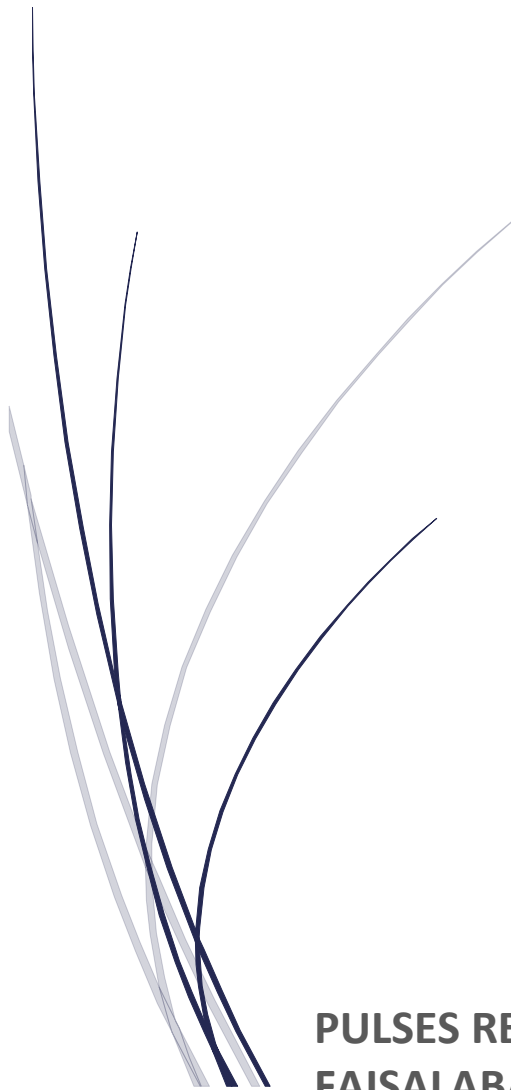




**Kharif
2018**

Annual Program of Research Work



**PULSES RESEARCH INSTITUTE,
FAISALABAD.**

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INTRODUCTION

Mung (*Vigna radiata* L. Wilczek) and Mash (*Vigna mungo* L. Hepper) are the two most important pulse crops grown in kharif season in Pakistan. Mungbean leads in acreage and production among Kharif pulses. In national mungbean production, during last five years Punjab leads with 90% contribution, KPK 5%, Baluchistan 4% while Sindh contributes 1%. During 2016-17 in Punjab its acreage showed 23% increase over last year from 133.1 to 163.7 thousand hectares. Similarly its production increased (28.9%) from 93.9 to 120.9 thousand tonnes during 2016-17 over last year.

Pakistan is deficient in mashbean production to meet the domestic demands. Pakistan need to import mashbean to meet its domestic requirements. Indigenous production meets only 9% of national requirements. Its national production was 7.2 thousand tonnes during 2016-17. Punjab contributes 57% of total production of the country followed by Baluchistan with 32% share. Cowpea is also gaining popularity among consumer/farmers due to its multifarious uses. However its production in the country is very limited. There is need to boost research activities to increase area and production of this crop.

Pulses Research Institute has intensified its efforts to increase domestic production of mung, mash and cowpeas with introduction of highly yielding and disease resistant genotypes coupled with climate resilient production technology.

Significant Achievements of Last Year's Research:-

Mungbean

- Thirty two crosses were attempted and twenty were successfully harvested.
- In advance yield trial five entries surpassed the check variety. Maximum yield was produced by V-15001 (1210 kg/ha) followed by V-15002(1095 kg/ha)
- In Micro yield trial four entries yielded higher (1190-1021 kg/ha) as compared to check AZRI-2006 (922 kg/ha). Maximum yield was produced by V-14006 (1190 kg/ha) followed by V-14007 (1165 kg/ha)
- Advance line V-12009 secured top position in National Uniform Yield Trial 2017.
- Two entries viz. 14001,14002 showed resistant against Mungbean Yellow Mosaic Virus (MYMV) and five entries viz. 14003,14004,14005,14006 and 14007 were moderately resistant to (MYMV)
- 1250 kg pre-basic and 3340 kg basic seed was produced by this institute.

Mash bean

- Three hundred eighty seven (387) entries were included in gene pool for enrichment of germplasm which also include (287) exotic entries from USA.
- One hundred fifty (150) single plants selection were made from farmer's field.
- Fifteen crosses were attempted and eleven were harvested.
- One entry 15M005 (1056kg/ha) out yielded Check variety Arooj-2011 in Micro Yield Trial.
- All the Eighteen entries showed resistant against Mungbean Yellow Mosaic Virus (MYMV)
- 1107 kg per basic and 4947 kg basic seed was produced by this institute.

