

Annual Program of Research Work

RABI 2018 – 19

Pulses Research Institute, Faisalabad

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INTRODUCTION

Pulses are an important source of proteins and sustain soil fertility through biological nitrogen fixation. Punjab contributes more than 85% of the total pulses production. Gram is the largest Rabi pulse crop, accounting for 76 percent of total production of pulses in the country mainly grown in rainfed areas of Thall and occupies about 5 percent of cropped area. It is being grown on (978 thousand ha) during 2017-18. Lentil is another important crop among Rabi pulses, being grown on about 13.7 thousands hector with 6.7 thousand tons production in Pakistan. During 2017-18, gram production witnessed an increase of 3 percent on account of increase in area sown and due to favorable weather condition prevailed at the time of sowing. However the production of (Lentil) Masoor remained same during 2017-18.

Area, production and yield of Gram and Lentil during 2017-18 are as under:

Crops	2016-17		2017-18		% Change in production over Last year
	Area (000 Hec.)	Production (000 Ton)	Area (000 Hec.)	Production (000 Ton)	
Gram	971	330	978	340	3.0
Masoor	14.6	6.7	13.8	6.7	0.0

Source: Pakistan Economic Survey 2017-18

Punjab is self-sufficient in gram production but most of the lentil requirements are being fetched through import with ever increasing import bill. The gap of demand of pulse is filled through import of pulses from Australia, Afghanistan, Argentina, Canada, Kenya, Russian Federation, Ukraine, U.S.A and Vietnam. During 2017-18 (July-February), pulses valued US \$ 300.6 million were imported. The situation necessitates increasing its production by increasing area and per acre yield. Being rain fed crop, pulses show abrupt fluctuations in production due to uncertain weather conditions. This situation demands popularization of pulses in irrigated areas to fulfill the consumption demand and reduction in import bill. Prices of essential consumer items prevailing on 29th March 2018 in Pakistan indicates that in comparison with the regional countries Pakistan was the lowest in 14 items out of 23 items like Gram Pulse, Masoor pulse, mung Pulse than regional countries. Pulses Research Institute, Faisalabad is working for the development of high yielding disease resistant varieties. So far this institute has developed (22) varieties of pulses and a number of high yielding advance lines are the pipeline for their approval.

Salient Achievements of Pulses Research Institute during 2017-18 is as under:

CHICKPEA KABULI (*Cicer arietinum L.*)

- Advance lines K-14003 (1425 kg/ha) and K-14001 (1410 kg/ha) out-yielded all other genotypes contributed by sister organizations in Cooperative yield trial conducted at ten locations.
- In Micro Yield Trial advance line K-01518 (1361 kg/ha) produced more grain yield than the check Noor 2013 (1210 kg/ha).
- Advance lines K-16031 (1159 kg/ha) and K-16025 (1129 kg/ha) out-yielded other genotypes including both the checks Noor-2013 (810 kg/ha) in Advance Yield Trials. While genotypes K-17010 (1542 kg/ha) in PYT Set-I and K-17018 (1531 kg/ha) In PYT Set-II occupied top positions in respective trials.
- Twenty-three (27) successful F₀ crosses were developed.

- Three hundred and forty (340) single plant progenies from F₃ to F₅ generations were selected for generation advancement. In F₂, twenty two (22) crosses were bulked separately.
- Twenty eight (28) uniform Advance lines were selected from F₆ for evaluation in yield trials.

CHICKPEA DESI (*Cicer arietinum* L.)

- Advance lines D-15030 (1873 kg/ha) gained 2nd position and out-yielded all other genotypes contributed by sister organizations in Cooperative yield trial conducted at nine locations.
- Advance line D-16017 (2573 kg/ha) and D16019 (2531 kg/ha) produced higher grain yield than the checks in Advance yield trial while genotypes D-17015 (2518 kg/ha) in PYT Set-I and D-17025 (2093 kg/ha) In PYT Set-II occupied top positions in respective trials.
- Twenty-three (27) successful F₀ crosses were developed.
- Four hundred and ninety (500) single plant progenies from F₂ to F₅ generations were selected for generation enhancement.
- Seed of one hundred (100) desirable selections from Thall areas was multiplied for further evaluation.
- Six entries were resistant and seven entries were moderately resistant against wilt.

LENTIL (*Lens culinaris* Medik)

- Advance line V- 15509 produced higher yield 1274 kg/ha as compared to Markez-2009 (1111 kg/ha) in Micro Yield Trial 2017-18
- Advance line V- 16508 produced higher yield 1476 kg/ha followed by the advance line V-16509 which produced 1315kg/ha as compared to check variety M-09 produced (1132 kg/ha) in Advance Yield Trial. Entries V-17504 (3046 kg/ha) and check variety M-09 (3021 kg/ha) gave significantly higher yield in Preliminary Yield Trial set I and in Preliminary Yield Trial set II, Advance line V- 17523 produced higher yield 2910 kg/ha as compared to Markez-2009 (2535 kg/ha)
- Twenty (20) successful new cross combinations were harvested.
- Four hundred and eight (408) progenies were selected for further studies from F₂- F₆ generations.
- Twenty six (28) uniform desirable lines were selected for preliminary yield testing.

CHICKPEA (DESI)

(*Cicer arietinum* L.) 2n = 16

1.	GERMPLASM STUDIES
OBJECTIVES	To collect, maintain, characterize and evaluate gene pool entries
RESEARCH WORKERS	Irfan Rasool, Dr. Anwar-ul-Haq, Muhammad Shafiq, Mushtaq Ahmad & Ch. Muhammad Rafiq
PROJECT DURATION	2018-19
LOCATION	PRI, Faisalabad
TREATMENTS/ METHODOLOGY	<p>Total Entries = 305 + 350 = 655</p> <p>PRI, Faisalabad = 305 (Pr. 297 + New 8)</p> <p>GBRSS, Kallurkot = 350 (Received from PGRI, Islamabad)</p> <p>Checks = Bittal-2016, Bhakkar-2011, Punjab-2008</p> <p>Design = Augmented</p> <p>Plot size = 1.75 x 0.6 m</p> <p>Inter/intra row space = 30/15 cm</p> <p>Planting time = 2nd fortnight of October</p>
PREVIOUS YEAR'S RESULTS	<p>Faisalabad: Entries studied & maintained = 297</p> <p>Kallurkot: Entries studied & maintained = 350</p> <p>Range of some important morphological traits of 297 chickpea desi entries at (Faisalabad)</p>

TRAIT	RANGE	
	Minimum	Maximum
Plant height (cm)	38	95
Days to 50% Flowering	82	102
Number of Leaflets/ leaf	12	20
Primary branches/ Plant	2	7
Secondary branches/ Plant	3	13
Pods/ plant	17	121
Seeds/ pod	1-2	2-3
100- grain weight (g)	16	35

2.	HYBRIDIZATION PROGRAMME
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OBJECTIVES To create variability for the selection of desirable recombinants
RESEARCH WORKERS Dr. Anwar-ul-Haq, Irfan Rasool and Muhammad Shafiq
PROJECT DURATION 2018-19
LOCATION PRI, Faisalabad

**TREATMENTS/
METHODODOGY**

CHICKPEA (Desi) NEW CROSS COMBINATIONS						
	High yielding	X	Herbicide Tolerant	18	Bhakkar2011	X “
1.	Bittal-2016	X	D-16004		High yielding	X Photoperiod insensitive
2.	Punjab-2008	X	“	19.	Bittal-2016	X 96029
3.	Bhakkar2011	X	“	20.	Punjab-2008	X “
4.	TG-1415	X	“	21.	Bhakkar2011	X “
5.	D-15030	X	“	22.	Bittal-2016	X 96030
6.	Bittal-2016	X	D-16019	23.	Punjab-2008	X “
7.	Punjab-2008	X	“	24.	Bhakkar2011	X “
8.	Bhakkar2011	X	“		High yielding	X High yielding
9.	TG-1415	X	“	25.	Bittal-2016	X TG-1415
10.	D-15030	X	“	26.	Punjab-2008	X “
11.	Bittal-2016	X	D-17026	27.	D-15024	X “
12.	Punjab-2008	X	“	28.	D-15030	X “
13.	Bhakkar2011	X	“	29.	Bittal-2016	X Almaz
14.	TG-1415	X	“	30.	Punjab-2008	X
15.	D-15030	X	“			
	High yielding	X	Double pod			
16.	Bittal-2016	X	E-26			
17.	Punjab-2008	X	“			

Parents Salient Character		
1.	Bittal-2016	High Yielding bold seeded approved varieties.
2.	Punjab-2008	
3.	Bhakar2011	
4.	D-15024	Advance line exhibited yield potential of 4058 kg/ha in CYT-2017-18 at PRI, Faisalabad
5.	TG-1415	Stood first in CYT 2017-18 with Ave. Yield of 2010 kg/ha in 9 locations
6.	D-16004	Advance lines with high yield potential and moderately tolerant to herbicides
7.	D-16019	
8.	D-17026	
9.	96029	Thermo and photoperiod-insensitive lines.
10.	96030	
11.	E-26	Double podded character line
12.	Almaz	Bold seeded Australian variety with grain weight of 55 g

Cross combinations = 30

Sowing time = 2nd fortnight of October

Parental lines will be planted in paired (male and female) 4 meter long and 30cm apart rows to facilitate crossing

PREVIOUS YEAR'S RESULTS

Seeds of 27 successful crosses were harvested.

3. STUDY OF FILIAL GENERATIONS

OBJECTIVES To select recombinants with desirable traits in segregating population
RESEARCH WORKERS Dr. Anwar-ul-Haq, Muhammad Shafiq, Irfan Rasool and Mushtaq Ahmad
PROJECT DURATION 2018-19
LOCATIONS PRI, Faisalabad

TREATMENTS/METHODLOGY Crosses / plant progenies to be studied:

Filial generation	Crosses	progenies
F ₁	27	-
F ₂	25	-
F ₃	21	150
F ₄	9	145
F ₅	19	135
F ₆	12	80

Breeding method = Pedigree
 Checks = Bittal-2016, Bhakkar-2011, Pb-2008 & Bittal-98
 Plot size = 4 × 0.30 m
 Inter/intra row spacing = 30/15 cm
 Sowing time = 2nd fortnight of October

PREVIOUS YEAR'S RESULTS Filial generations studied and selected:

Filial generation	Crosses/progenies Studied	Crosses/progenies Harvested	Uniform lines selected
F ₀	30	27	
F ₁	27	25	
F ₂	21	21/150	
F ₃	10/120	9/145	
F ₄	20/140	19/135	
F ₅	15/140	12/80	
F ₆	17/90	-	36

4. PRELIMINARY YIELD TRIAL

OBJECTIVES To evaluate promising lines for yield potential and disease tolerance
RESEARCH WORKERS Irfan Rasool, Dr. Anwar-ul-Haq and Muhammad Shafiq
PROJECT DURATION 2018-19
LOCATIONS 2 (Faisalabad & Kallurkot)
TREATMENTS/METHODLOGY Entries = 36
 Sets = 2 (18 entries +2 checks in each set)
 Checks = 2 (Bittal-2016 & Pb-2008)
 Design = R.C.B
 Plot size = 4 × 1.2 m
 Replications = 3
 Inter/intra row spacing = 30/15 cm
 Sowing time = 2nd fortnight of October
 Data to be taken = Plant Stand, Days to 50 % Flowering, Days to 90% Maturity, Plant height, Number of pods/plant, Number of seeds/pod, seed yield and reaction to disease under natural conditions.

