ANNUAL REPORT

OILSEEDS

2015-2016

OILSEEDS RESEARCH INSTITUTE

FAISALABAD

FOREWORD

Pakistan is facing a huge shortage in edible oil and local production is hardly satisfying about 1/3rd.of its consumption requirements. The Oilseeds Research Institute, Faisalabad is carrying out research for increasing oilseed yields to narrow down the gap between domestic production and consumption of edible oil.

The breeding of different oilseed crops for better varieties is the major objective of the Directorate. In addition to this, Pathological, Entomological, Agronomical and Oil Technological aspects of the oilseed crops are also being considered. Breeding endeavor leads to the evolution of better crop varieties while agronomic research is generating production technologies to exploit their genetic potential. Research efforts in Pathology and Entomology disciplines not only help in controlling the pests but also aid in the development of resistant/tolerant varieties against disease & insects. The oil technology laboratory is providing assistance on technical basis to improve quantity and quality of oil in new cultivars.

The results of the efforts made by the Directorate of oilseeds during the year

2015-2016 are presented in this report for the information & benefit of the interested Research Scientists, Students, Extension Workers and Policy Planners.

(MUHAMMAD AFTAB)

DIRECTOR

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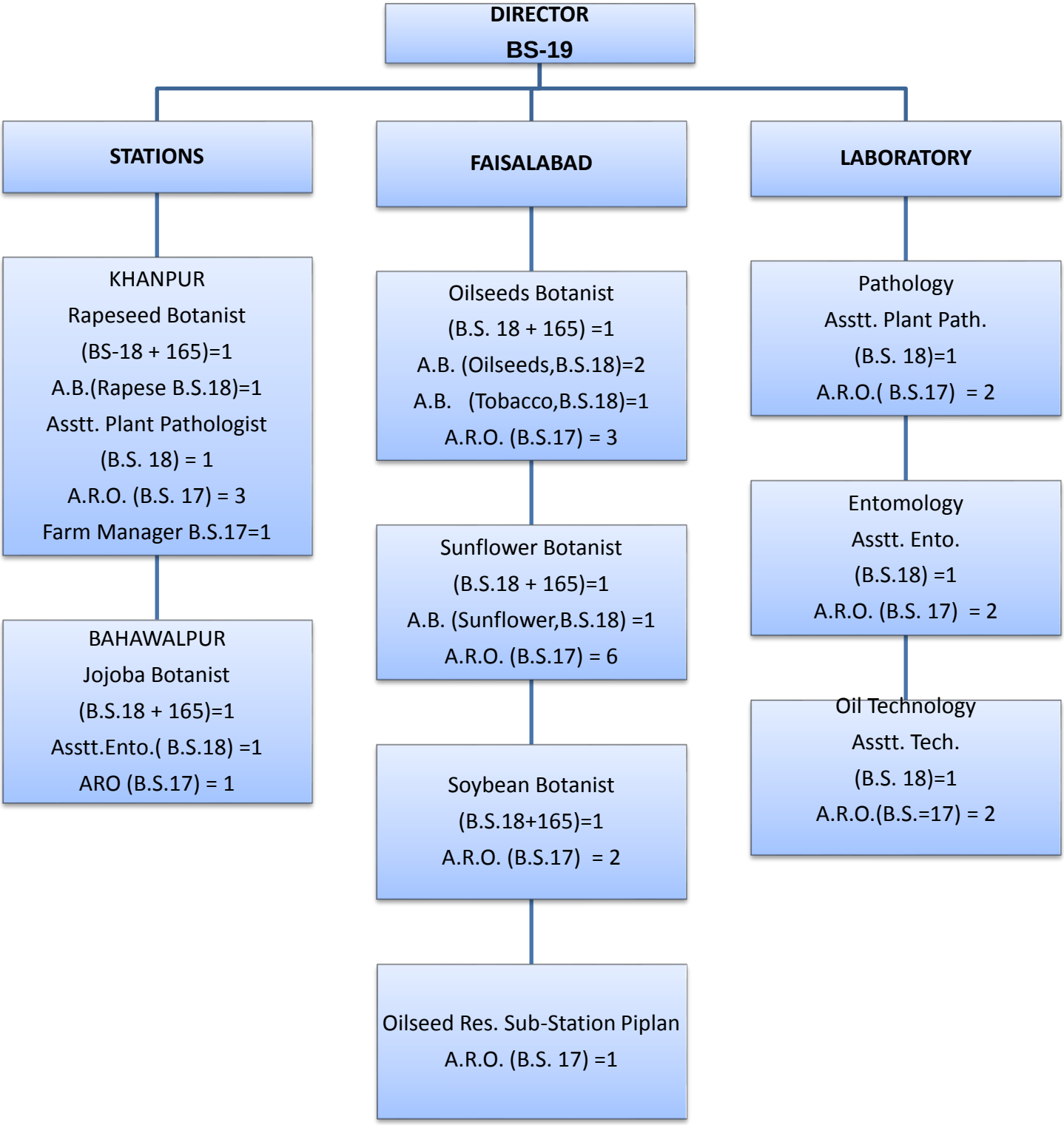
DIRECTOR
BS-19
STATIONS
FAISALABAD
LABORATORY
KHANPUR
Rapeseed Botanist
(BS-18 + 165)=1
A.B.(Rapese B.S.18)=1
Asstt. Plant Pathologist
(B.S. 18) = 1
A.R.O. (B.S. 17) = 3
Farm Manager B.S.17=1
BAHAWALPUR
Jojoba Botanist
(B.S.18 + 165)=1
Asstt.Ento.(B.S.18) =1
ARO (B.S.17) = 1
Oilseeds Botanist
(B.S. 18 + 165) =1
A.B. (Oilseeds,B.S.18)=2
A.B. (Tobacco,B.S.18)=1
A.R.O. (B.S.17) = 3
Sunflower Botanist
(B.S.18 + 165)=1
A.B. (Sunflower,B.S.18) =1
A.R.O. (B.S.17) = 6
Soybean Botanist
(B.S.18+165)=1
A.R.O. (B.S.17) = 2
Oilseed Res. Sub-Station Piplan
A.R.O. (B.S. 17) =1
Pathology
Asstt. Plant Path.
(B.S. 18)=1
A.R.O.(B.S.17) = 2
Entomology
Asstt. Ento.
(B.S.18) =1
A.R.O. (B.S. 17) = 2
Oil Technology
Asstt. Tech.
(B.S. 18)=1
A.R.O.(B.S.=17) = 2

Botanical Description			
S.No.	***Common Name***	***Botanical Name***	***Chromosome No.***
A	**Edible Oilseed Crops**		(2n)
1	Rapeseed		
	Toria	*Brassica campestris*var.Toria	20
	Ghobisarson (DGL)	*Brassica napus*spp.Oleifera	38
	Bhurisarson (BSA)	*Brassica campestris* var. Brown sarson.	20
	PeeliSarson	*Brassica campestris* var. yellow sarson.	20
2	Mustard		
	Poorbi Raya/Anmol	*Brassica juncea*	36
	RL-18	*Brassica juncea*	36
	Peela Raya	*Brassica carinata*	34
	Taramira	*Eruca sativa*	22
3	Groundnut	*Arachis hypogea* L.	40
4	Sesame	*Sesamumindicum*	26
5	Sunflower	*Helianthus annuus*	34
6	Soybean	*Glycine max* L.	40
7	Safflower	*Carthamustinctorius* L.	24
B	**Non Edible Oilseeds**		
1	Linseed	*Linumusitatisimum* L.	30
2	Castor	*Ricinuscommunis*	20
3	Jojoba	*Simmondsiachinensis*	52

LIST OF RESEARCH STAFF

S. No.	Post	Name of the incumbent	Qualification
	DIRECTOR	**Sultan Salah-ud-Din**	M.Sc.(Hons.)Agri.
1.	**OILSEEDS SECTION, FAISALABAD**		
	Oilseeds Botanist	Mr. Tariq Mehmood	M.Sc.(Hons.)Agri.
a)	**Rapeseed & Mustard**		
i.	Asstt. Botanist Tobacco)	Ms. Salsabeel Rauf	M.Sc. (Hons.) Agri.
ii.	Asstt. Res. Officer	Mr. Ejaz-ul- Hasan	M.Sc. (Hons.) Agri.
iii.	Asstt. Res. Officer	Mr. Hafiz Saad	M.Sc. (Hons.) Agri.
b)	**Sesame & Linseed**		
i.	Asstt. Res. Officer	Mr. Muhammad Anwar	M.Sc. (Hons.) Agri.
ii.	Asstt. Res. Officer	Miss. Tahira Bibi	M.Sc. (Hons.) Agri.
iii.	Asstt. Res. Officer	Mr. Fida Hussain	M.Sc. (Hons.) Agri.
c)	**Castor**		
	Asstt. Bot. (Oilseeds)	Dr. Busharat Hussain	Ph.D.
2.	**SUNFLOWER SECTION, FAISALABAD**		
i.	Sunflower Botanist	Dr. Muhammad Ali	Ph.D.
ii.	Asstt. Bot. (Sunflower)	Zahid Mehmood	M.Sc. (Hons.) Agri.
iii.	Asstt. Res. Officer	Dr. Muhammad Rafiq	Ph.D.
iv.	Asstt. Res. Officer	Mr. Muhammad Aslam	M.Sc. (Hons.) Agri.
3.	**SOYBEAN SECTION, FAISALABAD**		
i.	Soybean Botanist	Muhammad Atab	M.Sc. (Hons.) Agri.
ii.	Asstt. Res. Officer	Mrs. Najma Perveen	M.Sc. (Hons.) Agri.
iii	Asstt. Res. Officer	Miss. Natasha Kanwal	M.Sc. (Hons.) Agri.
4.	**GROUNDNUT FAISALABAD**		
i.	Asstt. Res. Officer	Mr. Muhammad Anwar	M.Sc. (Hons.) Agri.

5.	**RAPESEED RESEARCH STATION, KHANPUR**		
i.	Rapeseed Botanist	Mr. Muhammad Aslam Nadeem	M.Sc. (Hons.) Agri.
ii.	Asstt. Botanist (rapeseeds)	Muhammad Jamil	M.Sc. (Hons.) Agri.
iii.	Asstt..Plant Pathologist	Mr. M. Jamshaid Anwar	M.Sc. (Hons.) Agri.
6.	**JOJOBA RESEARCH STATION, BAHAWALPUR**		
i.	Jojoba Botanist	Mr. Syed Arif Hussain	M.Sc. (Hons.)
ii.	Asstt. Res. Officer	Mr. Zeshan Hafeez	M.Sc. (Hons.) Agri.
7.	**OILSEEDS PATHOLOGY, FAISALABAD**		
i.	Asstt. Plant Pathologist	Mr. Ehsan Mohyo-ud-Din	M.Sc. (Hons.) Agri.
ii.	Asstt. Res. Officer	Mr. Qamar Anser Tufail Khan	M.Sc. (Hons.) Agri.
iii.	Asstt. Res. Officer	Mr. Muhammad Iqbal	M.Sc. (Hons.) Agri.
8.	**OILSEEDS ENTOMOLOGY, FAISALABAD**		
i.	Asstt. Entomologist	Mr. Skindar Ali Cheema	M.Sc. (Hons.) Agri.
ii.	Asstt. Res. Officer	Mr. Quasar Abbas Khan	M.Sc. (Hons.) Agri.
9.	**OIL TECHNOLOGY, FAISALABAD**		
i.	Asstt. Res. Officer	Zafar Iqbal	M.Sc. (Hons.) Agri.
10.	**OILSEEDS RESEARCH SUB-STATION, PIPLAN**		
i.	Asstt. Res. Officer	Tanveer Ahmad Kalyar	M.Sc. (Hons.) Agri.

RAPESEED AND MUSTARD - FAISALABAD

A. ZAID KHARIF BRASSICA

Project 1. MAINTENANCE OF GENE POOL

86 entries of *B. juncea* were studied.

Project 2. DEVELOPMENT OF FRESH CROSSES

A) Thirteen crosses were made keeping ZBJ-08051as male parent (low Erucic acid and low Glucosinolates).

1. ZBJ-11035 x ZBJ-08051
2. ZBJ-12011 x ZBJ-08051
3. ZBJ-12012 x ZBJ-08051
4. ZBJ-13002 x ZBJ-08051
5. ZBJ-13007 x ZBJ-08051
6. ZBJ-14001 x ZBJ-08051
7. ZBJ-14005 x ZBJ-08051
8. ZBJ-14006 x ZBJ-08051
9. ZBJ-14011 x ZBJ-08051
10. ZBJ-14012 x ZBJ-08051
11. ZBJ-14013 x ZBJ-08051
12. ZBJ-14018 x ZBJ-08051
13. ZBJ-06012 x ZBJ-08051

Seed of each cross were collected at maturity to raise F_1 generation.

Project 3. STUDY OF FILIAL GENERATIONS

The crosses studied in different generations are given in table 1.1.

Table 1.1: Crosses/progenies studied and selections made in F_1 to F_6 summer Brassica generations during 2015-16 at Oilseeds Research Institute, Faisalabad.

Generation	No. of crosses studied	No. of progenies studied	No. of plants selected	No. of lines selected for PYT
F_1	15	-	-	-
F_2	14	Whole material	124	-
F_3	12	64	68	-
F_4	12	44	34	-
F_5	10	30	31	-
F_6	09	20	-	14

All F_1 crosses were harvested to rise F_2 generation. From 14 F_2 crosses, 124 desirable plants were selected. In F_3 to F_5 generations, the best progenies were selected and from each of those, one desirable plant was selected to rise next generation. In F_6, 14 progenies were selected for seed yield evaluation in preliminary yield trial.

Project 4. **YIELD TRIALS**

a) Preliminary Yield Trial*(B. juncea)*

Sixteen *B. juncea* lines were tested along with the standard variety "Raya Anmol and Toria". The data collected on seed yield and other agronomic traits are given in table 1.2.

Table 1.2: Performance of 16 entries for seed yield and other parameters in Preliminary Yield Trial at Oilseeds Research Institute, Faisalabad during Zaid Kharif 2015-16.

Rank	Line/Variety	Days to Flowering	Days to Maturity	Plant Height (cm)	Branches/ Plant	Seed Yield (kg/ha)
1	ZBJ-15021	58	140	179	7	2667
2	ZBJ-14017	56	137	191	7	2469
3	ZBJ-15020	58	139	215	9	2377
4	ZBJ-15023	55	136	179	7	2343
5	ZBJ-13013	59	140	198	8	2241
6	Raya Anmol (C)	56	138	163	7	2207
7	ZBJ-15016	51	134	183	9	2086
8	ZBJ-15018	52	135	191	8	2080
9	ZBJ-15009	55	137	215	9	2068
10	ZBJ-15019	57	138	217	8	1895
11	ZBJ-14019	56	137	207	8	1790
12	ZBJ-06012	49	133	178	7	1756
13	ZBJ-14009	59	141	218	9	1744
14	ZBJ-15022	58	139	190	7	1698
15	ZBJ-15003	52	135	195	9	1633
16	Toria (C)	48	132	145	10	1528
					LSD 5%	**279**

Design	R.C.B.
Plot size	6m x 0.90 m
Row spacing	45 cm
Fertilizer	75: 75 kg NP/ha
Sowing date	15.09.2015

The perusal of table 1.2 indicates that ZBJ-15021 gave highest yield i.e., 2667 kg/ha fallowed by ZBJ-14017i.e., 2469 kg/ha. Days to flowering ranged from 48- 59 and days to maturity 132 - 141.

b) Advanced seed yield trial

Fifteen *B. juncea* lines were evaluated along with Raya Anmol and Toria. The results are presented in table 1.3.

