

INTRODUCTION

Potato is an important food as well as cash crop. Being rich in starch and having highest productivity per unit area, it has great potential to address the challenge of food security. In many European countries, potato serves as staple food. In Pakistan also, potato is the part and parcel of common man's diet. In Pakistan, potato is cultivated all around the country from mountains to shores. In Punjab, its cultivation is concentrated in the districts of Okara, Pakpattan, Sahiwal and Kasur, so called the "Potato core area".

Asia and Europe are the world's major potato producing regions, accounting for more than 80% of world production. Potato plays a strong role in developing countries with its ability to provide nutritious food for the poor and hungry. The demand for potato is growing both as fresh and processed food.

Potato is reported to have been introduced in the sub-continent during sixteenth century. Potato had been cultivated in Nepal for a long time. In Pakistan, potato production has been increased 120 times from 24 thousand tons to 2901.1 thousand tons from 1947 to 2013-14. In Punjab, potato was grown on **165.4** thousand hectares with a production of **3810.7** thousand tones with an average yield of 23.0 t/ha during 2015-16. Although, the average yield of potato in Pakistan is higher than the world average, however it is far low as compared to the developed potato producing countries i.e New Zealand, Netherland, France, Germany etc. so this is the area to work at. Genetic diversity in potato cultivars has been studied widely for high yield & disease resistance in locally adapted potato cultivars. The Research on Potato is concentrated at Potato Research Institute, Sahiwal, Potato Research Station, Sahowali (Sialkot), and Potato Breeding Research Sub-Station, Murree with the following SMART (specific, measurable, achievable, realistic & time bound) objectives:

- Development of high yielding, disease resistant, frost tolerant and good quality potato varieties through conventional breeding
- Introduction of disease/frost tolerant varieties with high yield potential and good potato quality
- Standardization of production technology for elite potato strains
- Pathological studies to control fungal, viral and other diseases
- Quality evaluation to feed the Potato Processing Industry
- Pre-basic and basic seed production through modern techniques of tissue culture

Multifarious research experiments on all above mentioned important aspects of Potato crop were planned and conducted at Potato Research Institute, Sahiwal and its sub formations i.e., Potato Research Station, Sahowali (Sialkot) and Potato Research Sub-Station, Muree.

TECHNICAL STAFF POSITION

Name of the Post	Total sanctioned strength	Filled	Vacant
Potato Research Institute, Sahiwal			
Director	1	-	1
Botanist	1	1	-
Assistant Botanist Potato	1	1	-
Assistant Research Officer (PBG)	4	2	2
Assistant Research Officer (PP)	1	1	-
Assistant Research Officer (FT)	1	-	1
Total	9	5	4
Potato Research Station, Sahowali (Sialkot)			
Potato Botanist	1	1	-
Assistant Botanist Potato	1	1	-
Assistant Research Officer (PBG)	1	-	1
Assistant Plant Pathologist	1	1	-
Total	4	3	1
Potato Research Sub-station, Faisalabad			
Assistant Food Technologist	1	-	1
Assistant Research Officer (PBG)	1	-	1
Assistant Research Officer (FT)	1	1	-
Total	3	1	2
Potato Research Sub Station (Muree)			
Assistant Research Officer (PBG)	1	1	-
Grand Total	17	10	7

1.PLANT BREEDING

A.Potato Research Institute Sahiwal

1. Maintenance of Germplasm.

A total of 150 strains/varieties were maintained at Potato Research Institute, Sahiwal. The material was sown on **29.10,2015** keeping plant to plant and row to row distances as 20 & 75 cm, respectively. The plot size so maintained was 8.0m x 0.75 m. The trial was conducted according to non replicated single row layout. Standardized agronomic and plant protection measures were adopted. Harvesting was done on **23.02.2016**. Data regarding emergence %age, tuber grades/diseases and tuber yield were recorded. The results are presented in Table No.1

Table No. 1 Performance of germplasm during 2015-16

Rank	Variety	Emer (%)	Tuber Grade (%)			Tuber Diseases (%)			Yield (t/ha)
			<35 mm	35-55 mm	>55 mm	Scab	Rhiz	Crack	
1	SL 13-4	92.5	20.0	77.0	3.0	2.0	0.0	0.0	13.3
2	SL 13-39	100.0	12.0	84.0	4.0	3.0	17.0	1.0	13.3
3	Metro	65.0	20.0	78.0	2.0	2.0	30.0	0.0	11.7
4	FD 61-3	92.5	20.0	78.0	2.0	4.0	10.0	1.0	11.7
5	FD 76-38	95.0	12.0	84.0	4.0	2.0	5.0	0.0	10.8
6	FD 8-1	100.0	40.0	60.0	0.0	3.0	58.0	0.0	10.8
7	Safarane	70.0	10.0	86.0	4.0	2.0	10.0	0.0	10.0
8	FD 44-26	95.0	24.0	75.0	1.0	3.0	60.0	0.0	10.0
9	SL 13-16	92.5	10.0	88.0	2.0	2.0	2.0	0.0	10.0
10	Memphis	42.5	10.0	88.0	2.0	3.0	10.0	2.0	8.3
11	FD 75-50	97.5	24.0	76.0	0.0	2.0	4.0	1.0	8.3
12	FD 72-25	95.0	12.0	88.0	0.0	4.0	5.0	0.0	8.3
13	FD 74-47	72.5	40.0	60.0	0.0	2.0	20.0	0.0	8.3
14	FD 75-55	97.5	20.0	80.0	0.0	4.0	80.0	0.0	8.3
15	FD 74-19	100.0	60.0	40.0	0.0	2.0	95.0	0.0	8.3
16	SL 13-64	100.0	23.0	75.0	2.0	4.0	7.0	0.0	8.3
17	SL 14-13	97.5	17.0	80.0	3.0	6.0	4.0	1.0	8.3
18	N-2005-1	72.5	30.0	70.0	0.0	2.0	10.0	0.0	8.3
19	SH-778	75.0	25.0	73.0	2.0	2.0	0.0	0.0	8.3
20	FD 37-13	97.5	10.0	86.0	4.0	4.0	15.0	2.0	7.5
21	FD 3-10	90.0	35.0	63.0	2.0	2.0	20.0	0.0	7.5
22	FD 76-12	87.5	10.0	87.0	3.0	10.0	14.0	0.0	7.5
23	FD 75-35	95.0	45.0	55.0	0.0	0.0	0.0	0.0	7.5
24	Orchestar	77.5	30.0	68.0	2.0	4.0	20.0	0.0	7.5
25	FD 73-75	97.5	25.0	75.0	0.0	2.0	12.0	0.0	7.5

26	SL 21-10	100.0	70.0	30.0	0.0	0.0	0.0	0.0	7.5
27	N-2005-4	67.5	35.0	65.0	0.0	2.0	50.0	0.0	7.5
28	SH-718	55.0	40.0	60.0	0.0	3.0	5.0	0.0	7.5
29	Zina Red	25.0	20.0	76.0	4.0	2.0	8.0	0.0	6.7
30	Masai	80.0	50.0	50.0	0.0	2.0	70.0	0.0	6.7
31	Monika	82.5	45.0	55.0	0.0	4.0	95.0	2.0	6.7
32	FD 69-2	90.0	10.0	85.0	5.0	0.0	5.0	0.0	6.7
33	FD 80-6	87.5	17.0	81.0	2.0	2.0	30.0	0.0	6.7
34	FD 74-50	95.0	35.0	64.0	1.0	0.0	0.0	0.0	6.7
35	FD 76-27	87.5	10.0	88.0	2.0	2.0	10.0	1.0	6.7
36	FD 48-4	97.5	50.0	50.0	0.0	0.0	60.0	0.0	6.7
37	FD 77-62	95.0	15.0	80.0	5.0	5.0	7.0	0.0	6.7
38	FD 63-4	72.5	40.0	58.0	2.0	2.0	14.0	2.0	6.7
39	SL 14-6	85.0	20.0	78.0	2.0	4.0	5.0	0.0	6.7
40	SL 13-18	92.5	30.0	70.0	0.0	2.0	40.0	0.0	6.7
41	N-393619-44	65.0	35.0	65.0	0.0	3.0	5.0	0.0	6.7
42	SH-798	27.5	30.0	69.0	1.0	4.0	35.0	0.0	6.7
43	SH-1372	92.5	18.0	80.0	2.0	4.0	50.0	1.0	6.7
44	Mandola	55.0	25.0	71.0	4.0	2.0	20.0	0.0	5.8
45	Barren	80.0	40.0	60.0	0.0	2.0	30.0	1.0	5.8
46	HZD-03-941	45.0	45.0	55.0	0.0	3.0	20.0	0.0	5.8
47	Elodia	67.5	30.0	70.0	0.0	4.0	12.0	2.0	5.8
48	VDW-01-69	55.0	35.0	64.0	1.0	0.0	10.0	2.0	5.8
49	Verdy	40.0	20.0	86.0	4.0	2.0	15.0	1.0	5.8
50	FD 75-63	97.5	55.0	45.0	0.0	0.0	0.0	0.0	5.8
51	FD 61-6	82.5	50.0	50.0	0.0	2.0	80.0	0.0	5.8
52	FD 7-2	90.0	30.0	70.0	0.0	0.0	15.0	0.0	5.8
53	FD 76-48	90.0	13.0	85.0	2.0	2.0	10.0	1.0	5.8
54	FD 19-2	85.0	15.0	83.0	2.0	2.0	9.0	0.0	5.8
55	FD 52-2	82.5	28.0	70.0	2.0	2.0	11.0	3.0	5.8
56	FD 53-6	85.0	27.0	70.0	3.0	0.0	17.0	0.0	5.8
57	Diamant	95.0	30.0	70.0	0.0	3.0	10.0	0.0	5.8
58	Asterix	70.0	10.0	88.0	2.0	2.0	12.0	0.0	5.8
59	Rosetta	95.0	30.0	70.0	0.0	2.0	70.0	0.0	5.8
60	FD 3-9	67.5	30.0	70.0	0.0	4.0	25.0	0.0	5.8
61	N-2009	85.0	45.0	55.0	0.0	4.0	5.0	0.0	5.8
62	N-18	75.0	40.0	59.0	1.0	4.0	30.0	0.0	5.8
63	SH-726	40.0	8.0	91.0	1.0	4.0	78.0	0.0	5.8
64	SH-216A	60.0	15.0	82.0	3.0	5.0	35.0	0.0	5.8
65	SH-1065	92.5	25.0	74.0	1.0	2.0	35.0	0.0	5.8
66	SH-788	70.0	35.0	63.0	2.0	4.0	25.0	1.0	5.8
67	SH-117	60.0	40.0	59.0	1.0	2.0	15.0	0.0	5.8
68	Florence	40.0	30.0	70.0	0.0	2.0	32.0	0.0	5.0

69	Jitka	50.0	30.0	69.0	1.0	3.0	35.0	1.0	5.0
70	Muzart	60.0	15.0	80.0	5.0	2.0	20.0	1.0	5.0
71	Saghitta	77.5	35.0	63.0	2.0	2.0	30.0	0.0	5.0
72	Dolly	72.5	45.0	55.0	0.0	6.0	80.0	0.0	5.0
73	Ronaldo	67.5	20.0	80.0	0.0	2.0	80.0	0.0	5.0
74	Musica	67.5	29.0	71.0	0.0	2.0	20.0	0.0	5.0
75	Lucinda	70.0	34.0	65.0	1.0	0.0	20.0	0.0	5.0
76	FD 51-5	77.5	17.0	81.0	2.0	4.0	22.0	3.0	5.0
77	FD 74-40	85.0	10.0	88.0	2.0	0.0	57.0	0.0	5.0
78	FD 74-51	77.5	40.0	60.0	0.0	0.0	20.0	0.0	5.0
79	FD 74-33	87.5	35.0	64.0	1.0	2.0	0.0	0.0	5.0
80	Atlantic	80.0	15.0	83.0	2.0	2.0	90.0	2.0	5.0
81	Opal	97.5	40.0	59.0	1.0	3.0	60.0	2.0	5.0
82	FD 49-62	55.0	30.0	69.0	1.0	8.0	90.0	1.0	5.0
83	N-4	52.5	40.0	60.0	0.0	2.0	20.0	0.0	5.0
84	SH-1041	75.0	35.0	65.0	0.0	4.0	80.0	0.0	5.0
85	SH-704	60.0	50.0	50.0	0.0	2.0	10.0	0.0	5.0
86	SH-67	62.5	40.0	60.0	0.0	4.0	75.0	0.0	5.0
87	SH-29	92.5	20.0	80.0	0.0	6.0	70.0	2.0	5.0
88	Barbora	32.5	15.0	80.0	5.0	3.0	5.0	2.0	4.2
89	Caruso	100.0	45.0	55.0	0.0	4.0	90.0	0.0	4.2
90	Magda	82.5	50.0	50.0	0.0	0.0	98.0	0.0	4.2
91	FD 63-2	85.0	30.0	68.0	2.0	0.0	15.0	2.0	4.2
92	FD 74-53	70.0	40.0	60.0	0.0	1.0	17.0	1.0	4.2
93	Cardinal	85.0	15.0	82.0	3.0	7.0	40.0	0.0	4.2
94	N-13	50.0	20.0	79.0	1.0	3.0	80.0	0.0	4.2
95	SH-460	40.0	30.0	80.0	0.0	2.0	95.0	0.0	4.2
96	SH-701	42.5	14.0	85.0	1.0	3.0	60.0	1.0	4.2
97	SH-692	57.5	40.0	60.0	0.0	2.0	10.0	1.0	4.2
98	SH-295	45.0	40.0	60.0	0.0	4.0	70.0	0.0	4.2
99	Festival	27.5	20.0	78.0	2.0	2.0	7.0	1.0	3.3
100	Shepody	35.0	15.0	85.0	0.0	4.0	80.0	0.0	3.3
101	Bohemia	35.0	49.0	50.0	1.0	2.0	10.0	0.0	3.3
102	Estima	57.5	24.0	75.0	1.0	2.0	30.0	0.0	3.3
103	Arinda	35.0	30.0	70.0	0.0	0.0	15.0	0.0	3.3
104	Vendula	45.0	70.0	30.0	0.0	2.0	25.0	0.0	3.3
105	Milva	50.0	40.0	60.0	0.0	0.0	10.0	0.0	3.3
106	Crisp for all	60.0	35.0	65.0	0.0	4.0	90.0	0.0	3.3
107	Cumbica	75.0	40.0	60.0	0.0	0.0	0.0	0.0	3.3
108	Romera	82.5	70.0	30.0	0.0	2.0	85.0	2.0	3.3
109	FD 75-3	32.5	29.0	70.0	1.0	2.0	17.0	0.0	3.3
110	FD 74-21	22.5	15.0	83.0	2.0	1.0	35.0	0.0	3.3
111	FD 35-25	47.5	12.0	87.0	1.0	0.0	4.0	0.0	3.3