PREVIOUS YEAR'S
RESULTS

Set – I

Rank	Entries	PRI, Fsd	GBRSS K.Kot	Ave. Yield Kg/ha
1.	D-17015	3994	1042	2518
2.	D-17002	3601	1340	2471
3.	D-17014	4253	622	2437
4.	Pb.2008	3658	1115	2386
5.	D-17018	3901	854	2378
6.	D-17003	3742	1007	2374
7.	D-17008	3686	986	2336
8.	D-17010	3589	1073	2331
9.	D-17006	3906	747	2326
10.	D-17007	3992	615	2303
11.	D-17016	3715	833	2274
12.	D-17011	3550	965	2258
13.	D-17005	3697	785	2241
14.	D-17009	3525	951	2238
15.	D-17012	3619	813	2216
16.	D-17013	3447	833	2140
17.	D-17017	3644	611	2128
18.	Bittal -2016	3239	938	2088
19.	D-17004	3201	868	2034
20.	D-17001	2908	790	1849
CV %		11.4	13.85	
LSD (0.05)		208	100	

Set – II

Rank	Entries	PRI, Fsd	GBRSS, K.Kot	Ave. Yield Kg/ha
1.	D-17025	2832	1354	2093
2.	D-17033	3019	1125	2072
3.	D-17019	2712	1354	2033
4.	D-17027	2819	1181	2000
5.	D-17035	2715	1160	1938
6.	D-17020	2872	951	1911
7.	D-17032	2762	1056	1909
8.	D-17036	2688	1125	1906
9.	D-17030	2840	896	1868
10.	D-17034	2735	983	1859
11.	D-17026	2910	743	1826
12.	D-17031	2536	1042	1789
13.	D-17029	2665	896	1780
14.	D-17028	2483	1003	1743
15.	Pb.2008	2517	931	1724
16.	D-17023	2222	1174	1698
17.	Bittal -2016	2594	729	1661
18.	D-17024	2122	1191	1657
19.	D-17021	1965	931	1448
20.	D-17022	1576	1285	1431
CV %		8.59	6.10	
LSD (0.05)		181	118	

5.	IDENTIFICATION AND EVALUATION OF HIGH YIELDING LINES SELECTED FROM THALL AREA
OBJECTIVES	To evaluate lines selected from farmer fields of Thall area for yield potential and disease tolerance
RESEARCH WORKERS	Irfan Rasool, Dr. Anwar-ul-Haq and Muhammad Shafiq
PROJECT DURATION	2018-19
LOCATIONS	2 (Faisalabad & Kallurkot)
TREATMENTS/ METHODOLOGY	Entries = 20 Sets = 2 (each set with 10 entries + 2 checks) Checks = 2 (Bittal-2016 & Pb-2008) Design = R.C.B Plot size = 4 × 1.2 m Replications = 3 Inter/intra row spacing = 30/15 cm = 2 nd fortnight of October Sowing time = Plant Stand, Days to 50 % Flowering, Days to 90% Data to be taken Maturity, Plant height, Number of pods/plant, Number of seeds/pod, seed yield and reaction to disease under natural conditions.
PREVIOUS YEAR'S RESULTS	New experiment

6.	ADVANCE YIELD TRIAL
OBJECTIVES	To evaluate promising lines for yield potential and disease tolerance
RESEARCH WORKERS	Irfan Rasool, Dr. Anwar-ul-Haq, & Muhammad Shafiq
PROJECT DURATION	2018-19
LOCATIONS	Faisalabad & Kallurkot
TREATMENTS/ METHODOLOGY	Entries = 16 Checks = 2 (Bittal-2016 & Bhakkar-2011) Design. = R.C.B. Plot size = 4 × 1.2 m Replications = 3 Inter/intra row spacing = 30/15 cm Sowing time = 2 nd fortnight of October Data to be taken = Plant Stand, Days to 50 % Flowering, Days to 90% Maturity, Plant height, Number of pods/plant, Number of seeds/pod, seed yield and reaction to disease under natural conditions.

PREVIOUS YEAR'S RESULTS

Rank	Entries	PRI, Fsd	GBRSS, K.Kot	Av. Yield Kg/ha
1.	D-16017	3896	1250	2573
2.	D-16019	3757	1306	2531
3.	Bittal-2016	3806	1215	2510
4.	Pb-2008	3500	1333	2417
5.	D-16003	3644	1104	2374
6.	D-16020	3694	1021	2358
7.	D-16004	3618	969	2293
8.	D-16032	3708	868	2288
9.	D-16011	3608	965	2286
10.	D-16029	3163	1333	2248
11.	D-16007	3510	965	2238
12.	D-16033	3563	868	2215
13.	D-16015	3361	963	2162
14.	D-16001	2796	1438	2117
15.	D-16030	3160	899	2030
16.	D16012	3056	795	1925
	CV %	5.48	12.27	
	LSD (0.05)	199	125	

7.	COOPERATIVE YIELD TRIAL
OBJECTIVES	To evaluate Advance lines of PRI and sister organizations of Punjab in different agro-ecological zones
RESEARCH WORKERS	Irfan Rasool, Dr. Anwar-ul-Haq, Muhammad Shafiq and M. Mushtaq Ahmad
PROJECT DURATION	2018-19
LOCATION	13 (Faisalabad, NIAB, Kallurkot, Bhakkar, Bahawalpur, Karor, Rakhuttra & farmer fields.)
TREATMENTS/ METHODLOGY	<p>Entries = 28 Pulses Res. Institute will contribute (11) advance lines</p> <p>Sets = 2 (14 entries + 2 checks in each set)</p> <p>Checks = 2 (Bittal-2016 & Punjab-2008)</p> <p>Design. = R.C.B.</p> <p>Plot size = 4 × 1.2 m</p> <p>Replications = 3</p> <p>Inter/intra row spacing = 30/15 cm</p> <p>Sowing time = 2nd fortnight of October</p> <p>Data to be taken = Plant Stand, Days to 50 % Flowering, Days to 90% Maturity, Plant height, Number of pods/plant, Number of seeds/pod, seed yield and reaction to disease under natural conditions.</p>

PREVIOUS YEAR'S RESULTS

COOPERATIVE YIELD TRIAL OF CHICKPEA (DESI) RABI 2017-18											
R	Entries	PRI, Fsd	NIAB Fsd	K.Kot	AZRI. Bkr	Karor	B.Pur	K.Kot (Barani)	AZRI. Bkr (F.Field)	AZRI. Bkr (Barani)	Ave. (Kg/h)
1	TG1415	3774	2215	1649	2316	3080	2222	979	469	1389	2010
2	D-15030	3649	1578	1191	2802	2555	2188	760	573	1557	1873
3	CH 39/11	3313	1831	1236	2517	2809	2917	684	576	951	1871
4	D-15033	3800	1815	1229	3226	1911	1979	705	608	1353	1847
5	D-15024	4058	1603	1236	1976	3729	1806	538	549	1068	1840
6	TG1410	3035	2135	885	2396	2861	2708	458	531	1485	1833
7	TG1305	3219	2129	1132	3080	2486	2083	615	392	1126	1807
8	TG1218	3618	1955	1108	2122	2326	2674	813	417	1226	1806
9	CH 24/11	3169	2328	1288	2194	2792	2083	622	542	1138	1795
10	D-15036	3790	1272	1448	1594	2465	2639	733	472	1604	1780
11	CH 10/11	3506	1942	1129	2052	2896	2222	847	486	929	1779
12	D-15019	3653	1728	1125	2448	2472	2257	479	479	1363	1778
13	Bittal-16	3704	1591	1028	2486	2802	2292	358	576	1028	1763
14	Pb.2008	3424	1725	1142	2684	2680	2222	472	451	867	1741
15	CH 19/10	3425	1879	705	2365	2663	1875	878	493	1303	1732
16	CH 13/11	2781	1897	1375	1809	2486	2257	872	257	1174	1656
17	TGX220	2799	1941	1392	1715	2819	2292	632	306	828	1636
18	CH 2/11	3413	1801	851	2174	1552	2535	677	382	1204	1621
19	D-15012	2958	1265	674	2285	3014	2361	378	441	1131	1612
20	D-15014	3403	1331	955	1830	2465	1840	240	448	1656	1574
21	D-15015	3328	1601	611	2257	2569	2014	372	354	1006	1568
22	D-15020	3396	1403	878	1604	2326	1979	472	556	1243	1540
23	BRC-446	2747	1515	1410	1823	1694	2326	556	424	829	1480
24	D-15005	2878	1187	861	1594	2403	2222	372	375	795	1410
	CV	8.52	15.7	13.5	4.27	9.10	6.41	12.14	14.24	12.90	
	LSD 5%	234	122	156	77	135	117	178	54	124	

8.	NATIONAL UNIFORM YIELD TRIAL
OBJECTIVES	To test the performance of candidate lines in different ecological zones of the Country
RESEARCH WORKERS	Irfan Rasool, Dr. Anwar-ul-Haq, Muhammad Shafiq, Mushtaq Ahmad & Ch. Muhammad Rafiq
PROJECT DURATION	2018-19
LOCATIONS	2 (Faisalabad & KallurKot)
TREATMENTS/METHODOLOGY	This institute will contribute 07 entries in NUYT. Layout = As per instructions received along with seed Sowing time Data = 2 nd fortnight of October to be taken = Days to 50% flowering, days to 90% maturity, incidence of insect pests & diseases and grain yield
PREVIOUS YEAR'S RESULTS	Entries tested = 25 Advance line D-13011 contributed by Pulses Res. Institute, Faisalabad stood first in National Uniform Yield Trial 2017-18

Grain Yield (kg/ha)

Sr.#	Entry name	Locations*								
		AARI, Fsd	AZRI, Bhakkar	AZRI, D.I.Khan	BARS F.Jang	GRSS, K.Kot	NARC,	NIAB, Fsd	QAAR Larkana	Mean
1.	D-13011	3311	1215	2486	2408	1174	2700	2237	2020	2194
2.	TG 1410	3117	1344	2518	2358	688	2971	2134	2407	2192
3.	TG 1415	3690	1063	2479	2443	1125	2374	1986	2091	2156
4.	D-13036	3176	1170	2624	2122	938	3146	1835	2208	2152
5.	D-10008	3375	1163	2847	2448	903	2458	1662	2340	2149
6.	TG 1424	3488	1156	2752	2534	951	2335	1906	2055	2147
7.	D-10039	3894	903	2089	2396	451	2878	1717	2444	2096
8.	TG X 220	2661	1220	2776	2271	1063	2372	1723	2597	2085
9.	D-11030	3590	997	2254	2684	688	2075	1626	2611	2066
10.	TG 1218	3567	1052	2318	1264	972	3002	2061	1979	2027
11.	D-09027	3218	820	3122	1535	958	2282	1643	2576	2019
12.	D 14005	3879	698	2458	1964	479	2118	1693	2447	1967
13.	TG 1305	3347	771	2806	2313	563	1546	1733	2625	1963
14.	Bittle 2016	3063	1135	2448	2334	240	2615	1177	2201	1902
15.	Pb 2008	3389	354	2840	2361	521	1741	1483	2425	1889
16.	TG X 228	3714	962	2107	1823	486	2603	1392	1960	1881
17.	BRC-446	3061	656	2892	1010	917	2004	1800	2389	1841
18.	D-12011	3633	838	2525	1969	479	1550	1683	1944	1828
19.	SL-05-64	2660	856	2212	2179	583	2384	1396	2187	1807
20.	TG 1221	3254	764	2329	1125	892	2312	1745	1772	1774
21.	NIFA 1	2363	719	2768	1299	0	2608	1160	2514	1679
22.	D-13012	3496	253	2123	1272	479	1797	1589	2132	1643
23.	NIFA 2	2322	556	2142	2076	833	1995	847	2235	1626
24.	QG 3	2131	747	2452	1424	208	2280	1033	2618	1612
25.	NIFA 3	2232	549	2530	1564	0	2304	1219	2447	1606
Location Means			3185	878	2516	1967	664	2338	1619	2289

Coefficient of variation= 18.03% Genotypes (G), Location (L) and G x L interactions are highly significant (P<0.01)

*Locations			
1= AARI, Faisalabad	2= AZRI, Bhakkar	3= AZRI, D.I.Khan	4= BARS fateh jang
5= GRS, Kalur Kot	6= NARC, Islamabad	7= NIAB, Faisalabad	8= QAARI, Larkana

Note: Trial sent to 15 locations. Grain yield data received from 8 locations. So far grain yield data is not received from 7 locations.

9.	PRE-BASIC / BASIC SEED PRODUCTION
OBJECTIVES	i. To maintain the genetic purity of approved / commercial varieties ii. To supply seed to different seed producing organizations
RESEARCH WORKERS	Dr. Anwar-ul-Haq, Muhammad Shafiq, Irfan Rasool, Muhammad Aqeel and M. Mushtaq Ahmad
PROJECT DURATION	2018-19
LOCATION	Faisalabad and Kallurkot
TREATMENTS/ METHODLOGY	Single plants will be selected and single plant progeny rows will be sown in 4 meter long and 30 cm apart rows. True to type progeny rows will be harvested separately. Seed of selected progeny rows will be sown in blocks. Genetically

true to type, disease free and healthy progeny blocks will be selected, harvested and bulked as BNS which will be used for pre-basic seed production.

