KHARIF 2016

ANNUAL PROGRAM OF RESEARCH WORK

AYUB AGRICULTURAL RESEARCH INSTITUTE, FAISALABAD

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INTRODUCTION

During Kharif 2015 Mung (*Vigna radiata* L. Wilczek) and Mash (*Vigna mungo* L. Hepper) were cultivated on an area of 113025 hectares and 16686 hectares, respectively in the Punjab. The area under Mung crop has shown a nominal decrease of 0.11% over last year. While the acreage under Mash crop has increased by 3.36 % over last year which is due to better economic returns.The production of Mung and Mash in Punjab during kharif 2015 was 89.5 thousand tons and 5.4 thousand tons, respectively. The production of Mung shows an increase of 9.85 % over the last year, which is due to favourable weather conditions at the time of growth and maturity. However Mash production shows a decrease of 8.81 % over the last year, which is due to heavy rain and blow of fast wind at the time of growth and maturity in Gujranwala Division.

The production and distribution of quality seed of pulses especially of Mung and Mash is another major limiting factor and there is dire need to encourage private seed companies for production and distribution of quality seed to the pulses growers so that pulses production can be increased and import bill of Pulses may be reduced.

This institute is also working on Cowpeas and trying hard to stream line its breeding programme. Cowpea is being used as salad and very popular among the diet conscious people due to its high protein contents.

Significant Achievements of Last Year`s Research:-

Mungbean

- Forty (40) new entries were added to the Germplasm which were collected from PGRI, Islamabad.
- Seven crosses were attempted and six were harvested.
- In advance yield trial five entries out yield the check. Maximum yield was produced by 13009 (1131 kg/ha) followed by 13002(1094 kg/ha).
- In Micro yield trial eight entries yielded higher (643-1593 kg/ha) as compared to check Azri 2006 (614 kg/ha)
- 200 kg pre basic and 6500 kg basic seed was produced by this institute.

Mash bean

- Fifty Two (52) new entries were collected from PGRI, Islamabad and market.
- Seventy five single plants were selected from land races grown in Narowal area.
- Fifteen crosses were attempted and six were harvested.
- Four entries out yielded Arooj by giving 530-588 kg/ha yield in Preliminary Yield Trial. Maximum yield was given by 15M005.
- In advance yield trial one entry 14M007 (599 kg/ha) out yield the check. (557 kg/hec)
- In Micro yield trial Five entries out yielded the check. Maximum Yield was given by 13M001 (589 kg/ha) as compared to check (458 kg/ha)
- 300 kg pre basic and 2530 kg basic seed was produced by this institute.

Future Strategies

- Broadening of genetic base of Mung and Mash crop through strengthening of germplasm.
- Development of high input responsive cultivars possessing high yield potential, wider adaptability, short duration, resistant to insect pests and diseases.
- Seed multiplication of improved varieties and its distribution to farmers.
- Dissemination of improved production technology among the growers.
- Development of drought tolerant varieties to combat with the water shortage challenges.
- Popularization of spring sowing of Mung and Mash.
- Popularization of intercropping of Mung and Mash in spring planted sugarcane.
- Popularization of mung as catch crop in rice wheat system.

A - MUNGBEAN (*Vigna radiata* L. *Wilczek*) 2n = 22

1- Title — Maintenance of Germplasm

Objectives
Collection, maintenance and evaluation of elite lines/genotypes for their utilization in hybridization program.

Research worker(s)
Muhammad Sajjad Saeed, Dr. Aziz-ur-Rehman & Ch. Muhammad Rafiq

Project duration
2016 (continuous)

Location
Faisalabad

Treatments/ Methodology

No. of Entries	= 130+40 = 170
Blocks	= 5
Entry / block	= 34
Check	= 5
Design	= Augmented
Plot size	= 4m x 0.30m
Plant spacing	= 10 cm
Planting date	= 2nd fortnight of June.
Data to be taken	= Days to 50 % flowering, days to 90% maturity, plant height, number of pods/plant, pod length, number of seeds/pod,1000 grain weight, seed yield and reaction to diseases under natural conditions.

Previous year's Results
Data was collected and maintained. The range of various characters recorded is as follows:

Characters	Range
Days to flowering,	30-52
Plant height,	42-98
Pod length,	5-13 cm
No. of pods per plant,	15-72
days to maturity	60-90

2- Title — Hybridization Programme

Objectives
To create genetic variability by making crosses among the elite lines/ cultivars possessing desirable traits.

Research worker(s)
Muhammad Sajjad Saeed, Dr. Aziz-ur-Rehman & Ch. Muhammad Rafiq

Project duration
2016 (continuous)

Location
Faisalabad

Treatments/ Methodology

Number of parents = 11

Sr. No	Variety/Line	Salient Characters
1	NM-2011	High Yielding
2	Azri-M-2006	High Yielding
3	08009	High Yielding
4	13009	High Yielding
5	98006	Early maturing
6	L No.137	Crinkle & YMVR
7	M-6	Early maturing
8	L No.11	YMVR
9	M-303	Crinkle Virus Resistant
10	L No.107	YMVR
11	6144-A	Bold Seeded

Cross Combinations = 28

Mung Bean New Cross Combination Kharif 2016							
Sr.#	**Cross Combination**			**Sr.#**	**Cross Combination**		
1	NM-11	x	98006	15	Azri-M-2006	x	98006
2	"	x	L No.137	16	"	x	L No.137
3	"	x	M-6	17	"	x	M-6
4	"	x	L No.11	18	"	x	L No.11
5	"	x	M-303	19	"	x	M-303
6	"	x	L No.107	20	"	x	L No.107
7	"	x	6144-A	21	"	x	6144-A
8	08009	x	98006	22	13009	x	98006
9	"	x	L No.137	23	"	x	L No.137
10	"	x	M-6	24	"	x	M-6
11	"	x	L No.11	25	"	x	L No.11
12	"	x	M-303	26	"	x	M-303
13	"	x	L No.107	27	"	x	L No.107
14	"	x	6144-A	28	"	x	6144-A

Date of Sowing = 2nd fortnight of June

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

Previous year's Results

7 cross combinations were attempted and 6 successful crosses were harvested for further studies.