112	FD 48-54	65.0	30.0	69.0	1.0	0.0	7.0	0.0	3.3
113	FD 77-30	80.0	55.0	45.0	0.0	0.0	10.0	0.0	3.3
114	Fsd Red	77.5	60.0	40.0	0.0	4.0	80.0	0.0	3.3
115	Desiree	75.0	45.0	55.0	0.0	2.0	65.0	0.0	3.3
116	Lady Rosetta	75.0	35.0	65.0	0.0	2.0	95.0	0.0	3.3
117	Terka	82.5	50.0	50.0	0.0	3.0	75.0	2.0	3.3
118	Sassy	80.0	50.0	50.0	0.0	7.0	95.0	0.0	3.3
119	Horizon	52.5	25.0	75.0	0.0	2.0	35.0	2.0	3.3
120	Yona	45.0	45.0	55.0	0.0	0.0	50.0	0.0	3.3
121	FD 8-3	47.5	30.0	69.0	1.0	0.0	32.0	0.0	3.3
122	SH-376	30.0	10.0	88.0	2.0	0.0	0.0	8.0	3.3
123	SH-457	95.0	15.0	85.0	0.0	2.0	17.0	0.0	3.3
124	SH-240	27.5	12.0	85.0	3.0	2.0	5.0	0.0	3.3
125	SH-330	20.0	9.0	90.0	1.0	2.0	15.0	0.0	3.3
126	Santana	40.0	12.0	87.0	1.0	2.0	10.0	2.0	2.5
127	Diroso	10.0	20.0	75.0	5.0	3.0	0.0	0.0	2.5
128	Toscana	15.0	34.0	66.0	0.0	2.0	4.0	0.0	2.5
129	Kufri Pushkar	40.0	23.0	75.0	2.0	2.0	30.0	0.0	2.5
130	Red Anna	67.5	50.0	50.0	0.0	4.0	90.0	2.0	2.5
131	Challenger	30.0	35.0	65.0	0.0	2.0	40.0	0.0	2.5
132	Chipsona	95.0	35.0	65.0	0.0	0.0	40.0	0.0	2.5
133	FD 74-24	70.0	20.0	80.0	0.0	3.0	10.0	0.0	2.5
134	Morene	45.0	35.0	65.0	0.0	2.0	80.0	4.0	2.5
135	FD 76-13	25.0	10.0	89.0	1.0	2.0	15.0	0.0	2.5
136	SH-515	70.0	30.0	70.0	0.0	2.0	40.0	0.0	2.5
137	SH-68	45.0	70.0	30.0	0.0	2.0	40.0	0.0	2.5
138	Amarin	10.0	26.0	70.0	4.0	4.0	5.0	0.0	1.7
139	Red River	7.5	28.0	70.0	2.0	2.0	70.0	0.0	1.7
140	Nancy	17.5	40.0	60.0	0.0	2.0	25.0	0.0	1.7
141	Almira	20.0	30.0	70.0	0.0	0.0	10.0	0.0	1.7
142	HZD-04-684	10.0	40.0	60.0	0.0	0.0	0.0	0.0	1.7
143	Paramount	20.0	35.0	65.0	0.0	2.0	25.0	0.0	1.7
144	Artemis	15.0	50.0	50.0	0.0	3.0	10.0	4.0	1.7
145	Tiamo	20.0	50.0	50.0	0.0	0.0	10.0	0.0	1.7
146	Ludmilla	10.0	50.0	50.0	0.0	0.0	10.0	0.0	1.7
147	N-15	17.5	10.0	89.0	1.0	1.0	80.0	0.0	1.7
148	Evora	12.5	50.0	50.0	0.0	0.0	0.0	0.0	0.8
149	Suzen	15.0	40.0	60.0	0.0	0.0	15.0	0.0	0.8
150	Jared	10.0	35.0	65.0	0.0	0.0	17.0	0.0	0.8

According to the data regarding the parameters shown in the Table No.1, it was observed that maximum tuber yield (**13.3 t/ha**) was recorded in the local strains SL 13-4 & SL 13-39

followed by “Metro” & “FD 61-3” with yield value of **11.7** t/ha while the minimum tuber yield (**0.8** t/ha) was recorded in exotic varieties Evora, Suzen & Jared . Tuber grade data indicated that the varieties FD 69-2, FD 77-62, Muzart, Barbora & Dirosso produced maximum percentage (5.0%) of ration size tubers. Regarding disease infestation, it was noticed that maximum scab incidence (**10.0%**) was recorded on the local strain FD 76-12, maximum rhizoctonia incidence (98.0%) was observed on the variety Magda and maximum tuber cracking (**8.0%**) was seen on the strain SH-336.

2. Enhancement of Gerplasm.

A total of 21 strains/varieties were tested alongwith four check varieties. The material was sown on **29.10.2015**, keeping plant to plant and row to row distances as 20cm & 75 cm, respectively. The plot size so maintained was 8.0m x 0.75 m. The trial was conducted according to the Augmented design. Standardized agronomic and plant protection measures were adopted. Harvesting was done on **23.02.2016**. Data regarding tuber grades/diseases and tuber yield were recorded. The results are presented in Table No.2

Table No. 2 Performance of germplasm during at PRI, Sahiwal during 2015-16

Rank	Variety	Emr %	Tuber Grade (%)			Tuber Diseases (%)			Yield (t/ha)
			<35 mm	35-55 mm	>55 mm	Scab	Rhiz	Crack	
1	SL 4-26	85.8	16.1	81.8	2.2	1.9	30.8	0.3	9.6
2	SL 10-22	92.1	16.1	82.2	1.7	2.7	18.3	1.0	9.4
3	Red Valentine	89.6	12.8	84.8	2.2	1.4	0.8	0.8	8.6
4	SL 7-45	99.6	57.8	41.8	0.2	0.0	50.8	0.0	8.6
5	Camel	84.6	22.8	74.8	2.2	2.4	50.8	0.0	7.8
6	SL 7-21	99.6	31.1	68.2	0.7	3.7	9.3	0.0	7.7
7	SL 1-4	67.1	11.1	87.2	1.7	0.7	2.3	0.0	7.7
8	Red Sun	89.6	21.1	77.3	1.7	2.7	4.3	10.0	7.7
9	SH-5	80.0	10.7	86.7	2.6	2.0	82.3	0.7	7.2
10	FSD White	84.2	37.0	62.7	0.3	2.3	6.0	0.3	6.7
11	SL 10-9	98.3	16.1	81.8	2.2	9.9	4.8	0.3	6.3
12	Red Sonia	87.1	67.8	31.8	0.2	0.0	5.8	0.0	6.1
13	Elmundo	79.6	17.8	80.8	1.2	0.0	0.8	0.0	6.1
14	Kuroda	76.7	25.7	74.0	0.3	2.3	88.0	1.0	5.6
15	SL 8-10	83.3	21.1	77.8	1.2	11.9	8.8	1.3	5.4
16	SL 1-74	88.3	15.1	82.8	2.2	1.9	50.8	1.3	5.4

17	SL 1-47	89.6	13.1	84.2	2.7	2.7	93.3	0.0	5.2
18	Columbia	82.1	36.1	63.3	0.7	2.7	68.3	0.0	5.2
19	Sante	85.0	45.0	55.0	0.0	2.0	4.0	0.0	4.7
20	SL 7-26	78.3	39.1	60.8	0.2	0.9	10.8	0.3	4.6
21	Coronada	87.1	41.1	59.3	0.0	0.7	0.0	0.0	4.4
22	Lady Sara	57.1	47.8	51.8	0.2	1.4	10.8	0.0	4.4
23	SL 11-4	38.3	23.1	73.8	3.2	0.0	10.8	1.3	3.8
24	KWS-06-125	73.3	16.1	81.8	2.2	1.9	20.8	0.3	3.8
25	Rock	24.6	37.8	61.8	0.2	0.0	0.8	0.0	3.6
LSI 5%		13.7	18.9	18.1	N.S	N.S	20.8	N.S	3.4

According to the data regarding the parameters shown in the Table No.2, it is revealed that maximum tuber yield (**9.6 t/ha**) was recorded in the local strain SL 4-26 followed by SL 10-22 with yield value of **9.4 t/ha** while the minimum tuber yield (**3.6 t/ha**) was recorded in exotic variety Rock. Tuber grade data indicated that the strain SL 11-4 produced maximum percentage (**3.2%**) of ration size tubers whereas the strain SL 1-4 produced maximum medium size tubers (**87.2%**) Regarding disease infestation, it was noticed that maximum scab incidence (**11.9%**) was recorded on the local strain SL 8-10, maximum rhizoctonia incidence (93.3%) was observed on the strain SL 1-47 and maximum tuber cracking (**10.0%**) was seen on the exotic variety Red Sun.

3. Secondary evaluation of potato strains.

Eight new strains alongwith two check varieties were tested for their performance. The material was sown on **02.11.2015** keeping plant to plant and row to row distances as 20 cm and 75 cm, respectively with the plot size 8 .0 m x 0.75 m. The trial was conducted according to RCB design with three replications. Standard agronomic practices and plant protection measures were adopted during entire crop season. Harvesting was done on **25.02.2016**. Results are presented below in Table 3.

Table No. 3. Performance of strains/varieties In Secondary Trial at PRI, Sahiwal

Rank	Variety	Emer (%)	Tuber Grade (%)			Tuber Diseases (%)			Yield (t/ha)
			<35 mm	35-55 mm	>55 mm	Scab	Rhiz	Crack	
1	Simply Red	95.0	15.3	79.7	5.0	5.7	0.0	0.0	37.2
2	SL 41-10	83.3	24.3	73.0	2.7	5.0	0.0	1.3	29.7
3	SL 40-5	83.3	27.7	70.3	2.0	1.7	0.0	0.0	28.9
4	SL 41-1	60.8	17.3	77.3	5.4	4.0	0.0	0.0	24.4

5	Sante	88.3	36.0	63.0	1.0	3.3	8.3	0.0	23.9
6	SL 40-3	50.0	25.3	73.0	1.7	2.3	0.0	0.0	20.3
7	SL 42-1	40.0	18.3	77.4	4.3	5.7	0.0	0.0	19.2
8	SL 41-2	20.8	12.3	85.7	2.0	2.3	0.0	0.0	12.2
9	SL 40-4	14.2	14.7	84.0	1.3	1.3	0.0	0.0	5.6
10	SL 41-11	13.3	9.0	87.0	4.0	1.7	0.0	0.0	3.9
LSD 5%		14.550	5.347	4.547	1.959	1.287	0.829	0.313	6.012

It is revealed from the above Table that the commercial check variety Simply Red gave highest yield(**37.2** t/ha) followed by SL 41-10 (29.7 t/ha). The strain SL 11-41 showed the lowest tuber yield (3.9 t/ha). Yield of all the local strains was significantly lower than the commercial check variety Simply Red. As far as emergence %age is concerned, it was noticed that the commercial check variety Simply Red showed maximum emergence (**95.0%**) whereas the strain SL 41-11 showed lowest emergence (**13.3%**). Regarding tuber grades, it was noticed that the check variety Simply Red produced maximum ration size tubers i.e. **5.0%**. The lowest small size tuber percentage (**9.0%**) was produced by the strain SL 41-11. whereas maximum small size tuber percentage (**36.0%**) was produced by the commercial check variety Sante. Regarding disease infestation it was noticed that most of the strains showed resistance to the attack of tuber diseases. Maximum scab incidence (**5.7%**) was recorded on check variety Simply Red & local strain SL 42-1. Maximum rhizoctonia incidence (**8.3%**) and tuber cracking (1.3%) were recorded on the commercial check variety Sante and local strain SL 41-10. Whereas all the other strains/ varieties showed tolerance against rhizoctonia and tuber cracking.

4. Evaluation of potato strains/varieties against frost incidence at PRI, Sahiwal.

Frost is a sever threat to potato crop during autumn season. Researchers are trying to select frost tolerant varieties to overcome this issue. This study was carried out to test the performance of **10** elite potato strains against frost at Potato Research Institute, Sahiwal. Sowing was done on **21.10.2015**, keeping plant to plant and row to row distances as 20 cm & 75 cm, respectively. The plot size was so maintained as 7.0 m x 0.75 m. The trial was conducted according to RCB design with three replications. Appropriate agronomic and plant protection measures were carried out in the crop. The harvesting was done on **19.02.2016**. The results are presented below in Table 4.