Table 1.3: Performance of 15 entries of advanced seed yield trial, 2015-16 at Oilseeds Research Institute, Faisalabad.

Rank	Line/Variety	Days to Flowering	Days to Maturity	Plant Height	Branches/ Plant	Yield (kg/ha)
1	ZBJ-14013	53	135	216	10	2218
2	ZBJ-13012	56	139	204	10	2214
3	ZBJ-14011	58	139	193	9	2128
4	ZBJ-13015	53	138	217	8	2115
5	ZBJ-14018	55	138	193	8	2058
6	Raya Anmol (C)	50	133	188	9	2045
7	ZBJ-14005	56	135	225	10	2037
8	ZBJ-06012	52	134	162	8	2037
9	ZBJ-13006	59	137	221	10	1988
10	ZBJ-14012	56	136	198	10	1860
11	ZBJ-13007	54	134	191	11	1798
12	ZBJ-13002	56	140	216	10	1765
13	ZBJ-14001	55	134	202	9	1745
14	ZBJ-14016	50	133	182	8	1551
15	Toria (C)	48	131	150	11	1327
					LSD 5%	**290**

Design	R.C.B
Plot size	6 x 1.35 m
Row spacing	45 cm
Fertilizer	75:75 NP kg/ha
Sowing date	15.09.2015

The perusal of table 1.3 indicates that ZBJ-14013 gave highest yield i.e. 2218 kg/ha. Days to flowering ranged from 48 to 59. Toria flowered earliest (48 days) and matured earliest by taking 1318 days and ZBJ-14001 was the last in maturity (140 days).

Project 5. **ZONAL TRIALS**

Yield performance of 11 lines of *B. juncea* was tested under different agro- climatic conditions of the province. The results obtained from four locations are given in table 1.4 (a) and 1.4 (b).

Table 1.4 (a): Performance of *B. juncea* strains at different locations in the Punjab during Zaid Kharif 2015-16

RANK	Lines/Variety	F/Abad	Piplan	Bahawalpur	V & O	Avg.
1	ZBJ-10212	2531	2192	2685	2006	2354
2	ZBJ-11002	2562	2314	1481	2840	2299
3	Raya Anmol (C)	2238	1698	2593	2531	2265
4	ZBJ-10021	2670	1698	2500	2160	2257
5	ZBJ-12011	2778	1636	2407	2130	2238
6	ZBJ-08051	2238	1944	2685	2037	2226
7	ZBJ-11035	2377	1944	2315	2006	2161
8	ZBJ-13004	2577	1544	2593	1883	2149
9	ZBJ-12002	2685	1544	2500	1481	2053
10	ZBJ-06012	1821	1914	2315	2160	2053
11	Toria (C)	1404	1420	1667	1415	1477
LSD 5%		**255**	**181**	**203**	**397**	

Perusal of the table 1.4 (a) indicated that ZBJ-10212 surpassed all the entries included in the trial by giving seed yield of 2354 kg/ha while lowest yield was taken by Toria (1477 kg/ha), whereas Raya Anmol, the standard Variety, produced the seed yield of 2265 kg/ha.

Table 1.4 (b): Others parameters of advanced lines of zonal varietal trial, 2015-16 recorded at Oilseed Research Institute, Faisalabad.

Rank	Line/Variety	Days to Flowering	Days to Maturity	Plant Height	Branches/ Plant	Yield (kg/ha)
1	ZBJ-12011	53	134	198	8	2778
2	ZBJ-12002	56	136	206	6	2685
3	ZBJ-10021	52	133	190	8	2670
4	ZBJ-13004	53	134	199	8	2577
5	ZBJ-11002	53	134	198	7	2562
6	ZBJ-10212	54	135	213	6	2531
7	ZBJ-11035	53	133	208	7	2377
8	ZBJ-08051	55	135	209	7	2238
9	Raya Anmol(C)	56	133	174	7	2238
10	ZBJ-06012	51	133	220	6	1821
11	Toria(C)	50	132	177	9	1404
					LSD 5%	**255**

Design R.C.B.
Plot size 5 x 1.8 m

Row spacing	45 cm
Fertilizer	75:75 N:P kg/ha
Sowing date	15.09.2015

Perusal of the table 1.4 (b) indicated that eight lines surpassed the standard varieties Raya Anmol in seed yield. Days to flowering ranged from 50-56 days and days to maturity 133–136.

B. WINTER RAPESEED– FAISALABAD

Project 1. MAINTENANCE OF GENE POOL

80 entries of *B. juncea*

83 entries of *B. napus*

21 entries of *B. campestris*

03 entries of *B. carinata*

04 entries of *Eruca sativa* were studied.

Project 2 . DEVELOPMENT OF FRESH CROSSES

Following fresh crosses were made. Enough seed of each cross was saved for growing F_1 generation.

Sr.No.	Crosses
1.	KN-263 x RBN-13018
2.	KN-265 x RBN-13018
	SONG-2 x RBN-13018
3.	KN-272 x RBN-13018
4.	KN-277 x RBN-13018
5.	12CBN-001 x RBN-13018
6.	13CBN005x RBN-13018
7.	RBN-08004 x RBN-13018
8.	RBN- 09038 x RBN-13018
9.	RBN- 13028 x RBN-13018
10.	

Project 3. STUDY OF FILIAL GENERATIONS

The breeding material studied in F_1 to F_6 generations is given in table 1.5.

Table 1.5

Generations	No. of Crosses Studied	No. of Progenies Studied	No. of Plants Selected	No. of lines Selected for PYT
F_1	10	-	**Whole material**	-
F_2	10	Whole material	86	-
F_3	10	83	61	-
F_4	10	67	59	-
F_5	7	53	45	-
F_6	5	24	37	-
F_7	3	18	-	**08**

Each F_1 cross was harvested separately to advance the generation. Selection in F_2 to F_7 generations was based on desirable phenotypic manifestation of traits such as vigor of the plants, earliness and tolerance to diseases and insects along with seed yield of the selected plants.

86 plants were selected from 10 crosses of F_2 generation to raise F_3 generation.In F_3 generation, 61 plants were selected to raise F_4 in the next year. In F_4 generation, 59 plants were selected to raise F_5 generation. In F_5 generation 45 plants from 53 progenies derived from 7 crosses were selected. In F_6 generation 37 plants from 24 progenies derived from 5 crosses were selected. In F_7 generation, 08 lines were selected for PYT out of 18 progenies of 3 crosses.

Project 4. PRELIMINARY YIELD TRIAL

Eleven *B. napus* strains were evaluated along with Faisal canola as standard variety. The data obtained are given in table 1.6

Table 1.6

Rank	Line/Variety	Days to50% Flowering	Days to Maturity	Plant Height (cm)	Branches/ Plant	Seed Yield (kg/ha)
1	RBN-14030	97	149	142	6	2362
2	RBN-14034	98	155	168	7	2282
3	RBN-14013	96	154	200	7	2118
4	Faisal canola (C)	84	156	187	6	1830
5	RBN-14017	94	155	199	8	1718
6	RBN-14008	97	156	170	6	1644
7	RBN-14007	93	157	174	6	1622
8	RBN-14005	93	158	148	6	1452
9	RBN-14006	89	156	172	6	1414
10	RBN-14009	79	152	170	5	1244
11	RBN-14026	97	153	168	7	1170
					LSD 5%	**160**

Design	RCB
Plot size	5 m x 0.90 m
Repeats	3
Sowing date	17.10.2015
Date of harvesting	25.03.2016

RBN-14009took minimum days (79) to 50% flowering and maximum days (98) were taken by RBN-14034. As for as days to maturity are concerned, RBN-14030 took minimum days (149) while RBN-14005 took maximum days (158). RBN-14030 gave maximum yield (2362 kg/ha) followed by RBN-14034, which gave 2282 kg/ha.

Project 5. Advanced Seed Yield Trial

Fourteen *B .napus* strains were evaluated along with Faisal Canola as standard variety for seed yield and other agronomic traits. The data recorded are given in table 1.7.

Table 1.7

Rank	Line/Variety	Day of Flowering	Days to Maturity	Plant Height (cm)	Branches /Plant	Seed Yield (kg/ha)
1	RBN-13017	103	152	184	5	2312
2	RBN-13029	104	152	191	6	2259
3	RBN-13022	103	151	187	6	2204
4	RBN-13018	104	150	175	6	2126
5	RBN-13012	108	153	207	8	2075
6	RBN-13015	107	154	185	5	2075
7	RBN-13016	103	151	184	7	1964
8	RBN-13030	105	151	189	8	1964
9	RBN-11048	74	150	188	7	1740
10	RBN-12049	85	151	174	6	1704
11	RBN-12038	86	152	190	8	1533
12	Faisal canola (C)	81	151	175	6	1518
13	RBN-13033	106	150	181	7	1500
14	RBN-13008	105	152	211	7	1260
					LSD 5%	**254**

Design	RCB
Plot size	5 m x 1.35 m
Repeats	3
Sowing date	17.10.2015
Date of harvesting	25.03.2016

Minimum days of flowering (74) were taken by RBN-11048and maximum (108) by RBN-13012. RBN-13017 surpassed all entries in yield (2312 kg/ha) followed by RBN-13029 (2259 kg/ha) as compared to Faisal Canola which gave seed yield 1518 kg/ha.

Project 6. MICRO YIELD TRIAL

Nine *B. napus* strains were evaluated along with Faisal canola for seed yield & other agronomic traits. The data recorded are given in table 1.8 (a).

Table 1.8 (a) Seed Yield (kg/ha) of Nine entries of *B. napus*in Micro Yield Trial conducted over 9 locations in Punjab, 2015-2016

Rank	Line/Variety	FSD	V&O	BWP	BHK	K/pur	F/J	CHK	Karore	Piplan	Avg.
1	RBN-11049	1538	1636	1778	1469	1975	1194	1580	2192	1381	1638
2	RBN-13028	1461	1882	1511	1255	2006	572	1927	2144	1759	1613
3	**Faisal canola (C)**	1503	1543	1589	1556	1759	876	2037	2002	1590	1606
4	KN-277	1889	1512	1363	1178	1991	852	1562	2028	1605	1553
5	RBN-13019	1052	1266	1711	1226	1528	819	2109	2170	1512	1488
6	KN-263	1289	1666	1322	1529	1898	663	1816	1861	1219	1474
7	RBN-09038	1334	1667	1663	1265	1836	1158	1699	1710	887	1469
8	13CBN-005	1130	1574	1504	1087	1960	713	1807	1625	1412	1424
9	13CBN-006	1037	1450	1496	1635	1590	1020	1551	1422	1242	1383
	LSD5%	**234**	**236**	**109**	**273**	**178**	**122**	**191**	**121**	**78**	

Perusal of the table 1.8 (a) indicated that RBN-11049surpassed all the entries included in the trial by giving seed yield of 1638 kg/ha closely followed by RBN-13028 (1613 kg/ha).

Table 1.8 (b): Other parameters of advance lines of micro varietal trial recorded at the Oilseeds Research Institute, Faisalabad during 2015-2016

Rank	Line/Variety	Days to 50% Flowering	Days to Maturity	Plant Height (cm)	Branches/ Plant	Yield (Kg/ha)
1	KN-277	89	154	5	191	1889
2	RBN-11049	77	149	6	177	1538
3	Faisal Canola	81	151	8	175	1503
4	RBN-13028	98	152	7	179	1461
5	RBN-09038	75	150	6	172	1334
6	KN-263	79	153	6	187	1289
7	13CBN-005	87	155	6	195	1130
8	RBN-13019	97	150	5	175	1052
9	13CBN-006	85	152	4	168	1037
					LSD5%	**234**

Plot size	5 m x 1.35 m
Repeats	3
Date of Sowing	17.10.2015
Date of Harvesting	25.03.2016

Project 7. NATIONAL UNIFORM RAPESEED YIELD TRIAL (NURYT)

The objective of this trial was to test the performance of rapeseed varieties under Faisalabad environmental conditions. This trial was sown with the material supplied by the Pakistan Agricultural Research. The data recorded are given in table 1.9.

Table 1.9

Results of National Uniform Rapeseed Yield Trial conducted at 11 locations (Rabi 2015-16)

Sr. No	Entry Name	NARC Isd	BARI CHK	ORI F/abad	RARI B-pur	ORS K-pur	Pioneer Sahiwal	BARS Kohat	AZRC DIKhan	NIFA Peshawar	ARI T-jam	ARI Quetta	Mean
1	RBN-13018	2713	2281	1515	1444	1729	1196	2008	2770	2206	923	946	1794
2	SONG-1	1990	1767	1426	1383	1396	1510	1842	2374	**3783**	1183	642	1754
3	**Hyola 401(C)**	2168	1761	1363	1575	1625	1452	2083	2817	2400	983	923	1741
4	HBO-3	2632	1739	1135	814	1188	1771	2167	1973	3111	1088	918	1685
5	KN-256	2115	1998	1189	1314	1854	1654	1758	2288	1961	1348	918	1672
6	SONG-2	1717	1640	1120	1600	792	1713	2750	1799	3211	873	316	1594
7	KN-265	1486	1931	1163	942	1896	1675	1833	2494	1944	1334	739	1585
8	HBO-728	2202	2126	635	689	813	1642	1933	1630	3767	967	1020	1584
9	HBO-1	2149	1694	1030	1069	688	1533	1508	2407	3378	994	587	1549
10	CRH-119	1923	1703	1219	825	1792	1429	1800	2438	2306	1048	542	1548
11	HBO-5	2239	1974	956	950	625	1229	1817	1782	3589	856	1015	1548
12	RM-1/09-39	1884	1737	1320	794	1833	1435	1467	2698	2067	858	929	1547
13	AZRI Rapeseed	1138	1428	935	1183	1750	2021	1425	**3071**	1906	1216	856	1539
14	RBN-08004	2081	2032	1344	1150	2104	1404	1233	2020	1672	1369	440	1532
15	08-1/2-7	1645	1625	1269	833	1854	1631	1550	2487	1733	1283	779	1517
16	CRH-81	2130	1739	1122	797	1875	1450	1325	1883	2633	845	567	1488
17	11CBN-006	1510	1823	1320	1092	1917	1485	1767	2127	1300	1048	983	1488
18	**Faisal Canola (C)**	1469	1777	1254	1131	1750	1652	1492	2509	1556	1112	530	1476
19	CRH-388	1723	1923	1004	1200	1000	1494	1750	2130	1850	1064	1003	1467
20	DNC-23	1539	1739	1000	856	1521	1621	1892	2075	1539	883	552	1383
21	CRH-80	1464	1240	804	867	938	1552	1517	2218	2322	812	701	1312
22	UAF-11	723	1337	1215	603	-	1179	2117	1627	883	923	339	1095

Entries	22
Design	RCB
Repeats	4
Plot size	5 m x 1.35 m
Sowing date	22.07.2015
Harvesting date	25.03.2016

Perusal of the table 1.9 indicated that RBN-13018 gave the highest seed yield of 1794 kg/ha than check i.e. Hyola 401and Faisal Canola 1741&1476 kg/ha respectively. The variety UAF-11 gave the lowest seed yield (1095 kg/ha).

C. WINTER MUSTARD, FAISALABAD (2015-16)

Project 1. DEVELOPMENT OF FRESH CROSSES

Following fresh crosses were made. Enough seed of each cross was saved for growing F_1 generation.

