td>TMS</td> </tr> <tr> <td>Pasban.90</td> <td>5MS</td> <td>0</td> <td>Millat.11</td> <td>TMS</td> <td>0</td> </tr> <tr> <td>Chenab.2000</td> <td>0</td> <td>0</td> <td>Pb.11</td> <td>TMS</td> <td>TMS</td> </tr> <tr> <td>Iqbal.2000</td> <td>TMS</td> <td>0</td> <td>Aas.11</td> <td>0</td> <td>TMS</td> </tr> <tr> <td>SH.2002</td> <td>0</td> <td>5MS</td> <td>AARI.11</td> <td>0</td> <td>5MS</td> </tr> <tr> <td>AS.2002</td> <td>0</td> <td>5MS</td> <td>Galaxy.13</td> <td>0</td> <td>5MS</td> </tr> <tr> <td>Fareed.06</td> <td>0</td> <td>TMS</td> <td>V.11183</td> <td>TMS</td> <td>0</td> </tr> <tr> <td>Fsd.08</td> <td>TMS</td> <td>0</td> <td>V.08203</td> <td>0</td> <td>TMR</td> </tr> </tbody> </table> <p>i. F₂ generations Out of 468 crosses, 353 crosses were selected on the basis of disease resistance and other agronomic traits.</p>						Varieties	Disease reaction		Varieties	Disease reaction		Lr	Yr	Lr	Yr	Fsd.85	0	TMS	Lasani.08	0	TMS	Pasban.90	5MS	0	Millat.11	TMS	0	Chenab.2000	0	0	Pb.11	TMS	TMS	Iqbal.2000	TMS	0	Aas.11	0	TMS	SH.2002	0	5MS	AARI.11	0	5MS	AS.2002	0	5MS	Galaxy.13	0	5MS	Fareed.06	0	TMS	V.11183	TMS	0	Fsd.08	TMS	0	V.08203	0	TMR
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ii. Commercial varieties and advanced lines

Varieties/ Lines	Disease reaction		Yield kg ha ⁻¹
	Lr	Yr	
V.11183	10MS	TMS	60
Fsd.08	5MS	0	59
V.08203	0	TMR	53
Galaxy.13	0	10MS	49
Punjab.11	0	5MS	49
Pasban.90	0	5MS	48
Millat.11	0	5MS	44
AARI.11	0	20MSS	38
Lasani.08	0	5MS	34

PROJECTS

67.TITLE	SAFEGUARDING PAKISTANI WHEAT FROM POTENTIAL DISEASE THREATS (PARB FUNDED PROJECT # 161).
OBJECTIVES	Development of wheat varieties resistant to rusts, karnal bunt, <i>Helminthosporium</i> , blight and powdery mildew
RESEARCH WORKER (S)	Dr. MakhdoomHussain, Dr. GhulamMahboobSubhani, Javed Anwar, Faqir Muhammad and MujahidHussain
PROJECT DURATION	2010-15
LOCATION	Wheat Research Institute, Faisalabad.
TREATMENTS & METHODOLOGY	<ul style="list-style-type: none"> i. 300 lines will be screened during the current year. ii. 30 lines will be tested for yield in preliminary yield trials iii. 15 lines will be tested for regular yield trials
PREVIOUS YEAR'S RESULT	<ul style="list-style-type: none"> i. Fifty three lines were found resistant for leaf, yellow rust and powdery mildew. ii. Ten lines produced higher grain yield than checks varieties in preliminary yield trials. iii. Five lines viz; V-1305, V-13007, V-1310, V-13012 and V-13016 produced higher grain yield than checks. iv. V-12304 and V-11338 tested in MTWV v. V-09082 and V-09007 showed good results in NUWYT vi. Five demonstration plots were planted on farmers field