**PREVIOUS YEAR'S
RESULTS**

Seed of following genotypes was produced

Variety	BNS (Kg)	Pre-Basic (Kg)	Total (Kg)
Punjab-2008	-	1000	1000
Bittal – 2016	50	1810	1860
Bittal – 98	50	200	250
Total	100	3010	3110

CHICKPEA (KABULI)

(*Cicer arietinum* L.) 2n = 16

10.	GERMPLASM STUDIES
OBJECTIVES	To collect, maintain and characterize genepool entries
RESEARCH WORKERS	Muhammad Afzal Zahid, , Dr. Anwar ul haq, Muhammad Saleem and Muhammad Shafiq
PROJECT DURATION	2018-19
LOCATION	Faisalabad
TREATMENTS/ METHODOLOGY	<p>Entries = 312 (Pr. 300 + New 12)</p> <p>Checks = Noor-91, CM-2008, Noor-2009 & Noor-2013</p> <p>Design = Augmented</p> <p>Plot size = 1.8 × 0.6 m</p> <p>Inter/intra row = 30/15 cm spacing</p> <p>Planting time = 2nd fortnight of October</p>
PREVIOUS YEAR'S RESULTS	<p>Entries studied & maintained = 300</p> <p>Range of variation for some quantitative traits in the chickpea (kabuli) Germplasm</p>

TRAIT	RANGE	
	Minimum	Maximum
Plant height (cm)	28	96
Primary branches per plant	2	6
Secondary branches per plant	7	16
Days to flowering (50%)	85	106
Pods per plant	20	110
Days to maturity	145	153
100- grain weight (g)	18	33
Grain yield per plant (g)	22	96

11.	HYBRIDIZATION PROGRAMME
OBJECTIVES	To create variability for the selection of desirable recombinants
RESEARCH WORKERS	M. Afzal Zahid, Dr. Anwar ul haq, Irfan Rasool and Muhammad Shafiq
PROJECT DURATION	2018-19
LOCATION	Faisalabad
TREATMENTS/ METHODOLOGY	Cross combinations= 24

Sr	High Yielding		Wilt Resistant	Sr	Bold Seeded		High Yielding
1	K-01248	×	K-17009	13	UC 27	×	K-01241
2	K-01242	×	K-17023	14	K-01211	×	K-16031
3	K-01211	×	K-01625	15	NOOR 2013	×	Almaz
4	K-24012	×	K-14004	16	UC-27	×	K-17018
5	K-17018	×	K-01241	17	K-14024	×	CH64/11
6	K-16031	×	K-16031	18	K-06006	×	CH68/08
7	K-01308	×	K-16025		K-16001		K-01242
	High Yielding	×	Herbicide MT		High Yielding		Lodging Tollerant
8	K-01211	×	K-16025	20	K-01211		CDC Leader
9	K-01216	×	K-16027	21	K-01308		CDC Cabri
10	K-01242	×	K-01625	22	N00r-2013		CDC Marengo
11	K-16031	×	K-01626	23	K-01248		FLIP82/150C
12	K-01308		K-16027	24	K-01242		FLIP08/37C

Sowing time = 2nd fortnight of October

Parental lines will be planted in paired (male and female) 4 meter long and 60 cm apart rows to facilitate crossing

PREVIOUS YEAR'S RESULTS 30 crosses were attempted and seed of 27 successful crosses were harvested

12.	STUDY OF FILIAL GENERATIONS														
OBJECTIVES	To select recombinants with desirable traits from segregating populations														
RESEARCH WORKERS	M. Afzal Zahid, Dr. Anwar ul Haq , Irfan Rasool , Muhammad Shafiq														
PROJECT DURATION	2018-19														
LOCATION	Faisalabad														
TREATMENTS/ METHODOLOGY	Crosses / plant progenies to be studied;														
	<table border="1"> <thead> <tr> <th>Filial generation</th> <th>Crosses/progenies</th> </tr> </thead> <tbody> <tr> <td>F₁</td> <td>23</td> </tr> <tr> <td>F₂</td> <td>21</td> </tr> <tr> <td>F₃</td> <td>15/126</td> </tr> <tr> <td>F₄</td> <td>7/114</td> </tr> <tr> <td>F₅</td> <td>15/96</td> </tr> <tr> <td>F₆</td> <td>9/90</td> </tr> </tbody> </table>	Filial generation	Crosses/progenies	F ₁	23	F ₂	21	F ₃	15/126	F ₄	7/114	F ₅	15/96	F ₆	9/90
Filial generation	Crosses/progenies														
F ₁	23														
F ₂	21														
F ₃	15/126														
F ₄	7/114														
F ₅	15/96														
F ₆	9/90														

Breeding method	= Pedigree
Checks	= Noor-91, CM-2008, Noor-2009 & Noor-2013
Plot size	= 4 × 0.30 m
Inter/intra row spacing	= 30/15 cm
Sowing time	= 2 nd fortnight of October

PREVIOUS YEAR'S RESULTS

Filial generations studied and selected:

Filial generation	Crosses/progenies studied	Crosses/progenies selected/harvested	Uniform lines selected
F ₀	30	27	
F ₁	23	21	
F ₂	16	15/126	
F ₃	7/34	7/114	
F ₄	17/110	15/96	
F ₅	10/120	9/90	
F ₆	9/72	-	28

13.**PRELIMINARY YIELD TRIAL****OBJECTIVES**

To evaluate promising lines for yield potential and disease tolerance

RESEARCH WORKERS

Muhammad Afzal Zahid, Dr. Anwar ul Haq, Muhammad Saleem, Muhammad Shafiq, and Ch. Muhammad Rafiq

PROJECT DURATION

2018-19

LOCATIONS

Faisalabad and Kallurkot

TREATMENTS/METHODOLOGY

Entries	= 32
Sets	= 2
Checks	= Noor-2009 & Noor-2013
Design	= R.C.B.
Plot size	= 4 × 1.2 m
Replications	= 3
Inter/intra row spacing	= 30/15 cm
Sowing time	= 2 nd fortnight of October
Data to be taken	= Days to 50% flowering, days to 90% maturity, incidence of insect pests & diseases, and grain yield

PREVIOUS YEAR'S
RESULTS

Set-I

R	Entries	PRI, Fsd	GBRSS, K.Kot	Av. Yield Kg/ha
1	K-17010	2173.61	909.66	1541.64
2	K-17009	2111.11	826.34	1468.72
3	K-17012	1958.33	902.72	1430.53
4	K-17002	1800.69	1055.49	1428.09
5	K-17001	1746.52	1090.21	1418.36
6	K-17005	1945.14	791.62	1368.38
7	K-17004	1822.91	826.34	1324.62
8	K-17015	1826.39	736.06	1281.23
9	K-17003	1760.41	798.56	1279.49
10	K-17016	1684.03	819.39	1251.71
11	K-17007	1656.25	840.22	1248.24
12	K-17006	1621.53	854.11	1237.82
13	K-17013	1756.94	618.02	1187.48
14	K-17014	1548.61	749.95	1149.28
15	NOOR-09	1506.94	743.01	1124.97
16	K-17011	1739.58	506.91	1123.25
17	NOOR-13	1611.11	520.80	1065.96
18	K-17008	1277.78	763.84	1020.81
LSD 5 %		110	90	105
CV%		6.69	10.78	8.74

Set-II

R	Entries	PRI, Fsd	GBRSS, K.Kot	Av. Yield Kg/ha
1	K-17018	1909.72	1152.7	1531.21
2	K-17030	1802.08	1048.54	1425.31
3	K-17024	1781.25	1027.71	1404.48
4	K-17019	1604.16	1152.7	1378.43
5	K-17026	1871.52	812.45	1341.99
6	K-17020	1718.75	881.89	1300.32
7	K-17022	1743.05	812.45	1277.75
8	K-17029	1774.30	729.12	1251.71
9	NOOR-13	1482.64	659.68	1071.16
10	K-17027	1713.89	374.98	1044.44
11	K-17021	1366.66	701.34	1034.00
12	K-17031	1104.16	951.33	1027.75
13	K-17025	1545.14	409.7	977.42
14	K-17023	1274.30	680.51	977.41
15	K-17032	1447.91	499.97	973.94
16	K-17017	1527.78	368.03	947.91
17	NOOR-09	1170.14	708.29	939.22
18	K-17028	1115.28	618.02	866.65
LSD 50%		117	77	103
CV%		9.56	12.56	11.06

14.	ADVANCE YIELD TRIAL
OBJECTIVES	To evaluate promising lines for yield potential and disease tolerance
RESEARCH WORKERS	Muhammad Afzal Zahid, Dr. Anwar ul Haq, Muhammad Shafiq and Ch. Muhammad Rafiq
PROJECT DURATION	2018-19
LOCATIONS	Faisalabad, Kallurkot and Rakhuttra
TREATMENTS/METHODLOGY	<p>Entries = 12 + 2</p> <p>Checks = Noor-2009 & Noor-2013</p> <p>Design = R.C.B.</p> <p>Plot size = 4 × 1.2 m</p> <p>Replications = 3</p> <p>Inter/intra row spacing = 30/15 cm</p> <p>Sowing time = 2nd fortnight of october</p> <p>Data to be taken = Days to 50% flowering, days to 90% maturity, incidence of insect pests & diseases, and grain yield</p>

PREVIOUS YEAR'S RESULTS

R	Entry	PRI, Fsd	GBRSS, K.Kot	Av. Yield Kg/ha
1	K-16031	1673.61	645.79	1159.70
2	K-16025	1355.55	902.72	1129.14
3	K-16028	1234.72	944.38	1089.55
4	K-16010	1293.05	680.51	1055.53
5	K-16011	1291.66	819.39	1055.53
6	K-16009	1083.33	861.06	972.20
7	K-16021	1272.22	611.07	941.65
8	K-16013	1213.89	590.24	902.07
9	NOOR-09	940.28	798.56	869.42
10	K-16023	1209.03	486.08	847.56
11	K-16024	925.69	743.01	834.35
12	K-16027	1183.33	479.14	831.24
13	K-16026	1222.22	402.75	812.49
14	NOOR-13	1106.25	513.86	810.06
15	K-16005	832.64	687.46	760.05
16	K-16029	856.94	541.63	698.79
LSD%		115	88	93
CV%		8.12	13.0	10.07

15.	MICRO YIELD TRIAL
OBJECTIVES	To evaluate promising lines under different agro-climatic zones of Punjab
RESEARCH WORKERS	Muhammad Afzal Zahid, Dr. Anwar ul Haq, Muhammad Shafiq and Ch. Muhammad Rafiq
PROJECT DURATION	2018-19
LOCATIONS	Faisalabad, Kallurkot, Rakhuttra, Karor and Fatehjang
TREATMENTS/METHODOLOGY	Entries = 12 + 2 Checks = Noor-2009 & Noor-2013 Design = R.C.B. Plot size = 4 × 1.2 m Replications = 3 Inter/intra row spacing = 30/15 cm Sowing time = 2 nd fortnight of october Data to be taken = Days to 50% flowering, days to 90% maturity, incidence of insect pests & diseases, and grain yield

PREVIOUS YEAR'S RESULTS

R	Entry	PRI, Fsd	GBRSS, K.Kot	BARS, F.jang	ARS, Karor	Av. Yield Kg/ha
1	K-15018	1135.42	1645.73	1409.72	2340.00	1361.73
2	NOOR-2009	765.28	1465.18	1597.22	2722.00	1351.60
3	K-15014	888.89	1041.60	2086.81	2594.00	1329.20
4	K-15025	1243.06	1027.71	1661.11	2299.00	1287.84
5	K-15010	776.39	1097.15	1645.83	2694.00	1256.56
6	K-15019	1062.5	1215.20	1600.69	2167.00	1250.74
7	K-15017	983.34	1201.31	1687.50	2139.00	1236.95
8	K-15012	1079.86	1166.59	1496.53	2296.00	1210.57
9	K-15030	1165.98	770.78	1215.28	2639.00	1199.87
10	K-15001	901.39	1597.12	1322.92	2055.00	1189.17
11	NOOR-2013	979.17	881.89	1430.56	2448.00	1175.70
12	K-15013	1128.48	1006.88	1246.53	2153.00	1148.64
13	K-15009	1036.11	1284.64	1402.78	1923.00	1143.19
14	K-15011	1069.45	715.23	1295.14	2271.00	1097.94
	LSD (0.05)	125	139	141	155	
	CV%	7.73	13.5	6.41	14.73	9.68