Table No. 4. Performance of strains/varieties against frost at PRI, Sahiwal

Rank	Variety	Emer (%)	Tuber Grade (%)			Tuber Diseases (%)			Yield (t/ha)
			<35 mm	35-55 mm	>55 mm	Scab	Rhiz	Crack	
1	SL 8-5	90.5	10.3	87.7	2.0	13.3	0.0	0.0	36.2
2	SL 14-37	88.6	15.0	82.7	2.3	5.7	0.0	0.0	34.9
3	FD 75-6	86.7	11.3	86.0	2.7	6.7	0.0	0.0	33.0
4	SL 13-33	93.3	10.7	87.0	2.3	17.0	3.7	0.0	31.1
5	SL 15-15	95.2	11.0	86.7	2.3	11.3	0.0	0.0	29.2
6	FD 76-67	68.6	22.3	77.7	0.0	82.0	0.0	0.0	29.2
7	SL 15-10	98.1	44.3	55.7	0.0	8.0	0.0	0.0	29.2
8	SL 14-3	98.1	37.7	62.3	0.0	15.0	0.0	0.0	27.3
9	FD 76-35	93.3	27.3	71.7	1.0	4.7	0.0	0.0	25.4
10	FD 77-4	69.5	10.0	86.3	3.7	10.0	2.3	0.0	23.5
LSD 5%		8.686	4.326	5.295	1.060	2.838	1.139	N.S	7.690

During the crop growth period especially in December & January (peak frost incidence period) no frost incidence was observed. So screening of strains against frost could not be undertaken. However the Table shows that the strain SL 8-5 gave highest yield **36.2** t/ha followed by SL 14-37 which yielded **34.9** t/ha. The lowest tuber yield (**23.5** t/ha) was produced by the strain SL FD 77-4. As far as emergence %age is concerned, maximum emergence (**98.1%**) was shown by the strains SL 15-10 & SL 14-3, whereas lowest emergence was shown by the strain FD 76-67 (**68.6%**). Regarding tuber grades, it was noticed that strain FD 77-4 produced maximum ration size and minimum small size tubers i.e. **3.7%** & **10.0%** respectively. whereas maximum small size tuber percentage (**44.3%**) was produced by the strain SL 15-10. Regarding disease infestation it was noticed that all that maximum scab incidence was shown by the strain FD 76-67 (**82.0%**). Maximum rhizoctonia attack (**3.7%**) was recorded on strain SL 13-33. All ;the strains / varieties showed tolerance against tuber cracking.

4.1. Evaluation of potato strains/varieties against frost incidence at NARC, Islamabad.

The study was carried out to test the performance of **10** elite strains against frost at NARC, Islamabad. Sowing was done on **04.11.2015**, keeping plant to plant and row to row distances as 20cm & 75 cm, respectively. The plot size was maintained as 6.0 m x 0.75 m. The trial was conducted according to RCB design with two replications. Appropriate agronomic and plant protection measures were carried out in the crop. Harvesting was done on **25.02.2016**. Results are presented below in Table 5.

Table No. 5. Performance of strains/varieties against frost at NARC, Islamabad

Rank	Variety	Tuber Grade (%)			Yield (t/ha)
		<35 mm	35-55 mm	>55 mm	
1	SL 8-5	60.0	35.7	4.3	7.6
2	SL 13-33	71.5	24.1	4.4	6.8
3	SL 14-3	66.2	26.3	7.5	5.3
4	SL 15-15	68.3	28.5	3.2	5.1
5	FD 76-35	74.1	25.2	0.7	4.7
6	SL 14-37	74.4	25.0	0.6	4.5
7	FD 75-6	54.1	39.6	6.3	3.9
8	FD 76-67	55.0	33.3	11.7	3.8
9	FD 77-4	61.0	39.0	0.0	3.1
10	SL 15-10	100.0	0.0	0.0	1.8
LSD 5%		14.473	12.631	3.581	2.928

Table shows that the strain “SL 8-5” gave highest yield **7.6** t/ha followed by SL 13-33 which yielded **6.8** t/ha. The lowest tuber yield (**1.8** t/ha) was produced by the strain SL 15-10. Regarding tuber grades, it was noticed that strain FD 76-67 produced maximum ration size tubers (**11.7%**). Maximum small size tuber percentage (**100%**) was produced by the strain SL 15-10, whereas minimum small size tubers (**54.1%**) were recorded in the strain FD 75-6.

5. Varietal yield trial of red & white skinned potato strains

Ten strains with two standard entries viz “Simply Red” & “Sante” were evaluated at Potato Research Institute, Sahiwal. The material was sown on **20.10.2015**, keeping 20 cm plant to plant and 75 cm row to row distances. So the plot size was kept was 7.0 m x 2.25 m. The trial was laid out according to RCB design with three replications. Normal agronomic and plant protection practices were adopted. Harvesting was done on **17.02.2016**. Data regarding emergence %age, tuber grades, disease infestation and yield were recorded which are presented in below Table No 6:-

Table No. 6. Performance of strains/varieties in varietal trial at PRI, Sahiwal

Rank	Variety	Emer (%)	Tuber Grade (%)			Tuber Diseases (%)			Yield (t/ha)
			<35 mm	35-55 mm	>55 Mm	Scab	Rhiz	Crack	
1	SL 28-51	98.4	19.3	77.7	3.0	17.7	0.0	0.0	30.1
2	SL 28-15	86.0	17.7	77.0	5.3	10.0	0.0	1.0	26.9
3	SL 24-9	89.8	12.0	82.0	6.0	16.7	0.0	6.3	26.4
4	SL 28-72	94.9	12.0	82.3	5.7	7.3	2.7	0.0	26.2

5	Simply Red	93.3	22.3	74.7	3.0	0.0	9.3	1.3	25.2
6	SL 18-1	95.8	30.7	66.6	2.7	2.3	0.0	1.3	25.0
7	SL 22-4	91.1	13.4	80.3	6.3	10.7	1.3	0.0	23.9
8	SL 28-32	77.2	20.3	78.0	1.7	1.3	0.0	0.0	23.3
9	SL 28-22	68.6	16.0	79.3	4.7	6.7	0.0	1.0	23.3
10	SL 28-16	60.9	8.7	86.6	4.7	4.3	3.3	1.0	19.5
11	SL 16-7	76.2	16.7	78.6	4.7	14.0	0.0	0.0	19.3
12	Sante	94.0	20.7	77.6	1.7	4.3	3.7	0.0	17.8
LSD 5%		22.720	4.896	4.230	1.578	3.751	2.139	1.188	6.417

Results presented in above Table reveal that the highest tuber yield (**30.1 t/ha**) was recorded from the line SL 28-51 followed by “SL 28-15” (**26.9 t/ha**). The lowest tuber yield (17.8 t/ha) was produced by the commercial check variety “Sante”. Four local strains showed higher yield than both the commercial check varieties. Maximum emergence (**98.4%**) was recorded in the strain SL 28-51 whereas minimum in the strain SL 28-16 (**60.9%**). Regarding tuber grades, it was noted that the SL 22-4 produced maximum ration size tubers i.e. **6.3 %**. Maximum small size tubers (**30.7%**) were recorded in the strain SL 18-1. Regarding disease infestation, maximum scab infestation (**17.7 %**) was noted in the strain SL 28-51. Whereas maximum rhizoctonia (**9.3%**) was observed on the commercial check variety Simply Red. Seven local strains showed tolerance against rhizoctonia. Maximum tuber cracking (**6.3 %**) was observed in the strain SL 24-9, whereas six strains showed tolerance against tuber cracking.

6. Advanced varietal yield trial of red & white skinned potato strains

10 advance potato lines were evaluated against two standard entries i.e. “Simply Red” & “Sante” at Potato Research Institute, Sahiwal. The material was sown on **19.10.2015**, keeping 20 cm plant to plant and 75 cm row to row distances. Plot size was kept 7.0 m x 2.25 m. The trial was laid out according to the randomized complete block design with three replications. Normal agronomic and plant protection practices were adopted. Harvesting was done on **15.02.2016**. Data regarding emergence %age, tuber grades, disease infestation and yield were recorded which are presented below in Table No.7.

Table No. 7. Performance of strains/varieties in advanced varietal trial at PRI, Sahiwal

Rank	Variety	Emer (%)	Tuber Grade (%)			Tuber Diseases (%)			Yield (t/ha)
			<35 mm	35-55 mm	>55 Mm	Scab	Rhiz	Crack	
1	SL 14-32	98.7	12.3	80.0	7.7	10.3	0.0	1.7	31.1
2	SL 14-37	94.0	10.3	84.4	5.3	14.3	3.7	0.0	30.5
3	SL 13-43	91.7	15.0	81.7	3.3	3.3	12.7	0.0	30.5

4	SL 15-15	97.8	20.3	74.4	5.3	5.3	0.0	2.0	30.3
5	SL 15-21	96.4	28.7	67.6	3.7	7.0	0.0	0.0	29.6
6	Simply Red	97.5	22.7	75.6	1.7	3.0	0.0	0.0	29.0
7	SL 11-62	96.5	11.0	84.7	4.3	3.0	0.0	0.0	28.8
8	SL 14-15	92.7	10.7	80.3	9.0	6.0	0.0	5.3	28.6
9	SL 15-10	97.1	26.3	70.0	3.7	4.0	0.0	0.0	28.2
10	SL 13-33	99.0	11.7	80.3	8.0	7.3	4.3	0.0	27.3
11	SL 14-3	93.0	12.7	83.0	4.3	12.7	0.0	0.0	22.4
12	Sante	92.4	36.3	60.7	3.0	3.7	7.0	1.0	20.1
LSD 5%		4.728	3.565	3.246	2.577	3.109	1.862	0.642	2.822

It is shown by the results presented above that the highest tuber yield (**31.1 t/ha.**) was recorded in the strain “SL 14-32” followed by SL 14-37 (**30.5 t/ha.**). The lowest tuber yield (20.1 t/ha) was produced by the commercial check variety Sante. All the entries showed above **90%** emergence. The maximum emergence (99.0%) was shown by the strain SL 13-33. Regarding Tuber grades, it was noted that the strain SL 14-15 produced maximum ration size tubers (**9.0 %**). Minimum percentage of small size tubers (10.3%) was produced by the Strain SL 14-37. Regarding, tuber diseases, it was noted that maximum scab infestation (**14.3 %**) was noted in the strain SL 14-37. Maximum rhizoctonia (**12.7%**) was observed on the strain SL 13-43. Eight strains / varieties showed tolerance against rhizoctonia. Maximum cracks (**5.3%**) were observed in the strain SL 14-15 whereas eight strains showed complete tolerance against tuber cracking.

7. Zonal varietal yield trial at PRI, Sahiwal

Eight advance potato lines were evaluated against two standard entries i.e. “Simply Red” and Sante at Potato Research Institute, Sahiwal. The material was sown on **21.10.2015**, keeping 20 cm plant to plant and 75 cm row to row distances. The plot size was kept 7.0 m x 1.5 m. The trial was laid out according to the randomized complete block design with three replications. Normal agronomic and plant protection practices were adopted. Harvesting was done on **19.02.2016**. Data regarding tuber grades, disease infestation and yield were recorded which are presented below in Table No.8.

Table No. 8. Performance of strains/varieties In Zonal varietal trial at PRI, Sahiwal

Rank	Variety	Emer (%)	Tuber Grade (%)			Tuber Diseases (%)			Yield (t/ha)
			<35 mm	35-55 mm	>55 mm	Scab	Rhiz	Crack	
1	FD 63-1	93.8	8.7	85.3	6.0	2.3	0.0	0.0	32.4
2	Simply Red	94.8	19.3	79.4	1.3	4.0	3.0	0.0	26.7
3	FD 78-51	90.5	24.7	73.3	2.0	2.7	0.0	0.0	26.7
4	FD 73-73	90.5	14.0	83.3	2.7	3.3	1.7	0.0	26.4

5	SL 15-10	94.8	34.3	63.7	2.0	7.0	0.0	0.0	26.3
6	FD 76-67	70.0	8.7	88.0	3.3	66.0	0.0	0.0	26.0
7	FD 78-36	85.2	37.0	61.3	1.7	10.7	0.0	0.0	25.1
8	FD 77-4	62.8	11.3	86.4	2.3	8.0	0.0	0.0	24.8
9	FD 71-1	80.9	13.0	83.7	3.3	4.0	17.0	0.0	24.4
10	Sante	89.0	45.3	54.7	0.0	3.3	0.0	0.0	15.5
LSD 5%		14.001	10.216	4.088	1.209	3.404	1.706	N.S	5.792

It is shown by the results presented above that the highest tuber yield (**32.4** t/ha.) was recorded in the strain FD 63-1 followed by commercial check variety “Simply Red” (**26.7** t/ha). The lowest tuber yield (**15.5** t/ha) was produced by the commercial check variety Sante. The highest emergence (94.8%) was recorded from the commercial check variety Simply Red & local strain SL 15-10 whereas lowest emergence was given by the strain FD 77-4 (62.8%). Regarding Tuber grades, it was noted that FD 63-1 produced maximum ration size tubers (**6.0** %). The maximum small size tubers were produced by the commercial check variety Sante (45.3%). Regarding, tuber diseases, it was noted that maximum scab infestation (**66.0** %) was noted in the strain FD 76-67. Maximum rhizoctonia (**17.0%**) was observed on the strain FD 71-1 and all the strains / varieties showed tolerance against tuber cracking.

8. Zonal varietal yield trial at PRS, Sahowali (Sialkot)

Eight advance potato lines were evaluated against two standard entries i.e. Simply Red and Sante at Potato Research Station, Sahowali (Sialkot). The material was sown on **12.11.2015**, keeping 20 cm plant to plant and 75 cm row to row distances. The plot size was kept 6.0 m x 0.75 m. The trial was laid out according to the randomized complete block design with three replications. Normal agronomic and plant protection practices were adopted. Harvesting was done on **26.02.2016**. Data regarding tuber grades, disease infestation and yield were recorded which are presented below in Table No.9.