3- Title — Study of Filial Generations

Objectives To select the desirable recombinants from segregating generations

Research worker(s) Muhammad Sajjad Saeed, Dr. Aziz-ur-Rehman & Ch. Muhammad Rafiq

Project duration 2016 (continuous)

Location Faisalabad

Treatments/ Methodology

Filial generations	Crosses/progenies selected/harvested
F_1	06
F_2	12
F_3	14
F_4	10
F_5	8/120
F_6	8/90

Row length = 4.0 m
Row spacing = 30 cm
Plant spacing = 10 cm
Date of sowing = 2nd fortnight of June.

Previous year's Results

Filial generations	Crosses/progenies studied	Crosses/progenies selected/harvested
F_0	7	6
F_1	15	12
F_2	26	14
F_3	14	10
F_4	10	8/120
F_5	8	8/90

4- Title — Preliminary Yield Trial

Objectives To identify the promising genotypes for yield and other desirable characters

Research worker(s) Muhammad Sajjad Saeed, Dr. Aziz-ur-Rehman, Ch. Muhammad Rafiq & Mushtaq Ahmad

Project duration 2016 (continuous)
Location Faisalabad & Kallurkot

Treatments/ Methodology

Entries = 7 viz; 15001, 15002, 15003, 15004, 15005, 15006, 15007.
Standards = AZRI M-2006 & NM-2011
Design = RCB
Replications = 3

Plot size	=	4m x 1.2m
Row spacing	=	30cm
Plant spacing	=	10 cm
Planting date	=	1st & 2nd fortnight of June.
Data to be recorded	=	Plant Stand, Days to 50 % flowering, days to 90 % maturity, plant height, number of pods/plant, pod length, number of seeds/pod, 1000 grain weight, seed yield and disease incidence.

Previous year's Results

S. #	Entries	Yield (kg/ha)		
		Faisalabad	Kallurkot	Average
1	14001	553	944	748
2	14002	475	646	560
3	14003	329	1146	737
4	14004	503	910	706
5	14005	483	944	714
6	14006	327	792	560
7	14007	415	878	560
8	AZRI-06	485	1048	767
9	NM-11	685	972	828
	L.S.D at 5%	**84.29**	**89.00**	
	C.V %	**21.46**	**11.65**	

5- Title Advance Yield Trial

Objectives To evaluate the high yielding and disease resistant genotypes.

Research worker(s) Muhammad Sajjad Saeed, Dr. Aziz-ur-Rehman, Ch. Muhammad Rafiq & Mushtaq Ahmad

Project duration 2016 (continuous)

Location Faisalabad and Kallurkot.

Treatments/ Methodology

Entries	=	7 viz; 14001, 14002, 14003, 14004, 14005, 14006 14007
Standards	=	AZRI M-2006 & NM-2011
Design	=	RCB
Replications	=	3
Plot size	=	4m x 1.2m
Row spacing	=	30cm
Plant spacing	=	10 cm
Planting date	=	1st & 2nd fortnight of June.
Data to be recorded	=	Plant Stand, Days to 50 % flowering, days to 90 % maturity, plant height, number of pods/plant, pod length, number of seeds/pod, 1000 grain weight, seed yield and disease incidence.

Previous year's Results

R.#	Entries	Yield kg/ha		
		Faisalabad	Kallur kot	Average
1.	13009	996	1267	1131
2.	13002	937	1250	1094
3.	13004	880	1059	969
4.	13010	630	1232	931
5.	13011	914	937	926
6.	12005	753	972	863
7.	AZRI-06	675	1042	859
8.	13001	700	920	810
9.	13005	597	903	750
10.	13006	571	833	702
11.	NM-11	550	764	657
	L.S.D at 5%	**64.11**	**103.64**	
	C.V %	**10.50**	**12.47**	

6- Title — Micro Yield Trial

Objectives

To evaluate advance lines for high yield potential and wider adaptability under different ecological/agro climatic zones of the Punjab.

Reseaearch worker(s)

Muhammad Sajjad Saeed, Dr. Aziz-ur-Rehman, Ch. Muhammad Rafiq & Mushtaq Ahmad

Project duration

2016 (continuous)

Location

Faisalabad, Kallurkot, Bahawalpur, Chakwal and NARC Islamabad.

Treatments/ Methodology

Entries	= 9 viz; 13001, 13002, 13004, 12005, 13005, 13006, 13009, 13010 & 13011.
Checks	= AZRI M-2006 & NM-2011
Design	= RCB
Replications	= 3
Plot size	= 4m x 1.2m
Row spacing	= 30cm
Plant spacing	= 10 cm
Planting date	= 1st & 2nd fortnight of June.
Data to be recorded	= Plant Stand, Days to 50 % flowering, days to 90 % maturity, plant height, number of pods/plant, pod length, number of seeds/pod, 1000 grain weight, seed yield and disease incidence.

Previous year's Results

Sr. #	Entries	Yield kg/ha			
		Faisalabad	Kallurkot	BWP	Average
1.	12005	597	1059	3125	1593
2.	12001	636	1212	2777	1542
3.	12009	760	920	2916	1532
4.	12002	697	1302	298	766
5.	12008	744	1173	236	718
6.	12007	683	1303	97	694
7.	12004	853	993	194	680
8.	12006	626	989	312	643
9.	AZRI-06	708	903	229	614
10.	NM-11	622	975	160	586
	L.S.D at 5%	**93.25**	**106.45**	**106.37**	
	C.V %	**16.35**	**11.94**	**12.49**	

7- Title — National Uniform Yield Trial

Objectives

To test the performance of candidate Mungbean cultivars of different institutes.

Research worker(s)

Muhammad Sajjad Saeed, Dr. Aziz-ur-Rehman & Ch. Muhammad Rafiq

Project duration

2016 (continuous)

Location

Faisalabad

Treatments/ Methodology

This Institute will contribute 3 entries viz; 12001, 12005 & 12009.

Layout = As per instructions from the National Coordinator, Pulses, NARC, Islamabad.

Sowing date = 2nd fortnight of June

Data to be recorded = Days to 50 % Flowering, days to 90% Maturity, Plant height, Number of pods/plant, Pod length, Number of seeds/pod, 1000 grain weight, seed yield and disease incidence.