16.	COOPERATIVE YIELD TRIAL
OBJECTIVES	To evaluate Advance lines of PRI and sister organizations of Punjab in different agro-ecological zones
RESEARCH WORKERS	Muhammad Afzal Zahid, Dr. Muhammad Anwar ul Haq, Muhammad Shafiq and Ch. Muhammad Rafiq
PROJECT DURATION	2018-19
LOCATIONS	Faisalabad (PRI, NIAB), Kallurkot (Irri., barani), Bhakkar, Karor, Bahawalpur, Chakwal and Fatehjang

TREATMENTS/ METHODLOGY	Entries	= 17 + 1
	Checks	= Noor-2013
	Design	= R.C.B.
	Plot size	= 4 × 1.2 m
	Replications	= 3
	Inter/intra row spacing	= 30/15 cm
	Sowing time	= 2 nd fortnight of October
	Data to be taken	= Days to 50% flowering, days to 90% maturity, incidence of insect pests & diseases, and grain yield

PREVIOUS YEAR'S RESULTS

R	Entries	PRI, Fsd (R.fed)	PRI, Fsd (Irri)	NIAB, Fsd	K.Kot (R.fed)	K.Kot (Irri)	AZRI, Bhakr	ARS, Karor	RARI, Bwp	BARI, Chkwal	BARS, F.Jang	Mean Kg/ha
1	K-14003	1187	1331	1743	521	910	1448	2437	1771	1250	1656	1425
2	K-14001	1183	1206	1792	410	1028	1382	2590	1875	1139	1497	1410
3	CH68/08	1293	852	1891	937	972	1455	2277	1632	1130	1550	1399
4	CH64/11	967	1043	2008	344	1062	1330	3287	1944	1102	728	1381
5	K-14006	878	1287	1759	627	1028	1344	2312	1840	1204	1226	1350
6	K-14005	872	1074	1802	581	729	1250	2909	1736	1102	1419	1347
7	K-14002	1139	1083	1871	483	701	1247	2062	1528	1417	1861	1339
8	CM 1235/08	1375	1057	1728	683	812	1431	2222	1458	1176	1361	1330
9	CH54/07	1415	850	1783	462	1347	1292	2159	1875	1185	865	1323
10	BRC-408	1098	1365	1826	627	854	1260	2111	1944	1065	941	1309
11	CH63/11	1000	746	1959	316	937	1483	2430	1667	1102	1378	1302
12	K-14004	1146	1276	1897	399	875	1174	2382	1389	1185	1278	1300
13	CH74/10	1381	880	1786	497	1125	1653	1604	1979	1111	844	1286
14	K-14027	1246	1393	1876	625	889	1243	2278	1111	1028	966	1265
15	NOOR 2013	1161	1165	1753	197	542	889	2896	1632	1241	877	1235
16	K-14026	785	591	1722	518	889	1420	2430	1319	1083	1375	1213
17	K-14024	1411	1861	1559	232	507	778	2375	1319	1065	792	1190
18	TG12K01	1078	1069	1565	337	535	1125	1701	1458	1259	1745	1187
	LSD 50%	30.93	27.88	68.22	74.48	108	56.00	576	-	20.09	33.00	110.5
	CV %	9.17	8.76	9.69	38.91	31.6	11.08	NS	-	5.90	6.74	15.23

17.	RESPONSE OF ADVANCE LINES UNDER DIFFERENT MOISTURE LEVELS
OBJECTIVES	To find out suitable lines for irrigated areas
RESEARCH WORKERS	M. Afzal Zahid, Dr. Dr. Anwar ul Haq , Mushtaq Ahmad and M. Shafiq
PROJECT DURATION	2018-19
LOCATIONS	Faisalabad & Kallurkot
TREATMENTS/ METHODOLOGY	Entries = 18 No. of sets = 2 Moisture levels = Zero Irrigation & two Irrigations

Checks	= Noor-2009 & Noor-2013
Design	= R.C.B.
Plot size	= 4 × 0.6 m
Replications	= 2
Inter/intra row spacing	= 30/15 cm
Sowing time	= 2 nd fortnight of October
Data to be taken	= Days to 50% flowering, days to 90% maturity, incidence of insect pests & diseases, and grain yield

PREVIOUS YEAR'S RESULTS

R	Entries	Zero Irrigation	Two Irrigations	Av. Yield Kg/ha
1	K-14024	1411	1861	1636
2	K-14007	1246	1393	1320
3	K-14003	1187	1331	1259
4	BRC-408	1098	1365	1232
5	CM 1235/08	1375	1057	1216
6	K-14004	1146	1276	1211
7	K-14001	1183	1206	1195
8	NOOR 2013	1161	1165	1163
9	CH54/07	1415	850	1133
10	CH74/10	1381	880	1131
11	K-14002	1139	1083	1111
12	K-14006	878	1287	1083
13	TG12K01	1078	1069	1074
14	CH68/08	1293	852	1073
15	CH64/11	967	1043	1005
16	K-14005	872	1074	973
17	CH63/11	1000	746	873
18	K-14026	785	591	688
	LSD (0.05)	30.93	27.88	27.91
	CV%	9.17	8.76	8.97

18.	NATIONAL UNIFORM YIELD TRIAL
OBJECTIVES	To test the performance of candidate lines in different ecological zones of the country
RESEARCH WORKERS	Muhammad Afzal Zahid, Dr. Anwar ul Haq , Muhammad Shafiq and Ch. Muhammad Rafiq
PROJECT DURATION	2018-19
LOCATIONS	Faisalabad and Kallurkot
TREATMENTS/METHODOLOGY	NUYT-2018-19

Layout = As per instructions received alongwith seed
 Sowing time = 2nd fortnight of October
 Data to be taken = Days to 50% flowering, days to 90% maturity, incidence of insect pests & diseases & grain yield

PREVIOUS YEAR'S RESULTS

Entries tested= 19

R	Genotype Code	AARI, Fsd	AZRI, Bhakar	AZRC, DIKhan	BARS FATEH JANG	GBRSS, K.Kot	NARC, Islamabad	NIAB, Fsd	QAARI, Larkana	Mean Kg/ha
		1	2	3	4	5	6	7	8	
1	CH18-K-101	886	1514	1138	1285	1042	1833	1425	2395	1440
2	CH18-K-102	1264	573	1064	1670	278	700	1433	2604	1198
3	CH18-K-104	719	622	1160	1462	174	1169	1065	2542	1114
4	CH18-K-110	764	1434	1023	1177	556	1019	1518	2444	1242
5	CH18-K-108	729	611	1026	1483	35	1131	844	2548	1051
6	CH18-K-103	1424	1274	906	1316	799	1232	1535	2576	1383
7	CH18-K-111	125	587	941	1264	104	752	802	2538	889
8	CH18-K-107	1183	1177	876	1080	535	1555	1459	2409	1284
9	CH18-K-112	205	313	891	1382	0	2136	1093	2604	1078
10	CH18-K-109	1139	1226	921	1073	1077	937	1422	2500	1287
11	CH18-K-105	1571	1323	450	1271	875	1648	1500	2172	1351
12	CH18-K-106	1455	1358	650	1372	729	1039	1745	2430	1347
13	K-01209	955	1001	921	1319	517	1263	1320	2480	

19. Identification of climate resilient chickpea genotypes for mitigating climatic impacts on yield potential (AIP Project)

OBJECTIVES	To identify climate resilient genotypes by conducting different sowing date trials
RESEARCH WORKERS	M. Shafiq, Irfan Rasool, M. Afzal Zahid and C.M. Rafiq
PROJECT DURATION	2018-19
LOCATIONS	Kallurkot
TREATMENTS/ METHODLOGY	Entries = 300 (150 desi & 150 kabuli) Sowing date = 3 Design = Alpha lattice Plot size = 2 × 0.3 m Replications = 2 Inter/intra row spacing = 30/15 cm Sowing time = 14 October, 24 October & 3 rd November Data to be taken = Germination %age, days to 50% flowering, days to 90% maturity, Pods per plant and grain yield

PREVIOUS YEAR'S RESULTS

R. No	Desi Lines	Yield Kg /Ha
1.	D-02060	588
2.	D-02080	586
3.	D-12005	540
4.	D -02055	516
5.	D-03026	500
6.	D-05007	500
7.	D-07012	495

8.	D-03019	486
9.	D-04025	481
10.	Bakkhar -2011	453
11.	Punjab- 2008	441
12.	Bittal- 2016	171

R No	Kabuli Lines	Yield Kg /Ha
1.	K-52582	780
2.	K-01248	640
3.	NOOR -91	623
4.	CM 95/06	596
5.	CH 47/ 04	550
6.	NCS 0709	546
7.	K-01242	540
8.	CM 770/06	525
9.	k-01221	483
10.	Noor-2009	458
11.	Noor-2013	163

20.	Identification of post-emergent herbicide tolerant chickpea genotypes (PARB Project No. 909)	
OBJECTIVES	To access response / genetic variability of chickpea genotypes to different post-emergent herbicides	
RESEARCH WORKERS	M. Shafiq, Irfan Rasool, M. Afzal Zahid and C.M. Rafiq	
PROJECT DURATION	2018-19	
LOCATIONS	Faisalabad	
TREATMENTS/ METHODLOGY	Entries	= 150 (75 desi & 75 kabuli)
	Design	= Alpha lattice
	Plot size	= 1 × 0.3 m
	Inter/intra row spacing	= 30/15 cm
	Sowing time	= Last week of October / 1 st week of November
	Data to be taken	= Germination %age, scoring for herbicide tolerance 2-weeks after spray on a 1–5 scale (Gaur et al., 2013)
		1 = highly tolerant (excellent plant appearance, no burning/chlorosis of leaves),
		2 = tolerant (good plant appearance with minor burning/chlorosis of leaves),
		3 = moderately tolerant (fair plant appearance with moderate burning/chlorosis of leaves),
		4 = sensitive (poor plant appearance with severe burning/chlorosis of leaves), and
		5 = highly sensitive (complete burning of leaves leading to plant mortality).