Table No. 9. Performance of strains/varieties In Zonal varietal trial at PRS, Sahowali (Sialkot)

Rank	Variety	Emer (%)	Tuber Grade (%)			Tuber Diseases (%)			Yield (t/ha)
			<35 mm	35-55 mm	>55 mm	Scab	Rhiz	Crack	
1	FD 73-73	99.7	17.3	62.7	20.0	2.7	0.0	0.0	25.2
2	FD 63-1	100.0	26.7	62.6	10.7	9.7	6.3	0.0	24.4
3	FD 76-67	84.7	15.0	59.0	26.0	5.7	2.3	0.0	21.5
4	FD 78-36	100.0	32.7	56.6	10.7	12.0	7.3	0.0	20.0
5	FD 77-4	98.3	22.7	60.6	16.7	8.3	4.3	0.0	18.5
6	FD 78-51	99.7	24.7	62.0	13.3	33.0	28.0	0.0	18.5

7	SL 15-10	99.3	41.3	50.7	8.0	3.0	1.3	0.0	18.5
8	Simply Red	99.3	22.3	64.4	13.3	8.3	18.3	0.0	17.1
9	FD 71-1	97.0	24.3	61.0	14.7	9.7	9.7	0.0	15.6
10	Sante	88.3	44.0	48.7	7.3	50.7	22.7	1.7	11.1
LSD 5%		2.155	5.537	4.528	2.207	4.525	3.054	0.313	4.524

It is shown by the results presented above that the highest tuber yield (**25.2 t/ha.**) was recorded in the strain FD 73-73 followed by FD 63-1 (**24.4 t/ha.**). The lowest tuber yield (**11.1 t/ha**) was produced by the commercial check variety Sante. The maximum emergence (100%) was recorded from the local strains FD 63-1 & FD 78-36 whereas lowest emergence was given by the strain FD 76-67 (84.7%). Regarding Tuber grades, it was noted that FD 76-67 produced maximum ration size tubers (**26.0 %**). The maximum small size tubers were produced by the commercial check variety Sante (44.0%). Regarding, tuber diseases, it was noted that maximum scab infestation (**50.7 %**) was noted in the commercial check variety Sante. Maximum rhizoctonia (**28.0%**) was observed on the strain FD 78-51. All the entries showed tolerance against tuber cracking except the commercial check variety Sante which expressed 1.7% tuber cracking.

9. National uniform potato yield trial

Seventeen potato strains namely SL 11-50, SL 9-13, SL 10-4, FD 73-49, FD 73-44, SL 9-14, FD 73-110, FD 76-59, SL 8-5, SH-718, SH-1035, SL 5-2, FD 81-1, SL 1-62, N 393574-72, N 2005-1 along with two commercial check varieties Simply Red & Sante were tested at four locations i.e., Potato Research Institute Sahiwal, Vegetable Research Institute Faisalabad, Potato Research Station, Sahowali, (Sialkot) and NARC, Islamabad. The material was planted on **27.10.15, 09.11.15, 12.11.15** and **10.11.15** respectively. Plant to plant and row-to-row distances were kept 20 cm & 75 cm respectively. The plot size at PRI, Sahiwal, VRI, Faisalabad, PRS Sialkot and NARC, Islamabad was maintained as 8.0 m x 2.25 m, 5.0 m x 1.5 m, 6 x 1.5 m and 6 x 0.75 m respectively. The trial was laid out according to Randomized Complete Block design with three replications. Normal agronomic and plant protection measures were carried out to raise the crop properly. Trials were harvested on **22.02.16, 08.03.16, 22.02.16** and **28.02.16**, respectively. The data regarding emergence percentage, tuber grades, tuber diseases and tuber yield were recorded. The results are presented in the Tables 10-17.

Table No. 10. Emergence percentage of varieties/strains at different locations

Rank	Variety	PRI Sahiwal	VRI, Fsd	PRS, SKT	NARC, Islamabad	Average
1	SL 9-14	87.2	-	98.3	100.0	95.2
2	FD 73-44	95.3	-	89.3	99.0	94.5
3	SL 9-13	88.9	-	94.3	99.5	94.2
4	FD 76-59	94.7	-	88.3	99.5	94.2
5	SL 5-2	88.1	-	96.3	96.5	93.6
6	SL 11-50	92.5	-	88.3	100.0	93.6
7	SH-718	86.9	-	95.0	97.0	93.0
8	FD 73-110	88.9	-	90.0	97.5	92.1
9	SL 8-5	81.1	-	94.3	98.5	91.3
10	FD 81-1	88.9	-	84.7	99.0	90.9
11	Simply Red	71.1	-	97.7	100.0	89.6
12	FD 73-49	99.2	-	68.3	99.5	89.0
13	SH-1035	62.2	-	98.7	98.5	86.5
14	N 393574-72	65.0	-	85.7	91.5	80.7
15	Sante	84.7	-	55.7	99.0	79.8
16	SL 10-4	87.8	-	39.3	97.0	74.7
17	SL 1-62	69.4	-	56.7	98.0	74.7
18	N 2005-1	51.7	-	20.0	67.5	46.4
19	N 2005-4	0.5	-	0.0	95.5	32.0
	LSD 5%	12.874	-	7.159	19.909	

The data presented in Table 10 shows that on an average basis maximum emergence percentage (**95.2%**) was recorded in the strains SL 9-14 and minimum (**32.0 %**) was recorded in a strain FD N 2005-4. The strain N 2005-4 did not germinate at all the locations except NARC, Islamabad. Overall, the maximum emergence was recorded at NARC, Islamabad location.

Table No. 11. Small size tuber (<35mm) of varieties/strains at different locations

Rank	Variety	PRI Sahiwal	VRI, Fsd	PRS, SKT	NARC, Islamabad	Average
1	FD 73-110	10.3	19.0	17.3	38.5	21.3
2	SL 10-4	9.7	17.3	22.3	40.8	22.5

3	SL 11-50	7.0	21.0	16.3	47.1	22.9
4	FD 76-59	8.7	15.3	30.0	43.8	24.5
5	SL 9-14	10.0	13.3	28.0	48.2	24.9
6	FD 73-49	11.3	14.3	22.7	58.8	26.8
7	SL 8-5	14.0	18.7	28.7	47.4	27.2
8	SL 5-2	17.0	14.3	20.0	59.1	27.6
9	FD 73-44	10.0	19.0	24.7	58.2	28.0
10	SL 9-13	11.7	17.0	28.3	57.2	28.6
11	Simply Red	19.0	15.0	22.7	61.4	29.5
12	FD 81-1	13.7	14.7	23.7	71.3	30.9
13	SH-1035	29.0	12.3	15.0	70.2	31.6
14	N 393574-72	36.0	15.3	30.3	53.0	33.7
15	N 2005-1	17.0	16.0	43.0	59.8	34.0
16	SL 1-62	25.0	16.3	44.0	55.8	35.3
17	SH-718	32.3	11.0	38.3	65.8	36.9
18	Sante	46.7	15.3	37.0	66.3	41.3
19	N 2005-4	-	-	-	60.7	60.7
LSD 5%		2.685		6.188	17.411	

The data presented in Table 11 shows that on average basis, The minimum small size tuber percentage was recorded in strain FD 73-110 (**21.3%**) whereas maximum on strain N 2005-4 (**60.7%**). It was observed that the small size tuber percentage remained high at NARC, Islamabad followed by Potato Research Station, Sahowali (Sialkot) as compared to the other locations. On individual basis, the minimum small size tuber percentage was recorded in strain SL 11-50 at PRI, Sahiwal i.e. **7.0%** whereas maximum percentage of small size tubers was recorded in strain FD 81-1 at NARC, Islamabad where it was **71.3%**.

Table No. 12. Medium size tuber (35-55mm) of varieties/strains at different locations

Rank	Variety	PRI Sahiwal	VRI, Fsd	PRS, SKT	NARC, Islamabad	Average
1	FD 73-110	83.0	66.0	62.7	54.1	66.5
2	FD 76-59	84.3	72.7	52.7	49.3	64.8
3	SL 9-14	83.0	63.3	62.7	46.4	63.9
4	SL 5-2	80.3	67.7	67.3	39.1	63.6

5	SL 11-50	85.3	65.7	59.3	42.8	63.3
6	SL 10-4	85.7	66.7	54.0	44.6	62.8
7	SL 8-5	82.7	65.7	59.3	42.3	62.5
8	Simply Red	78.3	68.7	63.0	34.6	61.2
9	FD 73-49	82.0	70.0	56.7	36.1	61.2
10	FD 81-1	83.0	72.0	62.0	25.9	60.7
11	FD 73-44	82.3	68.0	54.7	36.4	60.4
12	N 393574-72	63.7	74.0	60.3	41.9	60.0
13	SL 9-13	83.7	62.7	58.7	34.2	59.8
14	N 2005-1	80.0	72.7	38.3	36.9	57.0
15	SL 1-62	72.7	68.7	46.7	39.4	56.9
16	SH-718	67.7	78.7	49.3	29.9	56.4
17	SH-1035	69.3	65.7	59.7	26.1	55.2
18	Sante	53.0	67.0	51.0	31.0	50.5
19	N 2005-4	-	-	-	31.9	31.9
LSD 5%		2.950		5.818	15.861	

The data presented in Table No. 12 shows that medium size tubers %age (35-55mm) remained high at PRI, Sahiwal whereas low at NARC, Islamabad. At PRI Sahiwal, the strain SL 10-4 produced maximum percentage of medium size tuber (**85.7%**) whereas the minimum percentage of medium size tuber produced by the strain FD 81-1 at NARC, Islamabad (**25.9%**). On an average basis maximum medium size tuber percentage (**66.5%**) was recorded in a strain FD 73-110 and minimum (**31.9 %**) was recorded in a strain N 2005-1.

Table No. 13. Large size tuber (>55mm) of varieties/strains at different locations

Rank	Variety	PRI Sahiwal	VRI, Fsd	PRS, SKT	NARC, Islamabad	Average
1	SL 10-4	4.7	16.0	23.7	14.7	14.8
2	SL 11-50	7.7	13.3	24.3	10.2	13.9
3	SH-1035	1.7	22.0	25.3	3.7	13.2
4	FD 73-110	6.7	15.0	20.0	7.5	12.3
5	FD 73-49	6.7	15.7	20.7	5.1	12.1
6	SL 9-13	4.7	20.3	13.0	8.7	11.7

7	SL 9-14	7.0	23.3	9.3	5.6	11.3
8	FD 73-44	6.0	13.0	20.7	5.5	11.3
9	FD 76-59	7.0	12.0	17.3	7.0	10.8
10	SL 8-5	3.3	15.7	12.0	10.3	10.3
11	Simply Red	2.7	16.3	16.0	4.0	9.8
12	N 2005-1	3.0	11.3	18.7	3.3	9.1
13	FD 81-1	3.3	13.3	14.3	2.9	8.5
14	SL 5-2	2.7	18.0	10.7	1.8	8.3
15	Sante	0.3	17.7	12.0	2.8	8.2
16	SL 1-62	2.3	15.0	9.3	4.9	7.9
17	N 2005-4	-	-	-	7.4	7.4
18	SH-718	0.0	10.3	12.3	4.3	6.7
19	N 393574-72	0.3	10.7	9.3	5.1	6.4
LSD 5%		1.308		3.654	3.532	

The data presented in Table No. 13 shows that on an average basis, maximum large size tuber percentage (**14.8%**) was produced by the strain SL 10-4 followed by SL 11-50 (13.9%) and minimum (**6.4%**) was recorded for the strain N 393574-72. Maximum large size tuber percentage was observed at PRS, Sahowali (Sialkot) & VRI, Faisalabad. On individual basis, maximum large size tubers (25.3%) were produced by the strain SH-1035 at Sialkot location.

Table No. 14. Scab %age of varieties/strains at different locations

Rank	Variety	PRI Sahiwal	VRI, Fsd	PRS, SKT	NARC, Islamabad	Average
1	N 2005-4	-	-	-	0.0	0.0
2	SH-1035	2.3	5.3	4.3	0.0	3.0
3	Simply Red	0.0	6.7	9.3	0.0	4.0
4	SL 5-2	0.0	6.3	10.0	0.0	4.1
5	SH-718	5.7	10.0	2.7	0.0	4.6
6	N 2005-1	0.0	10.0	8.3	0.0	4.6
7	FD 81-1	6.0	9.7	5.7	0.0	5.4
8	FD 76-59	10.3	8.7	4.0	0.0	5.8
9	Sante	0.0	8.3	14.7	0.0	5.8
10	FD 73-44	2.3	14.3	7.3	0.0	6.0

11	SL 10-4	2.7	16.7	5.7	0.0	6.3
12	SL 8-5	2.7	16.0	7.7	0.0	6.6
13	FD 73-110	5.3	7.0	14.0	0.0	6.6
14	SL 1-62	3.3	13.7	15.0	0.0	8.0
15	FD 73-49	17.3	9.0	6.7	0.0	8.3
16	N 393574-72	2.3	13.3	20.0	0.0	8.9
17	SL 11-50	9.7	42.0	10.7	0.0	15.6
18	SL 9-13	2.7	13.7	98.3	0.0	28.7
19	SL 9-14	5.0	17.7	96.7	0.0	29.9
LSD 5%		1.979		1.775	N.S	

It is revealed observed from the Table No. 14 that maximum incidence percentage for scab was observed at PRS, Sahowali, (Sialkot) and VRI, Faisalabad whereas no scab incidence was observed at NARC, Islamabad. On an average basis, the maximum attack of scab was recorded on the strain SL 9-14 (29.9%) followed by SL 9-13 (28.7%), whereas no incidence was shown by the strain N 2005-5 against scab. Because the strain N 2005-4 was germinated only at NARC, Islamabad, so its average results reflect the individual results at NARC, Islamabad. The strain SH-1035 showed minimum scab incidence (3.0%) on average basis of all the four locations. On individual basis, the strains SL 9-13 & SL 9-14 showed maximum scab incidence (98.3% & 96.7% respectively) at Sialkot location.