Previous year's Results

Advance Line V- 07006 ranked 12th in NUYT -15

Consolidated Results of Mung National Uniform Yield Trial 2015 across the country

(Grain Yield Kg/ha)

Entry No.	Entry Name	Source	Locations*											
			1	2	3	4	5	6	7	8	9	10	11	Mean
1.	NM-16	NIAB, Faisalabad	888	428	147	167	683	140	868	2146	1711	1076	875	830
2.	NM-19	NIAB, Faisalabad	620	628	138	111	822	119	476	1771	2173	833	764	769
3.	NM-18	NIAB, Faisalabad	1272	590	97	97	1090	125	344	1885	1566	882	431	762
4.	09-TM-11	AZRI, Bhakkar	1079	389	160	125	860	119	580	1854	1608	799	681	750
5.	NIFA Mung-5	NIFA, Peshawar	1072	403	176	42	628	121	309	1792	2368	417	653	725
6.	NM-14	NIAB, Faisalabad	729	775	106	63	425	135	351	1854	2166	694	590	717
7.	NIFA Mung-4	NIFA, Peshawar	463	551	106	52	874	114	451	1625	2158	764	715	716
8.	NM-17	NIAB, Faisalabad	963	443	154	45	487	154	483	1500	1788	903	854	707
9.	AZ-MH-4	AZRI, B.pur	597	418	114	69	578	114	601	2354	1310	708	834	700
10.	AZRI Mung-06	CHECK	749	510	76	118	591	104	493	1771	1726	729	833	700
11.	12-TM-03	AZRI, Bhakkar	644	292	197	87	697	121	573	1563	2166	674	667	698
12.	07006	AARI, Faisalabad	817	504	244	111	674	117	490	1615	1493	819	709	690
13.	AZ-MH-1	AZRI, B.pur	719	551	163	153	677	129	455	1594	1482	799	653	670
14.	NM-06	CHECK	655	440	231	90	795	150	476	1802	1482	382	632	649
15.	NM-2011	CHECK	606	469	113	31	580	119	715	1479	1413	660	785	634
16.	BRM-355	RARI, B.pur	628	506	150	31	561	131	510	1240	1719	938	542	632
17.	AZ-MY-6	AZRI, B.pur	540	411	110	94	520	114	514	1646	1501	924	577	632
18.	07008	AARI, Faisalabad	740	479	135	73	465	113	420	1177	1436	646	819	591
19.	NCM-252-10	NARC,	831	185	214	56	304	104	684	1031	1207	451	514	507
20.	NCM-257-10	NARC,	782	107	129	56	217	108	462	1031	1161	521	611	471
Location Means			770	454	148	84	626	123	513	1636	1682	731	687	

Coefficient of variation=21.43% Location (L) and G x L interactions are highly significant (P<0.01)

***Locations:**

1= NARC, Islamabad **2= AARI, Faisalabad** **3= ARI, Mingora, Swat** **4= ARI, Karak**
5= AZRC, D.I Khan **6= AZRI, Bhakkar** **7= BARS, Fateh Jang** **8= NIAB, Faisalabad**
9= NIFA, Peshawar **10= RARI, Bahawalpur** **11= BARI, Chakwal**

Note: The trial was sent to 15 locations for evaluation but yield data was received from 11 locations.

8- Title — Pre-basic and Basic Seed Production

Objectives
To maintain the genetic purity of approved cultivars.

Research worker(s)
Muhammad Sajjad Saeed, Dr. Aziz-ur-Rehman, Ch. Muhammad Rafiq and Mushtaq Ahmad

Project duration
2016 (continuous)

Location
Faisalabad & Kallurkot

Treatments/ Methodology
Variety = AZRI M-2006

- Selected seed of healthy and true to type single plants will be sown in plant to row progenies.
- Selected plant to row progeny lines will be sown in separate progeny blocks.
- Bulked seed of selected progeny blocks will be sown for the production of pre-basic seed.

Previous year's Results

Entries/varieties	Pre-basic (Kg)	Basic Seed (Kg)	Total (Kg)
AZRI M-2006	**200**	**6500**	**6700**

AIP - MUNGBEAN IMPROVEMENT PROJECT

9 - Title — Demonstration of Mungbean as catch crop in rice wheat system

Objectives
To introduce an additional crop of Mung Bean for economic up lift of the area of the farmers in rice wheat system.

Research Workers
Muhammad Sajjad Saeed, Dr. Aziz-ur-Rehman & Ch. Muhammad Rafiq

Project Duration
5 year

Location
Sheikhupura & Gujranwala District

Plot Size
4 kanal

Methodology
Production technology of mung bean will be demonstrated among selected farmers of the area in rice wheat system

Data to be recorded
The whole plot will be harvested and cost benefit ratio will be calculated.

10 - Title	Demonstration of intercropping of Mungbean in February sown sugarcane.
Objectives	To bring an additional area under mung bean cultivation to overcome the deficiency of pulses in the country.
Research Workers	Muhammad Sajjad Saeed, Dr. Aziz-ur-Rehman & Ch. Muhammad Rafiq
Project Duration	5 year
Location	T.T. Singh District
Plot Size	4 Kanal
Methodology	Two rows of mung bean will be planted on raised bed of four feet in between two sugarcane rows. No extra inputs will be applied to mung bean crop and weeds will be managed by the use of chemicals. The mung bean crop will be harvested in the Ist. week of June.
Data to be recorded	The whole plot will be harvested and cost benefit ratio will be calculated.

B - MASH (*Vigna mungo L. Hepper*) 2n = 22

11- Title: Germplasm Studies

Objectives
Collection, maintenance and evaluation of germplasm accessions for utilization in hybridization programme.

Research worker(s)
Muhammad Amir Amin, Irfan Rasool, Muhammad Shafiq, Dr, Aziz ur Rehman and Ch. Muhammad Rafiq

Project duration
2016 (continuous)

Location
Faisalabad

Treatments/ Methodology

No. of entries	= 112 (60+52)
Plot size	= 2.5 m x 0.6 m(paired rows)
Row spacing	= 30cm
Plant spacing	= 10cm
Sowing time	= 2nd fortnight of June to 1st week of July
Data to be taken	= Plant stand, Plant type, Days to 50% flowering, Plant height, Number of pods/plant, Number of seeds/pod, 1000 Grain weight, Days to maturity, Seed yield, Attack of insect pests and Disease reaction.