S.No. Crosses

1. RBJ-13029 x ZBJ-08051
2 RBJ-13030 x ZBJ-08051
3. RBJ-14002 x ZBJ-08051
4. RBJ-14012 x ZBJ-08051
5. RBJ-14020 x ZBJ-08051
6. RBJ-14021 x ZBJ-08051
7. BRJ-1004 x ZBJ-08051
8. BRJ-1103 x ZBJ-08051
9. KJ-221 x ZBJ-08051
10. KJ-230 x ZBJ-08051

Project 2. STUDY OF FILIAL GENERATIONS

The breeding material studied in F_1 to F_7 generations is given in table 1.10.

Table 1.10

Generations	No. of crosses studied	No. of Progenies Studied	No. of plants selected	No. of lines selected for PYT
F_1	10	-	**Whole material**	-
F_2	12	Whole material	96	-
F_3	11	80	78	-
F_4	8	50	37	-
F_5	6	40	32	-
F_6	6	42	24	-
F_7	6	20	-	11

Each F_1 cross was harvested separately to advance the generation. Selection in F_2 to F_7 generations was based on desirable phenotypic manifestation of traits such as vigour of the plants, earliness and tolerance to diseases and insect pests along with seed yield of the selected plants.

96 plants were selected from 12 crosses of F_2 generation to raise F_3 generation. In F_3 generation, 78 plants were selected to raise F_4 in the next year. In F_4 generation, 37 plants were selected to raise F_5 generation. In F_5 generation 32 plants from 40 progenies derived from 6 crosses were selected. In F_6 generation 24 plants from 42 progenies derived from 6 crosses were selected. In F_7 generation, 11 lines were selected for PYT out of 20 progenies of 6 crosses.

Project 3.PRELIMINARY YIELD TRIALS

Fourteen *B. juncea* strains were evaluated along with Khanpur Raya as standard variety. The data recorded are given in table 1.11.

Table 1.11

Rank	Line/ Variety	Days to 50% Flowering	Days to Maturity	Plant Height (cm)	No of Branches	Yield (kg/ha)
1	RBJ-15016	74	152	234	6	2740
2	RBJ-15007	85	153	249	6	2252
3	RBJ-14010	72	150	237	6	2170
4	RBJ-15015	86	154	241	6	2126
5	RBJ-15019	70	150	235	6	2060
6	RBJ-15017	81	153	229	6	1962
7	RBJ-14017	75	149	234	6	1912
8	RBJ-15018	71	152	236	6	1800
9	RBJ-15012	70	150	223	5	1756
10	RBJ-15013	60	153	219	5	1740
11	RBJ-15011	61	151	215	5	1570
12	RBJ-15009	64	149	224	6	1356
13	Khanpur Raya (C)	73	151	234	6	1192
14	RBJ-15006	64	151	227	5	1044
					LSD 5%	**221**

Design	RCB
Plot size	5 m x 0.90 m
Repeats	3
No. of rows	2
Sowing date	17.10.2015
Date of harvesting	25.03.2016

RBJ-15013 took minimum days (60) to 50% flowering and maximum days (86) were taken by RBJ-15015. As for as days to maturity are concerned, RBJ-14017 and RBJ-15009 took minimum days (149) while RBJ-15015took maximum days (154).RBJ-15016gave maximum yield (2740 kg/ha) followed by RBJ-15007 which gave 2252 kg/ha.

Project 4. ADVANCED SEED YIELD TRIAL

Thirteen (*B. juncea*) strains were evaluated along with Khanpur Raya as standard varieties for seed yield and other agronomic traits. The data recorded are given in table 1.12.

Table 1.12

Rank	Line/Variety	Days to 50% Flowering	Days to Maturity	Plant Height (cm)	Branches/ Plant	Yield (Kg/ha)
1	RBJ-13029	58	147	200	7	2508
2	RBJ-14011	80	153	220	8	2128
3	RBJ-13033	57	150	188	4	1990
4	RBJ-13051	63	146	163	6	1966
5	RBJ-14012	73	151	195	6	1946
6	RBJ-11008	66	150	161	6	1936
7	RBJ-12018	74	152	187	4	1916
8	Khanpur Raya (C)	74	152	205	7	1812
9	RBJ-14020	75	150	231	8	1748
10	RBJ-12021	73	151	178	6	1624
11	RBJ-11048	73	151	243	6	1614
12	RBJ-14021	81	152	183	6	1418
13	RBJ-14002	72	151	196	7	1250
					LSD 5%	**330**

Design	RCB
Plot size	5 m x 1.35 m
Repeats	3
Sowing date	17.10.2015
Date of harvesting	25.03.2016

Minimum days to 50 % flowering (57) were taken by RBJ-13033 and maximum (81) byRBJ-14021. RBJ-13029surpassed all entries in yield (2508 kg/ha) followed by RBJ-14011 (2128 kg/ha).

Project 5.MICRO YIELD TRIAL (*B. juncea*)

Thirteen *B .juncea* strains were evaluated along with Khanpur Raya for seed yield & other agronomic traits. The data recorded are given in table 1.13(a).

Table 1.13 (a): Seed Yield (kg/ha) of thirteen entries of *B. juncea* in Micro Yield Trial conducted over 9 locations in Punjab, 2015-2016

Rank	Line/Variety	FSD	V&O	BHP	BHK	K/PUR	F/J	CHK	KARORE	PIPLAN	Avg.
1	KJ-230	1296	2238	1786	1223	2238	1070	1297	2456	1404	1668
2	KJ-221	1385	2284	1930	698	2315	1109	1462	1852	1728	1640
3	BRJ-1104	1185	2531	2089	803	1991	798	1518	2074	1689	1631
4	13CBJ006	963	1944	2093	1098	2377	828	1483	1604	1227	1513
5	RBJ-08015	963	2037	1830	1057	2361	823	1571	1524	1420	1510

6	Khanpur Raya (C)	1001	2191	2130	1356	2114	883	1288	1205	1250	1491
7	BRJ-1103	1097	2164	2167	974	2238	720	1156	1541	1312	1485
8	13CBJ004	1001	1945	1496	690	2037	1037	1258	1566	1759	1421
9	RBJ-12019	1163	1944	1548	826	1960	750	1438	1533	1590	1417
10	RBJ-13030	1074	2130	1930	982	1836	844	1040	1388	1119	1371
11	ZBJ-08051	1238	2161	1822	271	1559	920	1002	1236	1451	1296
12	RBJ-13046	1112	1913	1704	555	1682	749	1170	1465	1042	1266
13	ZBJ-06012	963	2160	1491	394	2022	743	1094	1083	1250	1244
	LSD5%	**214**	**297**	**272**	**245**	**140**	**66**	**167**	**130**	**70**	

Perusal of the table 1.13(a) indicated that KJ-230 surpassed all the entries included in the trial by giving seed yield of 1668 kg/ha followed by the KJ-221 (1640 kg/ha).

Table 1.13 (b): Other parameters of advance lines of micro varietal trial recorded at the Oilseeds Research Institute, Faisalabad during 2015-2016

Rank	Line/Variety	Days to 50% Flowering	Days to Maturity	Plant Height (cm)	Branches/ Plant	Yield Kg/ha
1	KJ-221	80	146	5	206	1385
2	KJ-230	70	144	6	241	1296
3	ZBJ-08051	53	143	5	196	1238
4	BRJ-1104	58	145	5	186	1185
5	RBJ-12019	69	148	5	198	1163
6	RBJ-13046	55	144	5	196	1112
7	BRJ-1103	68	144	5	197	1097
8	RBJ-13030	54	145	5	193	1074
9	13CBJ004	75	149	5	203	1001
10	Khanpur Raya (C)	76	147	4	197	1001
11	13CBJ006	73	148	5	204	963
12	ZBJ-06012	50	142	5	200	963
13	RBJ-08015	62	148	5	206	963
					LSD5%	**214**

Plot size	5 m x 1.35 m
Repeats	3
Date of Sowing	22.10.2015
Date of Harvesting	25-03-2016

Project 7. NATIONAL UNIFORM MUSTARD SEED YIELD TRIAL (NUMYT)

The objective of this trial was to observe the behavior of different Mustard varieties under Faisalabad environmental conditions. The Pakistan Agricultural Research Council, Islamabad, supplied seed. The data recorded are presented in table 1.14.

Table 1.14: Results of National Uniform Mustard Yield Trial conducted at 12 locations during Rabi 2015-16

Sr. No	EntryName	NARC Isd	BARI CHK	ORI F/abad	RARI B-pur	ORS K-pur	Pioneer Sahiwal	BARS Kohat	AZRC DIKhan	ARI Tarnab	NIFA Peshawar	ARI T-jam	ARI Quetta	Mean
1	**Coral 432 (C)**	**1579**	**1586**	**1319**	**2733**	**3042**	**1673**	**1867**	**3967**	**1374**	**2433**	**1283**	**869**	**1977**
2	45S46	1585	1629	992	3411	3313	1785	1750	2744	1059	2150	1213	862	1874
3	JS-013	1059	1476	1358	2600	3563	2223	1913	2885	893	2150	1710	644	1873
4	Rachna-743	1504	1336	1489	2939	3375	1838	1625	3073	953	1900	1179	883	1841
5	M-5121	1403	1466	1003	2272	3125	1956	2008	3163	1033	1817	1910	576	1811
6	45S35	1645	1373	1350	2481	2667	1794	1975	3368	854	1783	1329	581	1767
7	Dhoom Mustard	1177	1409	1467	2872	2542	1804	1983	2695	1201	1833	1289	684	1746
8	**KJ-228**	**1213**	**1320**	**1028**	**2622**	**2563**	**1796**	**1808**	**2962**	**1051**	**1683**	**1590**	**848**	**1707**
9	Rachna 3051	1534	1241	1133	2836	3521	1363	1725	2533	1010	1717	1138	736	1707
10	M-5222	1267	1053	1233	2664	2875	1831	1750	3273	736	1733	1309	681	1700
11	M-5666	1406	1382	1114	2653	2667	2075	1533	2415	1083	1783	1208	711	1669
12	MS-4	1524	1416	1061	2400	2375	1829	1671	2847	943	1833	1143	649	1641
13	**KJ-224**	**1392**	**1467**	**900**	**1994**	**2417**	**1804**	**2008**	**2593**	**883**	**2000**	**1165**	**805**	**1619**
14	RBJ-9072	1133	1284	986	1817	2813	1950	1992	2892	1112	1550	1157	622	1609
15	RBJ-1004	1512	1260	1161	2328	2000	1833	1792	2605	1149	1600	1325	676	1603
16	**Khanpur Raya (C)**	1098	1281	989	2342	2854	1513	1921	2748	883	1517	1176	814	1595
17	MS-2	1326	1442	869	2336	2229	1863	1658	2555	784	1833	1485	613	1583
18	**RBJ-10786**	**1104**	**1313**	**803**	**2167**	**2604**	**1896**	**1600**	**2158**	**1086**	**1583**	**1301**	**825**	**1537**
19	MS-24	1071	1192	1231	1906	2646	1692	1579	2038	768	1583	1752	806	1522
20	MS-1	1256	1411	706	1553	1875	1629	1683	2294	1119	1767	1147	589	1419
21	UAP-635-15	1062	974	792	1436	1708	1815	1721	2680	763	1350	1079	784	1347
22	Sind Raya	1065	1106	864	1658	1459	1663	1883	1928	843	1333	1458	809	1339
23	11CBJ-004	1292	996	958	1397	1917	1625	2058	1707	641	1500	1137	775	1334
24	UAP-655-15	1137	870	936	908	1667	2171	1867	1592	920	1333	1494	720	1301
25	Mingora-1	1236	1334	108	808	167	-	1942	1220	679	1117	1335	825	979
26	Mingora-2	1093	1063	792	783	158	-	2033	1444	121	483	1328	635	903

Entries	26
Design	RCB
Repeats	4
Plot size	5 m x 0.90 m
Date of Sowing	22.10.2015

Varietal behaviors were statistically highly significant. Table 1.14 further shows that Coral-432 produced the maximum seed yield of 1977 kg/ha, followed by 45S46with seed yield 1874 kg/ha.

D. HYBRID CANOLA PROGRAMME

Project 1. MAINTENANCE OF INBRED LINES (*Brassica napus*)

20 "A" & their maintainer "B" lines and 24 restorer inbred lines were planted to maintain the genetic stock and their utilization in developing new hybrids. "A" lines were maintained by crossing with their respective "B" lines whereas "B" and restorer lines were maintained through selfing.

Project 2. DEVELOPMENT OF EXPERIMENTAL HYBRIDS

A set of six "A" lines and one "R" line whereas another set with same "A" lines and a different "R" line were planted in two isolation tunnels to avoid foreign pollen contamination. "A" lines were hand pollinated with the respective "R" line. In this way, following 12 single crosses were developed and seed was harvested.

S. No.	Name of Cross	Name of Hybrid
1	786-012 x 97002R	HC-114
2	786-013 x 97002R	HC-115
3	786-015 x 97002R	HC-116
4	786-016 x 97002R	HC-117
5	786-017 x 97002R	HC-118
6	786-003 x 97002R	HC-119
7	786-012 x 97002-1R	HC-120
8	786-013 x 97002-1R	HC-121
9	786-015 x 97002-1R	HC-122
10	786-016 x 97002-1R	HC-123
11	786-017 x 97002-1R	HC-124
12	786-003 x 97002-1R	HC-125

Project 3. TESTING OF NEW CANOLA HYBRIDS

An experiment was conducted to test the performance of local canola hybrids in comparison with the imported canola hybrid Hyola-401 as standard for seed yield. The data recorded are given in table 1.15.

Table 1.15

Set-I		
RANK	**HYBRID**	**SEED YIELD (kg/ha) 2015-16**
1	FHC-89	2696
2	FHC-107	2682
3	FHC-108	2578
4	FHC-109	2340
5	FHC-111	2340
6	FHC-113	2296
7	FHC-90	2288
8	Hyola-401(C)	2252
9	FHC-110	2178
10	FHC-92	2000
11	FHC-91	1940
12	FHC-112	1852
13	FHC-93	1838
	LSD 5%	**110**

Perusal of the table 1.15 indicated that FHC-89 surpassed all the entries included in the trial by giving seed yield of 2696 kg/ha followed by FHC-107 that give yield 2682 kg/ha. The standard canola hybrid "Hyola-401" gave 2252 kg seed yield per hectare.

WINTER RAPESEED AND MUSTARD - KHANPUR:

Project 1. MAINTENANCE OF GERMPLASM

Following Germplasm comprising 90 cultivars/collections belonging to *Brassica juncea, Brassica napus, Brassica alba, Brassica campestris,Brassica trilocularis and Brassica nigra* planted for maintenance and utilization in breeding programme. True to type identity of each entry was preserved by selfing/ sibbing. Seed of each entry was collected at maturity for utilization in breeding programme.

Table 1

Species	Number of entries
Brassica juncea	37
Brassica napus	23
Brassica campestris	16
Brassica nigra	05
Brassica alba	05
Brassica trilocularis	04
Total	**90**

Project 2. **HYBRIDIZATION / DEVELOPMENT OF FRESH CROSSES**

In order to create variability for the evolution of new varieties following crosses were attempted. Enough seed of each cross was saved for growing F_1 generation.