Table No. 15. Rhizoctonia %age of varieties/strains at different locations

Rank	Variety	PRI Sahiwal	VRI, Fsd	PRS, SKT	NARC, Islamabad	Average
1	N 2005-4	-	-	-	0.0	0.0
2	SL 5-2	0.0	0.0	1.7	0.0	0.4
3	N 2005-1	0.0	2.3	2.7	0.0	1.3
4	SL 8-5	2.7	1.3	4.3	0.0	2.1
5	SL 9-14	8.0	1.0	1.7	0.0	2.7
6	SL 1-62	5.3	2.7	3.7	0.0	2.9
7	SL 10-4	0.0	6.7	5.3	0.0	3.0
8	FD 73-44	3.3	1.7	11.7	0.0	4.2
9	SL 9-13	0.0	17.7	2.3	0.0	5.0

10	Simply Red	1.3	4.0	15.3	0.0	5.2
11	SH-1035	3.0	18.3	1.3	0.0	5.7
12	N 393574-72	0.0	3.3	19.3	0.0	5.7
13	FD 73-49	0.0	11.3	12.7	0.0	6.0
14	FD 81-1	7.7	4.0	18.3	0.0	7.5
15	SH-718	21.7	2.3	6.3	0.0	7.6
16	SL 11-50	3.3	16.0	11.7	0.0	7.8
17	FD 73-110	3.0	16.7	15.0	0.0	8.7
18	FD 76-59	0.0	34.3	1.3	0.0	8.9
19	Sante	0.0	34.0	46.7	0.0	20.2
LSD 5%		2.004		3.335	N.S	

The data presented in Table No. 15 shows that the incidence of Rhizoctonia varied among varieties. Some varieties/strains showed more incidence whereas some varieties/strains showed less incidence. No rhizoctonia incidence was observed at NARC, Islamabad. On an average basis, the maximum Rhizoctonia incidence was observed on the commercial check variety Sante (**20.2%**) where as no rhizoctonia incidence was observed on the strain N 2005-4. Because the strain N 2005-4 was germinated only at NARC, Islamabad, so its average results reflect the individual results at NARC, Islamabad. So, on an average basis of all the four locations, the strain SL 5-2 showed minimum rhizoctonia incidence (0.4%). Considering the individual locations, the maximum rhizoctonia incidence (**46.7%**) was recorded in the commercial check variety “Sante” at PRS, Sahowali, (Sialkot).

Table No. 16. Cracking %age of varieties/strains at different locations

Rank	Variety	PRI Sahiwal	VRI, Fsd	PRS, SKT	NARC, Islamabad	Average
1	SL 9-14	0.0	0.0	0.0	0.0	0.0
2	SH-1035	0.0	0.0	0.0	0.0	0.0
3	SL 10-4	0.0	0.0	0.0	0.0	0.0
4	SH-718	0.0	0.0	0.0	0.0	0.0
5	Simply Red	0.0	0.0	0.0	0.0	0.0
6	FD 73-49	0.0	0.0	0.0	0.0	0.0
7	FD 81-1	0.0	0.0	0.0	0.0	0.0

8	SL 5-2	0.0	0.0	0.0	0.0	0.0
9	FD 76-59	0.0	0.0	0.0	0.0	0.0
10	FD 73-44	0.0	0.0	0.0	0.0	0.0
11	N 2005-1	0.0	0.0	0.0	0.0	0.0
12	N 2005-4	-	-	-	0.0	0.0
13	N 393574-72	0.0	0.0	0.0	0.0	0.0
14	SL 1-62	0.0	0.3	0.0	0.0	0.1
15	SL 11-50	0.0	0.3	0.0	0.0	0.1
16	SL 9-13	1.0	0.0	0.0	0.0	0.3
17	FD 73-110	1.0	0.0	0.0	0.0	0.3
18	Sante	1.0	0.0	0.0	0.0	0.3
19	SL 8-5	0.0	0.3	2.3	0.0	0.7
LSD 5%		N.S		0.439	N.S	

The data presented in Table No. 16 shows that all the strains / varieties showed resistance against tuber cracking. However, on an average basis, the maximum tuber cracking was observed in the commercial check variety Sante. This variety showed maximum tuber cracking (2.3%) at PRS, Sahowali (Sialkot). Whereas, no tuber cracking was observed at NARC Islamabad at all.

Table No. 17. Tuber yield (t/ha) of varieties/strains at different locations

Rank	Variety	PRI Sahiwal	VRI, Fsd	PRS, SKT	NARC, Islamabad	Average
1	N 2005-4	-	-	-	31.8	31.8
2	SL 11-50	37.2	27.4	25.2	31.5	30.3
3	SL 9-13	27.2	31.4	22.6	33.0	28.6
4	SL 10-4	32.2	32.7	17.1	31.5	28.4
5	FD 73-49	28.5	27.9	22.9	32.3	27.9
6	FD 73-44	32.4	23.4	22.2	32.5	27.6
7	SL 9-14	27.8	31.4	17.0	29.9	26.5
8	FD 73-110	25.0	28.2	21.8	30.5	26.4
9	FD 76-59	30.2	24.4	22.6	24.1	25.3
10	SL 8-5	25.5	24.6	19.3	29.5	24.7
11	Simply Red	21.3	22.2	24.5	29.6	24.4
12	SH-718	18.5	26.6	25.9	25.5	24.1

13	SH-1035	14.6	25.9	24.8	30.2	23.9
14	SL 5-2	21.1	29.4	22.9	22.3	23.9
15	FD 81-1	24.8	17.2	20.7	28.5	22.8
16	SL 1-62	19.4	27.0	15.2	24.7	21.6
17	N 393574-72	11.1	25.7	12.9	31.3	20.3
18	Sante	12.8	31.1	10.7	18.2	18.2
19	N 2005-1	12.2	25.4	8.2	26.1	18.0
LSD 5%		4.273		3.348	8.599	

The data presented in Table No. 17 shows that on an average basis the strain N 2005-4 produced the maximum tuber yield (**31.8 t/ha**). As the strain N 2005-4 was germinated only at NARC, Islamabad, so its average results reflect the individual results at NARC, Islamabad. So, on an average basis of all the four locations, the strain SL 11-50 produced maximum tuber yield (30.3 t/ha) followed by SL 9-13 (**28.6 t/ha**). **Ten** strains showed higher yield than the standard variety Simply Red. Minimum tuber yield (**18.0 t/ha**) was recorded in strain N 2005-1. On an individual basis, maximum tuber yield (**37.2 t/ha**) was obtained from the strain SL 11-50 at PRI, Sahiwal location whereas minimum tuber yield (**8.2 t/ha**) was obtained from strain N 2005-1 at Potato Research Station, Sahowali (Sialkot) location.

10. Adaptability Trial of Exotic Potato Varieties.

Twenty one exotic varieties imported by four different seed companies were tested along with standard varieties / local checks in adaptability trials at Potato Research Institute (PRI) Sahiwal. Out of these, **Nineteen** exotic varieties were also planted at Potato Research Station, Sahowali (Sialkot).

Seed potatoes of these varieties were received at PRI, Sahiwal and PRS, Sahowali (Sialkot) during autumn crop season at different dates. These varieties were tested in four sets both at PRI, Sahiwal & three sets at PRS, Sahowali (Sialkot) in Randomized Complete Block Design with three replications and 7.0m x 2.25m plot size at PRI, Sahiwal (except set 4 where plot size was maintained as 6.0m x 2.25m) and 6.0m x 2.25m plot size at PRS, Sahowali (Sialkot) keeping plant to plant and row to row distances of 20 cm and 75 cm, respectively. Planting and harvesting were accomplished on the dates mentioned in each table. Standard

agronomic and plant protection practices were followed during the crop period. The results obtained and the data recorded are given and discussed below.

Table No.18. Performance of potato strains/varieties in an Adaptability Trial at Potato Research Institute, Sahiwal (Set-I)

Rank	Variety	Company Name	Emer (%)	Tuber Grade (%)			Tuber Diseases (%)			Yield (t/ha)
				<35 mm	35-55 mm	>55 mm	Scab	Rhiz	Crack	
1	Simply Red	Commercial Check	88.2	14.7	84.3	1.0	2.3	4.7	0.7	24.1
2	Focus Basic	Jaffer Agro Services	96.5	21.0	73.7	5.3	2.7	0.0	3.0	23.7
3	Miss Andes	Jaffer Agro Services	95.5	37.3	62.7	0.0	5.3	0.7	4.3	17.1
4	Sante	Commercial Check	92.1	25.3	74.0	0.7	15.0	15.3	0.0	17.0
5	Miss Mignonne	Jaffer Agro Services	97.4	36.3	63.7	0.0	1.7	0.0	0.7	16.5
LSD 5%			7.187	3.866	4.442	1.594	3.489	3.333	1.375	3.844
				<i>Date of planting = 28.10.2015</i>						
				<i>Date of harvesting = 29.02.2016</i>						

The commercial check variety “Simply Red” gave the maximum yield (**24.1** t/ha) followed by exotic variety Focus Basic which yielded **23.7** t/ha. The lowest yield was produced by the exotic variety Miss Mignonne (**16.5** t/ha). All the exotic varieties gave lower yield than the commercial check variety Simply Red. The highest emergence (**97.4%**) was shown by the exotic variety Miss Mignonne. The lowest emergence was shown by the commercial check variety Simply Red (88.2 %). Tuber grades have importance from commercial point of view. While persuing the tuber grade data, it was observed that the exotic variety Focus Basic produced maximum ration size tubers i.e. **5.3%**. Maximum percentage (**37.3%**) of small size tubers was recorded for the exotic variety “Miss Andes”. Maximum percentage (**84.3%**) of medium size tubers was recorded for the commercial check variety Simply Red. Regarding disease infection, it was observed that maximum scab & rhizoctonia infestation (**15.0% & 15.3% respectively**) was recorded on commercial check variety Sante. Minimum scab incidence (**1.7%**) was observed on exotic variety Miss Mignonne. Whereas the exotic varieties Focus Basic & Miss Mignonne showed complete tolerance against rhizoctonia. Maximum tuber cracking (**4.3%**) was recorded in exotic variety Miss Andes whereas the commercial check variety Sante showed complete tolerance against tuber cracking.

Table No.19. Performance of potato strains/varieties in an adaptability trial at Potato Research Station, Sahowali (Sialkot) (Set-I)

Rank	Variety	Company Name	Emer (%)	Tuber Grade (%)			Tuber Diseases (%)			Yield (t/ha)
				<35 mm	35-55 mm	>55 mm	Scab	Rhiz	Crack	
1	SH-1035	Commercial Check	96.3	14.7	58.0	27.3	4.7	1.3	0.3	34.8
2	PRI-Red	Commercial Check	99.3	11.3	52.7	37.3	5.7	0.0	0.0	29.6
3	Diamant	Commercial Check	96.3	25.3	48.7	27.3	8.7	7.3	1.3	29.4
4	SH-5	Commercial Check	97.7	20.0	52.7	27.3	8.7	7.3	2.7	25.7
5	Focus Basic	Jaffer Agro Services	100.0	16.7	52.0	31.3	23.3	4.3	1.0	24.0
6	Miss Andes	Jaffer Agro Services	98.3	36.7	64.7	8.7	8.7	3.3	0.0	20.2
7	Miss Mignonne	Jaffer Agro Services	96.7	30.3	50.3	20.0	6.0	2.0	0.7	19.7
LSD 5%			2.795	4.115	11.584	7.111	3.040	1.512	1.075	3.924
				<i>Date of planting</i> = 26.11.2015						
				<i>Date of harvesting</i> = 04.02.2016						

Study of the above Table reveals that the local check SH-1035 gave maximum yield (**34.8 t/ha**) followed by local check variety PRI-Red with yield value of **29.6 t/ha**. The lowest yield (**19.7 t/ha**) was recorded in exotic variety Miss Mignonne. All the exotic varieties gave lower yield than all the commercial check varieties. Highest emergence (**100%**) was recorded from the exotic variety Focus Basic. All the varieties showed above 90% emergence. While persuing the tuber grades, it was observed that the maximum ration size tuber percentage was recorded in the local check variety PRI-Red (**37.3%**) while maximum small & medium size tuber percentage was recorded in the exotic variety Miss Andes (**36.7% & 64.7%** respectively). Regarding disease infection, it was observed that maximum scab infestation (**23.3%**) was observed in exotic variety Focus Basic whereas minimum infestation (**4.7%**) was recorded in local check SH-1035. Commercial check varieties Diamant & SH-5 showed maximum attack of rhizoctonia (**7.3%** of each). While the local check variety PRI-Red showed complete tolerance against rhizoctonia. Maximum tuber cracking (**2.7%**) was recorded in local check variety SH-5 whereas the exotic variety Miss Andes and Local check variety PRI-Red showed complete tolerance against tuber cracking.

Table No.20. Performance of potato strains/varieties in an adaptability trial at Potato Research Institute, Sahiwal (Set-II)

Rank	Variety	Company Name	Emer (%)	Tuber Grade (%)			Tuber Diseases (%)			Yield (t/ha)
				<35 mm	35-55 mm	>55 mm	Scab	Rhiz	Crack	
1	Kastely	Hunza Seed Corporation	92.4	29.3	70.7	0.0	7.3	0.0	0.3	18.4
2	Amarin	Hunza Seed Corporation	83.2	38.3	61.7	0.0	3.3	0.0	0.0	11.4
LSD 5%			20.100	8.957	8.957	N.S	2.484	N.S	1.434	7.238
				<i>Date of planting = 05.11.2015</i>						
				<i>Date of harvesting = 29.02.2016</i>						

Above Table showed that the exotic variety Kastely gave maximum yield (**18.4 t/ha**) followed by Amarin with yield value of **11.4 t/ha**. Highest emergence (**92.4%**) was recorded from the exotic variety Kastely. Regarding disease infection, it was observed that maximum scab infestation (**7.3%**) was observed in exotic variety Kastely. Both the exotic varieties showed tolerance against rhizoctonia and tuber cracking.