Previous year's Results

Trait	Range
Plant height	19- 68 cm
No. of pods /plant	10-37
No. of seeds/ pod	4-6
1000-grain weight	35-58 g
Maturity days	95-115
Biological yield /plant	10.41-40.56 g
Grain yield / plant	2.63 – 14.28 g
Harvest index	6.87-30.32

60 entries were evaluated and maintained.

12- Title: Hybridization Programme

Objectives
To create genetic variability by crossing desirable parents

Research worker(s)
Muhammad Amir Amin, Anwar ul Haq, Irfan Rasool and Afzal Zahid

Project duration
2016 (continuous)

Location
Faisalabad

Treatments/
Parents: 8 viz. M-97, Arooj-2011, ES-1, 62027, 6036-21, 6065-1, 6036-24 & 6049-20

Methodology

Cross Combinations=15		
High yield	**x**	**ULCV Tolerant**
Arooj	x	Mash -97
	x	62027
	x	ES-1
6036-21	x	Mash -97
	x	62027
	x	ES-1
6065-1	x	Mash -97
	x	62027
	x	ES-1
6036-24	x	Mash -97
	x	62027
	x	ES-1
6049-20	x	Mash -97
	x	62027
	x	ES-1

Planting pattern = Paired rows of male and female parents.
Row spacing = 30cm
Plant spacing = 10cm
Sowing time = 15/06, 01/07, 15/07 and 30/07
Parental lines will be sown on different dates to find out best seed setting period

.

Previous year's Results 15 cross combinations were attempted and 3 crosses were harvested.

13- Title Study of Filial Generations

Objectives To select desirable genotypes from segregating generations.

Research worker(s) Muhammad Amir Amin, Irfan Rasool and Muhammad Shafiq
Project duration 2016 (continuous)
Location Faisalabad.

Treatments/ Methodology

Filial generations	Crosses/progenies selected/harvested
F_1	06
F_2	03
F_3	2/25
F_4	-
F_5	5/35
F_6	3/11

Row Length = 4 m
Row spacing = 45 cm
Plant spacing = 15 cm
Sowing time = 1st fortnight of July.

Previous years Results

Filial generations	Crosses/progenies studied	Crosses/progenies selected/harvested
F_1	3	3
F_2	2	2/25
F_3	-	-
F_4	5/55	4/40
F_5	5/45	4/32
F_6	3/12	10 lines were selected

14- Title Preliminary Yield Trial

Objectives To evaluate promising lines for yield potential.

Research worker(s) Muhammad Amir Amin, Irfan Rasool, Dr. Aziz-ur-Rehman and Ch. Muhammad Rafiq

Project duration 2016 (continuous)

Location Faisalabad and Kallurkot

Treatments/ Methodology

Entries = 10 viz; 16M001, 16M002, 16M003, 16M004, 16M005, 16M006, 16M007, 16M008, 16M009 & 16M010
Checks = Mash-97 & Arooj
Design = RCB
Replications = 3
Plot size = 4m x 1.2m
Row spacing = 30 cm
Plant spacing = 10 cm
Planting date = 1st fortnight of July.
Data to be recorded = Plant stand , Growth habit, Days to 50% flowering, Plant height, number of pods/plant, number of seeds/pod, 1000 grain weight, days to maturity, seed yield, attack of insect pests and disease reaction.

Previous year's Results

Rank	Entry No.	Yield Kg/ha		Average
		Faisalabad	Kallurkot	
1.	15M005	625	550	588
2.	15M007	620	525	572
3.	15M004	578	505	542
4.	15M008	555	505	530
5.	Arooj	557	500	529
6.	15M001	547	505	526
7.	M-97	573	465	519
8.	15M010	536	485	511
9.	15M003	531	475	503

10.	15M009	500	465	483
11.	15M002	490	465	478
12.	15M006	453	395	424
	C.V.%	10.45	12.85	

15- Title Advanced Yield Trial

Objectives To identify high yielding lines under different agro climatic conditions.

Research worker(s) Muhammad Amir Amin, Anwar ul Haq, Irfan Rasool and Ch. Muhammad Rafiq

Project duration 2016 (continuous)

Location Faisalabad, Kallur Kot and Sahowali

Treatments/ Methodology

Entries	= 9 viz, 15M001, 15M002, 15M003, 15M004, 15M005, 15M007, 15M008, 15M009, 15M010.
Checks	= Mash-97 & Arooj
Design	= RCB
Replications	= 3
Plot size	= 4m x 1.2m
Row spacing	= 30 cm
Plant spacing	= 10 cm
Planting date	= 1st fortnight of July.
Data to be recorded	= Plant stand, Growth habit, Days to 50% flowering, Plant height, number of pods/plant, number of seeds/pod, 1000 grain weight, days to maturity, seed yield, attack of insect pests and disease reaction.

Previous year's Results

Rank	Entry No.	Yield Kg/ha		Average
		Faisalabad	Kallurkot	
1.	14M007	672	525	599
2.	Arooj	619	495	557
3.	14M005	578	505	542
4.	14M008	568	505	537
5.	14M002	544	500	522
6.	14M006	526	485	506
7.	14M003	526	480	503
8.	14M001	464	485	475
9.	14M004	448	460	454
10.	M-97	615	540	390
	C.V.%	8.32	11.23	

16- Title Micro Yield Trial

Objectives To select better performing and well adapted lines suitable for different ecological zones of Punjab

Research worker(s) Muhammad Amir Amin, Irfan Rasool, and Muhammad Shafiq.