**PREVIOUS YEAR'S
RESULTS**

Entries	Tolerance	Number of Plants	Plant Stand	100 (g) wt
K-16025				
Meteribuzine	Moderate Tolerant	7	4	12.1
Isoproton	Tolerant	4	4	22.2
Axial	Tolerant	10	10	24.2
Carfentrazone	Moderate Tolerant	11	7	21.2
Phenoxaprop	Tolerant	10	10	21.1
K-16026				
Meteribuzine	Moderate Tolerant	12	7	15.1
Isoproton	Moderate Tolerant	12	8	21.1
Axial	Tolerant	10	10	25
Carfentrazone	Moderate Tolerant	9	8	17.5
Phenoxaprop	Tolerant	4	4	22.1
D-16027				
Meteribuzine	Moderate Tolerant	14	12	12.9
Isoproton	Moderate Tolerant	10	4	16.9
Axial	Tolerant	13	13	25
Carfentrazone	Moderate Tolerant	11	10	20.1
Phenoxaprop	Tolerant	11	11	24.5
Desi				
D-16004				
Meteribuzine	Moderate Tolerant	13	7	12.9
Isoproton	Moderate Tolerant	13	7	14.7
Axial	Tolerant	13	13	16.9
Carfentrazone	Moderate Tolerant	14	9	14.8
Phenoxaprop	Tolerant	14	14	13.9
D-16019				
Meteribuzine	Moderate Tolerant	11	11	14.8
Isoproton	Moderate Tolerant	14	12	21.3
Axial	Tolerant	12	12	21.1
Carfentrazone	Moderate Tolerant	11	11	14.2
Phenoxaprop	Tolerant	13	13	21.3
D-17026				
Meteribuzine	Moderate Tolerant	19	6	17.1
Isoproton	Moderate Tolerant	12	7	21.2
Axial	Tolerant	14	14	20.1
Carfentrazone	Moderate Tolerant	9	6	17.1
Phenoxaprop	Tolerant	10	10	20.2

21.	PRE-BASIC / BASIC SEED PRODUCTION
OBJECTIVES	<ul style="list-style-type: none"> i. To maintain the genetic purity of approved / commercial varieties ii. To supply seed to different seed producing organizations
RESEARCH WORKERS	M. Afzal Zahid, Dr. Anwar ul Haq, Mushtaq Ahmad and M. Shafiq
PROJECT DURATION	2018-19
LOCATION	Kallurkot
TREATMENTS/ METHODLOGY	Single plants will be selected. Single plant progeny rows will be sown in 2 meter long and 30 cm apart rows, true to type progeny rows will be harvested separately. Seed of selected progeny rows will be sown in 4 rows of 4 meter length with 30cm row to row spacing. Genetically true to type, disease free and healthy progeny blocks will be selected, harvested and bulked as BNS which will be used for pre-basic seed production.
PREVIOUS YEAR'S RESULTS	Seed of following genotypes was produced

Variety	Seed Produced (Kgs)		Total (Kgs)
	BNS	Pre-basic	
Noor-2009	-	195	195
Noor-2013	30	480	510
Total	30	675	705

LENTIL

(*Lens culinaris* Medik) 2n = 14

22.	MAINTENANCE AND EVALUATION OF GERmplasm
OBJECTIVES	<ol style="list-style-type: none"> 1. To maintain the genetic purity 2. To enrich the germplasm 3. To identify the sources for different economic characters.
RESEARCH WORKERS	Sadia Kaukab, Muhammad Sajjad Saeed, Dr. Busharat Husaain and Ch. Muhammad Rafiq
PROJECT DURATION	2018-19
LOCATION	Pulses Research Institute, Faisalabad
TREATMENTS/ METHODOLOGY	Local Entries = 246 Exotic = 8 Total = 254 Design = Augmented Checks = 7 Entries per block = 37 Plot size = 2 × 0.6 m Replications = 2 Row spacing = 30 cm Plant spacing = 7.5 cm Fertilizer = 9.23 NP kg/acre Sowing date = last week of Oct-1 st week of Nov
REVIIOUS YEAR'S RESULTS	228 entries were planted and characterized. The details are given below

Traits	Group 1		Group 2		Group 3	
	Range	No. of Entries	Range	No. of Entries	Range	No. of Entries
Days to 50 % Flowering	72-90	85	91-100	109	101-108	34
Days to 90% Maturity	135-142	97	143-150	79	151-160	52
Plant Height (cm)	20-25	25	26-31	157	32 -40	46
1st Pod Height (cm)	10-14	118	15-20	79	21 -23	31
No of Primary Branches / Plant	6-10	107	11-14	96	15 -18	25
No. of Secondary Branches/Plant	10-15	75	16-20	123	21-26	30
No. of Pods / Plant	50-150	58	151-250	91	250 -280	79
No. of Seeds / Pod	1	21	2	201	Above 2	6
Seed Yield/Plant (g)	2.5-3.5	89	3.6-4.5	115	4.6 -5.0	24
1000 grain wt. (g)	15-20	39	21-25	106	26 -29	83

23.	HYBRIDIZATION AND STUDY OF FILIAL GENERATIONS																										
OBJECTIVES	To develop new recombinants of <ol style="list-style-type: none"> 1. High yield potential 2. Wider adaptability 3. Early maturity 4. Resistance/tolerance to diseases 5. Bold seeds with spotted seed coat 																										
RESEARCH WORKERS	Sadia Kaukab, Muhammad Sajjad Saeed, Dr. Busharat Husaain and Ch. Muhammad Rafiq																										
PROJECT DURATION	2018-19																										
LOCATION	Pulses Research Institute, Faisalabad																										
TREATMENTS/ METHODOLOGY	A. Cross combinations proposed= 20 Sources of high yield = 5 Pb. Masoor 2009, LPP-12137, LPP-12161, V-10502 And V-36203 Resistant to rust = 8 V-17507, V-17502, V-17503, V-17506, V- 114513, V-13502, V- 13516 & V-13514. Entries will be sown in paired rows by keeping plant to plant distance 6cm and row to row 30cm. At flowering crosses will be attempted to pyramid genes for desirable traits.																										
	B. Filial Generations Breeding Methods = Modified Bulk method																										
	<table border="1"> <thead> <tr> <th>Generations</th> <th>Crosses</th> <th>Plot size</th> </tr> </thead> <tbody> <tr> <td>F₁</td> <td>20</td> <td>Single row of 4 m length</td> </tr> <tr> <td>F₂</td> <td>13</td> <td>6 rows of 4m length</td> </tr> <tr> <td>F₃</td> <td>14</td> <td>3 rows of 4m length</td> </tr> <tr> <td>F₄</td> <td>15</td> <td>3 rows of 4m length</td> </tr> <tr> <td>F₅</td> <td>27/297</td> <td>297 single plant progenies each in a 4 m row</td> </tr> <tr> <td>F₆</td> <td>13/111</td> <td>111 single plant progenies each in a 4 m row</td> </tr> </tbody> </table>	Generations	Crosses	Plot size	F ₁	20	Single row of 4 m length	F ₂	13	6 rows of 4m length	F ₃	14	3 rows of 4m length	F ₄	15	3 rows of 4m length	F ₅	27/297	297 single plant progenies each in a 4 m row	F ₆	13/111	111 single plant progenies each in a 4 m row					
Generations	Crosses	Plot size																									
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F ₅	27/297	297 single plant progenies each in a 4 m row																									
F ₆	13/111	111 single plant progenies each in a 4 m row																									
PREVIOUS YEAR'S RESULTS	Following Generations were studied and desirable recombinants/lines were selected																										
	<table border="1"> <thead> <tr> <th rowspan="2">Generations</th> <th colspan="2">No. of crosses/progenies</th> </tr> <tr> <th>Crosses Studied</th> <th>Selected/harvested</th> </tr> </thead> <tbody> <tr> <td>F₀(Fresh crosses)</td> <td>20</td> <td>20</td> </tr> <tr> <td>F₁</td> <td>20</td> <td>20</td> </tr> <tr> <td>F₂</td> <td>20</td> <td>20</td> </tr> <tr> <td>F₃</td> <td>15</td> <td>14</td> </tr> <tr> <td>F₄</td> <td>31</td> <td>27/297</td> </tr> <tr> <td>F₅</td> <td>13/188</td> <td>13/111</td> </tr> <tr> <td>F₆</td> <td>9/70</td> <td>14 uniform desirable lines were selected for PYT set-I</td> </tr> </tbody> </table>	Generations	No. of crosses/progenies		Crosses Studied	Selected/harvested	F ₀ (Fresh crosses)	20	20	F ₁	20	20	F ₂	20	20	F ₃	15	14	F ₄	31	27/297	F ₅	13/188	13/111	F ₆	9/70	14 uniform desirable lines were selected for PYT set-I
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F ₄	31	27/297																									
F ₅	13/188	13/111																									
F ₆	9/70	14 uniform desirable lines were selected for PYT set-I																									

24.	PRELIMINARY YIELD TRIAL	
OBJECTIVES	To evaluate advance lines for high yield and disease resistance.	
RESEARCH WORKERS	Dr. Busharat Husaain, Sadia Kaukab , Muhammad Sajjad Saeed and Ch. Muhammad Rafiq	
PROJECT DURATION	2018-19	
LOCATION	Faisalabad	
TREATMENTS/ METHODOLOGY	Entries	<p>= Set 1 (12viz, 2 Checks) V-18501, V-18502, V-18503, V-18504, V-18505, V-18506, V- 18507, V-18508, V-18509, V-18510, V-18511, V-18512 & V-18513.</p> <p>=Set 11 (13 viz, 2 Checks) V- 31102, V-31105, V- 31112, V-31117, V-31130, V-31217, V- 31227, V-31232, V-36102, V-36106, V-36108 & V-36124</p>
	Design	= R.C.B.
	Checks	= Markez-2009 & Pb. Masoor-2009
	Plot size	= 4 x 1.2m
	Replications	= 3
	Row spacing	= 30 cm
	Plant spacing	= 7.5 cm
	Sowing date	= last week of Oct-1 st week of Nov
	Data to be taken	= Days to 50% flowering, days to 90% maturity, grain yield, incidence of insect pest and diseases.

PREVIOUS YEAR'S RESULTS

Rank	Entries	Yield (kg/ha)
1	V-17504	3046
2	M-2009	3021
3	V-17503	2996
4	V-17510	2881
5	V-17505	2840
6	V-17509	2810
7	V-17513	2806
8	V-17501	2785
9	V-17512	2767
10	V-17502	2729
11	V-17507	2208
12	Pb.M-09	2140
13	V-17506	2114
14	V-17511	2090
15	V-17508	2085
	CV%	8.67
	LSD(5%)	380

SET-11

Rank	Entries	Yield (kg/ha)
1	V-17523	2910
2	V-17515	2756
3	V-17525	2619
4	V-17514	2556
5	M-2009	2535
6	V-17517	2417
7	V-17516	2340
8	Pb.M-09	2333
9	V-17521	2306
10	V-17526	2223
11	V-17519	2146
12	V-17524	2140
13	V-17518	2110
14	V-17522	2069
15	V-17520	1944
	CV%	10.07
	LSD(5%)	397.56

25.	ADVANCE YIELD TRIAL
OBJECTIVES	To evaluate promising lines for yield potential and disease tolerance
RESEARCH WORKERS	Dr. Busharat Husaain, Sadia Kaukab , Muhammad Sajjad Saeed and Ch. Muhammad Rafiq
PROJECT DURATION	2018-19
LOCATION	Faisalabad ,Sahowali (Sialkot) & kullorkot
TREATMENTS/ METHODLOGY	<p>Entries = 12 viz, 2 Checks V-17501, V-17502, V-17503, V-17504, V-17505, V-17509, V-17510, V-17512, V-17513, V-17515, V- V-17523 & V-17525.</p> <p>Design = R.C.B. Checks = Markez-2009 & Pb. Masoor-2009 Plot size = 4 x 1.2m Replications = 3 Row spacing = 30 cm Plant spacing = 7.5 cm Sowing date = 1st fortnight of November Data to be taken = Days to 50% flowering, days to 90% maturity, Grain yield, incidence of insect pest and diseases.</p>

PREVIOUS YEAR'S RESULTS

Rank	Entries	Yield kg/ha			
		Faisalabad	K.KOT	Sahowali	mean
1.	V-16508	2348	722	1358	1476
2.	V-16509	2048	278	1618	1315
3.	V-16506	1765	493	1340	1199
4.	M-09	2479	556	361	1132
5.	V-16503	2000	542	715	1086
6.	V-16504	1917	431	903	1083
7.	V-16505	1698	458	1076	1078
8.	V-16507	1869	299	1063	1077
9.	Pb.M-09	2110	551	431	997
10.	V-16510	1756	486	701	981
11.	V-16501	1938	514	490	980
12.	V-16502	1640	514	552	902
	CV%	7.98	33.2	47.57	
	LSD(0.05)	265.38	269	712.09	

26.	MICRO YIELD TRIAL
OBJECTIVES	To evaluate advance lines under different agro-climatic conditions
RESEARCH WORKERS	Dr. Busharat Husaain, Sadia Kaukab, Muhammad Sajjad Saeed, Faryad Ahmad Khan and Ch. Muhammad Rafiq
PROJECT DURATION	2018-19
LOCATION	Faisalabad, Sahowali (Sialkot), Kallurkot, Fatehjang, Kot Naina, Bahawalpur and Chakwal
TREATMENTS/ METHODLOGY	<p>Entries = 10 viz, 2 Checks V-16501, V-16502, V-16503, V-16504, V-16505, V-16507, V-16508, V-16509 & V-16510.</p> <p>Design = R.C.B.</p> <p>Checks = Markez-2009 & Pb. Masoor-2009</p> <p>Plot size = 4 x 1.2m</p> <p>Replications = 3</p> <p>Row spacing = 30 cm</p> <p>Plant spacing = 7.5 cm</p> <p>Sowing date = last week of October -1st week of November</p> <p>Data to be taken = Days to 50% flowering, days to 90% maturity, Grain yield, incidence of insect pest and diseases.</p>

**PREVIOUS YEAR'S
RESULTS**

Rank	Entries	Yield(kg/ha)					
		FSD	K.KOT	Sahow-ali	Fatehjung	BHW.pur	Mean
1	15509	2485	764	778	1146	1198	1274
2	M-09	2410	764	799	694	889	1111
3	15508	2069	347	694	1493	910	1103
4	15503	1833	625	750	1285	823	1063
5	15505	1910	451	604	1076	1215	1052
6	14513	2271	451	958	486	896	1013
7	14512	2098	556	708	972	677	1002
8	15506	1958	694	576	681	1049	992
9	15504	2140	243	611	1181	719	979
10	15507	2000	278	681	660	1243	972
11	15501	2125	278	597	917	833	950
12	15502	2090	313	479	885	965	946
13	14515	1771	278	625	1146	861	936
14	Pb.M-09	1881	347	729	833	670	892
	CV%	9.78	21.82	36.87	12.94	18.97	
	LSD(0.05)	340.56			200.91	145.3	

27.