Table 2

i) *B. napus*	**ii) *B. juncea***
1-KN-256 x KN-257	1-KJ-238 x ZBJ-08051
2-KN-259 x KN-257	2-KJ-206 x ZBJ-08051
3-KN-277 x KN-257	3-Khanpur Raya x ZBJ-08051
4-RBN-13018 x KN-257	4-Rachna-743 x ZBJ-08051
5-KN-256 x Rustam Canola	5-KJ-238 x ZBJ-06012
6-KN-259 x Rustam Canola	6-KJ-206 x ZBJ-06012
7-KN-277 x Rustam Canola	7-Khanpur Raya x ZBJ-06012
8-RBN-13018 x Rustam Canola	8-Rachna-743 x ZBJ-06012
9-KN-256 x Faisal Canola	9-KJ-238 x Coral-432
10-KN-259 x Faisal Canola	10-KJ-206 x Coral-432
11-KN-277 x Faisal Canola	11-Khanpur Raya x Coral-432
12-RBN-13018 x Faisal Canola	12-Rachna-743 x Coral-432
13-KN-256 x ECH-386	
14-KN-259 x ECH-386	
15-KN-277 x ECH-386	
16-RBN-13018 x ECH-386	
17-KN-256 x RBN-04016	
18-KN-259 x RBN-04016	
19-KN-277 x RBN-04016	
20-BN-13018 x RBN-04016	

Project 3. **STUDY OF FILIAL GENERATIONS**

The breeding material studied in F_1 to F_6 generations is given below.

Table 3

Generations	**No. of crosses studied**	**No. of progenies studied**	**No. of plants selected**	**No. of lines selected for PYT**
F_1	7	-	-	-
F_2	6	-	154	-
F_3	6	224	142	-
F_4	6	82	119	-
F_5	7	51	47	-
F_6	4	37	-	18

Each F_1 cross was harvested separately to advance the generation. Selection in F_2 to F_6 generations was based on desirable phenotypic traits such as vigor of the plant, earliness, resistance/tolerance to diseases and insects.

Project 4. JUDGEMENT OF YIELD PERFORMANCE

i. PRELIMINARY YIELD TRIAL (*B. juncea*)

Ten newly evolved strains of *B. juncea* including standard Khanpur Raya were tested at Oilseeds Research Station, Khanpur during 2015-16 for their yield performance. The trial was conducted under RCB design with 03 replications. Plot size was kept as 6.0 x 0.9 $m^{2.}$ The data recorded are given below.

Table 4

S.No.	Strains	Yield (Kg/ha)
1	**KJ-247**	**2623**
2	**KJ-248**	**2772**
3	**KJ-249**	**2160**
4	**KJ-250**	**2377**
5	**KJ-251**	**2796**
6	**KJ-252**	**2778**
7	**KJ-253**	**2593**
8	**KJ-254**	**2284**
9	**KJ-255**	**2222**
10	**Khanpur Raya**	**2315**
	LSD 5%	**254**

KJ-251produced the maximum grain yield 2796Kg/ha followed by KJ-252 with 2778 Kg/ha. while Khanpur Raya (check) produced 2315 kg/ha. grain yield

ii. PRELIMINARY YIELD TRIAL (*B. napus*)

Fifteen newly evolved strains of *B. napus* including standard Faisal Canola were tested at Oilseeds Research Station, Khanpur during 2015-16 for their yield performance. The trial was conducted under RCB design with 03 replications. Plot size was kept as 6.0 x 0.9 $m^{2.}$ The performance of strains is given below.

Table 5

S.No.	Strains	Yield (Kg/ha)
1	**KN-294**	**2747**
2	**KN-295**	**2284**
3	**KN-296**	**2346**
4	**KN-297**	**1944**
5	**KN-298**	**2068**
6	**KN-299**	**2130**
7	**KN-300**	**2222**
8	**KN-301**	**2685**
9	**KN-302**	**1914**

10	**KN-303**	**2222**
11	**KN-304**	**2068**
12	**KN-305**	**2068**
13	**KN-306**	**2438**
14	**KN-307**	**2068**
15	**Faisal Canola**	**2377**
	LSD 5%	**313**

The highest yield (2747 kg/ha) was produced by KN-294, followed by KN-301 with 2685 kg/ha.Check Faisal Canola yielded (2377 kg/ha), while Strain KN-302 proved to be most poor in performance.

i. ADVANCED YIELD TRIAL (*B. juncea*)

Ten good looking strains of *B. juncea* including standard Khanpur Raya were tested at Oilseeds Research Station, Khanpur during 2015-16 for their yield performance. The trial was conducted under RCB design with 03 replications. Plot size was kept as 6.0 x 1.35 $m^{2.}$ The data recorded are given below.

Table 6.

S.No.	Strains	*Days to 50% flowering	Yield (Kg/ha)
1	**KJ-232**	**48**	**2305**
2	**KJ-233**	**50**	**2284**
3	**KJ-234**	**62**	**2247**
4	**KJ-237**	**43**	**2078**
5	**KJ-238**	**64**	**3025**
6	**KJ-239**	**48**	**1831**
7	**KJ-240**	**58**	**1831**
8	**KJ-243**	**46**	**2284**
9	**KJ-244**	**62**	**2778**
10	**Khanpur Raya**	**64**	**2613**
	LSD 5%	**228**	

As regards yield KJ-238produced the maximum seed yield 3025Kg/ha followed by Kj-244 with (2778 kg/ha). Check Khanpur Raya ranked third with 2613 Kg/ha. KJ-237 was early to blossom than all tested entries.

ii. ADVANCED YIELD TRIAL (*B. napus*)

Ten advanced stage strains of *B.napus* along with check were evaluatedat Oilseeds Research Station, Khanpur during 2015-16 for their yield performance. Trial was conducted under RCB design with 03 replications. Plot size was kept as 6.0 x 1.35 $m^{2.}$ Performance of the strains is as under.

Table 7

S. No.	Strain/Variety	*Days to 50% flowering	Yield (Kg/ha)
1	**KN-270**	**58**	**2305**
2	**KN-276**	**68**	**2407**
3	**KN-278**	**60**	**2531**
4	**KN-279**	**59**	**2840**
5	**KN-280**	**55**	**2613**
6	**KN-281**	**47**	**2695**
7	**KN-283**	**66**	**2778**
8	**KN-287**	**68**	**1975**
9	**KN-288**	**75**	**2449**
10	**Faisal Canola**	**70**	**1872**
	LSD 5%	**200**	

The highest yield (2840 kg/ha) was produced by KN-279, followed by KN-283 with yield (2778 kg/ha). Strain KN-281 was earliest to bloom in 47 days.

Project 5. MICRO SEED YIELD TRIALS

i. MICRO SEED YIELD TRIAL (*B. juncea*)

Thirteen mustard strains were tested for their yield performance under RCB design with three replications. Plot size was kept as 6 x 1.8 m^2. Results of the trial conducted at Oilseeds Research Station Khanpur during 2015-16 are as under.

Table 8

S.No.	Strains/Varieties	Days to 50% flowering	Days to maturity	Plant height (cm)	Yield (Kg/ha)
1	**KJ-221**	**62**	**142**	**165**	**2315**
2	**KJ-230**	**64**	**145**	**190**	**2238**
3	**BRJ-1103**	**50**	**137**	**180**	**2238**
4	**BRJ-1104**	**48**	**142**	**156**	**1991**
5	**13 CBJ-004**	**64**	**139**	**138**	**2037**
6	**13 CBJ-006**	**62**	**142**	**185**	**2377**
7	**ZBJ-06012**	**40**	**140**	**165**	**2022**
8	**ZBJ-08051**	**44**	**140**	**205**	**1559**
9	**RBJ-08015**	**56**	**138**	**160**	**2361**
10	**RBJ-12019**	**60**	**150**	**165**	**1960**
11	**RBJ-13030**	**46**	**148**	**174**	**1836**
12	**RBJ-13046**	**45**	**145**	**156**	**1682**
13	**Khanpur Raya**	**62**	**144**	**185**	**2114**
				LSD 5%	**140**

Entry 13CBJ-006 produced the maximum yield 2377 kg/ha followed by RBJ-08015 with 2361 kg/ha. ZBJ-08051 was most poor yielder among tested entries with 1559 kg/ha. grain yield.

ii. MICRO SEED YIELD TRIAL (*B. napus*)

Nine strains of *B. napus* group were evaluated under RCB design with three replications at Oilseeds Research Station, Khanpur during 2015-16. Plot size was kept as 6 x 1.8 m^2. Results of the trial are given as under.

Table 9.

S.No.	Strains/Varieties	Days to 50% flowering	Days to maturity	Plant height (cm)	Yield (Kg/ha)
1	**KN-263**	**56**	**137**	**195**	**1898**
2	**KN-277**	**74**	**138**	**210**	**1991**
3	**13 CBN-005**	**76**	**138**	**212**	**1960**
4	**13 CBN-006**	**71**	**140**	**210**	**1590**
5	**RBN-09038**	**60**	**140**	**195**	**1836**
6	**RBN-11049**	**71**	**135**	**195**	**1975**
7	**RBN-13019**	**76**	**138**	**182**	**1528**
8	**RBN-13028**	**74**	**144**	**174**	**2006**
9	**Faisal canola**	**72**	**140**	**188**	**1759**
LSD 5%			**178**		

RBN-13028 performed well and gave the maximum yield (2006 kg/ha) followed by KN-277 **by** giving 1991 kg/ha.RBN-13019 proved to most poor yielder among tested entries.

OVER ALL POSITION OF VARIETIES UNDER MICRO SEED YIELD TRILS

(09 locations in Punjab)

B. napus

Rank	Line/Variety	Average
1	RBN-11049	1638
2	RBN-13028	1613
3	Faisal canola(check)	1606
4	**KN-277**	**1553**
5	RBN-13019	1488
6	**KN-263**	**1474**
	*	*
9	13 CBN-006	1383

B. juncea

Rank	Line/Variety	Average
1	**KJ-230**	**1668**
2	**KJ-221**	**1640**
	*	*
6	Khanpur Raya (check)	1491
	*	*
13	ZBJ-06012	1244

Project 6. NATIONAL UNIFORM MUSTARD YIELD TRIAL (NUMYT)

Twenty six strains were tested in this trial to assess the yield performance at Oilseeds Research Station, Khanpur during 2015-16. Yield data obtained are presented as under.

Table No.10

S.No.	Strain	Yield kg/hac.
1	JS-013	3563
2	Mingora-2	158
3	MS-2	2229
4	KJ-224	2417
5	11CBJ-004	1917
6	MS-24	2646
7	UAP-655-15	1667
8	KJ-228	2563
9	Sind Raya	1458
10	45S35	2667
11	RBJ-1004	2000
12	Dhoom Mustard	2542
13	**Khanpur Raya(C)**	2854
14	Rachna 3051	3521
15	MS-4	2375
16	Rachna-743	3375
17	UAP-635-15	1708
18	RBJ-10786	2604
19	**Coral 432 (C)**	3042
20	45S46	3313
21	Mingora-1	167
22	MS-1	1875
23	RBJ-9072	2813
24	M-5121	3125
25	M-5222	2875
26	M-5666	2667
	LSD (5%)	

JS-013 remained top in yield (3563 kg/ha) followed by strain Rachna-3051 with 3521 kg/ha. Mingora-2 proved to be poor yielder (158 kg/ha) among all tested entries.

Project 7. NATIONAL UNIFORM RAPESEED YIELD TRIAL (NURYT)

Twenty two strains were sown in this trial to assess yield performance at Oilseeds Research Station, Khanpur during 2015-16

Yield data obtained are presented in the following table No. 11

S.No	Strain	Av. yield kg/hac.
1	08-1/2-7	1854
2	HBO-1	688
3	CRH-119	1792
4	HBO-728	813
5	DNC-23	1521
6	CRH-81	1875
7	AZRI Rapeseed	1750
8	KN-256	1854
9	RM-1/09-39	1833
10	UAF-11	-
11	HBO-5	625
12	RBN-08004	2104
13	SONG-1	1396
14	**Faisal Canola (C)**	1750
15	CRH-80	938
16	SONG-2	792
17	RBN-13018	1729
18	KN-265	1896
19	HBO-3	1188
20	**Hyola 401(C)**	1625
21	CRH-388	1000
22	11CBN-006	1917
	LSD (5%)	

In this trial RBN-08004 is at the top in yield (2104 kg/ha.) followed by 11CBN-006 with 1917 kg/ha.

OVER ALL POSITION OF VARIETIES UNDER NATIONAL TRILS

NUMYT 2015-16 (12 locations in Pakistan)

Rank. #	Entry Name	Av. yield kg/hac.
1	**Coral-432 (C)**	**1977**
2	45S46	1874
3	JS-013	1873
	*	*
8	**KJ-228**	**1707**
	*	*
13	**KJ-224**	**1619**
	*	*
16	**Khanpur Raya (C)**	**1595**
	*	*
26	Mingora-2	903

NURYT 2015-16 (11locations in Pakistan)

Rank.	Entry Name	Av. yield kg/hac.
1	RBN-13018	1794
2	Song-1	1754
3	**Hyola-401 (C)**	**1741**
4	HBO-3	1685
5	**KN-256**	**1672**
6	Song-2	1594
7	**KN-265**	**1585**
	*	*
18	**Faisal Canola (C)**	**1476**
	*	*
22	UAF-11	1095

Project 8. **SOWING DATE EXPERIMENT**

In order to find out optimum sowing time for promising strains of Rapeseed KN-256 and KN-265 & Mustard KJ-224 & KJ- 228 were subjected to 6 sowing dates commencing from 20/09/2015 through 10/11/2015 at Oilseeds Research Station, Khanpur during 2015-2016.The yield data obtained are presented as under.

S.No.	Sowing Dates	KJ-224	KJ-228
1.	20.09.2015	1988	2157
2.	30.09.2015	1941	**2380**
3.	10.10.2015	**2034**	2309
4.	20.10.2015	1710	1765
5. 6.	30.10.2015 10.11.2015	1200 824	1281 948
	LSD 5%		
		S.Dates **SD*Var.**	**238** **231**
S.No.	**Sowing Dates**	**KN-256**	**KN-265**
1.	20.09.2015	1719	1904
2.	30.09.2015	**2281**	**2268**
3.	10.10.2015	2111	2160
4.	20.10.2015	1855	2071
5. 6.	30.10.2015 10.11.2015	1571 870	1478 1015
	LSD 5%		
		S.Dates	**281**
		SD*Var.	**373**

Design	Split plot design
Plot size	6.0 x 1.8 m^2
Repeats	4
Row spacing	45 cm
Fertilizer	75:75 NP Kg /ha

The seed yield data given in table showed that new varieties KN-256 (*B. napus*) gave maximum yield 2281 when sown on 30.09.2015and KJ-228(*B. juncea*) 2380 kg/ha, when sown on 30.09.2015.

Project.9. Determination of suitable planting geometry/ density

In order to find out optimum plant density for promising strains of Rapeseed KN-259 & Mustard KJ-206 were sown keeping row to row distances of 30 cm, 45 cm & 60 cm and plant to plant distance of 15 cm, 22.5 cm & 30 cm at Oilseeds Research Station, Khanpur during 2015-2016.The yield data (kg/ha) obtained are presented as under.

B. juncea		**Plant Spacing**		
S.No.	**Row spacing**	**15cm plant spacin**	**22.5cmpl.spc**	**30cm pl.spc**
1.	30 cm	1920	**2358**	**2253**
2.	45 cm	2022	2219	2049
3.	60 cm	1728	1799	1269
	LSD 5%	**RS** **RS*PS**	**239** **358**	
B. napus				
S.No.	**Row spacing**	**15cm plant spacing**	**22.5cmpl.spc**	**30cm pl.spc**
1.	30 cm	1876	**2188**	**1920**
2.	45 cm	1926	2136	1799
3.	60 cm	1574	1608	1413

LSD5%RS 197

RS*PS 362

Layout	Split Split Plot Design
Repeats	3
Plot size	6.0 x 1.80m
Fertilizer	90 : 85 NP kg/ha

The seed yield data given in table showed that varieties KN-259 (*B. napus*) and KJ-206 (*B. juncea*) gave maximum yield of 2358 and 2188 kg/ha, respectively when sown at row to row distance of 30 cm and plant to plant distance of 22.5 cm.