Project duration 2015 (continuous)

Location Faisalabad, Kallurkot, Sahowali, Krore, Chakwal, Fatehjang and Bhawalpur

Treatments/ Methodology

Entries	= 8 viz; 14M001, 14M002, 14M003, 14M004, 14M005, 14M006, 14M007, 15M008.
Checks	= Mash-97 & Arooj
Design	= RCB
Replications	= 3
Plot size	= 4m x 1.2m
Row spacing	= 30 cm
Plant spacing	= 10 cm
Planting date	= 1st fortnight of July.
Data to be recorded	= Plant stand, Growth habit, Days to 50% flowering, Plant height, number of pods/plant, number of seeds/pod, 1000 grain weight, days to maturity, seed yield, attack of insect pests and disease reaction.

Previous year's Results

Rank	Entry No.	Yield (Kg/ha)			Average
		Faisalabad	Kallurkot	Sahowali	
1.	13M001	627	550	-	589
2.	13M007	615	540	-	578
3.	13M005	601	555	-	578
4.	13M006	608	535	-	572
5.	13M008	569	485	-	527
6.	Arooj	481	435	-	458
7.	13M002	443	425	-	434
8.	M-97	458	405	-	432
9.	13M004	424	390	-	407
10.	13M003	417	395	-	406
	C.V.%	14.65	9.95		

17- Title — Pre Basic/Basic Seed Production

Objectives To maintain the genetic purity of approved cultivars.

Research worker(s) Muhammad Amir Amin, Mushtaq Ahmad, Faryad khan and Ch. Muhammad Rafiq

Project duration 2016 (continuous)

Location Faisalabad, Kallurkot & Sahowali

Treatments/ Methodology Approved cultivars = Mash-97 & Arooj

- Selected seed of healthy and true to type single plants will be sown in plant to row progenies.
- Selected plant to row progeny lines will be sown in separate progeny blocks.
- Bulked seed of selected progeny blocks will be raised for the production of pre-basic seed.

Previous year's Results

S #	Entries/Lines	Pre-Basic (Kgs)	Basic Seed (Kgs)
1.	Arooj-2011	200	1695
2.	Mash-97	100	840
	Total	**300**	**2530**

18- Title — Sowing date effect on yield and yield components

Objectives To ascertain the optimum sowing time for different Mash varieties

Research worker(s) Muhammad Amir Amin, Irfan Rasool and Muhammad Shafiq

Project duration 2016 (continuous)

Location Faisalabad and Sahowali

Treatments/ Methodology Entries = 3 Viz, Mash-97, ES-1 & Arooj

D1 = 1st June
D2 = 15th June
D3 = 1st July
D4 = 15th July
D5 = 30th July
Design = Factorial
Replications = 3
Plot size = 4m x1.2m
Row spacing = 30cm
Plant spacing = 10cm
Data to be taken = Plant stand, Days to 50% flowering, Plant height, number of pods/plant, number of seeds/pod, 1000 grain weight, days to maturity, seed yield, attack of insect pests and disease reaction.

19- Title National Uniform Yield Trial

Objectives To test the performance of candidate Mashbean cultivars of different institutes.

Research worker(s) Muhammad Amir Amin, Irfan Rasool and Muhammad Shafiq

Project duration 2016 (continuous)

Location Faisalabad

Treatments/ Entries will be provided by Pulses Coordinator.

Methodology

Layout = As per instructions from the National Coordinator, Pulses, NARC, Islamabad.

Sowing date = 2nd fortnight of June to 1st week of July

Data to be taken = Plant stand, Plant type, Days to 50% flowering, Plant height, Number of pods/plant, Number of seeds/pod, 1000 Grain weight, Days to maturity, Seed yield, Attack of insect pests and Disease reaction

Previous year's Results

Entry No.	Entry Name	Source	Locations Grain Yield Kg/ha					Mean
			1	2	3	4	5	
1.	10CM-707	BARI, Chakwal	182	705	313	825	1306	666
2.	10CM-703	BARI, Chakwal	167	855	601	883	819	665
3.	11CM-707	BARI, Chakwal	154	640	559	998	657	602
4.	10CM-702	BARI, Chakwal	118	717	361	869	755	564
5.	Arooj	Check	160	592	438	984	418	518
6.	NARC MASH-014	NARC, Islamabad	381	480	420	1013	223	503
7.	Mash-010-2	NARC, Islamabad	145	490	389	854	560	488
8.	Mash-010-1	NARC, Islamabad	238	586	378	1013	162	475
		Location Means	193	633	432	930	613	

Coefficient of variation=20.10% Location (L) and G x L interactions are highly significant (P<0.01)

Locations:

1= NARC, Islamabad
2= AARI, Faisalabad
3= BARS, Fateh Jang
4= BARI, Chakwal
5= AZRC, D.I Khan

Note: The trial was sent to 15 locations for evaluation but yield data was received from 05 locations.

C - COWPEAS (*Vigna sinensis*) 2n = 22

20- Title Germplasm Studies

Objectives Collection, maintenance and evaluation of elite lines / genotypes for their utilization in hybridization programme.

Research worker(s) Anwar-ul-Haq, Muhammad Sajjad Saeed and Ch. Muhammad Rafiq

Project duration 2016 (Continuous)

Location Faisalabad

Treatments/ Methodology

Entries	= 67
Check	= S.A. Dandy , CP-037 and JK-101
Design	= Augmented
Plot size	= 5 m x 1.5m
Row spacing	= 75cm
Plant spacing	= 20cm
Planting time	= 2nd fortnight of june
Data to be taken	= Plant stand, Days to 50 % flowering, plant type, days to maturity, disease incidence, number of pods/plant, flower colour, number of seeds/pod, 100 grain weight and seed yield.

Previous year's Results

Trait	Range
Plant type	Erect to Spreading
Flower colour	White and Purple
Leaf colour	Light green to Dark green
No. of pods /plant	35 -80
Days to 50% flowering	50-69
Maturity days	112-126
100-grain weight	12- 23 g

67 entries were evaluated and maintained

21- Title Hybridization

Objectives To create genetic variability for incorporation of desirable traits.