SCREENING OF ADVANCE LINES AGAINST DROUGHT STRESS

OBJECTIVES

To select drought tolerant genotypes

RESEARCH WORKER

Dr. Busharat Husaain, Muhammad Sajjad Saeed, M. Aqeel ,SadiaKaukab and Ch. Muhammad Rafiq

PROJECT DURATION

2018-19

LOCATION

Faisalabad

**TREATMENTS/
METHODOLOGY**

Entries = 14 viz, 2 Checks
V-16501, V-16502, V-16503, V-16504, V-16505
V-16507, V-16508, V-16509, V-16510, V-11508 &
V-11513..

Design = R.C.B.
Checks = Masoor-93 & Pb. Masoor-2009
Plot size = 4 x 1.2m
Replications = 3
Row spacing = 30 cm
Plant spacing = 7.5 cm
Sowing date = last week of Oct-1st week of Nov
Data to be taken = Days to 50% flowering, days to 90% maturity, grain yield and yield components, canopy temperature, root length, root weight and root/shoot weight ratio.

The experiment will be planted under two conditions (Irrigated and Un-irrigated). The material will be sown in well prepared soaked soil. Normal irrigation will be applied to one set and other set will be kept un-irrigated. Soil moisture condition will be checked in regular intervals. The rainfall data during the crop season will be recorded.

For root length studies, five plants of each line will be planted in plastic pipes of 4 inch diameter of 1.2m length. The pipes will be filled with sand and irrigation will be applied according to plant requirement.

PREVIOUS YEAR'S RESULTS

Rank	Entries	Yield(kg/ha)
1	V-15501	736
2	V-13514	674
3	V-15502	646
4	V-14512	639
5	V-15503	625
6	V-15506	597
7	V-15505	576
8	V-15504	563
9	V-13502	556
10	V-13516	542
11	M-93	528
12	V-14515	514
13	V-15508	507
14	V-15509	451
15	Pb.M-09	451
16	V-15507	417
	CV%	22.97
	LSD(0.05)	

28.	NATIONAL UNIFORM YIELD TRIAL
OBJECTIVES	To evaluate varieties with wider adaptability along with higher yield potential and other desirable characters.
RESEARCH WORKERS	Dr. Busharat Husaain, Sadia Kaukab, Muhammad Sajjad Saeed and Ch. Muhammad Rafiq
PROJECT DURATION	2018-19
LOCATION	Faisalabad
TREATMENTS/ METHODLOGY	The trial will be received from Coordinator (Pulses) NARC, Islamabad. The experiments will be planted and data will be recorded according to the instructions received with the seed. This Institute will contribute 3 advance lines (V-13502, V-14512 & V-13516) in the Lentil National Uniform Yield Trial..

PREVIOUS YEAR'S
RESULTS

Consolidated Results of Lentil National Uniform Yield Trial 2017-18 across the country

	Genotype Code	Locations*							MEAN Grain Yield (kg/ha)
		BARDC Quetta	AARI, Fsd	NARC, Islamabad	PARS, Faisalabad	AZRC, DI Khan	BARS, F.Jung	NIAB, Fsd	
1.	115	695.1	1479.2	533.8	1277.8	1325	986.1	1509.7	1115.2
2.	109	618.1	1236.1	758.7	1090.3	1324.3	972.2	1302.8	1043.2
3.	112	568.1	1418.1	684.8	1246.5	1489.7	1066	1543.1	1145.2
4.	116	877.8	1747.9	688.2	1000.7	1305.3	811.1	1172.2	1086.2
5.	114	590.3	1394.4	739.8	1379.2	1383.3	1034.7	1766.7	1184.1
6.	110	648.6	1263.9	355.9	1093.1	1182.7	795.1	1456.9	970.9
7.	106	413.9	1312.5	264.9	1177.1	1129.7	934	1571.5	971.9
8.	107	572.2	1125	237.8	1163.9	1304.7	736.1	1556.3	956.6
9.	111	411.1	2015.3	1103.5	1544.4	1295	1159.7	1831.3	1337.2
10.	105	747.9	1550	1013.5	740.3	817.3	1097.2	847.9	973.4
11.	108	455.6	1600	377.1	1152.8	1257.7	857.6	1456.3	1022.4
12.	113	1508.3	215.3	447.9	105.6	1395	994.4	143.1	687.1
13.	102	545.8	1909.7	733.6	759.7	1539.7	843.8	918.1	1035.8
14.	101	527.8	1138.9	473.6	1022.9	1447.3	1006.9	1313.2	990.1
15.	104	461.1	1158.3	581.4	1421.5	1236.3	993.1	1872.2	1103.4
16.	103	118.1	754.2	575	716.7	1614.7	892.4	877.8	792.7
		610.0	1332.4	598.1	1055.8	1315.5	948.8	1321.2	

Coefficient of variation=21.8% Genotypes (G), Location (L) and G x L interactions are highly significant (P<0.01)

*Locations			
1= BARDC, Quetta	2= AARI, Faisalabad	3= NARC, Islamabad	4=PARS, Faisalabad
5= AZRC, DI Khan	6= BARS, Fateh Jung	7= NIAB, Faisalabad	

Note: Trial sent to 16 locations. Grain yield data received from 7 locations.

29.	DETERMINATION OF PROPER SOWING DATE TO OVERCOME THE CLIMATIC CHANGE
OBJECTIVES	To find out proper sowing time for new lines
RESEARCH WORKERS	Dr. Busharat Husaain, Muhammad Sajjad Saeed, M. Aqeel and Sadia Kaukab
PROJECT DURATION	2018-19
LOCATION	Faisalabad
TREATMENTS/ METHODLOGY	<p>Entries = 6 viz; 2 checks V-10502, V-11508, V-11513, LPP-12103, LPP-12137, LPP-12161</p> <p>Checks = Masoor-93 & Pb. Masoor-2009</p> <p>Design = Split plot</p> <p>Replications = 3</p> <p>Plot size = 4 x 1.2m</p> <p>Row spacing = 30 cm</p> <p>Plant spacing = 7.5 cm</p> <p>Sowing date = 4 viz, 15 Oct, 1 Nov., 15 Nov and 30th Nov</p> <p>Data to be taken = Days to 50% flowering, days to 90% maturity, grain yield and yield components, canopy temperature</p>

PREVIOUS YEAR'S
RESULTS

Ran k	Genotype	SD1 (10 Oct)	SD 2 (25 Oct)	SD 3 (10 Nov)	SD 4 (25 Nov)	Average (kg/ha)
1	V-10502	2194	2529	1015	1208	1737
2	V-11508	1854	2206	979	1067	1527
3	V-11513	1557	2308	979	1201	1478
4	LPP12103	1960	1451	872	1074	1339
5	LPP-12137	2493	2688	1292	1078	1888
6	LPP-12161	1874	2211	924	1140	1537
7	M-2009	1905	2435	910	1103	1588
8	Pb M-09	1962	2620	924	1059	1641
		1975	2306	987	1116	

CV for reps x sowing =10.67

CV for repxsowingxentries =13.55

LSD (0.05) varieties = 67 kg/ha

LSD (0.05) Sowing dates = 51 kg/ha

30. PRE-BASIC / BASIC SEED PRODUCTION

OBJECTIVES	To maintain genetic purity of approved and promising varieties and to produce the pre-basic and basic seed
RESEARCH WORKERS	Dr. Busharat Husaain, Muhammad Sajjad Saeed, Sadiakaukab, Faryad Ahmad Khan and Ch. Muhammad Rafiq
PROJECT DURATION	2018-19
LOCATION	Faisalabad and Sahowali
TREATMENTS/ METHODOLOGY	S. No. Variety Pb.Masoor-2009

PREVIOUS YEAR'S
RESULTS

The following quantities of seed were produced at Faisalabad

Sr.#	Varieties	Quantity of seed produced kg		
		BNS	Pre-basic	Basic
1	Pb. Masoor-2009		500	500

DRYPEAS

(*Pisum sativum* L.) 2n = 14

31.	MAINTENANCE AND EVALUATION OF GERMLASM
OBJECTIVES	To collect, maintain, evaluate and characterize the gene pool genotypes
RESEARCH WORKERS	Muhammad Amin, Muhammad Shafiq and Ch. Muhammad Rafiq
PROJECT DURATION	2018-19
LOCATION	Faisalabad
TREATMENTS/ MEHODLOGY	Varieties/lines = 103 Sowing time = Last week of Oct/1st week of Nov, 2018 Inter/Intra row spacing = 30cm/15cm Plot size = 4m x 0.5m Checks = No.267 and PF-400 Design = Augmented

**PREVIOUS YEAR'S
RESULTS**

Range of variation for some morphological traits in Dry peas germplasm

Trait	Range	
	Minimum	Maximum
Plant height (cm)	27	120
Number of primary branches/ plant	1	4
Number of pods/plant	12	71
Pod length (cm)	5	8
Number of clusters/plant	6	21
Number of seeds/pod	3	7
Thousand seed weight (g)	100	170

32.	HYBRIDIZATION
OBJECTIVES	To create genetic variability for the selection of desirable recombinants possessing. <ol style="list-style-type: none"> i) High yield potential and wide adaptability ii) Resistance to powdery mildew iii) Early maturity
RESEARCH WORKERS	Muhammad Amin, Muhammad Shafiq and Ch. Muhammad Rafiq
PROJECT DURATION	2018-19
LOCATION	Faisalabad
TREATMENTS/	New Cross combinations = 30

METHODOLOGY

Following parents are selected for crossing

HIGH YIELDING	×	POWDERY MILDEW RESISTANT
I-05	×	PF-400
I-31	×	T-27
T-34	×	T-28
T-2	×	Meteor
T-38	×	Climax
NO.267		

Sowing time = Last week of October, 2017/1st week of Nov.

Parental lines will be planted in paired (female and male) 4 meter long and 30 cm apart rows to facilitate crossing.

Previous year's results

Thirty (30) crosses were attempted and seed of 25 crosses was harvested successfully.

STUDY OF FILIAL GENERATIONS

To select recombinants with desirable traits from segregating populations

F₁-F₆

Filial generations to be studied:

Filial generation	Crosses/progenies studied
F ₁	25
F ₂	25
F ₃	16/56
F ₄	06/210
F ₅	21/120
F ₆	12/110

Breeding method = Bulk/Pedigree

Sowing time = Last week of October/1st week of November, 2018

Plot size = 4m×1.2m

F₁ = Flanked with one row of parents.

F₂ = Bulk - Single Plant

F₃ = Plant to progeny row

F₄- F₆ = One to four rows of each single plant progeny

Checks = Climax and No.267

Selection to be made = Desirable recombinants

PREVIOUS YEAR'S RESULTS

Following segregating populations and progeny rows were studied.

F ₀	30	25		F ₀
F ₁	25	25	-	F ₁
F ₂	16/56	16/56	-	F ₂
F ₃	06/56	06/50	-	F ₃
F ₄	21/210	21/120	-	F ₄
F ₅	12/120	12/101	-	F ₅
F ₆	11/110	-	14	F ₆
F ₀	30	25		F ₀

Fourteen (14) Uniform lines were selected from F₆ to make a preliminary yield trial.