Project 10. SEED MULTIPLICATION

Pre-basic seed of approved varietiy of Winter Mustard was multiplied to meet the demand of Seed Corporations/growers and for use in various experiments. 600 kg seed of Khanpur raya was produced.

PLANT PATHOLOGY, KHANPUR

Technical work on pathological aspects of Oilseeds crop was carried out at Oilseeds Research Station, Khanpur during 2012-13 is presented as follows: -

Project 11. SCREENING OF BRASSICA VARIETIES AGAINST VARIOUS DISEASES.

Sixteen advance stage strains of Rapeseed and Mustard were sown at Oilseeds Research Station, Khanpur to observe their reaction against various diseases such as Alternaria blight (*Alternaria brassicae*), Powdery mildew (*Eryshiphe cruciferarum*) and White rust (*Albugo candida*) under natural conditions. The data presented in the table 15 were recorded at flower shedding stage by using 0-9 score scale.

Score	Condition
0	No disease (immune)
1	A few scattered plants blighted with 1-2 spots/plant (very highly resistant).
2	A few scattered plants blighted with 5-10 spots/plant (highly resistant).
3	A few plants blighted but with 11-25 spots/plant (resistant).
4	A few plants blighted but with 26-50 spots/plant (moderately resistant).
5	Blighted plants more common nearly on every leaf stem and branch (infected but plants remains normal in form (moderately susceptible).
6	Every plant affected with about 50% of leaf area and stem infection (susceptible).
7	Every plant affected with about 75% of leaf area and stem infection (highly susceptible).
8	Every plant severely infected defoliation common and 95% of stem surface affected (very highly susceptible).
9	Defoliation severe and 100% leaf area and stem area affected and destroyed (completely susceptible).

S.No.	Lines Tested	Disease Alternaria blight	Powdery mildew	White rust
	B.juncea			
1	KJ-232	0	15	0
2	KJ-233	0	10	0
3	KJ-234	0	10	0
4	KJ-237	0	15	0
5	KJ-238	0	15	0
6	KJ-239	0	20	0
7	KJ-240	0	10	0
8	KJ-243	0	10	0
9	KJ-244	0	10	0
10	Khanpur Raya	0	05	0
B.napus				
8	KN-281	0	0	0
9	KN-282	0	0	0
10	KN-283	0	0	0
11	KN.284	0	0	0
12	KN-285	0	0	0
13	KN-286	0	0	0
14	KN-287	0	0	0
15	KN-292	0	0	0
16	Punjab Sarsoon	0	0	0

Amongst tested promising strains of rapeseed and mustard, all the entries escaped from Alternaria blight, White rust and Downy mildew diseases. However 10 to 20% disease incidence of Powdery mildew was observed on the *B.juncea* entries.

2-SUNFLOWER:

Experiment -1: PERFORMANCE OF VARIOUS SUNFLOWER HYBRIDS UNDER NUYT IN SPRING-2016

Table-1: PERFORMANCE OF VARIOUS SUNFLOWER HYBRIDS UNDER NUYT IN SPRING-2016

HYBRIDS	NUMBER OF DAYS TO			PLANT POPULATION/HA	PLANT HEIGHT (CM)	HEAD DIAMETRE (CM)	100 SEED WEIGHT (G)	SEED YIELD (KG/HA)
	FLOWERING		PHYSIOLOGICAL MATURITY					
	50%	100%						
NK-Ferti	73.66	76	103	45169	197.3	18.13	4.74	1920
S-2216	79	81	108	44444	195.4	16.2	5.55	2536
S-3950	77.33	79.33	108.3	42271	193.1	19.8	5.74	3140
L-126-T	75.66	78.66	107	42995	199.4	15.6	4.76	1932
ESFH-3391	72.66	75	102	48551	191.1	15.6	4.12	1787
Armoni Gold	74.33	76.66	105.7	52174	196.3	18.53	5.03	2029
ESFH-3590	75.33	77.33	106	40097	214.5	15	3.83	1498
FH-593	76	76.33	103.3	45894	196.7	18.33	4.66	1884
SMH-0917	72.33	74.66	103	40580	192.8	18.2	4.26	1812
KSF-2815	72.66	75.33	102	45169	186.5	17.67	3.91	1570
L-121-TC	77	79.33	107	45411	209.8	17.8	5.10	2403
SMH-0927	74.33	76.66	106.3	42754	199.7	19	4.92	1957
KQS-HSF-1	78.33	80.33	107.7	48068	227.2	17.27	5.09	2331
SMH-0926	74.66	77	106.3	46618	199.7	18.8	5.25	2415
FMC-3	71.33	73.66	102	42271	181.1	18.8	4.96	2029
FMC-2	74.33	76.33	103	40097	179.3	19.73	3.95	1691
NK-S-278	74.66	76.66	104.3	45894	192.3	18.2	5.03	2041
HYSUN-33	76.66	79.33	104.3	47826	232.5	18.53	4.57	1884
							LSD at 5 %	**201**

LAY OUT	RCBD
HYBRIDS	18
PLOT SIZE	4.6 M X 3.00 M= 13.8 M^{-2}
ROWS/PLOT	4
FERTILIZER (NPK)	148-99-62 KG/HA
DATE OF SOWING	09-02-2016
IRRIGATIONS	4
DATE OF HARVESTING	30—05—2016

The data presented indicated that maximum number (108.3) of days were taken by S-3950 to mature and S-2216 followed it very closely by availing 108 days to mature physiologically. Both the checks (NK-S-278 and HYSUN-33) took 104.3 days to mature. Minimum no. of days (102) to mature were availed by three hybrids ESFH-3391 , FMC-3 and KSF-2815. The highest seed yield (3140 kg/ha) was recorded for the sunflower hybrid S-3950 and it was followed very closely by that of S-2216 (2536 kg/ha). The check NKS 278 gave a seed yield of 2041 kg/ha while HYSUN-33 produced 1884 kg/ha. The lowest achene yield (1498 kg/ha)was recorded for the sunflower hybrid ESFH-3590.

Experiment-2 : PERFORMANCE OF LOCALLY DEVELOPED SUNFLOWER HYBRIDS UNDER FAISALABAD CONDITIONS DURING SPRING 2016

DATE OF SOWING	9-2-2016
PLOT SIZE	2.25 M X4.60 M
FERTILIZER	148 – 99—62 (NPK) Kg ha^{-1}
REPEATS	THREE
SEED RATE	06 Kg ha^{-1}
LAY OUT	RCBD
IRRIGATIONS	04
PLANTING GEOMETRY	A: RIDGE – RIDGE = 75 CM B: PLANT – PLANT = 23 CM
DATE OF HARVESTING	31—05—2016

It is clear from the data presented in the table -2 for set-1 that maximum no. of plants /ha were maintained by the hybrid **FH-653 while minimum no. of plants were recorded from the plots of FH-629. Maximum seed yield (3273kg/ha) was recorded for the sunflower hybrid FH-624 and it was followed very closely by the sunflower hybrid FH-331 with seed yield of 2855 kg/ha. The leas seed yield (1005 kg/ha) was recorded for the sunflower hybrid**FH-625. HYSUN-33 – the check- produced seed yield of 2742 kg/ha

Table-2: PERFORMANCE OF LOCALLY DEVELOPED SUNFLOWER HYBRIDS IN SPRING 2016 (SET-1)

HYBRIDS	Plants /ha	Plant Height (cm)	Days to			Head Diameter (cm)	100 Seed Wt. (g)	Seed wt. from 5 heads	YIELD / ha (KG)
			Flowering		Maturity				
			50 %	100 %					
FH-623	53006	156.5	65	67	91	16.5	3.41	214.1	1201

FH-624	52198	163.1	68.5	70.7	90	15.9	5.29	291.6	3273
FH-625	50985	164.5	67	69.7	93	15.9	3.85	199.8	1005
FH-626	52602	161.3	67.5	69.7	93	14.7	4.18	224.3	1822
FH-627	53410	155.8	65.5	68	91	15.3	4.15	281.4	2049
FH-628	50986	154.3	65.5	67.7	90	14.5	3.86	285.5	1867
FH-629	49774	170.4	70.5	72.6	96	13.9	3.85	216	1399
FH-630	52920	181.2	72	74	94	15.2	3.81	242.6	1436
FH-631	52198	165.3	69	71.7	97	17.3	4.14	385.4	1515
FH-632	53410	194.5	68.5	71.6	95	18.0	4.57	407.8	2563
FH-633	54622	151.6	68	70	95	13.5	3.40	281.4	2103
FH-649	51794	157.9	67.5	70	89	16.4	3.99	212.1	1285
FH-650	50582	172.4	69.5	71.6	89	15.0	4.35	228.4	1383
FH-651	52602	162.9	64	66.6	86	13.7	4.56	261	1196
FH-652	53006	153.3	63.5	66	85	14.6	4.56	275.3	2169
FH-653	56122	152.3	64	67	92	14.0	3.67	197.8	1711
FH-654	55026	183.9	70	72.7	97	16.0	4.00	230	1712
FH-331	55834	191.5	68.5	70.7	93	15.5	4.01	211	2855
Hysun-33	52198	216.4	76	78	102	15.8	4.43	372	2742
								LSD at 5 %	231

Table-3:PERFORMANCE OF LOCALLY DEVELOPED SUNFLOWER HYBRIDS-SPRING 2016 -SET-11

HYBRIDS	Plants /ha	Plant Height (cm)	Days to			Head Diameter (cm)	100 Seed Wt. (g)	Seed wt. from 5 heads	YIELD / ha (KG)
			Flowering		Maturity				
			50 %	100 %					
FH-583	53037	164	67	69	97	14.13	3.81	238.05	1117
FH-610	52228	210	71	74	96	17.67	4.77	279.45	1810
FH-634	51016	153	63	67	96	15.00	4.14	322.92	1435
FH-635	52633	160	65	67	96	14.73	4.21	260.82	2282
FH-636	53441	170	68	70	91	14.47	3.91	194.58	1080
FH-637	51017	164	69	71	91	15.33	4.15	281.52	881
FH-638	49805	173	66	68	94	16.53	3.59	204.93	1350
FH-639	52951	163	68	70	93	15.47	4.53	327.06	1706
FH-640	52229	177	70	73	91	14.87	3.84	209.07	1026
FH-641	53441	148	69	70	90	16.73	4.18	188.37	1332
FH-642	54653	171	67	69	96	15.67	3.72	184.23	1400

FH-643	**51825**	**157**	**67**	**69**	**91**	**14.00**	**3.77**	**204.93**	**1619**
FH-645	**50613**	**158**	**66**	**68**	**95**	**16.87**	**4.33**	**225.63**	**1426**
FH-646	**52633**	**152**	**66**	**68**	**94**	**15.33**	**4.15**	**238.05**	**2431**
FH-647	**52737**	**159**	**68**	**70**	**96**	**16.40**	**4.59**	**283.59**	**1975**
FH-648	**56153**	**161**	**67**	**69**	**97**	**17.13**	**4.27**	**372.6**	**2660**
FH-331	**55390**	**194**	**69**	**72**	**99**	**15.93**	**4.56**	**209.07**	**2127**
Hysun-33	**55877**	**222**	**77**	**79**	**104**	**15.87**	**4.43**	**253.58**	**2173**
LSD at 5 %									**148**

It is clear from the data presented in the table -3 for set-2 that maximum no. of plants /ha were maintained by the hybrid **HYSUN-33 while minimum no. of plants were recorded from the plots of FH-638. Maximum seed yield (2660 kg/ha) was recorded for the sunflower hybrid FH-648 and it was followed very closely by the sunflower hybrid FH-646 with seed yield of 2431 kg/ha. The leas seed yield (881 kg/ha) was recorded for the sunflower hybrid**FH-637. HYSUN-33 – the check- produced seed yield of 2173 kg/ha.

Experiment-3: PERFORMANCE OF DIFFERENT SUNFLOWER HYBRIDS SOWN AT DIFFERENT DATES – SPRING 2016

LAY OUT	**RCBD**
HYBRIDS	**4 (FH331, FH-593,FH-572, FH-516)**
PLOT SIZE	**6.9 METER X 2.25 M= 15.525 M^{-2}**
ROWS/PLOT	**03**
FERTILIZER (NPK)	**148-99-62 KG/HA**
DATE OF SOWING	
IRRIGATIONS	**4**
DATE OF SOWING	**11** **SR. # — SOWING DATE — D.O. H.** **1 — 30-12- 2015 — 10-5-16** **2 — 06-01-2016 — 10-5-16** **3 — 13-01-2016 — 11-5-16** **4 — 20-01-2016 — 11-5-16** **5 — 27-01-2016 — 11-5-16** **6 — 02-02-2016 — 11-5-16** **7 — 09-02-2016 — 11-5-16** **8 — 17-02-2016 — 11-5-16** **9 — 24-02-2016 — 11-5-16** **10 — 03-03-2016 — 7-6-2016** **11 — 10-03-2016 — 7-6-2016**

Table-4: PERFORMANCE OF DIFFERENT SUNFLOWER HYBRIDS SOWN AT DIFFERENT DATES – SPRING 2016

Hybrids	SEED YIELD (KG/HA)											
	SOWING DATES											
	1	2	3	4	5	6	7	8	9	**10**	11	**Mean**
FH-331	**3325**	**3274**	**3223**	**3174**	**3127**	**2869**	**2608**	**2484**	**964.3**	**475.3**	**334**	**2350**
FH-593	**3417**	**3364**	**3312**	**3261**	**3213**	**3195**	**2879**	**2742**	**1085**	**419.7**	**472.3**	**2487**
FH-572	**3690**	**3633**	**3577**	**3523**	**3470**	**3071**	**2767**	**2635**	**819.7**	**482.3**	**362.3**	**2548**
FH-516	**3805**	**3747**	**3689**	**3632**	**3579**	**3298**	**2893**	**2756**	**882.3**	**685**	**413.3**	**2670**
Mean	**3559**	**3504**	**3450**	**3397**	**3347**	**3108**	**2786**	**2654**	**937**	**515**	**395**	

The data presented in the table 4 indicated vividly that maximum seed yield of 3805 kg/ha was obtained from the sunflower hybrid FH-516 when planted on 30th of December indicating that early sowing improves seed yield and FH-516 excelled all other hybrids included in the trial. FH-572 followed FH-516 very closely. FH-331, though produced reasonable seed yield but was at the bottom. Overall, FH-516 produced the the highest achene yield (2670 kg/ha) and FH-331remained at the bottom. So for as planting dates were concerned, sowing during January proved higher yielder compared to February and March sowing.