Pulses Research Institute is striving hard to cope with increasing challenges with the following 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.
- 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	1. To maintain the genetic purity 2. To enrich the germplasm 3. To identify the sources for different economic characters.																		
Research worker(s)	Muhammad Sajjad Saeed, Sadia Kaukab, Dr. Busharat Hussain, & Ch. Muhammad Rafiq																		
Project duration	2018 (continuous)																		
Location	Faisalabad																		
Treatments/ Methodology	<table border="0"> <tr> <td>No. of Entries</td> <td>= 270 +40 = 310</td> </tr> <tr> <td>Blocks</td> <td>= 5</td> </tr> <tr> <td>Entry / block</td> <td>= 62</td> </tr> <tr> <td>Check</td> <td>= 5</td> </tr> <tr> <td>Design</td> <td>= Augmented</td> </tr> <tr> <td>Plot size</td> <td>= 4m x 0.30m</td> </tr> <tr> <td>Plant spacing</td> <td>= 10 cm</td> </tr> <tr> <td>Planting date</td> <td>= 2nd fortnight of June.</td> </tr> <tr> <td>Data to be taken</td> <td>= 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 incidence of diseases under natural conditions.</td> </tr> </table>	No. of Entries	= 270 +40 = 310	Blocks	= 5	Entry / block	= 62	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 incidence of diseases under natural conditions.
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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 incidence of 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 50% flowering	28-52
Plant height (cm)	36-99
Pod length (cm)	5-15
No. of grains/pod	4-11
No. of pods per plant	18-76
days to 90% maturity	56-91
1000 grain weight (gm)	35-50

2 - Title Hybridization Programme

Objectives To develop new recombinants of:

1. High yield potential
2. Wider adaptability
3. Early maturity
4. Resistance/tolerance to diseases
5. Bold seeded.

Research worker(s) Muhammad Sajjad Saeed, Sadia Kaukab, Dr. Busharat Hussain & Ch. Muhammad Rafiq

Project duration 2018 (continuous)

Location Faisalabad

Treatments/ Methodology Cross Combinations = 20

Mung Bean New Cross Combination Kharif-2018							
Sr.#	Cross Combination			Sr.#	Cross Combination		
1	013009	x	LS-442	11	AZRI-M-2006	x	LS-442
2	"	x	014068	12	"	x	014068
3	"	x	016078	13	"	x	016078
4	"	x	016058	14	"	x	016058
5	"	x	15002	15	"	x	15002
6	NM-11	x	LS-442	16	08009	x	LS-442
7	"	x	014068	17	"	x	014068
8	"	x	016078	18	"	x	016078
9	"	x	016058	19	"	x	016058
10	"	x	15002	20	"	x	15002

Sr. No	Variety/Line	Salient Characters
1	NM-2011	High yielding/disease tolerant
2	AZRI-M-2006	High yielding/Bold Seeded
3	13009	Erect type
4	16058	Disease Resistant
5	LS-442	Extra-long pod
6	014068	Bold seeded
7	016078	Crinkle & MYMV resistant
8	08009/PRI-M-17	Drought tolerant
9	015002	Short duration/early maturing

Date of Sowing = 2nd fortnight of June

Planting pattern = 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 Thirty two (32) cross combinations were attempted and 20 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, Sadia Kaukab, Dr. Busharat Hussain, Muhammad Aqeel & Ch. Muhammad Rafiq

Project duration 2018 (continuous)

Location Faisalabad

**Treatments/
Methodology**

Filial generations	Crosses/progenies selected/harvested
F ₁	20
F ₂	14
F ₃	06
F ₄	12/120
F ₅	14/110
F ₆	10/96

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	32	20
F ₁	28	14
F ₂	7	6
F ₃	15	12/120
F ₄	26	14/110
F ₅	14	10/96
F ₆	10	8/120

4 - Title Preliminary Yield Trial

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

Research worker(s) Muhammad Sajjad Saeed, Dr. Busharat Hussain, Sadia Kaukab, Ch. Muhammad Rafiq, Mushtaq Ahmad & Tariq Mahmood.

Project duration 2018 (continuous)

Location Faisalabad & KallurKot

**Treatments/
Methodology**

Entries = 8 viz; V-17001, V-17002, V-17003, V-17004, V-17005, V-17006, V-17007 & V-17008
 Standards = AZRI M-2006 & NM-2016
 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)
1	16005	1250
2	16003	1020
3	16008	985
4	16006	976
5	16002	935
6	16007	926
7	Azri-06	735
8	NM-16	720
9	16004	538
10	16001	516
	L.S.D at 5%	19.12
	C.V %	11.55

5 - Title Advance Yield Trial

Objectives	To evaluate the high yielding and disease resistant genotypes.	
Research worker(s)	Muhammad Sajjad Saeed, Dr. Busharat Hussain, Sadia Kaukab, Ch. Muhammad Rafiq, Mushtaq Ahmad & Tariq Mahmood.	
Project duration	2018 (continuous)	
Location	Faisalabad and KallurKot.	
Treatments/	Entries	= 7 viz; V-16001, V-16002, V-16003, V-16004, V-16005, V-16006 & V-16007.
Methodology	Standards	= AZRI M-2006 & NM-2016
	Design	= RCB
	Replications	= 3
	Plot size	= 4m x 1.2m
	Row spacing	= 30cm
	Plant spacing	= 10 cm
	Planting date	= 1st & 2 nd 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)
1.	15001	1210
2.	15002	1095
3.	15003	875
4.	15007	856
5.	15006	806
6.	NM-16	740
7.	Azri-06	722
8.	15005	650
9.	15004	632
	L.S.D at 5%	24.55
	C.V %	15.14

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.

Research worker(s) Muhammad Sajjad Saeed, Dr. Busharat Hussain, Sadia Kaukab, Muhammad Aqeel, Ch. Muhammad Rafiq, Mushtaq Ahmad & Tariq Mahmood.

Project duration 2018 (continuous)

Location Faisalabad, Karor, KallurKot & Bahawalpur

Treatments/ Entries = 7 viz; V-15001, V-15002, V- 15003, V15004,
Methodology V-15005, V-15006 &V-15007.

Checks = AZRI M-2006 & NM-2016.