Table No.21. Performance of potato strains/varieties in an adaptability trial at Potato Research Institute, Sahiwal (Set-III)

Rank	Variety	Company Name	Emer (%)	Tuber Grade (%)			Tuber Diseases (%)			Yield (t/ha)
				<35 mm	35-55 mm	>55 mm	Scab	Rhiz	Crack	
1	Touareg	Jaffer Agro Services	92.9	11.0	85.5	3.5	1.5	0.0	0.0	27.0
2	Eldorado	Jaffer Agro Services	91.9	9.0	85.0	6.0	1.5	0.0	1.5	24.8
3	Hybrid 202-05-01	Jaffer Agro Services	99.1	14.0	85.5	0.5	2.5	0.0	0.0	21.0
4	Elbeida	Jaffer Agro Services	91.4	21.0	77.0	2.0	1.5	0.0	0.0	20.0
5	Red Valentine	Jaffer Agro Services	95.7	22.5	76.0	1.5	0.0	0.0	0.0	17.8
6	Miss Andes	Jaffer Agro Services	98.6	42.5	57.5	0.0	0.0	0.0	1.0	16.8
7	Miss Mignonne	Jaffer Agro Services	96.2	52.5	47.5	0.0	0.0	0.0	0.0	16.2
8	Florice	Jaffer Agro Services	95.3	13.0	85.5	1.5	0.0	0.0	0.0	15.9
9	Nazca	Jaffer Agro Services	96.2	28.0	72.0	0.0	0.0	0.0	1.0	15.6
10	Focus Basic	Jaffer Agro Services	98.1	16.5	83.0	0.5	0.0	0.0	1.5	15.3
11	Elodie	Jaffer Agro Services	90.5	17.0	82.5	0.5	1.5	0.0	0.0	15.2
12	Simply Red	Commercial Check	79.5	22.5	77.5	0.0	2.5	17.0	0.0	15.2
13	Sante	Commercial Check	81.4	37.5	62.5	0.0	3.0	19.0	1.0	13.4
14	Achilles	Jaffer Agro Services	85.7	35.0	65.0	0.0	0.0	0.0	4.0	10.5
15	Aurea	Jaffer Agro Services	78.6	90.0	10.0	0.0	0.0	0.0	0.0	2.2
LSD 5%			8.578	7.041	6.681	1.282	1.265	1.146	0.900	6.115
				<i>Date of planting = 17.11.2015</i>						
				<i>Date of harvesting = 18.03.2016</i>						

Study of the above Table reveals that the exotic variety Taureg gave maximum yield (**27.0 t/ha**) followed by exotic variety Eldorado with yield value of **24.8 t/ha**. The lowest yield (**2.2 t/ha**) was recorded in exotic variety Aurea. Highest emergence (**99.1%**) was recorded from Hybrid 202-05-01. While persuing the tuber grades, it was observed that the maximum ration size tuber percentage was recorded in the exotic variety Eldorado (**6.0%**) while maximum small size tuber percentage was recorded in the exotic variety Aurea (**90.0%**). Regarding disease infection, it was observed that all the varieties showed low attack of tuber diseases. However, the maximum scab infestation (**3.0%**) was observed in commercial check variety Sante, whereas eight exotic varieties showed complete tolerance against the scab. All the exotic varieties showed tolerance against rhizoctonia except commercial check varieties Simply Red and Sante where the disease incidence percentages were **17.0%** & **19.0%** respectively. Maximum tuber cracking (**4.0%**) was recorded in exotic variety Achilles whereas nine exotic varieties showed complete tolerance against tuber cracking.

Table No.22. Performance of potato strains/varieties in an adaptability trial at Potato Research Station, Sahowali (Sialkot) (Set-II)

Rank	Variety	Company Name	Emer (%)	Tuber Grade (%)			Tuber Diseases (%)			Yield (t/ha)
				<35 mm	35-55 mm	>55 mm	Scab	Rhiz	Crack	
1	Eldorado	Jaffer Agro Services	96.7	14.7	61.3	24.0	4.3	0.0	0.0	19.5
2	Touareg	Jaffer Agro Services	98.7	19.3	53.0	27.7	8.0	0.0	0.0	17.1
3	Hybrid 202-05-01	Jaffer Agro Services	99.7	24.0	62.0	14.0	2.0	0.0	0.0	14.3
4	Focus Basic	Jaffer Agro Services	87.0	19.7	64.7	15.7	9.3	0.0	0.0	14.3
5	Florice	Jaffer Agro Services	97.3	17.3	62.7	18.7	3.3	0.0	0.0	12.1
6	Elbeida	Jaffer Agro Services	97.3	25.0	59.7	15.3	2.0	0.0	0.0	11.6
7	Achilles	Jaffer Agro Services	94.0	33.0	59.0	11.3	11.3	0.0	0.0	11.6
8	Red Valentine	Jaffer Agro Services	78.3	19.0	68.3	12.7	2.3	0.0	0.0	10.6
9	Elodie	Jaffer Agro Services	96.7	14.7	66.0	19.3	4.7	0.0	0.0	10.4
10	Miss Andes	Jaffer Agro Services	97.7	23.7	69.7	6.0	3.7	0.0	0.0	10.4
11	Nazca	Jaffer Agro Services	97.7	44.7	50.7	4.7	6.3	0.0	0.0	9.9
12	Miss Mignonne	Jaffer Agro Services	99.3	36.0	60.3	3.7	5.7	0.0	0.0	8.9
13	Aurea	Jaffer Agro Services	54.0	59.7	36.0	4.3	2.7	0.0	0.0	3.7
LSD 5%			8.342	3.824	4.188	4.332	2.229	N.S	N.S	2.291
			<i>Date of planting</i> = 26.11.2015 <i>Date of harvesting</i> = 29.02.2016							

The above Table reveals that the exotic variety Eldorado gave maximum yield (**19.5 t/ha**) followed by the exotic variety Taureg with yield value of **17.1 t/ha**. The lowest yield (**3.7 t/ha**) was recorded in exotic variety Aurea. Highest emergence (**99.7%**) was recorded from Hybrid 202-05-01. While persuing the tuber grades, it was observed that the maximum ration size tuber percentage was recorded in the exotic variety Taureg (**27.7%**) while maximum small size tuber percentage was recorded in the exotic variety Aurea (**59.7%**). It was observed that all the exotic varieties showed tolerance against rhizoctonia & tuber cracking with slight scab incidence. Maximum scab infestation (**11.3%**) was observed in exotic variety Achilles whereas minimum infestation (**2.0%**) was recorded in Hybrid 202-05.01 & Elbeida.

Table No.23. Performance of potato strains/varieties in an adaptability trial at Potato Research Institute, Sahiwal (Set-IV)

Rank	Variety	Company Name	Emer (%)	Tuber Grade (%)			Tuber Diseases (%)			Yield (t/ha)
				<35 mm	35-55 mm	>55 mm	Scab	Rhiz	Crack	
1	Red Sun	M.A. Sons	81.8	22.3	76.0	1.7	5.3	0.0	0.0	24.0
2	Rock	Bhatti Brothers	90.4	40.0	60.0	0.0	27.3	0.0	0.0	23.7
3	Red Valentine	M.A. Sons	83.0	35.0	64.3	0.7	5.3	0.0	0.0	17.7
4	Sante	Commercial Check	55.2	32.0	68.0	0.0	3.3	73.3	0.0	12.3
5	Simply Red	Commercial Check	44.4	25.0	74.0	1.0	1.7	0.0	0.0	8.3
LSD 5%			30.3	6.6	6.5	0.6	3.0	4.9	N.S	7.1
				<i>Date of planting = 27.11.2015</i>						
				<i>Date of harvesting = 24.03.2016</i>						

Results of the trial depicted above show that the exotic variety Red Sun gave maximum yield (**24.0 t/ha**) followed by the exotic variety Rock with yield value of **23.7 t/ha**. The lowest yield (**8.3 t/ha**) was recorded in commercial check variety Simply Red. Maximum emergence (**90.4%**) was recorded from the exotic variety Rock. While persuing the tuber grades, it was observed that the maximum ration size tuber percentage was recorded in the exotic variety Red Sun (**1.7%**) while maximum small size tuber percentage was recorded in the exotic variety Rock (**40.0%**). Regarding disease infection, it was observed that maximum scab infestation (**27.3%**) was observed in exotic variety Rock whereas minimum infestation (**1.7%**) was recorded on commercial check variety Simply Red. All the varieties showed complete tolerance against rhizoctonia and cracking except commercial check variety Sante where rhizoctonia incidence was **73.3%**.

Table No.24. Performance of potato strains/varieties in an adaptability trial at Potato Research Station, Sahowali (Sialkot) (Set-III)

Rank	Variety	Company Name	Emer (%)	Tuber Grade (%)			Tuber Diseases (%)			Yield (t/ha)
				<35 mm	35-55 mm	>55 mm	Scab	Rhiz	Crack	
1	Red Sun	M.A. Sons	99.3	23.7	67.0	9.3	4.3	0.0	0.0	13.6
2	Rock	Bhatti Brothers	99.7	35.3	56.0	8.3	3.3	0.0	0.0	12.6
3	Red Valentine	M.A. Sons	99.0	32.0	60.7	7.3	3.7	0.0	0.0	9.9
LSD 5%			2.449	2.449	2.725	3.070	3.294	N.S	N.S	1.334
				<i>Date of planting = 27.11.2015</i>						
				<i>Date of harvesting = 01.03.2016</i>						

The data presented in above table reveals that the exotic variety Red Sun exhibited maximum yield (**13.6 t/ha**) followed by the exotic variety Rock with yield value of **12.6 t/ha**. The lowest yield (**9.9 t/ha**) was recorded in exotic variety Red Valentine. All the exotic varieties showed almost 100% emergence. Regarding the tuber grades, it was observed that the maximum ration size tuber percentage was recorded in the exotic variety Red Sun (**9.3%**) while maximum small size tuber percentage was recorded in the exotic variety Rock (**35.3%**). Regarding disease infection, it was observed that maximum scab infestation (**4.3%**) was observed in exotic variety Red Sun, whereas minimum infestation (**3.3%**) was recorded on exotic variety Rock. All the exotic varieties showed complete tolerance against rhizoctonia and tuber cracking.

B. Potato Research Station, Sahowali (Sialkot)

Potato Research Station, Sahowali, Sialkot was established initially in 1964 as Potato Research Station, Sialkot after shifting its Headquarters from Murree to Sialkot. An area of 50.44 acres land was under its control. During the course of 1964 to the year 2012 all the area of 50.44 acres was transferred to various other Departments by the Government in public interest and no agricultural land was left for carrying out research experiments on Potato crop. In the year 2012 an area of 9.9 acres was allotted to this Station for conducting research experiments on Potato at Pulses Research Station, Sahowali, Pasrur Road distt. Sialkot and the Potato Research Station was shifted to Sahowali, Sialkot. It comprises of two Sub-stations, one at Murree and the other at Faisalabad. The Primary objective of this Station is to develop high yielding, frost and disease tolerant potato varieties possessing good tuber quality characteristics with wider adaptability to different agro ecological zones compared to the existing varieties in order to enhance Potato

production in the province as well as in the country through introduction, selection, hybridization and improved crop growing techniques.

The main fields of study/ research work with this station are as under:-

1. Hybridization is carried out for the creation of variability in the existing local as well as exotic varieties of Potato at Potato Breeding Research Sub-Station, Murree where flowering in Potato varieties takes place during July-August. The conditions are conducive for getting viable seed after crossing. Botanical seed in raised is nursery beds. Keen observations are taken from sowing to harvesting, like growth, leaf, stem characters, foliar, tuber diseases and tuber characters. The promising plants are selected for multiplication and further studies at Potato Research Station, Sahowali, Sialkot.
2. Introduction of exotic high yielding, disease tolerant, frost tolerant varieties having good quality and other desirable characters.
3. Standardization of packages of crop production technology for new elite strains and low cost production techniques.
4. Pathological studies are carried out for control of Fungal, viral and other tuber diseases.
5. Quality evaluation is carried out at Potato Research Sub-Station, Faisalabad.

During the year under report all the experiments were sown at proper time according to the Annual Programme of Research work covering important aspects of Potato crop. During summer 2015, new crosses were attempted at Potato Breeding Research Sub-station, Murree. Nursery was raised and screened. During Autumn 2015-16, experiments were sown at Potato Research Station, Sialkot under normal crop growing conditions. The seed potato tubers were planted with plant to plant distance of 20cm and row to row distance 75cm followed by ridging. To control Weeds, suitable weedicides were sprayed upon the crop at proper time. For the control of insect pests, fungal and other Potato diseases, the crop was sprayed with recommended doses of suitable insecticides and fungicides at regular intervals. Irrigation was applied as and when needed. Utmost efforts were made to give equal management to all the trials to keep the experimental error at minimum level.

WEATHER AND ITS EFFECTS

The meteorological parameters viz. Maximum, Minimum, Temperature, High velocity winds, Hail storm, Frost, Mist, Cloudy days and Rainfall recorded at Sahowali, Sialkot from 01-

07-2015 to 30-06-2016 are given in Table No.25 below.

Table No. 25. Meteorological data recorded at potato research station, sahowali, sialkot during the year, 2015-2016

Sr. No.	Month	Max. Temp. (Mean) C°	Min. Temp. (Mean) C°	No. of Frosty Days	Mist (Days)	High velocity wind (Days)	Hail-storm (Days)	No. of Cloudy days	Rain-fall mm
1	July,2015	38.16	26.64	-	-	-	-	29	218.00
2	Aug.,2015	34.93	25.03	-	-	-	-	22	65.00
3	Sept.,2015	34.07	21.96	-	-	-	-	8	36.00
4	Oct.,2015	31.48	16.41	-	-	1	-	6	55.00
5	Nov.,2015	25.70	10.70	-	1	-	-	12	7.00
6	Dec.,2015	21.46	4.56	3	14	-	-	11	2.00
7	Jan.,2016	20.82	5.39	-	12	-	-	18	2.00
8	Feb.,2016	24.76	7.54	-	7	-	-	5	23.00
9	March,2016	28.86	12.09	-	-	-	-	13	57.00
10	April,2016	37.33	17.33	-	-	-	-	11	Nil
11	May,2016	36.84	23.47	-	-	5	-	9	16.00
12	June,2016	41.89	26.68	-	-	2	-	10	108.00
Total:-				3	34	8	-	154	589.00

Normal monsoon rains were received during the month of July, 2015. However, less than normal monsoon rains were received during the months of August and September, 2015. However rain water kept standing in the fields due to lack of proper drainage. Kharif fodder crops for generating income to meet income targets could not be sown because of standing rain water in the fields. Land preparation for sowing of Rabi crops of Potato and Berseem for 2015-16 was carried out when the fields dried. Wheat crop was also sown on an area of six acres for generating income. Emergence of Potato crop and experiments was good and plant stand was satisfactory. Weedicides were sprayed upon the Potato crop to check the growth of weeds. Frost was observed for only three days during the month of December, 2015 but did not cause any damage to the crop. Attack of blight was also noted on the crop but it was adequately controlled by spraying fungicides on the Potato crop at regular intervals. Harvesting of Potato experiments was started in the last week of the month of January,2016. Quick rise in temperature during the month of April, 2016 helped in ripening of Wheat crop.