Experiment-5:YIELD RESPONSE OF FH -593 TO VARIOUS DOSES OF NITROGEN AND PHOSPHORUS FERTILIZER -SPRING 2016

LAY OUT= SPLIT PLOT DESIGNE		**DATE OF SOWING = 09/02/2016**
ROWS/PLOT=3		**PLOT SIZE = 3.68 M X2.25 M= 8.28 m^2**
TREATMENTS=30	**K_2O = 62 kg/ha (Recommended)**	
	MAIN PLOT= P2O5	P0 = NO P_2O_5
		P1= P_2O_5@ 99 kg/ha (Standard)
		P2= P_2O_5@ 129 kg/ha (99+ 30% of it=99+30 =129)
		P3 = P_2O_5 @ 144 Kg/ha (99 +45 % of it= 99+ 45= 144)
		P4 = P_2O_5@ 144 Kg/ha (99 +60 % of it = 99+ 60= 159)
	SUB PLOT= N	N0 = NO NITROGEN
		N1 = 148 kg/ha (Standard)
		N2 =170 Kg/ha (148+ 15% of it = 148 +22= 170)
		N3= 192 Kg/ha (148+ 30% of it = 148 +44= 192)
		N4= 215 Kg/ha (148+ 45% of it = 148 +67= 215)
		N5= 237 Kg/ha (148+ 60% of it = 148 +89= 237)
Reps= 3		
Hybrid= FH-593		

Table-5: RESPONSE of FH -593 to VARIOUS DOSES OF NITROGEN AND PHOSPHORUS-SPRING 2016

PHSPHORUS	NITROGEN	Days to Maturity	Head Diametre (cm)	100- seed weight (g)	Seed Yield (Kg/ha)	Population/ha
P0	N0	104.333	9.8	2.30	267.333	**52929**
	N1	105	12.1	2.49	685	**51312.3**
	N2	105.667	12.6667	2.48	700.667	**52120.7**
	N3	104.333	12.6333	2.66	684.667	**50908.3**
	N4	105.333	12.5	2.84	561.333	**52525**
	N5	105.333	12.5667	2.91	556	**53333**
P1	N0	104	11.4	3.33333	580.333	**50908.7**
	N1	104.333	16.2667	4.23	2512.33	**49697**
	N2	104.333	18.3333	4.77	2584.67	**52928.7**
	N3	103	18.3667	4.23	2813.67	**52121**
	N4	104	18.5933	4.16667	2342.33	**53333.3**
	N5	103.333	18.5433	4.10333	2166	**54545**
P2	N0	103	11.6333	2.97333	605.333	**51717**
	N1	104	17.06	5.05	2717.33	**50504.7**
	N2	103	19.07	5.53667	3278	**52525.3**
	N3	104.667	19.1	5.71333	3124	**52929**
	N4	103.667	19.34	5.22667	2750	**54545.3**
	N5	101.667	19.2833	5.26333	2746	**54949.3**
P3	N0	101.667	11.8667	2.99667	592.667	**55757.3**
	N1	103	17.2667	5.27667	2773.67	**52121**
	N2	103.667	19.31	5.59667	3030.33	**53736.7**
	N3	104.333	19.34	5.29	2940.33	**54141**
	N4	104	19.58	4.57667	2770.67	**54545.3**
	N5	101.667	19.5233	4.29	2678.33	**55757.3**
P4	N0	103	11.5333	2.98333	557	**53130.7**
	N1	103	14.1867	5.14667	2318.67	**50356.7**
	N2	104.333	15.7433	5.49333	2647.33	**51716.7**
	N3	103	16.0633	4.84667	2206	**50908.3**
	N4	103.333	16.0267	4.64333	2193.67	**52524.7**
	N5	104.333	15.7567	4.46667	1866.33	**53333**
	LSD at 5%	N.S.	0.48	0.21	129	**NS**

It is evident from the data presented in the above table that both the fertilizers have significant effect on achene yield. Maximum achene yield 3278 kg/ha was recorded by the combination of Phosphorus @129 kg/ha and Nitrogen @ 170 kg/ha. Minimum seed yield 267 kg/ha was obtained from the plots without fertilizers.

3- LINSEED

Project 1. MAINTENANCE OF GERM PLASM

160 entries of linseed were sown for maintenance of germplasm according to the following design.

Plot size	Single row
Row spacing	0.6 m
Fertilizer	60:60 kg NP/ha
Sowing date	09.11.2015
Harvesting date	18.05.2016

Entries were purified by rouging technique. Petal color was also recorded.

	Corola colour	
	White	Blue
No. Entries	54	106

Sufficient seed of each entry was collected at harvest for future use.

Project 2. HYBRIDIZATION.

The crosses attempted for developing high yielding and short stature lines are presented in table 2.1.

Table-2.1

Sr No	Female parent	Male parent
1	LS-29	LS-14050
2	LS-29	LS-14062
3	LS-29	LS-14074
4	LS-29	LS-2009
5	LS-2009	LS-14050
6	LS-14050	LS-14062
7	CHANDNI	LS-14050
8	LS-14062	LS-14074

F_0 seed of each cross was collected for raising F_1 generation during 2016-17.

Project 3. STUDY OF FILIAL GENERATIONS.

Different filial generations were studied to select the desirable genotypes. The material studied and selected is shown in table 2.2.

Table 2.2

GENERATION	CROSSES STUDIED	PROGENIES STUDIED	PLANTS SELECTED
F_1	08	Whole material studied	Whole breeding material selected
F_2	09	″	60
F_3	10	70	60
F_4	08	60	50
F_5	08	50	45
F_6	08	40	20
F_7	08	25	07 lines

Project 4. **PRELIMINARY YIELD TRIAL.**

09 strains along with check variety "Chandni" were evaluated for seed yield potential. The performance of new promising strains is given in table 2.3.

Table 2.3: Performance of new promising strains at Faisalabad during 2015-16

Rank	Line / Variety	Seed yield (kg/ha)
1.	LS-15014	1800
2.	LS-15069	1594
3.	LS-15022	1556
4.	LS-15035	1548
5.	LS-15066	1503
6.	CHANDNI	1495
7.	LS-15085	1476
8.	LS-15048	1403
9.	LS-15056	1294
10.	LS-15005	1200
	LSD 5%	**115**

New strain LS-15014 top yielded followed by LS-15069,LS-15022 and LS-15035 over check Chandni.

Project 5. **ADVANCED YIELD TRIAL**

The yield performance of 09 promising strains was tested against Chandni. The data recorded is presented in table 2.4.

Table 2.4

The results of advanced yield trial of linseed conducted at Faisalabad during 2015-2016

S. No.	LINES/VARIETIES	YIELD (kg/ha)
1.	LS-14056	1603
2.	LS-14074	1561
3.	LS-14003	1532
4.	LS-14044	1504
5.	LS-14024	1455
6.	LS-14032	1408
7.	CHANDNI (C)	1353
8.	LS-14062	1334
9.	LS-14050	1328
10.	LS-14019	1251
	LSD %	**73**

LS-14056 gave maximum yield of 1603 kg/ha followed byLS-14074(1561 kg/ha), whereas standard variety Chandni yielded 1353 kg/ha.

Project 6. **ZONAL VARIETAL TRIAL**

The yield performance of 4 promising strains was tested against Chandni. The yield data recorded at different locations is presented in table 2.5.

Table 2.5: The results of zonal varietal trial of linseed conducted at different locations During 2015-16.

S.No.	Line/variety	Yield kg/ha				
		Faisalabad	Piplan	Khanpur	Bahawalpur	Average
1.	LS-13028	1930	1563	2480	1667	1910
2.	LS-13036	1896	1480	2626	1292	1824
3.	LS-13038	2021	2605	2438	1292	2089
4.	LS-12089	2280	2938	2396	1709	2331
5.	CHANDNI (C)	1984	2167	2584	1625	2090
	LSD	147	54	105	131	

Advance line LS-12089 out yielded Chandni on an average at all the locations.

4-SOYBEAN

Project 1. **MAINTENANCE OF GENE POOL**

232 entries of Soybeanwere maintained.

Project2. **DEVELOPMENT OF FRESH CROSSES**

Six crosses were made keeping Koala, Prover, S-39-40, S47-40 and Foster as male parent and 95-1, Koala and Ertou No 2 as female parent.

1. 95-1 x Koala
2. 95-1 x Foster
3. 95-1 x S47-40
4. Koala x S39-40
5. Foster x Prover
6. Ertou No. 2 x Prover

Six cross combinations were attempted and seed setting was found in four cross combinations.

Project 3. **YIELD TRIALS**

Preliminary Yield Trial

Ten lines were tested along with the standard varieties "Faisal Soybean and Ajmeri". The data collected on seed yield is given in table 1.

Table 1: Performance of 12 entries for seed yield in Preliminary Yield Trial at Oilseeds Research Institute, Faisalabad during Zaid Kharif 2015.

Rank	Line/Variety	Seed Yield (kg/ha)
1	Desoto	566
2	FS-60	963
3	Ertou No. 2	1085
4	FS-10	1569
5	RX(48-52-1)	1255
6	S39-40	1088
7	E-402	345
8	R-315	1163
9	Valder	718
10	SK-5	1227
11	Ajmeri	405
12	Faisal Soybean	1440
	LSD at 5%	**188**

Design	R.C.B.
Plot size	5m x 0.90 m
Row spacing	30 cm
Fertilizer	60: 100 kg NP/ha
Sowing date	04.08.2015

The perusal of table 1.2 indicates that FS-10 gave highest yield i.e., 1569kg/ha followed by RX(48-52-1) i.e., 1255 kg/ha. Check variety Faisal Soybean yielded 1440kg/ha.

Project 4. <u>Plant and Row Spacing Trial</u>

To find out optimum yield potential, Soybean was sown under three plant spacing (5cm, 10cm and 15cm) and three row spacing (20cm, 30cm and 40cm) . The results are presented in table 1.3.

Table 4.1: Performance of Faisal Soybean in Plant and Row Spacing trial, 2015 at Oilseeds Research Institute, Faisalabad.

Row **Spacings**	**Plant Spacing**	**Seed Yield(Kg/ha)**
RS1(20cm)	**PS1(5cm)**	**840**
	PS2(10cm)	644
	PS3(15cm)	668
RS2(30cm)	**PS1(5cm)**	1007
	PS2(10cm)	867
	PS3(15cm)	620
RS3(40cm)	**PS1(5cm)**	880
	PS2(10cm)	737
	PS3(15cm)	522
LSD at 5% for		
	Row Spacing	34
	Plant Spacing	103
	Interaction	89

Design	Split Plot
Plot size	5 x 1.2 m
Fertilizer	60:100 NP kg/ha
Sowing date	04.08.2015

The perusal of table 4.1 indicates that combination of Plant Spacing 1 (5cm) and Row Spacing 2 (30cm) gave maximum seed yield of 1007kg/ha followed by interaction of Plant Spacing 1 (5cm) and Row Spacing (40cm) with the seed yield of 880 kg/ha.

5-SESAME

Project 1. MAINTENANCE OF GENE POOL

Seventy Six entries were maintained through rouging. At maturity, all entries were harvested and sizeable seed from each entry was collected.

Project 2. HYBRIDIZATION PROGRAMME

Following 11 crosses were successfully attempted to create genetic variability for the selection of new recombinant and their seed was retained for raising F1 generation next year.

Sr. No.	Name of cross
1.	Ent. No.7 x 70004
2.	No.1-2 x Korea-1
3.	Ent. No.7 x Korea-1
4.	Ent. No.8 × 50022
5.	DM 28-P-11 x G.P.40. No7
6.	70004 x DM22-1-2
7.	70004 x DM25-6-2
8.	50022 x M.L.6-8/12
9.	97007 x 96006-C
10.	50022 x 92001-1/62/98
11.	Korea-1 x 96006-C

Project 3. STUDY OF FILIAL GENERATIONS.

The breeding material studied in F1 to F7 generations is detailed in table. The selections were made based on apparent good performance in the field for agronomic traits, diseases and seed yield per plant.

Generations	No. of crosses studied
F1	08
F2	11
F3	06
F4	10
F5	-
F6	07
F7	04

All the segregating generations have bulked and will be studied through bulk breeding method.

Project 4 YIELD TRIALS

a. Preliminary Yield Trial

Fofteen new strains including two check varieties TS-3, TS-5 and TH-6 were evaluated for seed yield potential. The performance of new promising strains are given in table below:

Performance of new promising strains at Oilseeds Research Institute, Faisalabad during 2014-15

S. No.	Line	Seed Yield (kg/ha)
1.	50009	1324
2.	50022	1176
3.	96020	1000
4.	70002	995
5.	40009	976
6.	TS-5 (C)	872
7.	TH-6 (C)	701
.	.	.
.	.	.
.	.	.
15.	50007	586

The line 50009 and 50022 gave the highest yield 1324 & 1176 kg/ha respectively while the line 50007 gave the minimum yield 586 kg/ha.

b. Advanced Yield Trial

The yield performance of 10 promising strains was tested against TS-5 and TH-6. The yield performances of the promising lines are presented in table below: -

S. No.	**Lines/strains**	**Seed Yield (kg/ha)**
1.	40004	1204
2.	40021	775
3.	95001	774
4.	87008	771
5.	70005	768
6.	TS-5 (C)	511
.	.	.
.	.	.
12.	ML-6-8/2	438

The strain 40004 and 40021 gave the maximum yield 1204 kg/ha and 775 kg/ha, against the check varieties TS-5, 511 kg/ha where as the minimum yield 728 kg/ha obtained from ML-6-8/12.

c. Zonal Varietal Trial

The yield performance of 8 promising strains was tested against tow locations in Punjab. The yield performances of the promising lines are presented in table below: -

S. No.	Lines/strains	Seed Yield (kg/ha)	
1.	70004	1251	556
2.	50011	1221	815
3.	50022	989	704
4.	40012	973	537
5.	TS-5	940	510
6.	Black Til	875	343
7.	10003	806	741
8.	TH-6	309	463

Project 5 **SEED MULTIPLICATION**

During the year, 2014-15, pre-basic seed of approved varieties i.e. TS-3, TH-6 and TS-5 was produced for distribution among farmers/progressive growers and private seed companies.

6-OILSEEDS PATHOLOGY

RAPESEED AND MUSTARD

Project-1 SCREENING OF RAPESEED/MUSTARD CULTIVARS AGAINSTDIFFERENT DISEASES

09 promising cultivars of rapeseed and 13 promising cultivars of mustard were sown at Faisalabad to observe their behavior against diseases such as *Alternaria* blight (*Alternaria brassicae*), powdery mildew (*Erysiphe cruciferarum*), white rust (*Albugo candida*) and downy mildew (*Peronospora parasitica*) under natural conditions.

Data on *Alternaria* blight incidence was recorded on the basis of diseased/healthy plants and intensity of the disease was recorded on 0-9 rating scale which is given below, while all other diseases were recorded on the basis of diseased/healthy plants.

Table-1: 0-9 Rating Scale for Estimation of Intensity of *Alternaria* Blight in Rapeseed/ Mustard.

Score	Conditions	Remarks
0	No disease	Immune
1	A few scattered plants blighted with 1-2 spots/plant.	Very Highly Resistant (VHR)
2	A few scattered plants blighted with5-10 spots/plant.	Highly Resistant (HR)
3	A few scattered plants blighted with 11-25 spots/plant.	Resistant (R)
4	A few scattered plants blighted with 26-50 spots/plant.	Moderately Resistant (MR)
5	Blighted plant more common, nearly every leaf, stem and branch infected but plant remains normal in form.	Moderately Susceptible (MS)
6	Every plant infected with about 50% of leaf area and stem.	Susceptible (S)
7	Every plant severely infected with about 75% of leaf area and stem.	Highly Susceptible (HS)
8	Every severely infected defoliation common and 95% of stem surface affected	Very Highly Susceptible (VHS)
9	Defoliation severe and 100% leaf and stem area affected and destroyed.	Completely Susceptible (CS)

REFERENCE:

Mayo, L.D and Datar, V.V., 1986. Phytopath matry. Techanical bullatin-2. Special bullatin-3, Puld. Marathwada Agri. University, Porbhari- 431402, 196-97.