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)
1.	14006	1190
2.	14007	1165
3.	14001	1062
4.	14004	1021
5.	Azri-06	922
6.	14003	895
7.	NM-2016	835
8.	14005	802
9.	14002	799
	L.S.D at 5%	19.71
	C.V %	10.61

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. Busharat Hussain, Sadia Kaukab & Ch. Muhammad Rafiq

Project duration 2018 (continuous)

Location	Faisalabad
Treatments/ Methodology	This Institute will contribute 2 entries viz; V-14005 & V-15003. Layout = As per instructions from the National Coordinator, Pulses, NARC, Islamabad. Sowing date = 2 nd 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- 120009 contributed by PRI, Faisalabad ranked 1 st in NUYT -2017.

Consolidated Results of Mungbean National Uniform Yield Trial 2017 across the country

Rank	Entry Name	Locations*												Mean
		1	2	3	4	5	6	7	8	9	10	11	12	
1	120009	1032	742	1198	1301	849	1158	2275	396	729	1168	1222	1507	1131
2	13-TM-14	1306	850	1021	1052	1052	900	1213	431	826	1494	1833	1444	1119
3	TM-1418	1169	724	1104	1425	783	832	1424	479	573	1508	1674	1632	1111
4	GV-1	1029	808	955	1117	810	799	1778	420	843	1355	1531	1563	1084
5	13-TM-04	1284	785	1271	1085	937	1094	1421	462	962	1252	1587	583	1060
6	MH 3153	974	742	1049	1220	1100	958	1108	406	886	1182	1670	1427	1060
7	TM-1426	1044	749	1083	1117	897	1157	1078	465	741	1643	1667	986	1052
8	NIFA Mung-4	1106	801	917	1240	990	1314	1128	535	586	1265	1545	1125	1046
9	MSPS 119	672	701	833	1014	735	807	1581	361	1353	1348	973	1813	1016
10	NIFA Mung-5	928	809	681	1085	783	735	1510	490	845	1138	2038	1035	1006
11	NM-2011	1041	783	847	1112	982	976	1136	219	983	1369	1413	1069	994
12	MMH 34143	854	791	1153	938	879	865	1178	403	513	1138	1170	1729	968
13	NCM-11-2	709	752	1063	1065	744	897	1303	351	1069	1037	1191	1306	957
14	AZRI Mung-06	853	742	646	1024	869	978	1161	200	928	1172	1642	1250	955
15	14002	1060	699	708	1009	828	906	1185	385	515	1106	1948	847	933
16	NCM-11-8	307	772	944	1236	660	892	1006	337	602	471	774	1611	801
	Location Means	961	766	967	1127	869	954	1343	396	810	1228	1492	1308	

Coefficient of variation= 13.36% Genotypes (G), Location (L) and G x L interactions are highly significant (P<0.01)

*Locations:

1 = AARI, Faisalabad 2 = ARI Mingora, Swat. 3 = ARI, Tando Jam, Sindh
4 = AZRI, Bawalpur 5 = AZRI, Bhakkar 6= AZRC, D.I.Khan
7 = AZRC, Umer Kot 8 = BARS, Fateh Jang 9= NARC, Islamabad
10= NIAB, Faisalabad 11= NIFA, Peshawar 12= QAARI, Larkana

8- Title Pre-basic and Basic Seed Production

Objectives	To maintain the genetic purity of approved cultivars.
Research worker(s)	Muhammad Sajjad Saeed, Dr. Busharat Hussain, Sadia Kaukab, Ch. Muhammad Rafiq, Mushtaq Ahmad & Tariq Mahmood.
Project duration	2018 (continuous)
Location	Faisalabad & KallurKot
Treatments/	Variety = AZRI M-2006 and advance line V-8009/PRI-M-17.
Methodology	<ul style="list-style-type: none"> 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)
AZRI-M-2006	1200	3240
V-08009/PRI-M-2017	50	100
Total (Kg)	1250	3340

9 - Title Impact of Plant Geometry on Yield and its Development

Objectives	To determine the optimum plant and row spacing of Mungbean.
Research Workers	Muhammad Sajjad Saeed,, Muhammad Aqeel, Dr. Busharat Hussain, Sadia Kaukab & Ch. Muhammad Rafiq.
Project Duration	2018 (continuous)
Location	Faisalabad and kallurkot.
Treatments /	Entries = 2 viz; V-13006 & V-08009/PRI-M17.
Methodology	Row spacing = Viz; 3 (30cm, 45cm, 60cm)
	Plant spacing = Viz; 3 (7.5cm, 10cm, 15cm)
	Design = RCB
	Replications = 3
	Plot size = 1.2 m x 4m
	Sowing date = 2 nd 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

Line No./Vt. Name	RXR Distance (cm)	PXP Distance (cm)	Yield Kg/ha
AZRI-M-06	30	7.5	1088
	45	10	1260
	60	15	1020
V-08009/PRI-M-17	30	7.5	1310
	45	10	980
	60	15	946

10 - Title**Determination of Proper Sowing Dates to Overcome the Climatic Change.****Objectives**

To find out proper sowing time for Mungbean cultivars.

Research Workers

Muhammad Sajjad Saeed,, Muhammad Aqeel, Dr. Busharat Hussain, Sadia Kaukab & Ch. Muhammad Rafiq.

Project Duration

2018 (continuous)

Location

Faisalabad and kallurkot.