33.**PRELIMINARY YIELD TRIAL****OBJECTIVES**

To evaluate/select high yielding and disease resistant lines for advanced yield trial

RESEARCH WORKERS

Muhammad Amin, Faryad Ahmad Khan, Muhammad Shafiq and Ch. Muhammad Rafiq

PROJECT DURATION

2018-19

LOCATION

Faisalabad and Sialkot

**TREATMENTS/
METHODOLOGY**

Entries = 14+2
 Checks = No.267and PF-400
 Design = RCB
 Replications = 3
 Plot size = 4m x 1.2m
 Inter/intra row spacing = 30/ 15cm
 Sowing time = Last week of October / 1st week of November, 2018
 Data to be taken = Plant stand, Days taken to 50% flowering, Days taken to maturity, Plant height, Pod color, Pod shape, Number of pods per plant, Number of seeds per pod, Seed color, Seed shape, 100 seed weight and Seed surface etc

PREVIOUS YEAR'S RESULTS

Ranking	Entries	Av. Yield (Kg/ha)
1	1700	3410
2	17005	3396
3	17004	3083
4	17006	3083
5	17007	2674
6	17011	2604
7	17012	2576

8	17014	2410
9	17013	2278
10	17010	2236
11	17002	2186
12	CLIMAX (C)	2111
13	17008	2076
14	17001	2035
15	NO.267 (C)	1882
16	17009	1875
<i>LSD (0.05)</i>		829
<i>C.V %</i>		19

34.	ADVANCE YIELD TRIAL	
OBJECTIVES	To evaluate/select high yielding and disease resistant lines for micro yield trial	
RESEARCH WORKERS	Muhammad Amin, Faryad Ahmad Khan and Ch. Muhammad Rafiq	
PROJECT DURATION	2018-19	
LOCATION	Faisalabad	
TREATMENTS/ METHODLOGY	Entries	= 14
	Checks	= No.267 and Meteor
	Design	= RCB
	Replications	= 3
	Plot size	= 4m x 1.2m
	Inter/intra row spacing	= 30/ 15cm
	Sowing time	= Last week of October / 1st week of November, 2017
	Data to be taken	= Plant stand, Days taken to 50% flowering, Days taken to maturity, Plant height, Pod color, Pod shape, Number of pods per plant, Number of seeds per pod, Seed color, Pod shape, 100 seed weight and Seed surface etc.

REVIOUS YEAR'S RESULTS

Ranking	Entries	Av. Yield (Kg/ha)
1.	DP-09-07	2785
2.	DP-12-14	2375
3.	DP-03-13	2299
4.	DP-04-14	2222
5.	DP-02-13	2069
6.	DP-07-13	2056
7.	DP-09-15	2021
8.	DP-03-14	1826
9.	DP-05-12	1764
10.	DP-10-14	1521
11.	NO.267 (C)	1354
12.	DP-02-14	1319
13.	PF-400	1083
14.	CLIMAX (C)	1063
LSD (0.05)		597
C.V %		19

35.

MICRO YIELD TRIAL

OBJECTIVES

To select high yielding, well adapted and disease resistant advanced lines suitable for different agro-climatic zones of the Punjab Province.

RESEARCH WORKERS

Muhammad Amin, Muhammad Shafiq and Ch. Muhammad Rafiq

PROJECT DURATION

2018-19

LOCATIONS (8)

Locations-09

(PRI-Fsd, Karor, Sahowali, VRI-Sahiwal, Agronomic, AARI-Fsd, Pathological RI-Fsd, ERI-Fsd, RARI-Bahawalpur and BARI-Chakwal)

TREATMENTS/
METHODLOGY

Entries = 10+2
 Checks = Climax and NO.267
 Design = RCB
 Replications = 3
 Inter/intra row spacing = 30/ 15cm
 Plot size = 4m x 1.2m
 Sowing time = Last week of October / 1st week of November, 2017
 Data to be taken = Plant stand, Days taken to 50% flowering, Days taken to maturity, Plant height, Pod color, Pod shape, Number of pods per plant, Number of seeds per pod, Seed color, Seed shape, 100

seed weight and Seed surface etc.

REVIIOUS YEAR'S RESULTS

Micro yield trial was conducted at Eight (8) locations in Punjab.

Rank	Entries	Locations						Av. Yield (Kg/ha)	
		FSD	CKWL	Agr	SWL	Sialkot	BAH-WPR		KAROR
1	DP-03-15	1283	771	143	3264	2014	451	428	1429
2	DP-14-15	2257	785	251	2639	1667	208	752	1245
3	DP-04-15	2215	854	246	4236	1403	313	738	1237
4	DP-02-15	1861	799	207	3056	1771	347	620	1223
5	NO.267 (C)	2129	722	237	2569	1660	243	710	1205
6	DP-01-15	1493	875	166	2765	1014	264	498	1193
7	DP-05-15	1319	653	147	2622	1715	556	440	1181
8	DP-13-15	693	694	77	3333	972	347	231	1165
9	DP-11-15	1625	806	181	2604	2118	278	542	1064
10	DP-10-15	1750	715	194	3472	1688	313	583	1011
11	Climax (C)	1625	688	181	3142	1910	347	542	916
12	DP-12-15	840	757	93	2674	1354	417	280	907
LSD (0.05)		244	70	16	314	184	69	15	
C.V %		9	5	3	6	7	12	10	
C.V % location*replication 12									
C.V % location*replication*entries 9									

This institute contributed three(03) entries including one check to FSC&RD for further DUS studies.

36. IMPACT OF HIGH FERTILIZER DOSES ON BIOMASS AND YIELD OF DRY PEAS

OBJECTIVES

To determine the optimum dose of fertilizer to obtain maximum biomass and grain yield.

RESEAEARCH WORKERS

Muhammad Amin, Dr. Shakeel Ahmad Anwar and Ch. Muhammad Rafiq

PROJECT DURATION

2018- 19

LOCATION

Pulses Research Institute, Faisalabad

TREATMENTS/ METHODLOGY

No. of Entries(1) = DP-09-08
 Plot size = 4m x 1.2m
 Replications = 3
 Inter/intra row spacing = 30cm/ 15cm
 Design = RCB
 Sowing time =Last week of October / 1st week of Novembe
 (N-P-K) Kg/acre
 T1 00-00-00
 T2 25-23-25
 T3 25-35-25 (Recommended fertilizer dose)
 T4 25-47-25

Data to be taken = Plant stand, Days taken to 50% flowering, Days taken to maturity, Plant height, Pod color, Pod shape, Number of pods per plant, Number of seeds per pod, Seed color, Seed shape, 100 seed weight and Seed surface etc.

PREVIOUS YEAR'S RESULTS

Treatments	Av. Yield (Kg/ha)
T1	803
T2	1621
T3 Recommended	2301
T4	1822

37. IMPACT OF PLANT GEOMETRY ON BIOMASS AND YIELD OF DRY PEAS

OBJECTIVES

To determine the optimum plant spacing of dry peas.

RESEARCH WORKERS

Muhammad Amin, Dr. Shakeel Ahmad Anwar and Ch. Muhammad Rafiq

PROJECT DURATION

2018- 19

LOCATION

Pulses Research Institute, Faisalabad

**TREATMENTS/
METHODOLOGY**

No. of Entries(2) = DP-09-08 and No.267
 Plot size = 4m x 1.2m
 Replications = 3
 Row spacing = 9" (24cm), 12" (30 cm), and 15" (38 cm)
 Plant spacing = 4" 6" and 8"
 Design =RCB
 Sowing time =Last week of October / 1st week of November, 2018
 Data to be taken = Plant stand, Days taken to 50% flowering, Days taken to maturity, Plant height, Pod color, Pod shape, Number of pods per plant, Number of seeds per pod, Seed color, Seed shape, 100 seed weight and Seed surface etc.

DP-09-08

PREVIOUS YEAR'S RESULTS

Treatments	Av. Yield (Kg/ha)
T1(4")	826
T2(6") recommended	2313
T3(8")	1802

NO.267

Treatments	Av. Yield (Kg/ha)
T1(12") recommended	848
T2(15")	2133
T3(9")	1796

PLANT PATHOLOGY

38.	SCREENING OF CHICKPEA (DESI AND KABULI) ADVANCE LINES AGAINST ASCOCHYTA BLIGHT						
OBJECTIVES	To identify lines of chickpea resistant/ tolerant to blight (<i>Ascochyta rabiei</i> (Pass.) Lab.)						
RESEARCH WORKERS	Dr. M. Azhar Iqbal , Javed Ihsan and Javed Anwar Shah						
PROJECT DURATION	2017- 18 (Continuous)						
LOCATION	Pulses Research Institute, Faisalabad						
TREATMENTS/ METHODLOGY	<table> <tr> <td>No of line</td> <td>= 200</td> </tr> <tr> <td>Plot size</td> <td>= 3m x 0.30m</td> </tr> <tr> <td>Check line</td> <td>= AUG-424</td> </tr> </table> <p>The experiment will be conducted under tunnel condition. The disease will be produced artificially in the tunnel. Spore suspension will be sprayed on the test lines at 3 days interval till the initiation of disease. Fresh tap water will also be sprayed daily to provide required humidity. The incidence of the disease will be recorded using International Standard Scale 1-9 (ICARDA).</p>	No of line	= 200	Plot size	= 3m x 0.30m	Check line	= AUG-424
No of line	= 200						
Plot size	= 3m x 0.30m						
Check line	= AUG-424						
PREVIOUS YEAR'S RESULTS	<p>All the tested varieties/lines of chickpea Desi (115) and Kabuli (88) showed moderately susceptible to highly susceptible behavior to <i>Ascochyta</i> blight.</p> <p>In Desi (115) varieties/lines, only 07 lines moderately susceptible , 85 susceptible and 23 showed highly susceptible .</p> <p>In Kabuli (88) varieties/lines , 31 lines were found susceptible and the remaining 57 were highly susceptible.</p>						
39.	SCREENING OF CHICKPEA LINES AGAINST WILT AND ROOT ROT DISEASES						
OBJECTIVES	To identify chickpea varieties/ lines resistant/ tolerant to wilt and root rot diseases caused by <i>Fusarium oxysporum</i> f. sp. <i>ciceri</i> , <i>Rhizoctonia solani</i> and <i>R. bataticola</i> .						
RESEARCH WORKERS	Javed Ihsan ,Dr. M. Azhar Iqbal and Javed Anwar Shah						
PROJECT DURATION	2018- 19 (Continuous)						
LOCATION	Pulses Research Institute, Faisalabad						
TREATMENTS/ METHODLOGY	<table> <tr> <td>No of lines</td> <td>= 200</td> </tr> <tr> <td>Plot size</td> <td>= 3m x 0.30m</td> </tr> <tr> <td>Check line</td> <td>= AUG-424</td> </tr> </table>	No of lines	= 200	Plot size	= 3m x 0.30m	Check line	= AUG-424
No of lines	= 200						
Plot size	= 3m x 0.30m						
Check line	= AUG-424						

The data will be recorded at early and late infection stages (on plant basis) from seedling to maturity using international 1-9 scale (ICARDA).

PREVIOUS YEAR'S RESULTS

115 desi chickpea varieties/lines,

Resistant (07) viz: (D-15019, D-16001, D-16002, D-16024,D-16032,D-17005 and D-17009),

Moderately resistant (08) viz: (D-12011,D-16025,D-16033,D-16034,D-17007, D-17008,D-17011 and D-17013).

Moderately susceptible (18) viz: 31 susceptible and remaining 51 lines highly susceptible.

88 kabuli varieties/lines ,

08 resistant lines (K-01242,K-14004,K-14026,K-16023 ,K-16025,CH54/07,CH60/10 & K-17009) and

12 lines (K-01221,K-01241, K-01308,K-14006, K-15010, K-15011, K-16026, K-17010, K-17018, K-17021, CM1235/08 and Noor-2009) were found moderately resistant.

12 lines were found moderately susceptible , 36 susceptible and 20 were highly susceptible.