68. TITLE	WHEAT CROP IMPROVEMENT FOR DROUGHT TOLERANCE THROUGH BIOTECHNOLOGY (PARB FUNDED PROJECT # 103)
OBJECTIVES	Wheat crop improvement for drought tolerance by introducing drought tolerance enhancing genes from other species through biotechnology.
RESEARCH WORKER (S)	Dr. MakhdoomHussain, Dr. Muhammad Munir, Muhammad MuzafarIqbal, Ch. ZahidMukhtar and Dr. Nasir Ahmad Saeed
PROJECT DURATION	2014-15
LOCATION	Wheat Research Institute, Faisalabad and National Institute for Biotechnology and Genetic Engineering (NIBGE), Faisalabad
TREATMENTS & METHODOLOGY	Field trials of transgenic material, micro field trials will be conducted for yield potential and other desirable morphological traits according to the NIBGE instructions

PREVIOUS YEAR'S RESULTS	Set I (No irrigation and no rainfall, Tunnel)												
	<table border="1"> <thead> <tr> <th>Entry No.</th> <th>Yield (Kg ha⁻¹)</th> <th>% increase over Punjab-11</th> </tr> </thead> <tbody> <tr> <td>7</td> <td>2507</td> <td>26.68</td> </tr> <tr> <td>11</td> <td>2480</td> <td>25.31</td> </tr> <tr> <td>8</td> <td>2243</td> <td>13.34</td> </tr> </tbody> </table>	Entry No.	Yield (Kg ha ⁻¹)	% increase over Punjab-11	7	2507	26.68	11	2480	25.31	8	2243	13.34
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	Entry No.	Yield (Kg ha ⁻¹)	% increase over Punjab-11										
	4	4222	27.97										
	5	3958	19.75										
	8	3826	15.97										
Set III (One irrigation + rainfall)													
<table border="1"> <thead> <tr> <th>Entry No.</th> <th>Yield (Kg ha⁻¹)</th> <th>% increase over Seher-06</th> </tr> </thead> <tbody> <tr> <td>10</td> <td>5542</td> <td>42.87</td> </tr> <tr> <td>11</td> <td>5225</td> <td>34.69</td> </tr> <tr> <td>9</td> <td>4829</td> <td>24.50</td> </tr> </tbody> </table>	Entry No.	Yield (Kg ha ⁻¹)	% increase over Seher-06	10	5542	42.87	11	5225	34.69	9	4829	24.50	
Entry No.	Yield (Kg ha ⁻¹)	% increase over Seher-06											
10	5542	42.87											
11	5225	34.69											
9	4829	24.50											
Set IV (Normal irrigation +rainfall)													
<table border="1"> <thead> <tr> <th>Entry No.</th> <th>Yield (Kg ha⁻¹)</th> <th>% increase over Seher-06</th> </tr> </thead> <tbody> <tr> <td>7</td> <td>5964</td> <td>0.44</td> </tr> <tr> <td>5</td> <td>5938</td> <td></td> </tr> <tr> <td>10</td> <td>5806</td> <td></td> </tr> </tbody> </table>	Entry No.	Yield (Kg ha ⁻¹)	% increase over Seher-06	7	5964	0.44	5	5938		10	5806		
Entry No.	Yield (Kg ha ⁻¹)	% increase over Seher-06											
7	5964	0.44											
5	5938												
10	5806												

69.TITLE	WHEAT PRODUCTIVITY ENHANCEMENT PROGRAMME (W-PEP)
OBJECTIVES	To enhance wheat productivity by provision of high yielding varieties with rust resistance especially Ug99.
RESEARCH WORKER (S)	Dr. Makhdoom Hussain and Dr. Javed Ahmad
PROJECT DURATION	2010-15 (Five years)
LOCATION	Wheat Research Institute, Faisalabad
TREATMENTS & METHODOLOGY	This project has four objectives i.e. i) Objective-1 (Surveillance), ii) Objective-2 (Host resistance), iii) Objective-3 (Breeding) and iv) Objective-4 (Seed). Work will be carried out according to specified plan of the project.