Treatments / Methodology

Entries = 4 viz; 1 Check (AZRI-M-2006.)
V-08009/PRI-M-17, V-14005, V-15003

Design = Split plot

Replications = 3

Plot size = 1.2 m x 4m

Row spacing = 30cm

Plant spacing = 10 cm

Sowing date = 5 viz: 1stMay, 16th May, 1st June, 1st July & 15thJuly

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

Sowing Dates	Yield (Kg/ha).				
	V-08009/PRI-M-17	V-13006	V-12001	V-14001	AZRI-M-06
1 st May	1360	1410	880	980	890
16 th May	1260	1186	1096	816	896
1 st June	1180	1190	1120	856	930
16 th June	1160	1106	1026	940	960
1 st July	1056	1010	986	878	810

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)	Amer Hussain, Muhammad Amir Amin, Irfan Rasool, Muhammad Shafiq and Ch. Muhammad Rafiq	
Project duration	2018 (continuous)	
Location	Faisalabad	
Treatments/ Methodology	No. of entries	= 457(70 local+287 USA+100 PGRI Islamabad) under AIP- CYMMIT Mash project
	Plot size	= 2.5 m x 0.6 m(paired rows)
	Row spacing	= 30cm
	Plant spacing	= 10cm
	Sowing time	= Spring - 2 nd to 3 rd week of March Kharif - 1 st of July to 31 st 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, incidence of insect pests and Diseases.

Previous year's Results

Trait	Range
Plant type	Spreading to erect
Plant height	21- 68 cm
No. of pods /plant	10-100
No. of seeds/ pod	4-6
1000-grain weight	38-57 g
Maturity days	75-115
Biological yield /plant	12-41 g
Grain yield / plant	2.8 – 14.5 g

67 entries were evaluated and maintained.

12- Title Hybridization Programme

Objectives	To create genetic variability by crossing desirable parents
Research worker(s)	Amer Hussain, Muhammad Amir Amin and Muhammad Shafiq
Project duration	2018 (continuous)
Location	Faisalabad
Treatments/ Methodology	Parents: 8 viz. M-97, Arooj-2011, ES-1, 62027, SS-1,SS-2,6036-21,AARIM-2

Cross Combinations=15		
High yield	X	ULCV Tolerant
Mash-97	X	Arooj-11
	X	62027
	X	ES-1
SS-1	X	Arooj-11
	X	62027
	X	ES-1
SS-2	X	Arooj-11
	X	62027
	X	ES-1
6036-21	X	Arooj-11
	X	62027
	X	ES-1
AARIM-02	X	Arooj-11
	X	62027
	X	ES-1

Planting pattern = Paired rows of male and female parents.

Row spacing = 30cm

Plant spacing = 10cm

Sowing time = 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 11 crosses were successfully harvested.
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13- Title Study of Filial Generations

Objectives	To select desirable genotypes from segregating generations.
Research worker(s)	Amer Hussain, Muhammad Amir Amin, and Muhammad Shafiq
Project duration	2018 (continuous)
Location	Faisalabad.

**Treatments/
Methodology**

Filial generations	Crosses/progenies selected/harvested
F ₁	11
F ₂	06
F ₃	7/21
F ₄	6/18
F ₅	2/5
F ₆	5/14

Row Length = 4 m
 Row spacing = 60 cm
 Plant spacing = 15 cm
 Sowing time = 1st of July to 31st July

Previous years**Results**

Filial generations	Crosses/progenies studied	Crosses/progenies selected/harvested
F ₁	06	06
F ₂	7/25	7/21
F ₃	6/22	6/18
F ₄	2/5	2/5
F ₅	4/12	4/10
F ₆	2/12	2/10 10 lines were selected

14- Title**Preliminary Yield Trial****Objectives**

To evaluate promising lines for yield potential.

Research worker(s)

Amer Hussain, Muhammad Amir Amin, Muhammad Shafiq and
Ch. Muhammad Rafiq

Project duration

2018 (continuous)

Location

Faisalabad

**Treatments/
Methodology**

Entries = 14 viz; 18M001, 18M002, 18M003, 18M004,
18M005, 18M006, 18M007, 18M008,
18M009 & 18M010, 18M011, 18M012,
18M013, 18M014

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 of July to 31st 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

**Previous year's
Results**

Rank #	Yield Kg/ha	
	Entry No.	Faisalabad
1.	17M010	1181
2.	17M013	1173
3.	17M005	1148
4.	Arooj-11	1135
5.	17M006	1079
6.	17M014	1071
7.	Mash-97	1035
8.	17M007	1027
9.	17M011	1023
10.	17M009	1019
11.	17M008	981
12.	17M012	927
13.	17M001	831
14.	17M004	742
15.	17M002	500
16.	17M003	406
C.V.%		16.2
LSD 5%		60.4

15- Title

Advanced Yield Trial

Objectives

To identify high yielding lines under different agro climatic conditions.

Research worker(s)

Amer Hussain, Muhammad Amir Amin, Muhammad Shafiq, Muhammad Shafiq Tariq and Faryad Ahmad Khan

Project duration

2018 (continuous)

Location

Faisalabad, Kallur Kot and Sahowali

**Treatments/
Methodology**

Entries = 10 viz, 17M005, 17M006, 17M007, 17M008, 17M009, 17M010, 17M011, 17M012, 17M013, 17M014.

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 of July to 31st 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, Incidence of insect pests and diseases.