Table -2:-During 2015-16, 09 cultivars of *Brassica napus* were screened against various diseases under natural conditions.

S.No.	Variety/Line	Alternaria blight %	Alternaria blight (0-9) (intensity)	Remarks	White rust %	Remarks
1	KN – 263	30	3	R	-	-
2	KN – 277	28	4	MR	-	-
3	13CBN005	30	4	MR	-	-
4	13CBN006	40	5	MS	-	-
5	RBN – 09038	38	4	MR	-	-
6	RBN – 11049	20	3	R	-	-
7	RBN – 13019	25	3	R	-	-
8	RBN – 13028	20	3	R	-	-
9	Faisal Conola	30	4	MR	-	-
10	KJ-159 (Spreader)	95	8	VHS		

Downy mildew and powdery mildew diseases did not appear during 2015-16.

Layout	RCBD
Plot size	4X1m
Repeats	3
Fertilizer	75:75:60 Kg/ha NPK
Sowing date	31-10-2015
Harvesting date	29-03-2016

Table -3: During 2015-16, 13 cultivars of *Brassica juncea* were screened against various diseases under natural conditions.

S.No.	Variety/Line	Alternaria blight (0-9) (intensity)	Alternaria blight %	Remarks	Powdery Mildew (%)	Downey mildew (%)
1	KJ-221	40	4	MR	-	-
2	KJ-230	45	4	MR	-	-
3	BRJ-1103	50	5	MS	-	-
4	BRJ-1104	55	5	MS	-	-
5	13CBJ004	55	5	MS	-	-
6	13CBJ006	40	4	MR	-	-
7	ZBJ-06012	60	5	MS	-	-
8	ZBJ-08051	60	6	S	-	-
9	RBJ-08015	50	5	MS	-	-

10	RBJ-12019	60	6	MS	-	-
11	RBJ-13030	65	7	HS	-	-
12	RBJ-13046	60	6	S	-	-
13	Khanpur Raya	60	6	S	-	-
14	KJ-159 (Spreader)	96	9	VHS	-	-

Whit rust, downy mildew and powdery mildew diseases did not appear during 2015-16.

Layout	RCBD
Plot size	4X1m
Repeats	3
Fertilizer	75:75:60 Kg/ha NPK
Sowing date	31-10-2015
Harvesting date	29-03-2016

Project-2: EVALUATION OF VARIOUS FUNGICIDES AGAINST BLIGHT (*Alternaria brassica*) DISEASE OF BRASSICA.

In this experiment 06 fungicides were used against *Alternaria* blight of Brassica, Nativo fungicide gave the best control followed by Topsin M and Score in vivo as well as in vitro.

In-vivo

Table: 4

Treatments	Disease %	% Inhibition
T1 = Antracol 70 WP (Propineb) @2.5gm/liter of water	70	27
T2 = Topsin – M (Thiophenate Methyle) @ 2.5g/liter of water	20	79.16
T3 = Score 250 EC (Difenoconazole) @ 1ml/liter of water	25	73.95
T4 = Topass 100 EC (Penoconazole) @ 1ml/liter of water	60	37.5
T5 = Nativo 75 WG (Tebuconazole + Trifloxystrobin) @ 1g/liter of water	10	89.58
T6 = Control	96	0

In-vitro

Table: 5

Treatments	Disease %	% Inhibition
T1 = Antracol 70 WP (Propineb) @2.5gm/liter of water	60	33.3
T2 = Topsin – M (Thiophenate Methyle) @ 2.5g/liter of water	14	84
T3 = Score 250 EC (Difenoconazole) @ 1ml/liter of water	18	80
T4 = Topass 100 EC (Penoconazole) @ 1ml/liter of water	50	44.4
T5 = Nativo 75 WG (Tebuconazole + Trifloxystrobin) @ 1g/liter of water	09	90
T6 = Control	90	0

Design	RCB
Plot size	6 x 1.8m
Repeats	3

Fertilizer	90:85:60 Kg NPK/ha
Sowing Date	31-10-2015
Harvesting Date	29-03-2016

Project-3: SCREENING OF SUNFLOWER NUSYT MATERIAL FOR ITS BEHAVIOUR AGAINST DISEASES DURING 2016.

During spring 2016, 18 entries NUSYT inbred lines/hybrids were tested against their behavior to diseases like charcoal rot [by tooth pick method] and head rot [by injury method] under natural condition. Data for disease infection of head rot were recorded on the basis of diseased and healthy plants and data for charcoal rot were collected on the basis of A-D. Disease Rating Scale as under

Score **Condition**.

A After inoculation with tooth pick method, infection covered the stem length 1-10 cm only (highly resistant).

B Infection covered the stem length 11-20 cm (resistant).

C Infection covered the stem length 21-30 cm (moderately susceptible).

D Infection covered the stem length 31 cm and above (susceptible)

Reference: CDRI (NARC) Islamabad.

Methodology:

Inoculation of charcoal rot disease will be done by tooth pick method at flowering initiation stage on stem. Data will be recorded on the basis of A to D disease rating scale measuring the disease spread after the harvest of crop by splitting stem vertically into two halves.

Table-6:-Behavior of Sunflower hybrids against Charcoal Rot disease at ORI, Faisalabad during spring, 2016 under NUSYT.

Score	Conditions	Remarks	Hybrids	No. of hybrids
A	After inoculation with toothpick method, infection covered the stem length 1-10cm only	Highly Resistant (HR)	0	0
B	infection covered the stem length 11-20cm	Resistant (R)	NK-Ferti, SMH-0926, FMC-3, NK-S-278, Hysun-33	05
C	infection covered the stem length 21-30cm	Moderately Resistant (MR)	S-2216, S-3950, L-126-T, ESFH-3319, Armoni Gold, ESFH-3590, FH-593, KSF-2815, L-121-TC, SMH-0927, KQS-HSF-1, FMC-2	12
D	Infection covered the stem length 31cm or above	Susceptible (S)	SMH-0917	1
			Total	18

Layout	RCBD
Repeats	3
Plot size	4.5x1 m
Plant spacing	22cm
Row spacing	75 cm
Fertilizer	148; 99; 62 NPK. Kg/ha
Sowing date	09-02-2016
Harvesting date	22-05-2016

Out of 18 entries of NUSYT, 5 hybrids were resistant, 12 were moderately resistant and 1 was susceptible. No hybrid showed highly resistant reaction.

Table-7:-Disease Rating Scale for the estimation of head rot disease of sunflower

SCORE	CONDITIONS	REMARKS
0	No disease	Immune
1	1 % or less Head roted	Highly resistant (HR)
3	1-10 % Head roted	Resistant (R)
5	11-25 % Head roted	Moderately susceptible (MS)
7	26-50 % Head roted	Susceptible (S)
9	51 % Head roted	Highly susceptible (HS)

REFERENCE: Mayo, L.D and Datar, V.V., 1986. Phytopathomatry. Techanical bullatin-2. Special bullatin-3, Puld. Marathwada Agri. University, Porbhari-431402, 196-97.

Table-8: Behavior of Sunflower hybrids against Head Rot Disease at ORI, Faisalabad during spring, 2016 under NUSYT.

Score	Conditions	Remarks	Hybrids	No. of hybrids
0	No disease	Immune	0	0
1	1% or less head rotten	Highly Resistant (HR)	0	0
3	1-10% head rotten	Resistant (R)	0	0
5	11-25% head rotten	Moderately susceptible (MS)	0	0
7	26-50% head rotten	Susceptible (S)	0	0

9	51% rotten and above	Highly Susceptible	NK-Ferti, S-2216, S-3950, L-126-T, ESFH-3391, Armoni Gold, ESFH-3590, FH-593, SMH-0917, KSF-2815, L-121-TC, SMH-0927, KQS-HSF-1, SMH-0926, FMC-3, FMC-2, NK-S-278, Hysun-33	18
			Total	18

Out of 18 NUYST entries, no hybrid was found highly resistant, resistant and moderately susceptible. All 18 were highly susceptible.

Layout	RCBD
Repeats	3
Plot size	4.5 x 1m
Plant spacing	22cm
Row spacing	75 cm
Fertilizer	148:99:62 NPK Kg/ha
Sowing date	09-02-2016
Harvesting date	22-05-2016

Project-4 SCREENING OF SUNFLOWER LOCAL MATERIAL FOR ITS BEHAVIOUR AGAINST DISEASES DURING 2016

During spring 2016, 16 entries local inbred lines/hybrids were tested against their behavior to diseases like charcoal rot [by tooth pick method] and head rot [by injury method] under natural condition. Data for disease infection of head rot were recorded on the basis of diseased and healthy plants and data for charcoal rot were collected on the basis of A-D. Disease Rating Scale already mentioned.

Table-9:-Behavior of local Sunflower hybrids against Charcoal Rot Disease at ORI, Faisalabad during spring, 2016.

Score	Conditions	Remarks	Hybrids	No. of hybrids
A	After inoculation with toothpick method, infection covered the stem length 1-10cm only	Highly Resistant (HR)	0	0
B	infection covered the stem length 11-20cm	Resistant (R)	FH-583,FH-610,FH-624, FH-626,FH-628,FH-629, FH-630,FH-645,FH-646,	09
C	infection covered the stem length 21-30cm	Moderately Resistant (MR)	FH-623,FH-631,FH-633 FH-647,	04

D	infection covered the stem length 31cm or above	Susceptible (S)	FH-627,FH-632,FH-648	03
			Total	16

Out of 16 hybrids, 9 were Resistant, 4 were moderately resistant and 3 were susceptible against charcoal rot disease. No hybrid observed highly resistant.

Layout	RCBD
Repeats	3
Plot size	4.5x1m
Plant spacing	22cm
Row spacing	75 cm
Fertilizer	148: 99: 62 NPK. Kg/ha
Sowing date	09-02-2016
Harvesting date	23-05-2016

Table No.10: Behavior of Sunflower local hybrids against Head rot disease at ORI, Faisalabad, during spring 2016.

Score	Conditions	Remarks	Hybrids	No. of hybrids
0	No disease	Immune	0	0
1	1% or less head rotten	Highly Resistant (HR)	0	0
3	1-10% head rotten	Resistant (R)	0	0
5	11-25% head rotten	Moderately susceptible (MS)	0	0
7	26-50% head rotten	Susceptible (S)	0	0
9	51% rotten and above	Highly Susceptible	FH-583,FH-610,FH-623, FH-624,FH-626,FH-627, FH-628,FH-629,FH-630, FH-631,FH-632,FH-633, FH-645,FH-646,FH-647, FH-648	16
			Total	16

Out of 16 entries, no hybrid was found highly resistant, resistant and moderately susceptible and susceptible. All 16 were highly susceptible.

Layout	RCBD
Repeats	3
Plot size	4.5x1m
Plant spacing	22cm
Row spacing	75 cm
Fertilizer	148:99: 62 NPK. Kg/ha
Sowing date	09-02-2016
Harvesting date	23-05-2016

PROJECT -5: BEHAVIOR OF SESAME GERMPLASM AGAINST CHARCOAL ROT DISEASE DURING 2016.

The sesame germplasm was sown at Faisalabad, Bahawalpur, Pilan, Bhakkar and M.B.Din to note their behavior to charcoal rot disease caused by *Macrophomina phaseolina*. 11 lines/varieties were sown in a sick plot at ORI field. The disease infection was recorded on the basis of diseased/healthy plants in each entry. The entries were classified according to the intensity of infection and the data recorded are presented in table.

Table-11:-BEHAVIOUR OF SESAME GERMPLASM AGAINST CHARCOAL ROT DISEASE DURING 2016 AT FAISALABAD IN SICK FIELD.

Faisalabad

Score	Conditions	Remarks	Varieties/lines	No. of varieties/lines
	No symptoms on plants	Immune	0	0
	1% or less plants mortality	Highly Resistant (HR)	0	0
	1-10% mortality	Resistant (R)	0	0
	11-25% mortality	Moderately resistant (MR)	50011,50022,	2
	26-50% mortality	Susceptible (S)	40012,40004, 40021,Black Till, 70004,87008, TS-5,TH-6	8
	51% or more mortality	Highly Susceptible (HS)	10003	1
			Total	11

Out of 11 varieties/lines of sesame, there was no immune, highly resistant. 2 were moderately resistant and 8 were susceptible and 1 was highly susceptible.

Table-12:-BEHAVIOUR OF SESAME GERMPLASM AGAINST CHARCOAL ROT DISEASE DURING 2016 AT BAHAWALPUR.

Score	Conditions	Remarks	Varieties/lines	No. of varieties/lines
0	No symptoms on plants	Immune	-	-
1	1% or less plants mortality	Highly Resistant (HR)	-	-
3	1-10 % mortality	Resistant (R)	40012, 10003, 40004, 50011, 70004, 87008, 50022, 40021, Black Till, TS-5, TH-6	11
5	11-25 % mortality	Moderately Resistant (MR)	-	-
7	26-50% mortality	Susceptible (S)	-	-
9	51% or more mortality	Highly Susceptible (HS)	-	-
			Total	11

Out of 11 varieties/lines of sesame, there was no immune and highly resistant. All varieties/lines were found resistant.

Table 13:- BEHAVIOUR OF SESAME GERMPLASM AGAINST CHARCOAL ROT DISEASE DURING 2016 AT PIPLAN.

Score	Conditions	Remarks	Varieties/lines	No. of varieties/lines
0	No symptoms on plants	Immune	-	-
1	1% or less plants mortality	Highly Resistant (HR)	-	-
3	1-10 % mortality	Resistant (R)	50011,50022,	2
5	11-25 % mortality	Moderately Resistant (MR)	40012, 40004, 40021, 70004, 87008, TS-5, Black Till	7
7	26-50% mortality	Susceptible (S)	10003, TH-6	2
9	51% or more mortality	Highly Susceptible (HS)	-	-
			Total	11

Out of 11 varieties/lines of sesame, there was no immune and highly resistant. 2 were resistant. 7 were moderately Resistant. 2 were found Susceptible.

Table 14:-BEHAVIOUR OF SESAME GERMPLASM AGAINST CHARCOAL ROT DISEASE DURING 2016 AT BHAKKAR

Score	Conditions	Remarks	Varieties/lines	No. of varieties/lines
0	No symptoms on plants	Immune	-	-
1	1% or less plants mortality	Highly Resistant (HR)	-	-
3	1-10 % mortality	Resistant (R)	40004, 50011, 50022, 40021,	4
5	11-25 % mortality	Moderately Resistant (MR)	40012, 10003, 70004, 87008, Black Till, TS-5, TH-6	7
7	26-50% mortality	Susceptible (S)	-	-
9	51% or more mortality	Highly Susceptible (HS)	-	-
			Total	11

Out of 11 varieties/lines of sesame, there was no immune and highly resistant. 4 were resistant. 7 were moderately resistant. No line or variety was found susceptible.

Table 15:-BEHAVIOUR OF SESAME GERMPLASM AGAINST CHARCOAL ROTDISEASE DURING 2016 AT M.B.DIN.