Research worker(s) Anwar-ul-Haq , Muhammad Sajjad Saeed, Muhammad Amir Amin, Muhammad Shafiq and Ch. Muhammad Rafiq

Project duration 2015 (continuous)

Location Faisalabad

Treatments/ Methodology

Parents: = 6 viz. CP-002, CP-017, CP-030, CP-034, CP-037& CP-72

High yield		Erect type
CP-012	X	CP-002 (Semi Erect)
	X	CP-030 (Spreading)
	X	CP-034 (Semi Spreading)
CP-017	X	CP-002 (Semi Erect)
	X	CP-030 (Spreading)
	X	CP-034 (Semi Spreading)
CP-037	X	CP-002 (Semi Erect)
	X	CP-030 (Spreading)
	X	CP-034 (Semi Spreading)
CP-072	X	CP-002 (Semi Erect)
	X	CP-030 (Spreading)
	X	CP-034 (Semi Spreading)

Planting pattern = Paired rows of male and female parents.
Row spacing = 75cm
Plant spacing = 20cm
Planting time = 1st fortnight of September

Previous year's Results

Harvested (6) successful crosses

22- Title Study of Filial Generations

Objectives

To evaluate various segregating generations for selecting desirable genotypes.

Research worker(s)

Anwar-ul-Haq , Muhammad Sajjad Saeed ,Muhammad Amir Amin and Muhammad Shafiq

Project duration

2016 (continuous)

Location

Faisalabad.

Treatments/ Methodology

Filial generation	Crosses/ progenies
F1	= 6 crosses
F2	= 2 crosses
Row Length	= 4m
No of rows	= Single and four rows of F_1 and F_2 crosses respectively
Row spacing	= 75cm
Plant spacing	= 20cm
Planting time	= 2nd fortnight of June.

Previous year's Results

Two F_1 crosses were harvested

23. Title Preliminary Yield Trial

Objectives To evaluate promising lines for high yield potential.

Research worker(s) Anwar-ul-Haq, Muhammad Sajjad Saeed, Muhammad Shafiq
Ch. Muhammad Rafiq

Project duration 2016 (continuous)

Location Faisalabad.

Treatments/ Methodology

Entries	= 9 viz; CP-016, CP-027, CP-039, CP-040, CP-043, CP-044, CP-050, CP-076, CP-099
Check	= S.A. Dandy
Design	= RCB
Replications	= 3
Plot size	= 5 m x 3.0m
Row spacing	= 75cm
Plant spacing	= 20cm
Planting time	= 2nd fortnight of june
Data to be taken	= Plant stand, Days to 50 % flowering, plant type, to maturity, disease incidence, number of pods/plant, flower colour, number of seeds/pod, 100 grain weight and seed yield.

Previous year's Results

Rank	Entry	Yield kg/ha
1.	CP-009	1129
2.	CP-021	1102
3.	CP-025	933
4.	S.A.Dandy(Check)	918
5.	CP-005	900
6.	CP-006	844
7.	CP-041	822
8.	CP-035	796
9.	CP-038	733
10.	CP-008	684
	LSD 5%	**66**
	CV %	**4.34**

24- Title Advanced Yield Trial

Objectives To select high yielding, well-adapted and disease resistant lines.

Research worker(s) Anwar-ul-Haq, Muhammad Sajjad Saeed and Muhammad Shafiq

Project duration 2016 (Continuous)

Location Faisalabad

Treatments/ Methodology

Entries = 09 viz; CP-005,CP-009, CP-021, CP-O25, CP-030, CP-032,CP-036, CP-049, CP-091
Check = S.A. Dandy
Design = RCB
Replications = 3
Plot size = 5 m x 4.5m
Row spacing = 75cm
Plant spacing = 20cm
Planting time = 2nd fortnight of june
Data to be taken = Plant stand, Days to 50 % flowering, plant type, to maturity, disease incidence, number of pods/plant, flower colour, number of seeds/pod, 100 grain weight and seed yield.

Previous year's results

Rank	Entry	Yield kg/ha
1.	CP-030	1148
2.	CP-012	1086
3.	CP-041	1077
4.	CP-009	1004
5.	S.A. Dandy (Check)	975
6.	CP-001	953
7.	CP-093	927
8.	CP-005	822
9.	CP-065	812
10.	CP-038	804
	LSD 5%	**80**
	CV %	**4.87**

25. Title Micro Yield Trial

Objectives To select high yielding, well-adapted and disease resistant lines.

Research worker(s) Anwar-ul-Haq, Muhammad Sajjad Saeed and Muhammad Shafiq

Project duration 2016 (Continuous)

Location Faisalabad, Kallurkot, Sahowaliand Fateh Jang

Treatments/ Methodology

Entries = 07 viz. CP-009,JK-101, CP-030, CP-041, CP-037, CP-034 & CP-072
Check = S.A. Dandy
Design = RCB
Replications =3
Plot size = 5 m x 6 m
Row spacing = 75 cm
Plant spacing = 20 cm
Planting time = 2nd fortnight of june
Data to be taken = Plant stand, Days to 50 % flowering, plant type, to maturity, disease incidence, number of pods/plant, flower colour, number of seeds/pod, 100 grain weight and seed yield.

Previous year's Results

Rank	Entry No.	Location			Av. Yield kg/ha
		Faisalabad	Kallurkot	Fatehjang	
1.	CP-037	11022	1026	1240	1132
2.	CP-072	1070	1032	1021	1036
3.	CP-034	1050	963	795	901
4.	S.A.Dandy (Check)	942	986	774	889
5.	CP-029	933	983	681	820
6.	CP-012	912	833	674	749
7.	CP-002	842	828	639	737
8.	CP-065	920	771	545	696
	LSD (5%)	**77**	**NS**	**75**	
	CV %	**4.55**	**17.29**	**11.55**	

26- Title Sowing Date Trials

Objectives To find out the optimum time of sowing of the crop.

Research worker(s) Anwar-ul-Haq, Muhammad Sajjad Saeed and Muhammad Shafiq

Project duration 2016 (continuous)

Location Faisalabad

Treatments/ Methodology

Entries = CP-037, CP-065 and JK-101
D1 = 15th May
D2 = 1st June
D3 = 15th June
D4 = 1st July
D5 = 15th July
Design = Split Plot
Replications = 3
Plot size = 5 m x 3.0m
Row spacing = 75cm
Plant spacing = 20cm

Previous year's Results First year of the trial.