**Previous year's
Results**

Rank #	Yield Kg/ha	
	Entry No.	Faisalabad
1.	M-97(check)	1431
2.	16M007	1173
3.	16M004	1042
4.	16M009	1002
5.	16M010	977
6.	AROJ-11	973
7.	16M008	956
8.	16M005	910
9.	16M009	908
10.	16M010	887
11.	16M001	885
12	16M003	798
	C.V.%	9.9
	LSD 5%	38.5

Advance Yield Trial was completely damaged due to Floods in Sahowali,

16- Title

Micro Yield Trial

Objectives

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

Research worker(s)

Amer Hussain, Mushtaq Ahmad, Muhammad Shafiq Tariq, Faryad Ahmad Khan and Muhammad Shafiq.

Project duration

2018 (continuous)

Location

Faisalabad, Kallur kot, Sahowali

**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 of July to 31st 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, Incidence of insect pests and diseases.

**Previous year's
Results**

Rank #	Yield Kg/ha	
	Entry No.	Faisalabad
1.	Mash-97	1227
2.	15M005	1056
3.	Arooj-11	1004
4.	15M003	990
5.	15M007	987
6.	15M006	979
7.	15M004	973
8.	15M008	967
9.	15M002	860
10.	15M001	760
	C.V.%	9.7
	LSD 5%	37.1

Micro Yield Trial was completely damaged due to Floods in Sahowali, Sialkot

17 - Title National Uniform Yield Trial

Objectives	To test the performance of candidate Mashbean cultivars of different institutes.
Research worker(s)	Amer Hussain, Muhammad Amir Amin and Muhammad Shafiq
Project duration	2018 (continuous)
Location	Faisalabad
Treatments/	Entries will be provided by Pulses Coordinator.
Methodology	<p>Layout = As per instructions from the National Coordinator, Pulses, NARC, Islamabad.</p> <p>Sowing date = 1st of July to 31st July</p> <p>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</p>

Previous year's Results

Entry No.	Entry Name	Source	Location									Mean (kg/ha)
			Grain Yield(kg/ha)									
			1	2	3	4	5	6	7	8	9	
1	13CM-708	Chakwal	1061.1	361.1	825.0	506.9	804.2	1232.6	616.0	1138.9	287	759
2	Arooj- Mash	Check	1020.8	329.9	827.8	621.5	845.8	1187.5	634.7	651.4	361.1	720
3	13-CM-707	Chakwal	816.7	493.1	759	635.4	794.4	679.2	794.4	730.6	388.9	710
4	NARC Mash-2014	NARC	731.9	590.3	761.8	697.9	836.1	708.3	843.1	809.7	296.3	697
5	NMS-16-1	NARC	969.4	4688	829.9	857.6	613.9	708.3	597.9	769.4	287	678
6	14-M-005	AARI,Fsd	910.4	475.7	821.5	548.6	804.2	840.3	532.6	880.6	287	678
7	NARC MASH-03	Check	812.5	555.6	745.1	545.1	868.1	881.9	586.1	788.9	287	675
8	13CM-712	Chakwal	977.1	395.8	773.6	743.1	826.4	750	421.5	706.9	416.7	668
9	MASH-010-2	NARC	656.9	434	741	604.2	769.4	916.7	798.6	663.9	370.4	662
Location Mean			884	456	787	640	796	912	647	793	331	

Locations:

1= AARI, Faisalabad 2= BARS, Fateh Jung 3= AZRI, DI Khan 4= AZRI, Umerkot

5= BARDC, Quetta 6=ARI, Tandojam, 7 =NARC, Islamabad 8=ARI, Mangora,Sawat 9=BARI, Chakwal

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 Aqeel, Amer Hussain, Muhammad Shafiq Tariq and Faryad Ahmad Khan
Project duration	2018 (continuous)
Location	Faisalabad and Sahowali
Treatments/ Methodology	<p>Entries = 2 Viz, Mash-97 & Arooj-11</p> <p>D1 = 1st May</p> <p>D2 = 15th May</p> <p>D3 = 1st June</p> <p>D4 = 15th June</p> <p>D5 = 1st July</p> <p>D6 = 15th July</p> <p>D7 = 1st August</p> <p>Design = Split Plot</p> <p>Replications = 3</p> <p>Plot size = 4m x1.2m</p> <p>Row spacing = 30cm</p> <p>Plant spacing = 10cm</p> <p>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, Incidence of insect pests and diseases.</p>
Previous year's Results	New Experiment

19- Title	Pre Basic/Basic Seed Production
Objectives	To maintain the genetic purity of approved cultivars.
Research worker(s)	Amer Hussain, Mushtaq Ahmad, Muhammad Shafiq Tariq, Faryad Ahmad Khan, Muhammad Shafiq and Ch. Muhammad Rafiq
Project duration	2018 (continuous)
Location	Faisalabad, Kallurkot & Sahowali
Treatments/ Methodology	<p>Approved cultivars = Mash-97 & Arooj</p> <ul style="list-style-type: none"> 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	520	4947
2.	Mash-97	587	-
	Total	1107	4947

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)

Muhammad Amir Amin, Dr. Anwar-ul-Haq, and Ch. Muhammad Rafiq

Project duration

2018 (Continuous)

Location

Faisalabad

Treatments/

Methodology

Entries = 51
 Check = S.A. Dandy
 Plot size = 5 m x 1.5m
 Row spacing = 60 cm
 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	30-98
Days to Flower initiation	48-70
Maturity days	110-132
100-grain weight	11-34 g

51 entries were evaluated and maintained

21- Title

Hybridization Programme

Objectives

To create genetic variability for incorporation of desirable traits.