40.	SCREENING OF LENTIL GERmplasm AGAINST WILT AND ROOT ROT DISEASES
OBJECTIVES	To identify the resistant/ tolerant genotypes of lentil against wilt and root rot diseases caused by <i>Fusarium oxysporum</i> f. sp. <i>lentis</i> W. L. Gordon.
RESEARCH WORKERS	Javed Anwar Shah Javed Ihsan and Dr. Muhammad Azhar Iqbal
PROJECT DURATION	2018-19 (Continuous)
LOCATION	Pulses Research Institute, Faisalabad
TREATMENTS/ METHODOLOGY	<p>No of lines = 60</p> <p>Plot size = 3m x 0.30m</p> <p>Check line = M-85</p>
	Observations on the incidence of wilt/ root rot diseases will be recorded under field conditions by following international 1-9 scale (ICARDA) at both seedling and adult stages.
PREVIOUS YEAR'S RESULTS	60 lines were evaluated against wilt/ root rot diseases. 05 resistant (V-13502, V-13514, V-13516, V-14513 and V-14515) , 20 moderately susceptible ,26 susceptible and 09 showed highly susceptible.
41.	SCREENING OF LENTIL GERmplasm AGAINST LENTIL RUST
OBJECTIVES	To identify varieties/ lines resistant/ tolerant to lentil rust disease caused by <i>Uromyces viciae-fabae</i> Pers.
RESEARCH WORKERS	Dr. M. Azhar Iqbal , Javed Anwar Shah and Javed Ihsan
PROJECT DURATION	2018-19 (Continuous)
LOCATION	Adoptive Research Station, Kot Naina (Teh. Shakargarh)
TREATMENTS/ METHODOLOGY	No of lines = 100

Plot size = 3m x 0.30m
 Check line = M-85
 Replications = 1

Observations on the incidence of rust will be recorded under field conditions following international 1-9 scale (ICARDA).

REVIIOUS YEAR'S RESULTS

This trial was conducted at Adaptive Research Farm, Kot Naina, Teh. Shakar Garh. Out of 60 lines, 01 line(V-17507) highly resistant , 08 resistant (V-16505, V-16506, V-16509, V-16510, V-17502, V-17503, V-17505 and V-17506) , 17 moderately susceptible, 24 susceptible and 10 highly susceptible.

42. SCREENING OF DRY PEAS GERMPLOSM AGAINST POWDERY MILDEW

OBJECTIVES

To identify varieties/ lines resistant/ tolerant to powdery mildew caused by *Erysiphe pisi* [syn. *E. polygoni*] and *E. trifolii*.

RESEARCH WORKERS

Javed Ihsan, Dr. M. Azhar Iqbal, Javed Anwar Shah

PROJECT DURATION

2018-19 (Continuous)

LOCATION

Pulses Research Institute, Faisalabad

**TREATMENTS/
METHODLOGY**

No of lines = 12 (Advanced lines)
 Plot size = 3m x 0.30m
 Check line = Meteor and Climax
 Replications = 3

The experiment will be conducted in natural condition. Disease severity in different lines will be quantified by using the disease severity scale described by Jan, 1999 and Ghufran ul haq, *et al.* 2000.

REVIIOUS YEAR'S RESULTS

12 advanced lines were tested against powdery mildew. 09 resistant , (DP-03-15, DP-04-15, DP-05-15, DP-10-15, DP-11-15, DP-12-15, DP-13-15 DP-14-15 and DP-N0267) , one line DP-02-15 susceptible and DP-01-15 highly susceptible to disease.

BACTERIOLOGICAL STUDIES

43.	RESPONSE OF CHICKPEA TO RHIZOBIUM AND PGPR CO-INOCULATION
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OBJECTIVES To identify the best suited Rhizobium-PGPR Co-inoculation for optimum chickpea production

RESEARCH WORKERS Dr. Shakeel Ahmad Anwar, Irfan Rasool, Muhammad Shafiq and Dr. Azhar Iqbal in collaboration with Soil Bacteriology Section, AARI, FSD.

PROJECT DURATION 2017-19

LOCATION Faisalabad

**TREATMENTS/
METHODLOGY**

Variety: = Bittal 2016

Treatments:

T1	Control (25-60-0)
T2	Rhizobium sp. of chickpea
T3	Azotobacter (PGPR ₁)
T4	Bacillus (PGPR ₂)
T5	Rhizobium + PGPR ₁
T6	Rhizobium + PGPR ₂

Layout: = RCBD

Treatments: = 6

Replication: = 3

Plot size: = 4m×1.2 m

Row spacing: = 30cm

Plant spacing: = 10 cm

Variety: = Bittal 2016

Sowing date: = First fortnight of November

Recommended dose (25-60 N, P kg/ha) of fertilizers will be added to the soil prior to sowing. Rhizobium as well as PGPR culture as per treatment will be applied to seed before sowing. Data for Plant height, No. of branches and No. of pods per plant, 1000 grain weight and grain yield will be recorded. Pre sowing and post-harvest soil analysis for P,K and Organic matter will be carried out

PREVIOUS YEAR'S
RESULTS

Treatments	Nodules Plant ⁻¹	Plant Height (cm)	Secondary branches plant ⁻¹	Pods Plant ⁻¹	1000 grain weight (g)	Grain yield (kg ha ⁻¹)
T1	12.0	46.4	13.7	62.1	201.1	1799
T2	17.0	60.7	19.7	103.0	245.5	2444
T3	17.2	56.3	17.9	94.2	224.5	2056
T4	19.2	59.0	18.1	93.7	225.5	2028
T5	16.5	56.3	17.8	93.9	218.7	1938
T6	18.5	55.9	17.7	93.8	220.9	1986

Treatments	Dry matter	Ash	Crude protein	Crude fat	Phosphorus	Potassium
	<-----%age----->					
T1.	90.2	2.70	20.6	3.17	0.32	0.41
T2.	92.9	3.02	22.1	3.79	0.38	0.48
T3.	91.1	2.92	21.1	3.83	0.34	0.44
T4.	90.8	2.91	21.2	3.91	0.33	0.45
T5.	91.7	2.64	21.3	3.62	0.37	0.45
T6.	91.5	2.95	21.4	3.28	0.34	0.47

44.	NUTRITIONAL QUALITY EVALUATION OF CHICKPEA GENOTYPES DUE TO MICROBIAL INOCULATION
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OBJECTIVES To improve the nutritional value of chickpea through microbial inoculation.

RESEARCH WORKERS Dr. Shakeel Ahmad Anwar, Muhammad Shafiq and Irfan Rasool

PROJECT DURATION 2017-19

LOCATION Faisalabad

TREATMENTS/ Lay out = Split Plot

METHODOLOGY Replication = 3

Plot Size = 4m x1.2 m

Row spacing = 30cm

Plant Spacing = 10cm

Sowing Date = First fortnight of November

Varieties:

Kabuli: K-70005 , Noor-2009, Noor-2013,

Desi: D-10008, Punjab-2008 & Bittal2016

Recommended doses (25-60 N, P kg/ha) of fertilizer will be applied at sowing. Following Split Plot Design with three replications. One set of treatments will be inoculated with microbial strains while the other remains un-inoculated and treated as control. Data regarding yield and nodulation will be recorded. Samples will be dried, ground and analyzed for dry matter, crude protein, crude fiber, crude fat, ash, and phosphorus etc.

PREVIOUS YEAR'S
RESULTS

Name of genotypes	Un-inoculated			Inoculated		
	Nodules plant ⁻¹	Plant height (cm)	Secondary branches plant ⁻¹	Nodules plant ⁻¹	Plant height (cm)	Secondary branches plant ⁻¹
NOOR-2013	12.8	66.7	6.1	19.5	69.5	7.4
NOOR-2009	12.3	59.7	5.3	16.5	64.5	7.0
K-70005	12.5	70.3	5.5	19.8	79.1	7.1
BITTAL-2016	9.3	50.2	12.6	17.0	59.5	14.9
Pb-2008	12.5	45.8	14.7	17.0	53.3	16.1
D-10008	14.5	49.7	13.7	17.7	54.0	15.3

Name of genotypes	Un-inoculated			Inoculated		
	Pods Plant ⁻¹	1000 grain weight (g)	Grain yield (kg ha ⁻¹)	Pods Plant ⁻¹	1000 grain weight (g)	Grain yield (kg ha ⁻¹)
NOOR-2013	82.3	266.5	1965.3	91.4	294.8	2256.9
NOOR-2009	79.5	229.8	2305.3	87.8	242.6	2652.8
K-70005	88.0	223.9	2694.4	97.4	237.7	2854.2
BITTAL-2016	46.6	221.1	1583.3	58.0	241.7	2194.4
Pb-2008	46.5	245.7	1784.7	53.9	269.6	1944.5
D-10008	50.6	228.8	1861.1	57.1	244.9	1986.1

45. **BIOFORTIFICATION OF RABI PULSES (Chickpea) BY ZINC AND IRON APPLICATION****Objectives**

Zinc (Zn) and Iron (Fe) deficiencies have been reported in our soils which lead to malnutrition. Therefore, this study is planned to increase the Zn and Fe concentration in pulse crops.

Research Workers

Dr. Shakeel Ahmad Anwar, Irfan Rasool and Muhammad Shafiq

Duration

2018-2021

Location

Faisalabad

**TREATMENTS/
METHODOLOGY**

Treatments =10

T1	Control (25-60-0)
T2	2.5 kg Zn/ ha
T3	5.0 kg Zn / ha
T4	2.5 kg Fe/ ha
T5	5.0 kg Fe / ha
T6	2.5 kg Zn + 2.5 kg Fe/ ha
T7	5 kg Zn + 5 kg Fe/ ha
T8	0.1 % ZnSO ₄ (Two sprays: one at flowering and one 15 days after first spray

T9	0.1 % FeSO ₄ (Two sprays: one at flowering and one 15 days after first spray
T10	0.1 % ZnSO ₄ +0.1 % FeSO ₄ (Two sprays: one at flowering and one 15 days after first spray

Variety: = Approved variety of chickpea
 Layout: = RCBD
 Treatments: = 10
 Replication: = 3
 Plot size: = 4m x 1.2 m
 Row spacing: = 30cm
 Plant spacing: = 10 cm
 Sowing date: = First fortnight of November

Recommended dose (25-60 N, P kg/ha) of fertilizers will be added to the soil prior to sowing. Data for Plant height, No. of branches, No. of pods per plant, 1000 grain weight and grain yield will be recorded. Pre sowing and post-harvest soil analysis for Zn, Fe, P,K and Organic matter will be carried out

PREVIOUS YEAR'S RESULTS

New Experiment

46. BIOFORTIFICATION OF RABI PULSES (Lentil) BY ZINC AND IRON APPLICATION

Objectives Zinc (Zn) and Iron (Fe) deficiencies have been reported in our soils which lead to malnutrition. Therefore, this study is planned to increase the Zn and Fe concentration in pulse crops.

Research Workers Dr. Shakeel Ahmad Anwar and Muhammad Sajjad Saeed

Duration 2018-2021

Location Faisalabad

TREATMENTS/ METHODOLOGY

T1	Control (25-60-0)
T2	2.5 kg Zn/ ha
T3	5.0 kg Zn / ha
T4	2.5 kg Fe/ ha
T5	5.0 kg Fe / ha
T6	2.5 kg Zn + 2.5 kg Fe/ ha
T7	5 kg Zn + 5 kg Fe/ ha
T8	0.1 % Zn (Two sprays: one at flowering and one 15 days after first spray
T9	0.1 % Fe (Two sprays: one at flowering and one 15 days after first spray
T10	0.1 % Zn +0.1 % Fe (Two sprays: one at flowering and one 15 days after first spray

Variety: = Approved variety of Lentil

Layout:	= RCBD
Treatments:	= 10
Replication:	= 3
Plot size:	= 4m x 1.2 m
Row spacing:	= 30cm
Plant spacing:	= 10 cm
Sowing date:	= First fortnight of November

Recommended dose (25-60 N, P kg/ha) of fertilizers will be added to the soil prior to sowing. Data for Plant height, No. of branches, No. of pods per plant, 1000 grain weight and grain yield will be recorded. Pre sowing and post-harvest soil analysis for Zn, Fe, P,K and Organic matter will be carried out

**PREVIOUS YEAR'S
RESULTS**

First year