D. PLANT PATHOLOGY

27. Title — **EVALUATION OF MUNGBEAN (*Vigna radiata* (L.) Wilczek) PROMISING LINES/ VARIETIES FOR RESISTANCE/ TOLERANCE TO MUNGBEAN YELLOW MOSAIC VIRUS (MYMV) AND URDBEAN LEAF CRINKLE VIRUS (ULCV)**

Objectives

To select mungbean cultivars/lines resistant/tolerant to Mungbean Yellow Mosaic Virus and Urdbean Leaf Crinkle Virus for use in hybridization programme.

Research worker(s)

Dr. M. Azhar Iqbal, M. Umar Shahbaz and Javed Anwar Shah

Project duration

2016

Location

Faisalabad (PRI)

Treatments

Varieties/ lines

Methodology

Each entry will be planted in 3 meter long and 30cm apart single row during the 1st week of July in three replications. A highly susceptible variety **Mung Kabuli** will be sown as spreader after every two test entries.
Observations on the incidence of MYMV and ULCV will be recorded under field conditions at Seedling stage and Maturity according to disease rating scale (Bashir, 2005 and Khalid *et al*., 2011).

Previous Years Results

REACTION	LINES / VARIETIES (MYMV)
Highly Resistant	-
Resistant	-
Moderately Resistant	7006, 8009, 1009, AZRI-06 and NM-11.
Moderately Susceptible	-
Susceptible	11002 and 7008.
Highly Susceptible	-

Note: Urdbean Leaf Crinkle Virus was not observed on the Mung bean lines.

28. Title	**EVALUATION OF MASH (*Vigna mungo* (L.) Hepper) LINES/ VARIETIES FOR RESISTANCE/ TOLERANCE TO URDBEAN LEAF CRINKLE VIRUS (ULCV) AND MUNGBEAN YELLOW MOSAIC VIRUS (MYMV)**
Objectives	To select mash cultivars/lines, resistant/tolerant to Urdbean Leaf Crinkle Virus and Mungbean Yellow Mosaic Virus for use in hybridization programme.
Research worker(s)	Dr. M. Azhar Iqbal, Javed Anwar Shah and M. Umar Shahbaz
Project duration	2016
Location	Faisalabad (PRI)
Treatments	Varieties/ lines
Methodology	Each entry will be planted in 3 meter long and 30cm apart single row during the 1st week of July in three replications. A highly susceptible variety **Kandhari Mash** will be sown as spreader after every two test entries. Observations on the incidence of ULCV and MYMV will be recorded under field conditions at Seedling stage and Maturity according to disease rating scale (Bashir, 2005 and Khalid *et al*., 2011).

Previous Years Results

REACTION	LINES/ VARIETIES (MYMV)
Highly Resistant	-
Resistant	13M002 and 13M003.
Moderately Resistant	13M001, 13M007, 13M008, 14M001 and 15M006.
Moderately Susceptible	14M002, 15M002 and 15M007.
Susceptible	
Highly Susceptible	-

Note: Urdbean Leaf Crinkle Virus was not observed on the Mash bean lines.

29. Title	**EVALUATION OF COWPEAS (*Vigna sinensis*) PROMISING LINES FOR RESISTANCE/ TOLERANCE TO COWPEA YELLOW MOSAIC VIRUS (CYMV)**
Objectives	To select cultivars/lines, resistant/tolerant to CYMV
Research worker(s)	M. Umar Shahbaz, Dr. M. Azhar Iqbal and Javed Anwar Shah
Project duration	2016
Location	Faisalabad (PRI)
Treatments	Varieties/ lines

Methodology

Each entry will be planted in 3 meter long and 30cm apart single row during the 1st week of July having three replications. A highly susceptible **Desi Arvan** will be sown after every two test entries. Observations on the virus incidence will be recorded under field conditions at seedling and maturity, according to disease rating scale (Bashir, 2005 and Khalid *et al*., 2011).

Previous Years Results

REACTION	LINES/ VARIETIES
Highly Resistant	CP-01, CP-03, CP-05, CP-07, CP-09, CP-010, CP-012, CP-013, CP-015, CP-017, CP-038, CP-041, CP-049, CP-065.
Resistant	-
Moderately Resistant	-
Moderately Susceptible	-
Susceptible	-
Highly Susceptible	-

30. Title — Evaluation of Mungbean (*Vigna radiata* (L.) Wilczek) Lines for Resistance/ Tolerance to *Cercospora* leaf spot

Objectives

To select Mungbean cultivars/ lines resistant/ tolerant to Cercospora canesens for use in hybridization programme.

Research worker(s)

Dr. M. Azhar Iqbal, M. Umar Shahbaz and Javed Anwar Shah

Project duration

2016)

Location

Faisalabad (PRI)

Treatments / Methodology

During the 1st week of July in two replication. A highly susceptible variety C_2-94-4-36 will be sown as spreader after every two test entries. Observations on Percentage Disease Index (PDI) and Infection Percentage (PI) will be recorded according to disease rating scale.ach entry will be planted in 3 meter long and 30cm apart single row

Previous Years Results

Out of 150 lines/ varieties, no line was highly resistant, resistant or moderately resistant, 77 moderately susceptible, 62 susceptible and 11 were found highly susceptible.

31. TITLE	MANAGEMENT OF CERCOSPORA LEAF SPOT (*Cercospora canescens*) in MUNG BEAN (*Vigna radiata* (L.) Wilczek) BY USING CURATIVE FUNGICIDES
Objectives	To see the effect of different spray fungicides for the management of Cercospora leaf spot (*Cercospora canescens*) in Mungbean.
Research worker(s)	M. Umar Shahbaz, Dr. M. Azhar Iqbal and Javed Anwar Shah
Project duration	2016
Location	Faisalabad (PRI)
Treatments	Variety = C_2-94-4-36 T_1 Daconil (Chlorothalonil) (600ml/ Acre) T_2 Ridomil Gold (Mancozeb+Metalaxyl) (250g/ Acre) T_3 Bavistin (Carbendazim) (200ml/ Acre) T_0 Control (H_2 O)
Methodology	Cercospora leaf spot (CLS) susceptible variety C_2-94-4-36 will be sown in RCBD having 3 replications with 1x4m subplots. The inoculum will be sprayed after 40-45 days of sowing to create disease epidemic. The test fungicides will be sprayed after the appearance of the disease. Observations on Percentage Disease Index (PDI) and Infection Percentage (PI) will be recorded after 7 days interval.
Previous Years Results	New experiment