Research worker(s)

Muhammad Amir Amin, Dr. Anwar-ul-Haq and Ch. Muhammad Rafiq

Project duration

2018 (continuous)

Location

Faisalabad

Treatments/

Methodology

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

Cross combinations		
High yield	x	Erect type
CP-017		CP-002
	x	CP-034
	x	CP-037
CP-030	x	CP-002
	x	CP-034
	x	CP-037
CP-072	x	CP-002
	x	CP-034
	x	CP-037

Planting pattern = Paired rows of male and female parents.

Row spacing = 60 cm

Plant spacing = 20cm

Planting time = 2nd fortnight of August & 1st fortnight of September

Harvested 3 successful crosses

Previous year's Results

22- Title Study of Filial Generations

Objectives To evaluate various segregating generations for selecting desirable genotypes.

Research worker(s) Muhammad Amir Amin, Dr. Anwar-ul-Haq and Muhammad Shafiq

Project duration 2018 (continuous)

Location Faisalabad.

Treatments/ Methodology

Filial generation	Crosses/ progenies
F1	= 3 crosses
Row Length	= 4m
Row spacing	= 60 cm
Plant spacing	= 20cm
Planting time	= 2 nd fortnight of June.

Previous year's Results Three F₀ crosses were harvested

23. Title Preliminary Yield Trial

Objectives To evaluate promising lines for high yield potential.

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

Project duration 2018 (Continuous)

Location Faisalabad

Treatments/ Methodology

Entries	= 10 viz; CP-008, CP-020, CP-030, CP-034, CP-037, CP-040, CP-047, CP-060, CP-072 & CP-101
Check	= S.A. Dandy

Design = RCB
 Replications = 3
 Plot size = 5 m x 3.0m
 Row spacing = 60 cm
 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

Rank	Entry	Yield kg/ha
1.	S A Dandy (CHECK)	920
2.	CP-085	814
3.	CP-076	783
4.	CP-029	753
5.	CP-077	716
6.	CP-100	689
7.	CP-002	667
8.	CP-075	658
9.	CP-096	549
10.	CP-070	433

24- Title Advanced Yield Trial

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

Research worker(s) Muhammad Amir Amin, Dr. Anwar-ul-Haq and Muhammad Shafiq

Project duration 2018 (Continuous)

Location Faisalabad

Treatments/ Methodology

Entries = 09 viz; CP-002, CP-029, CP-070, CP-075, CP-076, CP-077, CP-085, CP-096 & CP-100

Check = S.A. Dandy

Design = RCB

Replications = 3

Plot size = 5 m x 3.0 m

Row spacing = 60 cm

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

Rank	Entry	Yield kg/ha
1.	CP-067	1173
2.	CP-064	987
3.	CP-036	944
4.	CP-086	934
5.	S A Dandy (CHECK)	907
6.	CP-032	904
7.	CP-065	852
8.	CP-058	818
9.	CP-016	778
10.	CP-054	689

25. Title **Micro Yield Trial**

Objectives	To select high yielding, well-adapted and disease resistant lines.
Research worker(s)	Muhammad Amir Amin, Dr. Anwar-ul-Haq and Muhammad Shafiq
Project duration	2018 (Continuous)
Location	Faisalabad, Kallurkot and Sahowali
Treatments/ Methodology	<p>Entries = 09 viz; CP-016, CP-032, CP-036, CP-054, CP-058, CP-064, CP-065, CP-067 & CP-086</p> <p>Check = S.A. Dandy</p> <p>Design = RCB</p> <p>Replications =3</p> <p>Plot size = 5 m x 3 m</p> <p>Row spacing = 60 cm</p> <p>Plant spacing = 20 cm</p> <p>Planting time = 2nd fortnight of June</p> <p>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.</p>

Previous year's Results

Rank	Entry No.	Location		Av. Yield kg/ha
		Faisalabad	Kallurkot	
1.	CP-074	693	1215	954
2.	CP-077	818	1076	947
3.	CP-033	889	972	931
4.	S A Dandy (CHECK)	1158	642	900
5.	CP-021	549	1093	821
6.	CP-049	787	694	741
7.	CP-030	551	902	727
8.	CP-056	482	972	727
9.	CP-025	524	902	713
10.	CP-032	553	659	606

26- Title Seed Multiplication Trial

Objectives	To maintain the genetic purity of approved cultivars.	
Research worker(s)	Muhammad Amir Amin, Dr. Anwar-ul-Haq and Muhammad Shafiq	
Project duration	2018 (continuous)	
Location	Faisalabad	
Treatments/ Methodology	Entries	= CP-017, CP-037, JK-101, CP-067
	Row spacing	= 60 cm
	Plant spacing	= 20 cm
Previous year's Results	First year of the trial.	

27- Title Sowing Dates Trial

Objectives	To find out the optimum time of sowing of the crop	
Research worker(s)	Muhammad Amir Amin, Muhammad Aqeel and Muhammad Shafiq	
Project duration	2018 (continuous)	
Location	Faisalabad	
Treatments/ Methodology	Entries = CP-017, CP-037, CP-067 and JK-101	
	Dates	
	T ₁	= 15 th April
	T ₂	= 1 st May
	T ₃	= 15 th May
	T ₄	= 1 st June
	T ₅	= 15 th June
	T ₆	= 1 st July
	T ₇	= 30 th July
	Design	= RCB
	Replications	= 3
	Plot Size	= 5m x3m
	Row Spacing	= 60cm
	Plant Spacing	= 20cm
Previous year's results	New experiment	