RESEARCH WORK PERFORMED

1. Preliminary evaluation of crossed material during autumn, 2015-2016

Study of progenies of crosses made during 2014

A total of 57 progenies were raised and studied according to augmented design with a plot size of 6.0m X 0.75m. Planting was done on 22-01-2016 and harvesting on 10-5-2016. Out of 57 progenies, 50 promising were selected on overall basis as given below in Table No. 26

Table No.26. Number of progenies raised and selected during 2015-16

Progenies planted (57)	Progenies selected (50)
SH-1721, SH-1722, SH-1723, SH-1724, SH-1725, SH-1726, SH-1727, SH-1728, SH-1729, SH-1730, SH-1731, SH-1732, SH-1733, SH-1734, SH-1735, SH-1736, SH-1737, SH-1738, SH-1739, SH-1740, SH-1741, SH-1742, SH-1743, SH-1744, SH-1745, SH-1746, SH-1747, SH-1748, SH-1749, SH-1750, SH-1751, SH-1752, SH-1753, SH-1754, SH-1755, SH-1756, SH-1757, SH-1758, SH-1759, SH-1760, SH-1761, SH-1762, SH-1763, SH-1764, SH-1765, SH-1766, SH-1767, SH-1768, SH-1769, SH-1770, SH-1771, SH-1772, SH-1773, SH-1774, SH-1775, SH-1776, SH-1777,	SH-1721, SH-1722, SH-1723, SH-1724, SH-1725, SH-1726, SH-1727, SH-1728, SH-1729, SH-1730, SH-1733, SH-1734, SH-1735, SH-1736, SH-1737, SH-1738, SH-1739, SH-1740, SH-1741, SH-1742, SH-1743, SH-1744, SH-1745, SH-1746, SH-1748, SH-1749, SH-1750, SH-1751, SH-1753, SH-1755, SH-1756, SH-1758, SH-1759, SH-1760, SH-1761, SH-1762, SH-1763, SH-1764, SH-1765, SH-1766, SH-1767, SH-1768, SH-1769, SH-1770, SH-1771, SH-1772, SH-1773, SH-1774, SH-1775, SH-1777

2. Secondary evaluation of twenty three red and white potato strains/ varieties for their yield potential and other desirable traits during 2015-16

The trial was planted on 16-10-2015 according to Randomized Complete Block design with three replications, keeping plot size of 6.0m x 1.5m for selecting new promising varieties/ strains. This trial was harvested on 29-01-2016. Data on emergence percentage, tuber grades, tuber diseases and tuber yield were recorded and are presented in Table No.27 below:-

Table No. 27. Performance of strains/varieties in a secondary trial.

Rank	Variety	Emergence (%)	Tuber Grade (%)			Tuber Disease (%)			Yield (t/h)
			>55 mm	35-55 mm	<35 mm	Scab	Rhiz.	Crack	
1	SH-1648	100.00	17.67	45.67	36.67	3.33	0.00	0.00	53.33
2	SH-1638	97.00	38.67	41.67	19.67	1.67	0.00	0.00	45.93

3	SH-1643	99.67	26.33	55.00	18.67	3.33	2.33	0.00	44.83
4	SH-1644	98.67	48.67	36.33	15.00	5.33	1.67	0.00	43.33
5	SH-1650	99.67	24.67	51.00	24.33	3.33	1.33	0.00	41.83
6	SH-1655	97.00	51.67	18.33	30.00	6.00	1.67	1.33	40.37
7	SH-1662	99.67	40.33	27.67	32.00	2.33	0.00	0.00	40.00
8	SH-1658	98.67	39.67	34.67	25.67	4.67	7.33	2.33	39.63
9	SH-1646	97.33	21.67	32.67	45.67	0.00	0.00	0.00	38.90
10	Diamant (Check)	99.33	39.67	40.67	20.33	0.00	6.33	0.00	38.53
11	SH-1649	99.67	19.00	56.33	24.67	5.33	2.67	0.00	37.43
12	SH-1654	98.00	20.33	50.67	29.00	5.33	0.00	0.00	37.07
13	SH-1653	98.67	21.67	52.33	29.00	3.67	1.67	0.00	34.83
13	SH-1656	99.67	40.00	29.67	30.33	3.33	1.33	0.00	34.83
14	SH-1641	100.00	30.33	36.33	33.33	0.00	0.00	0.00	30.73
15	SH-5 (Check)	99.67	26.33	48.67	25.00	0.00	7.33	7.33	30.37
16	SH 1652	98.67	44.67	27.33	28.00	2.33	0.00	0.00	28.17
17	SH-1668	98.33	26.33	48.67	25.00	3.67	3.00	0.00	27.40
18	SH-1637	99.67	15.67	39.67	44.67	4.33	3.67	0.00	24.80
18	SH-1664	99.33	17.67	41.67	40.67	7.33	5.00	3.00	24.80
19	SH-1645	96.33	18.33	50.00	31.67	2.33	1.33	0.00	24.07
19	SH-1663	95.33	23.67	17.67	58.67	10.33	3.33	2.33	24.07
20	SH-1647	99.33	23.67	41.67	34.67	4.33	3.67	0.00	22.93
LSD at 0.05 level		2.02	3.02	3.41	4.66	1.06	0.84	0.59	3.58

The variety SH-1648 showed the best yield of 53.33 tons/hectare followed by the varieties SH-1638 and SH-1643 with a yield of 45.93 and 44.83 tons per hectare respectively. These varieties showed significantly higher yield than both the check varieties. These three varieties along with the varieties SH-1181, SH-1191, SH-1200, SH-1208 and SH-1205 significantly exceeded the check varieties SH-5 and “Diamant” with respect to yield. These varieties were selected for inclusion in further yield trials.

3. Regular varietal yield trials with new strains/varieties of potato 2015-16

Varieties in the experiment were divided into two sets. Set-1 comprised of Twelve varieties while Set-2 comprised of Eleven varieties as given below table No. 28.

Table No. 28. Regular Varietal Yield Trial at PRS, Sahowali (Sialkot).

Set-1 (12 including checks)	SH-795, SH-1109, SH-1155, SH-1181, SH-1195, SH-1196, Kuroda, SH-1205, SH-1206, SH-1208, SH-1213 and SH-5 (Check)
Set-2 (11 including checks)	SH-726, SH-729, SH-1040, SH-1041, SH-1191, SH-1212, SH-1259, SH-1270, SH-1294, SH-5(Check) and Diamant(Check)

Both the Set-1 and Set-2 were planted on 13-10-2015 according to Randomized Complete Block design with three replications for selecting new promising varieties/ strains. The size of plot in both the sets was kept 6 meter x 2.25 meter. The Set-1 was harvested on 27-01-2016 while Set-2 was harvested on 28-01-2016. Data on emergence percentage, tuber grades, tuber diseases and tuber yield for Set-1 and Set-2 were recorded and are presented below in Table No.29 and Table No.30 respectively:-

Table No. 29. Regular Varietal Yield Trial at PRS, Sahowali (Sialkot) Set-I.

Rank	Variety	Emergence (%)	Tuber Grade (%)			Tuber Disease (%)			Yield (t/h)
			>55 mm	35-55 mm	<35 mm	Scab	Rhiz.	Crack	
1	SH-1195	100.00	42.00	40.00	18.00	3.33	0.00	2.67	41.73
2	SH-1196	98.67	29.33	51.33	19.33	12.67	4.67	2.00	39.50
3	SH-795	97.33	37.33	51.33	11.33	6.33	2.00	2.33	36.30
4	SH-1213	99.33	40.00	34.67	25.33	13.67	6.67	0.00	35.57
5	SH-1206	99.33	26.67	54.67	18.67	7.33	0.00	0.00	32.33
6	SH-5 (Check)	99.67	42.00	42.67	15.33	12.00	9.67	5.67	31.83
7	Kuroda	99.67	33.33	44.00	22.67	15.67	4.67	2.33	30.87
8	SH-1181	98.67	22.67	59.33	18.00	4.00	0.00	0.00	29.63
9	SH-1109	90.00	32.00	52.00	16.00	7.67	1.67	4.67	28.87
10	SH-1205	67.67	27.33	53.33	19.33	5.00	0.00	0.00	27.90
11	SH-1155	99.67	24.27	43.33	32.00	18.00	3.33	3.33	27.87
12	SH-1208	98.33	40.67	44.00	15.33	21.67	7.67	4.67	27.67
LSD at 0.05 level		2.30	3.40	3.33	3.20	2.64	1.86	1.33	2.40

Above data reveals that the variety SH-1195 was at the top with respect to yield showing a yield of 41.73 tonnes per hectare followed by the varieties SH-1196 and SH-795 with a yield

of 39.50 and 36.30 tonnes per hectare respectively. Difference in yield between top two varieties was non-significant. However, the top three varieties along with the variety SH-1213 significantly exceeded in yield than the check variety SH-5.

Table No. 30. Regular Varietal Yield Trial at PRS, Sahowali (Sialkot) Set-II.

Rank	Variety	Emergence (%)	Tuber Grade (%)			Tuber Disease (%)			Yield (t/h)
			>55 mm	35-55 mm	<35 mm	Scab	Rhiz.	Crack	
1	SH-1294	98.33	27.33	42.00	30.67	6.00	3.33	3.33	40.73
2	SH-1259	99.67	30.67	46.67	6.67	12.33	3.33	4.33	37.80
3	SH-1191	100.00	20.67	52.67	26.67	10.00	1.33	0.00	36.03
4	SH-729	100.00	48.00	38.67	13.33	13.33	1.67	2.33	34.30
5	SH-1040	99.33	47.33	44.00	8.67	7.67	2.33	1.67	33.83
6	SH-1041	98.67	34.67	44.00	21.33	13.67	4.33	6.00	30.37
7	SH-5 (Check)	98.67	37.33	46.00	16.67	4.67	1.33	1.33	29.37
8	Diamant (Check)	99.67	42.00	29.33	28.67	9.17	4.33	4.33	28.37
9	SH-1212	97.00	38.00	43.33	18.67	10.67	2.00	0.00	26.43
10	SH-726	99.67	49.33	34.00	16.67	14.00	2.67	4.33	25.20
11	SH-1270	99.67	13.13	44.67	42.00	6.33	1.67	1.33	21.47
LSD at 0.05 level		1.49	4.60	3.22	5.31	3.47	1.82	2.19	1.77

The variety SH-1294 gave the best yield of 40.73 tonnes per hectare followed by the varieties SH-1259 and SH-1191 with a yield of 37.80 and 36.03 respectively. These three varieties along with the varieties SH-729 and SH-1040 significantly exceeded both the check varieties SH-5 and Diamant with respect to yield.

4. Adaptability Trial of Exotic Potato Varieties

Four sets of different exotic Potato varieties were received from the DG, FSC & RD, Islamabad through the Directorate of Potato Research Institute, Sahiwal. Set-1 comprised of four varieties while Set-2, 3 and 4 consisted of two, thirteen and three varieties respectively. Local promising checks were also included in Set-1 and Set-2. Set-1 was sown on 21-10-2015 while Set-2, Set-3 and Set-4 were sown on 12-11-2015, 26-11-2015 and 27-11-2015 respectively according to R.C.B.D. with three replications keeping plot size of 6 x 2.25 meters for their evaluation under Sahowali, Sialkot conditions. Set-1 was harvested on 4-02-2016 whereas Set-2

and Set-3 were harvested on 29-02-2016. Set-4 was harvested on 1-03-2016. Data on emergence percentage, tuber grades, tuber diseases and tuber yield were recorded. The portion of adaptability trial conducted at PRS, Sahowali (Sialkot) has been discussed in detail under Plant Breeding section of PRI, Sahiwal in experiment No. 10.

5. National Uniform Potato Yield Trial

Potato Coordinator, National Agricultural Research Centre, Islamabad supplied the seed potatoes of nineteen varieties/promising lines coded as “A to S” through the Directorate of Potato Research Institute, Sahiwal for their evaluation of yield potential, foliar disease, tuber grades and tuber diseases etc. at Sahowali, Sialkot. This experiment was sown on 15-11-2015 according to R.C.B.D. with three replications keeping plot size of 6 x 1.5 m. The seed of Potato varieties was provided late due to which sowing was delayed to some extent. The variety “Q” did not emerge at all. This experiment was harvested on 25-02-2016. Data on emergence percentage, tuber grades, tuber diseases and tuber yield were recorded. The portion of NUYT trial conducted at PRS, Sahowali (Sialkot) has been discussed in detail under Plant Breeding section of PRI, Sahiwal in experiment No. 9.

6. Zonal Varietal Yield Trial

Seed of ten coded varieties was received from the Directorate of Potato research Institute, Sahiwal for their evaluation of yield potential, foliar disease, tuber grades and tuber diseases etc. at Sahowali, Sialkot. This experiment was sown on 12-11-2015 according to R.C.B.D. with three replication. The size of plot was kept 6.0m x 0.75m. This trial was harvested on 26-02-2016. Data on emergence percentage, tuber grades, tuber diseases and tuber yield were recorded. The portion of zonal varietal trial conducted at PRS, Sahowali (Sialkot) has been discussed in detail under Plant Breeding section of PRI, Sahiwal in experiment No. 8.