PREVIOUS YEAR'S RESULT	Objective-1 (Surveillance)	180 locations in 35 districts surveyed
	Objective-2 (Host resistance)	The isogenic lines of Leaf Rust including Lr 18, Lr 19, Lr 25, Lr 27 +31, Lr 28, Lr 32, Lr 36, Lr 37 and Lr 23+Gaza as well as the isogenic lines of Yellow Rust including Yr 1, Yr 3, Yr5,Yr 10, Yr 15, Yr 17, Yr 18, Yr 24, Yr 26, Yr 28, YrCv, Yr3, SERI, Super Kauz and Yrsp were found resistant.
	Objective-3 (Breeding)	Overall breeding program strengthened & capacity building
	Objective-4 (Seed)	Pre basic seed=4.56 tons Basic seed=33.70 tons

70. TITLE	DEVELOPMENT OF HALOPHYTIC WHEAT FOR AGRICULTURE ON SALT AFFECTED LANDS
OBJECTIVES	To change the physiology of the wheat plant making it halophytic.
RESEARCH WORKER (S)	Dr. Makhdoom Hussain, Dr. Javed Ahmad and Muhammad Waqas Jamil, Muhammad Yousaf, Director, SSRI, Pindi Bhattian. Jan Dvorak, Dept. of Plant Sciences, University of California, Davis, USA), M. Javed. Iqbal,Dept. of Plant Sciences,University of California, Davis, USA.
PROJECT DURATION	2012-15 (Three years)
LOCATION	Wheat Research Institute, Faisalabad and University of California, Davis, USA.
TREATMENTS & METHODOLOGY	The homozygosity for the <i>ph1</i> state will allow homoeologous recombination between the E and D chromosomes. Recombinant inbreds and backcross recombinant inbred lines will be tested both for agronomic evaluation in field trials in Pakistan, and by simultaneous genotyping at North Dakota State University, USA. Current year work plan <ul style="list-style-type: none"> i. Salinity trials under Wheat Research Institute, Faisalabad. <ul style="list-style-type: none"> a. Wheat Research Institute, Faisalabad. b. Pacca Anna, Faisalabad. c. Tandojam, Sindh. ii. Salinity trials under Soil salinity Research Institute, PindiBhattian. <ul style="list-style-type: none"> a. SSRI, PindiBhattian b. Bahawalnagar c. Rahim Yar Khan

- iii. Amphiploid Yield Trial consists of following entries/varieties
 - a. AgCS, BeCS, YecoraRojo, Chinese spring, Ishi, Auqab-2000, Pasban-90 and Haider-93
 - b. Salinity levels (Three)
 - i. Low, Medium and High salinity
- iv. Soil analysis of amphiploid trials and minerals analysis of wheatgrass will be conducted.
- v. Dataofbiomass and grain yield of amphiploid trials will be recorded and analyzed.
- vi. Training of one Pakistani scientist at UC, Davis.

PREVIOUS YEAR'S RESULT

**Pakka Anna
Biomass**

Table 1: Comparison of biomass (kgha⁻¹) of different wheat/barley varieties under different salinity levels

Varieties	Low Salinity Level	Medium Salinity Level	High Salinity Level	Mean
AgCS	7087	5326	4354	5589 A
Yecora	5625	2826	2333	3595 F
BeCS	5861	4653	3938	4817 CD
Chinese spring	7118	4896	4069	5361 AB
Ishi (Barley)	6007	4847	3535	4796 CD
Uqab-2000	7083	3938	3118	4713 D
Pasban-90	5729	4215	2618	4188 E
Haider-93 (Barley)	6528	5104	3535	5056 BC
Mean	6380 A	4476 B	3438 B	

Grain Yield

Table-2: Comparison of grain yield (kgha⁻¹) of different wheat/barley varieties under different salinity levels

Varieties	Low Salinity Level	Medium Salinity Level	High Salinity Level	Mean
AgCS	1519	1197	969	1228 D
Yecora	2486	1089	1027	1534 C
BeCS	1044	944	865	951 F
Chinese spring	1333	1026	910	1090 E
Ishi (Barley)	1962	1407	1125	1498 C
Uqab-2000	2918	1528	1318	1921 A
Pasban-90	2527	1816	1125	1823 AB
Haider-93 (Barley)	2445	1594	1198	1746 B
Mean	2029 A	1325 B	1067 B	