D. PLANT PATHOLOGY

28. Title SCREENING 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.

Research worker(s) Javed Anwar Shah, Dr. M. Azhar Iqbal and Javed Ihsan

Project duration 2018

Location Faisalabad (PRI)

Treatments 100 Advance lines

Methodology Each entry will be planted in 3 meter long and 30 cm 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)	LINES / VARIETIES (ULCV)
Highly Resistant	-	-
Resistant	14001,14002	-
Moderately Resistant	14003,14004,14005, 14006 and 14007	-
Moderately Susceptible	-	-
Susceptible	-	14001,14002, 14003,14004, 14005,14006 and 14007
Highly Susceptible	-	-

29. Title **SCREENING 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

Research worker(s) Dr. M. Azhar Iqbal, Javed Ihsan and Javed Anwar Shah

Project duration 2018

Location Faisalabad (PRI)

Treatments 30 advance lines/Varieties

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)	LINES/ VARIETIES (ULCV)
Highly Resistant	-	
Resistant	15MOO1,15M002,15M003 M,15M004,15M005, 15006,15MOO7,15M008,16 M001,16M002,16M003, 16M004,16M005,16M006,1 6M007,16M008,16M009, 16M0010 and Arooj	
Moderately Resistant	-	
Moderately Susceptible	-	
Susceptible	-	15MOO1,15M002, 15M003M,15M004, 15M005,15006,15MOO7,1 5M008,16M001, 16M002,16M003, 16M004,16M005, 16M006,16M007, 16M008,16M009, 16M0010 and Arooj (2011)
Highly Susceptible	-	-

30. Title SCREENING 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)	Javed Ihsan, Dr. M. Azhar Iqbal and Javed Anwar Shah
Project duration	2018
Location	Faisalabad (PRI)
Treatments	10 advance lines/Varieties
Methodology	Each entry will be planted in 3 meter long and 30cm apart single row during the 1 st 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 <i>et al.</i> , 2011).

Previous Years Results

REACTION	LINES/ VARIETIES
Highly Resistant	-
Resistant	CP-001,CP-017,CP-021,CP-025,CP-030,CP-032,CP-034,CP-037,CP-049 and CP-072
Moderately Resistant	-
Moderately Susceptible	-
Susceptible	-
Highly Susceptible	-

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

Objectives	To select Mungbean cultivars/ lines resistant/ tolerant to <i>Cercospora canesens</i> for use in hybridization programme.
Research worker(s)	Javed Ihsan, Dr. M. Azhar Iqbal and Javed Anwar Shah
Project duration	2018
Location	Faisalabad (PRI)
Treatments	20 lines/ Varieties
Methodology	Each Entry will be planted in 3 meter long and 30 cm apart single row during the first week of July having three replications. A susceptible line 14003 will be sown as spreader after every two test entries. The severity of disease will be recorded by using scale 0-9 (C.D.MAYEE & V.V DATAR, 1986) in natural conditions.

**Previous Years
Results**

Scale	Reaction	Lines / Varieties
0	Immune	-
1	Highly Resistant	-
3	Resistant	-
5	Moderately Resistant	14001,14004,14005, 14006,14007,NM-16 and Azari
7	Susceptible	14002,14003
9	Highly Susceptible	-

32. 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) Javed Ihsan, Dr. M. Azhar Iqbal and Javed Anwar Shah

Project duration 2018

Location Faisalabad (PRI)

Treatments Variety = 14003

- T₁ Amistar Top 325 SC@ 200ml/ Acre
 T₂ Score 250 EC@ 120 ml/Acre
 T₃ Revus 250 EC @ 200ml / Acre
 T₄ Cymoxanil+ Mancozeb 250 gm/Acre
 T₅ Metalaxyl+ Mancozeb 250gm/Acre
 T₀ Control (H₂O)

Methodology

Cercospora leaf spot (CLS) susceptible variety 14003 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. The severity of disease will be recorded after 7 days interval by using scale 0-9 (C.D.MAYEE & V.V DATAR, 1986)

**Previous Years
Results**

S.No.	Treatments	Disease Severity %	% Decrease over Control
1	Amistar Top 325 SC	10.00 BC	75.99
2	Score 250 EC	6.66 C	84.01
3	Revus 250EC	15.00 B	63.99
4	Cymoxamil+Mancozeb	13.33 B	68.00
5	Metalaxyl+ Mancozeb	11.66 BC	72.01
6	Control	41.66 A	-

E. BACTERIOLOGY

33. TITLE RESPONSE OF MUNGBEAN TO RHIZOBIUM AND PGPR CO-INOCULATION

Objectives	To identify the best suited Rhizobium-PGPR co- inoculation for optimum mung bean production
Research workers	Dr. Shakeel Ahmad Anwar and Muhammad Sajjad Saeed in collaboration with Soil Bacteriology Section, AARI, FSD.
Project duration	2017-2019
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: = 4 m x 1.2 m
	Row spacing: = 30 cm
	Plant spacing: = 10 cm
	Sowing date: = 15 June – 15 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, 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	15.0	37.4	2.60	11.3	50.47	1799
T2	19.0	44.3	4.20	19.2	56.64	2479
T3	18.8	40.7	3.53	15.8	55.21	2403
T4	18.5	40.1	3.27	15.1	54.52	2306
T5	19.0	41.5	3.47	14.3	53.70	2229
T6	18.3	40.8	3.53	15.3	54.92	2111

Treatments	Ash	Crude Protein	Crude Fat	Crude Fiber
	←----- % -----→			
T1	3.45	22.57	0.96	3.29
T2	3.82	23.97	1.17	4.04
T3	3.94	23.71	1.07	4.18
T4	3.81	23.89	1.14	4.13
T5	4.20	23.97	1.16	4.49
T6	4.04	24.78	1.23	4.45

34. TITLE **NUTRITIONAL QUALITY EVALUATION OF MUNGBEAN GENOTYPES DUE TO MICROBIAL INOCULATION**

Objectives To improve the nutritional value of Mung bean through microbial inoculation.