E. ENTOMOLOGY STUDIES

32 - TITLE	EFFICACY OF SOME INSECTICIDES AGAINST WHITE FLY ON MUNG CROP.
Objectives	To find out the most effective and economical insecticide for the control of white fly.
Research worker(s)	Zubair Ahmad, Dr. Aziz- ur- Rehman and Ch.Muhammad Rafiq
Project duration	2016
Location	Faisalabad and Dist. Sheikhupura
Treatments	1. Mospilan 20 SP (Acetamiprid) @ 125 gram/acre 2. Priority 10.8 EL (Pyriproxyfen) @ 500 ml/acre 3. Pyramid 10 % SC (Nitenpyram) @ 200 ml/ acre 4. Confidor 200 % SL (Imidacloprid) @ 250 ml/acre 5. Priority 10.8 EL (Pyriproxyfen) @ 500 ml/acre + Mospilan 20 SP (Acetamiprid) @ 125 gram/acre 6. Priority 10.8 EL (Pyriproxyfen) @ 500 ml/acre + Confidor 200 % SL (Imidacloprid) @ 250 ml/acre 7. Check
Methodology	Layout = RCBD Replications = 3 Row spacing = 30 cm Plant spacing = 10 cm Plot size = 5.0 m x 6.0m (Line per plot 20) Data to be taken = The Whitefly population will be recorded on per leaf before spray and then after 3 and 7 days of spray from 15 randomly selected leaves of 15 plants from each plot. The experiment will be conducted as an activity of PARB project 532.
Previous Years Results	First Year

33 - TITLE	MANAGEMENT OF COWPEA POD BORER HELICOVERPA ARMIGERA
Objectives	To find out the effective control strategy on Cowpea pod borer.
Research worker(s)	Zubair Ahmad, Dr. Anwar ul Haq and Ch. Muhamamd Rafiq
Project duration	2016
Location	Faisalabad

Treatments	1. Weed control at 3 and 6 weeks after sowing 2. Intercropping of Sorghum (One line in between plot) 3 .Neem oil/aqueous @ 500 ml/acre 4. Eucalyptus oil/aqueous @ 500 ml/acre 5. Emmamectin Benzoate 1.9 EC @ 200 ml/acre 6. T1+T2+T3+T5 7. Check
Methodology	Layout = RCBD Replications = 3 Row spacing = 75cm Plant spacing = 20 cm Plot size = 5.0m x 6.0m (line per plot=8) Data to be taken = Five plants from each plot will be selected randomly for recording data. Pod borer infestation %age will be recorded after 10 days interval upto maturity.
Previous Years Results	First Year

34- Title	**SCREENING OF MUNG BEAN ADVANCE LINES AGAINST STORED GRAIN PEST CALLOSOBRUCHUS ANALIS (FAB) IN LABORATORY.**
Objectives	To find out the advance lines tolerant to stored grain pest.
Research workers	Zubair Ahmad and Ch. Muhammad Rafiq
Project duration	2016
Location	Faisalabad
Treatments / Methodology	100 gram grains each of 50 advance lines along with checks of mung will be placed in a chamber covered with muslin cloth. Experiment will be replicated thrice. Five pairs per 100 gram grains of C.analis adults will be released in the chamber. After completion of one generation, the weight of damaged grains will be taken after removing all dust and insects. The difference between initial and final weight will be recorded to assess the loss of weight in grains. Percentage of damaged grains will also be recorded by counting damaged and undamaged grains in the whole sample replication wise.
Previous Years Results	First Year First Year

F. BACTERIOLOGY

35. Title	**IMPACT OF COTTON MUNG BEAN INTERCROPPING ON YIELD AND SOIL HEALTH.**
Objectives	To study **the** impact of cotton Mung bean intercropping on yield and soil health.
Research workers	Muhammad Aslam Avais, Dr. Azhar Iqbal in collaboration with Soil Bacteriology Section, AARI, FSD
Project duration	2016
Location	Faisalabad
Treatments/ Methodlogy	Variety: = FH-142 (Cotton), AZRI-2006 (Mung Bean) Treatments: = 4 T1- Cotton T2- Mung T3- Cotton + Mung(One row of cotton alternating with one row of mung bean) T4- Cotton + Mung(One row of cotton alternating with two rows of mung bean) Layout: = RCBD Replication: = 5 Plot size: = 4. 5m x 3m Row spacing: = Cotton (75 cm), Mung Bean (30cm) Plant spacing: = Cotton (45cm), Mung Bean (10cm) Sowing date: = First week of May Recommended dose of fertilizer will be added to the soil prior to sowing. Data for Plant height, No. of branches and No. of pods/ plant, 1000 grain weight (Mung Bean), No. of bolls per plant, boll weight (Cotton) and yields will be recorded. Pre sowing and post-harvest soil analysis for NPK, Organic-C and microbial count will be carried out. Cost-benefit ratio will be calculated.
Previous year's Results	First Year
36. TITLE	**USE OF RHIZOBIUM AND PGPR COINOCULATION FOR MUNG BEAN PRODUCTION**
Objectives	To identify the best suited Rhizobium-PGPR co inoculation for optimum mung bean production
Research workers	Muhammad Aslam Avais, Dr. Azhar Iqbal in collaboration with Soil Bacteriology Section, AARI, FSD.
Project duration	2016
Location	Faisalabad

Treatments/ Methodology

Variety: = AZRI-2006
Treatments: = 6
T1- Control (25-60-0)
T2- Rhizobium sp. Of mung bean
T3- Azoto bacter ($PGPR_1$)
T4- Bacillus ($PGPR_2$)
T5- Rhizobium + $PGPR_1$
T6- Rhizobium + $PGPR_2$
Layout: = RCBD
Replication: = 3
Plot size: = 3m x 5m
Row spacing: = 30 cm
Plant spacing: = 10 cm
Sowing date: = First week of July

Recommended dose 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 NPK, Organic-C and microbial count will be carried out

Previous year's Results

First Year