Tandojam

Biomass

Table-3: Comparison of biomass (kg ha⁻¹) of different wheat/barley varieties under different salinity levels

Varieties	Low Salinity Level	Medium Salinity Level	High Salinity Level	Mean
AgCS	15764	10694	8150	11536BC
Yecora	13360	8847	6575	9594E
BeCS	13889	8660	7228	9925DE
Chinese spring	14444	11910	10651	12335B
Ishi (Barley)	10910	11197	10867	11021 CD
Uqab-2000	15694	14469	13958	14707 A
Pasban-90	12153	11681	10525	11457 BC
Haider-93 (Barley)	15764	14444	13617	14608 A
Mean	14008 A	11488 B	10196C	

Grain Yield

Table-4: Comparison of grain yield (kg ha⁻¹) of different wheat/barley varieties under different salinity levels

Varieties	Low Salinity Level	Medium Salinity Level	High Salinity Level	Mean
AgCS	2684	2319	2138	2380 D
Yecora	5655	3620	2603	3959 C
BeCS	2239	1472	1394	1702 F
Chinese spring	3121	2583	2186	2630 D
Ishi (Barley)	2386	1965	1763	2038 E
Uqab-2000	5822	4875	4553	5084 A
Pasban-90	5153	5146	3099	4466 B
Haider-93 (Barley)	1800	1681	1629	1703 F
Mean	3607 A	2958 B	2421 C	

Rahim Yar Khan**Biomass****Table-5: Comparison of biomass (kg ha⁻¹) of different wheat /barley varieties under different salinity levels**

Varieties	Low Salinity Level	Medium Salinity Level	High Salinity Level	Mean
AgCS	6621	5172	4291	5361 A
Yecora	5561	2859	2228	3549 E
BeCS	5523	4739	3877	4713 BC
Chinese spring	6300	4949	3908	5052 AB
Ishi (Barley)	5963	4728	3256	4647 C
Uqab-2000	6533	3734	3066	4444 C
Pasban-90	5524	4001	2586	4037 D
Haider-93 (Barley)	6197	4893	3359	4816 BC
Mean	6028 A	4384 B	3321 C	

Grain Yield**Table-6: Comparison of grain yield (kg ha⁻¹) of different wheat/barley varieties under different salinity levels**

Varieties	Low Salinity Level	Medium Salinity Level	High Salinity Level	Mean
AgCS	1455	1141	973	1189 DE
Yecora	2387	1006	999	1464 BC
BeCS	990	893	800	894 F
Chinese spring	1209	1019	949	1059 EF
Ishi (Barley)	1768	1223	1067	1352 CD
Uqab-2000	2600	1304	1237	1714 D
Pasban-90	2380	1625	1114	1706 A
Haider-93 (Barley)	2253	1302	1065	1540 AB
Mean	1880 A	1189 B	1025 C	

Bhawalnagar

Biomass

Table-7: Comparison of biomass (kg ha⁻¹) of different wheat /barley varieties under different salinity levels

Varieties	Low Salinity Level	Medium Salinity Level	Mean
AgCS	6181	5985	6083 A
Yecora	4779	4392	4585 E
BeCS	5079	4780	4929 D
Chinese spring	5665	5596	5630 B
Ishi (Barley)	5124	5067	5096 C
Uqab-2000	5800	5605	5702 B
Pasban-90	4775	4578	4677 E
Haider-93 (Barley)	5806	5509	5657 B
Mean	5401 A	5189 B	

Grain Yield

Table-8: Comparison of grain yield (kg ha⁻¹) of different wheat /barley varieties under different salinity levels

Varieties	Low Salinity Level	Medium Salinity Level	Mean
AgCS	1484	1413	1449 E
Yecora	2057	1733	1895 C
BeCS	1365	1215	1290 F
Chinese spring	1332	1297	1314 F
Ishi (Barley)	1576	1315	1445 E
Uqab-2000	3164	3076	3120 A
Pasban-90	2115	2052	2083 B
Haider-93 (Barley)	2178	1888	2033 B
Mean	1909 A	1749 B	