Research Workers Dr. Shakeel Ahmad Anwar, Muhammad Sajjad Saeed

Duration 2017(Continuous)

Location Faisalabad

Treatments Lay out = Split Plot
Replication = 3
Plot Size = 4m x1.2 m
Row spacing = 30cm
Plant Spacing = 10cm
Sowing Date =15 June -15 July

Varieties:

15003
14005
15005
08009
Azri-2006
NM-16

Methodology 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
15003	16.3	39.6	3.9	20.3	54.0	4.3
14005	16.5	56.7	3.9	20.2	63.6	4.9
15005	16.5	36.7	3.3	22.3	51.7	3.8
08009	16.5	36.5	3.3	21.5	42.2	3.5
AZRI-2006	17.0	36.2	3.6	21.2	45.1	4.3
NM-16	17.5	36.5	2.8	21.8	42.3	3.7

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)
15003	8.9	39.03	2007	11.1	42.50	2382
14005	8.8	40.41	1410	11.8	42.53	1931
15005	10.8	39.42	1694	15.1	41.47	1993
08009	15.3	46.97	2201	21.5	48.80	2930
AZRI-2006	15.5	41.49	2090	19.1	43.45	2777
NM-16	7.9	53.56	1833	9.8	55.87	2097

Name of genotypes	Un-inoculated				Inoculated			
	Ash (%)	Crude Protein (%)	Crude Fat (%)	Crude Fiber (%)	Ash (%)	Crude Protein (%)	Crude Fat (%)	Crude Fiber (%)
15003	3.58	23.42	1.12	3.92	3.96	23.91	1.32	4.93
14005	3.70	23.57	1.19	3.77	3.87	25.35	1.35	3.91
15005	3.44	23.91	1.19	4.22	3.88	24.82	1.22	4.87
08009	3.69	23.77	1.19	4.51	4.01	23.89	1.41	5.15
AZRI-2006	3.75	24.01	1.14	4.13	4.04	24.01	1.18	4.46
NM-16	3.68	23.60	1.14	3.84	3.90	24.21	1.22	4.12

35. TITLE NUTRITIONAL QUALITY EVALUATION OF MASH GENOTYPES DUE TO MICROBIAL INOCULATION

Objectives To improve the nutritional value of mash through microbial inoculation

Research Workers Dr. Shakeel Ahmad Anwar, Amer Hussain and Muhammad Shafiq

Duration 2017(Continuous)

Location Faisalabad

Treatments Lay out = Split Plot
 Replication = 3
 Plot Size = 4m x1.2 m
 Row spacing = 30cm
 Plant Spacing = 10cm
 Sowing Date =15 June -15 July
 Varieties:

15 M 002

15 M004

15 M 001

15 M008

Mash 97

Arooj 2011

Methodology

Recommended doses (25-60 N, P kg/ha) of fertilizer will be applied at sowing. Following RCBD with three replications. One set of treatment 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, hard grain and phosphorus etc.

Previous Year's Results

Name of genotypes	Un-inoculated			Inoculated		
	Nodules plant ⁻¹	1000 grain weight (g)	Grain yield (kg ha ⁻¹)	Nodules plant ⁻¹	1000 grain weight (g)	Grain yield (kg ha ⁻¹)
15 M 001	17.3	41.57	990	28.3	42.80	1005
15 M 002	16.3	46.47	1069	28.0	48.80	1104
15 M 004	17.0	43.50	991	29.3	45.53	1031
15 M 008	17.2	40.50	955	28.5	43.07	974
Mash 97	17.3	43.50	1166	28.8	46.10	1186
Arooj2011	23.0	43.13	955	30.8	45.53	975

Name of genotypes	Un-inoculated				Inoculated			
	Ash (%)	Crude Protein (%)	Crude Fat (%)	Crude Fiber (%)	Ash (%)	Crude Protein (%)	Crude Fat (%)	Crude Fiber (%)
15 M 001	3.40	22.10	1.10	3.52	3.89	24.03	1.23	3.75
15 M 002	3.30	21.85	1.09	3.13	3.48	23.65	1.21	3.56
15 M 004	3.26	22.51	1.14	3.22	3.75	25.07	1.19	3.58
15 M 008	3.43	23.07	1.06	3.41	3.82	24.30	1.19	4.01
Mash 97	3.55	22.64	1.11	3.34	3.55	23.19	1.21	3.72
Arooj 2011	3.28	20.98	1.14	3.39	3.80	23.41	1.19	3.79

36. TITLE**BIOFORTIFICATION OF KHARIF PULSES BY ZINC AND IRON APPLICATION****Objectives**

Zinc (Zn) and Iron (Fe) deficiencies has 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, Muhammad Sajjad Saeed and Muhammad Shafiq

Duration

2018-2021

Location

Faisalabad

Treatments

- 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 & 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 Mung bean and Mash
Layout: = RCBD
Treatments: = 10
Replication: = 3
Plot size: = 4m x 1.2 m
Row spacing: = 30cm
Plant spacing: = 10 cm
Sowing date: = 15 June -15 July

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 First Year
RESULTS