Score	Conditions	Remarks	Varieties/lines	No. of varieties/lines
0	No symptoms on plants	Immune	-	-
1	1% or less plants mortality	Highly Resistant (HR)	-	-
3	1-10 % mortality	Resistant (R)	50011, 50022,	2
5	11-25 % mortality	Moderately Resistant (MR)	40012, 10003, 40004, 40021, 87008, 70004, TS-5, Black Till,	8
7	26-50% mortality	Susceptible (S)	TH-6	1
9	51% or more mortality	Highly Susceptible (HS)	-	-
			Total	11

Out of 11 varieties/lines of sesame, there was no immune and highly resistant. 2 were resistant. 8 varieties/lines were found moderately resistant and 1 was susceptible.

Layout	RCBD
Plot size	5 x 1.5m
Repeats	3
Fertilizer	60:60 NP Kg/ha
Sowing date	21-07-2016
Harvesting date	26-10-2016

PROJECT -6: BEHAVIOR OF SESAME GERMPLASM AGAINST PHYLLODY DISEASE DURING 2015.

The sesame germplasm was sown at Faisalabad to note their behavior to phyllody disease. 11 lines/varieties were sown under natural conditions at ORI field. The disease infection was recorded on the basis of diseased/healthy plants in each entry. The entries were classified according to the intensity of infection and the data recorded are presented in table.

Table-16:-BEHAVIOUR OF SESAME GERMPLASM AGAINST PHYLLODY DISEASE DURING 2016.

Score	Conditions	Remarks	Varieties/lines	No. of varieties/lines
0	No symptoms on plants	Immune	-	-
1	1% or less plants infected	Highly Resistant (HR)	-	-
3	1-10% plants infected	Resistant (R)	40012, 10003, 40004, 50011,	4
5	11-20% plants infected	Moderately resistant (MR)	40021, 70004, 50022, 87008, Black Till, TS-5, TH-6	7

7	21-50% plants infected	Susceptible (S)	-	-
9	51% or above plants infected	Highly Susceptible (HS)	-	-
			Total	11

Out of 11 varieties/lines of sesame, there was no immune and highly resistant. 4 were resistant. 7 were moderately resistant. No line/variety was found susceptible.

Layout	RCBD
Plot size	5 x 1.5m
Repeats	3
Fertilizer	60;60 NP Kg/ha
Sowing date	21-07-2016
Harvesting date	26-10-2016

7-OILSEED ENTOMOLOGY

Project 1. SCREENING OF PROMISING STRAINS OF *Brassica juncea* AGAINST MUSTARD APHID

Fourteen promising strains of *Brassica juncea* were sown to test their behavior against aphids under natural conditions. The aphid population was recorded from top 10 cm central shoot by selecting 5 plants randomly from each plot in three replications. The results are given in the following table.

Table

Sr. No.	Strain/Variety	Avg. aphid population/10 cm central shoot
1	13CBJ004	133.09
2	RBJ-08015	127.24
3	RBJ-12019	121.82
4	RBJ-13030	121.46
5	KJ-230	113.74
6	Khan pur Rya	112.38
7	13CBJ006	111.37
8	RBJ-13046	111.03
9	ZBJ-08051	107.58
10	BRJ-1104	108.20
11	ZBJ-06012	105.51
12	Kj-221	103.86
13	BRJ-1103	99.56
14	Jangli Rye	40.44
	LSD@5%	**50.523**

Design	RCB
Plot size	5 x 0.9 m
Row spacing	45 cm
Repeats	3
Plant spacing	15 cm
Fertilizer	75:75:0 NPK kg /ha
Sowing date	13.11.15

Statistical analysis showed significant differences among the tested cultivars. The maximum aphid population was found on Brassica juncea line 13CBJ004 (133.9) followed by RBJ-08015 and RBJ-12019 with the aphids population of 127 and 121 per top 10 cm of plant. While minimum population of aphids was found on Jangli rye.

Project 2. SCREENING OF PROMISING STRAINS OF *Brassica napus* AGAINST MUSTARD APHID

Ten promising entries of *Brassica napus* were sown to test their behaviour against aphids under natural conditions. The aphid population was recorded from top 10 cm central shoot by selecting 5 plants randomly from each plot in three replications. The results are given in the table.

Sr. No.	Strain/Variety	Avg. aphid population/10 cm central shoot
1	KN-263	157.53
2	Faisal Canola	113.91
3	RBN-13028	112.74
4	RBN-13019	109.76
5	RBN-09038	107.18
6	13CBN006	100.49
7	KN-277	97.86
8	RBN-11049	94.78
9	13CBN005	93.88
10	Jangli Rye	33.81
LSD@5%		48.223

Design	RCB
Repeats	3
Plot size	5 m x 1.3 m
Plant spacing	15 cm
Fertilizer	75 : 75 NP Kg /ha
Row spacing	45 cm
Date of sowing	03.11.2015

The data revealed that statistically significant differences were found among all the genotypes. However, All the genotypes showed above ETL population whereas, the aphid population remained below ETL on the genotype, Jangli Rye.

Project 3. EVALUATION OF DIFFERENT INSECTICIDES AGAINST MUSTARD APHID ON *Brassica juncea*

Four insecticides were tested for their efficacy against Mustard Aphids.Data regarding Mustard Aphids were recorded on the top 10 cm of the central shoot. When its population reached at ETL, the treatments were applied. Data after application of insecticides were recorded after 24, 48 and 72 hours. The following formula was used for data recording.

$$\% \text{ Mortality} = \frac{\text{Pre treatment population-post treatment population}}{\text{Pre treatment population}} \times 100$$

Sr.#	Insecticides		Pre-treatment pop.	24 hrs after treatment % Mortality	48 hrs after treatment % Mortality	72 hrs after treatment % Mortality	168 hour after treatment
	Trade Name	Common Name					
1	Advantage	Carbosulfan	(251.00)	(21.40) 91.4	(14.20) 94.3	(2.67) 98.9	(3.33) 98.7
2	Planum	pymetrozine	(230.33)	(18.13) 92.0	(19.4) 91.6	(31.0) 87.2	(7.7) 96.6
3	Oshin	Dinotefuron	(239.33)	(41.87) 81.8	(55.07) 77.9	(44.4) 81.8	(31.2) 87.1
4	Chlorphenapayar	Chlorphenapayar	(190.80)	(88.93) 53.0	(19.20) 89.8	(127.6) 31.8	(95.3) 49.6
5	Control		(268.67)	(279.8) -4.4	(275.2) -2.5	(279.2) -4.1	(271.9) -1.20

The results are given as under;

Design	RCB
Repeats	3
Plot size	5m x1.3 m
Fertilizer	75:75:0 NPK kg/ha
Row spacing	45 cm
Sowing date	13.11.2015

The results revealed that Advantage was found to be the most effective by rendering more than 90 % control during all observation of times. Which was followed by Planum and Oshin etc.

Project 4. IDENTIFICATION OF GENETIC RESISTANCE IN BRASSICA AGAINST MUSTARD APHID)

The source population was sown in the field under natural conditions. The healthy plants free from aphid attack were selected for further testing as single plant progenies during next season.

Project 5. SCREENING OF PROMISING STRAINS OF SUNFLOWER AGAINST INSECT PESTS (SPRING CROP, 2016)

Sixteen promising hybrids of sunflower were sown to test their behavior against different insect pests of sunflower under natural conditions. The population of sucking insect pest (Jassid) was recorded from 3 leaves from each of five plants per plot. Whereas, the data regarded Head moth was recorded from heads of five randomly selected plants in each treatment. The results are given in table.

PREVIOUS YEAR'S RESULTS:			
Sr.No.	**Varieties/Hybrids**	**Jassid/leaf**	**Head moth larval Pop./Plant**
1.	FH-606	5.17	0.58
2.	FH-607	5.57	0.46
3.	FH-608	4.53	0.27
4.	FH-609	5.33	0.41
5.	FH-610	5.93	0.29
6.	FH-611	5.61	0.36
7.	FH-612	5.53	0.49
8.	FH-613	6.21	0.38
9.	FH-614	5.37	0.38
10.	FH-615	8.97	0.47
11.	FH-616	5.13	0.45
12.	FH-618	7.47	0.41
13.	FH-619	5.71	0.39
14.	FH-620	9.21	0.33

Sr. No.	**Avg. aphid population/10 cm central shoot**
1	226.6
2	220.4
3	214.7
4	214.1
5	218.2
6	215.8
7	20
8	219.4
9	217.0
10	216.4
11	216.4
12	226.1

15.	FH-621	6.07	0.42
16.	FH-622	3.77	0.35
	LSD 5%	0.4981	0.1376

- The data revealed that the population of Whitefly did not appear during the entire season.
- The population of jassid remained above ETL on all the tested hybrids.
- In case of Head moth larvae, the population remained below ETL on all the tested hybrids during the entire season.

Project 6. COMPARATIVE EFFICACY OF DIFFERENT INSECTICIDES AGAINST HEAD MOTH LARVAE ON SUNFLOWER.

Head moth caterpillars were recorded on the heads of sunflower. When its population reached 1.0/head, the treatments were applied. Data after application of insecticides were recorded after 24 hours, 48 hours and 72 hours respectively. The following formula was used for data recording.

% Mortality of Aphid population =

$$100 \times \frac{\text{Pretreatment population} - \text{post treatment population}}{\text{Pre-treatment population}}$$

The Results are given as under:-

Sr. #	Insecticides	Pre-treatment pop.	24 hrs after treatment % Mortality	48 hrs after treatment % Mortality	72 hrs after treatment % Mortality
1	**Emamectin benzoate**	**1.00**	**53.33**	**60.00**	**94.00**
2	**Radiant (Spinetoram)**	**1.00**	**46.67**	**80.00**	**90.00**
3	**Chlorpyriphos**	**1.27**	**31.39**	**52.76**	**63.00**
4	**Profenofos**	**1.13**	**41.11**	**53.09**	**76.00**
5	**Spinosad**	**1.00**	**20.00**	**40.00**	**87.00**
6	**check (Unsprayed)**	**1.07**	**-5.56**	**-12.15**	**-24.00**

Design	R.C.B.
Replications	3
Row spacing	45 cm
Plot size	4.5 x 5 m
Fertilizer	75 : 75 NP kg/ha
Date of sowing	12.02.2016

It is quite evident from the data that up to 94.00 % pest mortality occurred where Emamectin Benzoate was used. However, significant differences were also found among treatments.

8-OIL TECHNOLOGY

Project 1. EVALUATION OF PROMISING LINES OF MUSTARD FOR OIL CONTENT

LINE	OIL CONTENTS %	LINE	OIL CONTENTS %	LINE	OIL CONTENTS %
ZKB 1	39.13	ZKB 23	38.93	ZKB 45	36.18
ZKB 2	39.21	ZKB 24	38.55	ZKB 46	36.56
ZKB 3	36.90	ZKB 25	39.39	ZKB 47	35.98
ZKB 4	37.28	ZKB 26	38.64	ZKB 48	35.86
ZKB 5	36.75	ZKB 27	39.00	ZKB 49	37.00
ZKB 6	40.34	ZKB 28	39.32	ZKB 50	35.77
ZKB 7	39.34	ZKB 29	40.09	ZKB 51	36.11
ZKB 8	39.27	ZKB 30	39.20	ZKB 52	37.02
ZKB 9	39.60	ZKB 31	43.97	ZKB 53	36.73
ZKB 10	39.91	ZKB 32	44.05	ZKB 54	36.36
ZKB 11	39.57	ZKB 33	44.58	ZKB 55	35.85
ZKB 12	40.44	ZKB 34	45.16	ZKB 56	36.41
ZKB 13	40.36	ZKB 35	44.68	ZKB 57	35.78
ZKB 14	39.57	ZKB 36	44.58	ZKB 58	38.53
ZKB 15	40.00	ZKB 37	43.53	ZKB 59	38.00
ZKB 16	37.96	ZKB 38	44.08	ZKB 60	37.98
ZKB 17	36.29	ZKB 39	44.80	ZKB 61	39.53
ZKB 18	37.56	ZKB 40	45.15	ZKB 62	39.27
ZKB 19	38.27	ZKB 41	43.15	ZKB 63	40.27
ZKB 20	38.03	ZKB 42	43.40	ZKB 64	40.34
ZKB 21	38.31	ZKB 43	36.65	ZKB 65	40.89
ZKB 22	38.63	ZKB 44	37.02	ZKB 66	39.84

Sixty six zaid kharif Brassica lines were tested for oil contents. Highest oil content was recorded in ZKB 34 (45.16%) followed by ZKB 40 (45.15%) while lowest in was ZKB 50 (35.77%).

Project 2. DETERMINATION OF OIL COTENTS OF SUNFLOWER HYBRIDS

HYBRID	OIL CONTENTS %	HYBRID	OIL CONTENTS %
FH 516	42.09	FH 587	39.18
FH 331	39.78	FH 592	38.59
FH 533	35.63	FH 594	37.35
FH 557	36.29	FH 595	36.14
FH 558	36.21	FH 596	35.97
FH 572	37.19	FH 598	37.22
FH 585	38.45	FH 600	38.69
FH 586	39.17	FH 583	40.44

Sixteen hybrids (forty eight samples) were tested for oil contents. Highest oil content was recorded in FH 516 (42.09%) followed by FH 583 (40.44%) while lowest in was FH 533 (35.63%).

Project 3. EVALUATION OF OIL CONTENT OF SUNFLOWER HYBRID SOWN AT DIFFERENT SOWING DATES

SOWING DATES	OIL CONTENTS %	SOWING DATES	OIL CONTENTS %
30-12- 2015	41.70	**02-02-2016**	39.04
06-01-2016	41.08	**09-02-2016**	37.81
13-01-2016	41.0	**17-02-2016**	30.32
20-01-2016	39.26	**24-02-2016**	30.62
27-01-2016	39.02	**03-03-2016**	27.14
		10-03-2016	21.21

One hybrid sown on nine sowing dates tested for oil contents indicated that first sowing date was the best (41.70%) while lowest was the last sowing date (Table-3)

Project 4. OIL CONTENT OF SUNFLOWER HYBRID INFLUENCED BY DIFFERENT FERTILIZERS

FERTILIZERS	OIL CONTENT %	FERTILIZERS	OIL CONTENT %
P0N0	30.75	P2N3	37.93
P0N1	36.43	P2N4	44.12
P0N2	37.46	P2N5	39.81
P0N3	39.40	P3N0	36.02
P0N4	39.63	P3N1	36.00
P0N5	37.59	P3N2	38.18
P1N0	32.17	P3N3	39.80
P1N1	36.22	P3N4	39.68
P1N2	38.39	P3N5	38.61
P1N3	39.27	P4N0	31.42
P1N4	40.06	P4N1	33.72
P1N5	42.19	P4N2	37.20
P2N0	32.37	P4N3	38.18
P2N1	33.48	P4N4	38.75
P2N2	37.74	P4N5	35.59

(Note: P0 = No Phosphorus ; P_1= Phosphorus @ 99 kg/ha (standard); P_2= Phosphorus @129 kg/ha

P_3= Phosphorus @ 144 kg/ha ; P_4= Phosphorus @ 159 kg/ha

N_o= No Nitrogen ; N1 =Nitrogen @ 148 kg/ha(standard); N_2= Nitrogen @ 170 kg/ha
N_3= Nitrogen @ 192 kg/ha; N_4= Nitrogen @ 215 kg/ha ; N_5= Nitrogen @ 237 kg/ha)

Thirty samples with triplicate (total ninety samples) of sunflower influenced by different fertilizer rate were tested for oil contents. Highest oil content was recorded at P2N4 (phosphorus level 2 and nitrogen level 4) that were 44.12% followed by P1N5 (phosphorus level 1 and nitrogen level 5) that were 42.19% while lowest was P0N0 (phosphorus level 0 and nitrogen level 0) that were 30.75%