C. Potato Breeding Research Sub-Station, Murree.

1. Hybridization

A total of 54 crosses were attempted for obtaining crossed berries between different selected parent Potato varieties/strains during Summer, 2015. Out of 54 crosses, 31 crosses were successful and as a result of crossing, 122 berries were obtained from 31 cross combinations for nursery raising during Summer, 2016. The detail of crosses is given in the table No. 31

Table No. 31. Cross combinations and berries obtained at Potato breeding Sub-Station, Murree during summer, 2015

Sr. No.	Cross combination			No. of berries
	Female	X	Male	
1	ROCCO	X	SH-5	3
2	ROCCO	X	SH-692	3
3	ROCCO	X	SH-1210	2
4	SH-718	X	SH-1155	1
5	SH-78-51	X	SH-5	4
6	SH-718	X	SH-5	1
7	SH-5	X	SH-1210	1
8	SH-718	X	SH-1210	4
9	Diamant	X	Red River	3
10	SH-692	X	SH-1195	3
11	FD 78-36	X	PRI-Red	1
12	SH-718	X	SH-692	1
13	SH-1181	X	SH-718	4
14	SH-1181	X	SH-5	4
15	SH-1181	X	SH-1210	1
16	Burna	X	FD-171	2
17	ROCCO	X	SH-718	19
18	FD 63-1	X	FD 73-110	1
19	SH-718	X	SH-661	3
20	SH-729	X	SH-718	3
21	SH-1206	X	SH-1181	6
22	SH-1155	X	SH-729	3
23	SH-1040	X	SH-1155	4
24	SH-5	X	SH-692	4
25	SH-1181	X	SH-1206	9
26	SH-692	X	Red River	6
27	SH-692	X	SH-5	7
28	SH-1195	X	SH-718	5
29	SH-1195	X	Red River	4
30	Karoda	X	SH-5	2
31	Karoda	X	FD 63-1	8
			Total	122

2. Selection of desirable genotypes from crosses of 2013

51 plants of 9 cross combinations were selected on the basis of their performance. The detail is presented below in table No.32

Table No. 32. Selected crosses at Potato Breeding Sub-Station Murree during summer 2013

Sr. No.	Cross combination	Plant Number	No. of Tubers	Allotted Strain Number		
1	SH-718 X SH-5	P 1	7	SH-1721		
		P 4	5	SH-1722		
		P 5	16	SH-1723		
		P 8	5	SH-1724		
		P 10	3	SH-1726		
		P 12	9	SH-1727		
		P 16	2	SH-1728		
		P 17	7	SH-1729		
2	SH-692 X SH-5	P 1	10	SH-1731		
		P 2	8	SH-1732		
		P 5	4	SH-1733		
		P 8	6	SH-1734		
		3	SH-726 X SH-5	P 2	6	SH-1735
				P 3	10	SH-1736
				P 4	3	SH-1737
				P 5	5	SH-1738
4	SH-795 X SH-5	P 1	7	SH-1739		
		P 2	15	SH-1740		
		P 6	6	SH-1741		
		P 9	4	SH-1742		
5	SH-493 X SH-5	P 1	8	SH-1743		
		P 5	10	SH-1744		
6	Sialkot Sufaid X SH-5	P 3	0	SH-1745		
		P 7	12	SH-1746		
		P 8	4	SH-1747		
		P 10	5	SH-1748		
7	VDW 1-69 X FD 78-51	P 1	3	SH-1749		
		P 2	7	SH-1750		
		P 3	5	SH-1751		
		P 9	8	SH-1754		
		P 10	9	SH-1755		
		P 11	10	SH-1756		
8	VDW 1-69 X FD 74-21	P 1	3	SH-1758		
		P 2	5	SH-1759		
		P 4	7	SH-1760		
		P 5	14	SH-1761		
		P 9	3	SH-1762		
		P 11	6	SH-1764		

		P 13	4	SH-1765
		P 14	2	SH-1766
		P 17	5	SH-1767
		P 18	5	SH-1768
		P 19	8	SH-1769
		P 20	2	SH-1770
9	FD 78-51 X SH-5	P 1	6	SH-1771
		P 2	4	SH-1772
		P 3	2	SH-1773
		P 6	2	SH-1774
		P 7	3	SH-1775
		P 8	8	SH-1776
		P 10	1	SH-1777

3. Selection of desirable genotypes from nursery of crosses of 2014

69 plants of 19 cross combinations were selected on the basis of their performance. The detail is presented in table No.33

Table No. 33. Selected genotypes from nursery of crosses made during 2014 at Potato Breeding Sub-Station Murree

Sr. No.	Cross combination	Plant Number	No. of Mini tubers	No. of plants selected
1	SH-718 X SH-1040	P 1	1	4
		P 2	9	
		P 3	1	
		P 5	1	
2	SH-718 X SH-5	P 1	2	5
		P 2	2	
		P 3	2	
		P 4	10	
		P 5	2	
3	SH-718 X SH-1041	P 1	1	3
		P 2	1	
		P 5	6	
4	SH-718 X SH-493	P 1	2	4
		P 2	7	
		P 3	6	
		P 4	2	
5	SH-718 X SH-661	P 1	2	4
		P 2	6	

		P 3	3	
		P 5	2	
6	SH-718 X SH-1072	P 1	3	3
		P 2	2	
		P 3	3	
		P 10	3	
7	SH-718 X SH-692	P 1	1	2
		P 2	1	
8	SH-1040 X SH-718	P 1	1	2
		P 4	4	
9	SH-1040 X SH-5	P 1	2	3
		P 2	1	
		P 3	3	
10	SH-493 X SH-718	P 1	1	4
		P 2	1	
		P 4	4	
		P 5	4	
11	SH-493 X SH-5	P 3	3	1
12	SH-5 X SH-1041	P 3	2	1
13	FD 63-1 X SH-1041	P 1	2	4
		P 2	3	
		P 3	2	
		P 5	2	
14	FD 63-1 X SH-5	P 1	3	4
		P 2	5	
		P 3	3	
		P 4	2	
15	SH-1067 X SH-5	P 1	3	10
		P 2	3	
		P 3	3	
		P 4	3	
		P 5	3	
		P 6	5	
		P 7	4	
		P 8	5	
		P 9	5	
		P 10	3	
16	SH-1072 X SH-5	P 1	5	8
		P 3	4	
		P 4	4	
		P 6	5	
		P 7	3	
		P 8	6	
		P 9	3	

		P 10	3	
17	SH-661 X SH-493	P 1	2	3
		P 3	6	
		P 5	2	
18	SH-692 X SH-1041	P 1	2	2
		P 4	3	
19	SH-1067 X SH-5	P 1	7	2
		P 3	7	

2. PLANT PATHOLOGICAL STUDIES

Potato Research Station, Sahowali (Sialkot)

1. Evaluation of thirty promising local genotypes for resistance/tolerance against foliar and tuber diseases.

A field experiment comprising thirty potato genotypes was planned to evaluate their resistance/tolerance potential against major foliar and tuber disease. For this purposes, thirty elite varieties/lines were planted on 11-10-2015 along with one check/standard variety viz., cardinal. All the genotypes were planted in 6.0m long single row plots. Normal agronomic practices were carried out and no fungicide was sprayed.

Data on incidence of different parameters, foliar diseases viz., early blight, late blight, potato virus(PVX), potato virus Y (PVY), potato leaf roll virus (PLRV) and tuber diseases i.e. common scab, Rhizoctonia and tuber cracking were recorded Table 34.

Table No. 34. Performance of strains/varieties against foliar and tuber diseases

S.No.	Variety/ Line	Emer %	Blight %	Scab %	Rhz %	Crack %	Rot %	PVX %	PVY %	PLRV %	Yield T/hac.
1	SH-5	100	40	5	3	2	-	-	-	35	30.61
2	SH-701	100	50	20	25	3	-	-	-		21.99
3	SH-718	100	10	2	3	-	-	-	-	-	34.68
4	SH-726	100	60	25	50	3	-	-	-	-	20.22
5	SH-729	100	25	15	3	2	-	-	-	5	28.44
6	SH-1035	100	10	5	6	-	-	-	-	-	31.77
7	SH-1040	100	30	6	4	2	-	-	-	-	26.28
8	SH-1041	100	35	10	15	6	-	-	-	-	24.95
9	SH-1072	100	40	12	10	3	-	-	-	-	27.22
10	SH-1109	100	50	20	25	5	-	-	-	-	22.48
11	SH-1154	100	50	10	15		-	-	-	-	23.39
12	SH-1155	100	40	8	12	3	-	-	-	3	21.13
13	SH-1181	100	30	5	7	-	-	-	-	2	25.84

14	SH-1191	100	20	4	6	-	-	-	-	-	32.19
15	SH-1195	100	10	4	2	-	-	-	-	-	35.51
16	SH-1196	100	10	3	2	2	-	-	-	-	33.08
17	SH-1200	100	30	5	10	-	-	-	-	-	20.82
18	SH-1205	100	25	6	3	-	-	-	-	-	26.91
19	SH-1206	100	20	3	4	-	-	-	-	-	28.17
20	SH-1207	100	40	6	2	-	-	-	-	-	27.88
21	SH-1208	100	25	6	5	-	-	-	-	2	24.42
22	SH-1212	100	30	5	8	1	-	-	-	-	29.59
23	SH-1259	100	10	4	2	-	-	-	-	-	33.79
24	SH-1270	98	30	12	10	-	-	-	-	-	27.39
25	SH-1276	100	40	15	12	-	-	-	-	-	19.06
26	SH-1294	100	10	5	4	2	-	-	-	-	31.44
27	S-Safaid	100	60	30	50	3	-	-	-	15	29.11
28	Kuroda	100	40	40	30	3	-	-	-	-	30.22
29	Cardinal	100	90	30	70	2	-	-	-	5	19.91
30	Diamant	100	80	25	60	2	-	-	-	5	27.08

FOLIAR DISEASE INCIDENCE

Early Blight.

The weather proved unfavorable for the onset of the disease, so the disease was not observed in experimental area.

Late Blight.

Among thirty lines/varieties screened against late blight of Potato, none of the lines/varieties seemed to be free from the disease. Five lines viz. SH-718,SH-1035, SH-1195, SH-1196 and SH-1259 were found with least disease incidence i.e. 10%. Whereas a variety Diamant showed 80% disease incidence. The check variety Cardinal exhibited high level of disease incidence (90%).

Potato Virus X (PVX).

Among thirty genotypes sown for screening purposes, all the entries showed no visible symptoms of (PVX).

Potato Virus Y (PVY).

All the lines/varieties expressed tolerance against (PVY).

Potato Leaf Roll Virus (PLRV)

Twenty two lines/varieties remained free from (PLRV) infection while Cardinal and Diamant expressed 5% disease incidence, The line SH-1181 showed lowest disease incidence (2%). However SH-1155 and SH-1270 expressed only 3% disease incidence while 15% disease incidence was recorded on S.Sufaid. Maximum infection level of 35% was recorded on variety SH-5.

TUBER DISEASE INCIDENCE

Common Scab.

Among thirty Potato germplasm, none of the varieties/ lines was found to be free of the disease. Line SH-718 expressed 2% disease incidence. Two lines/ varieties SH-726 and Diamant showed 25% disease incidence. 30% disease incidence was observed on the potato varieties S.Sufaid and Cardinal, while maximum disease incidence (40%) was recorded on a variety Kuroda.

Black Scurf (Rhizoctonia sp) .

Among thirty genotypes, none of the lines/varieties seemed to be free from the disease. Four lines viz., SH-1195, SH- 1196, SH-1207 and SH-1259 expressed only 2% disease incidence. Maximum disease incidence (70%) was noted on the variety Cardinal.

Tuber Cracking

Out of thirty genotypes, eleven lines/varieties remained free from the disease. Minimum disease incidence (1%) was observed on SH-1212, whereas SH-1109 expressed 5% disease incidence. Maximum disease incidence (6%) was recorded on SH-1041.

Tuber Yield

SH-1195 proved to be the highest yielder with the maximum potato yield of 35.51 t/ha followed by SH-718 with the tuber yield of 34.68 t/ha and SH-1196 having tuber yield of 33.08 t/ha respectively. Minimum tuber yield was recorded in the variety Cardinal with 19.91 t/ha.

2. Control of late blight of potato through different fungicides

An experiment with five different fungicides was planned in order to find out the most efficacious fungicide for the control of late blight disease. The trial was laid out having RCBD design, with three replications and 2.8m x 6m plot size. Row and plant spacing were maintained

as 70 cm and 20 cm respectively. The test variety SH-5 was planted on 11-10-2015. Five fungicides viz: Ridomil Gold, Defeater, Puslan, Aliette and Success were included in the trial. Fungicides were sprayed according to the schedule. While in control, only simple water was sprayed. The standard agronomic practices were followed.

Late Blight

Among all the treatments, statistically analyzed data revealed that Treatment No. 1 proved efficacious with the least disease incidence (7.33%) as compared to control possessing 100% disease incidence given in Table 35.

Treatment No.2 expressed 8.66% disease incidence percentage followed by T3 and T4 with the result of 10.66% and 17.00% respectively. Treatment no.5 was also effective compared with that of control.

Table No. 35. Performance of different fungicides against late blight disease

Sr. No.	Treatments	Disease % Means	Percent Decrease/ Control	Yield T/ha.
1	All sprays of Ridomil Gold @2.5 g/ lit. of water	7.33	92.67	28.67
2	All sprays of Defeater @2.5g/lit. of water	8.66	91.34	28.13
3	All sprays of Puslan @2.5 g/ lit. of water	10.66	89.34	27.23
4	. All sprays of Success @2.5 g/ lit.of water.	17.00	83.00	26.38
5	. All sprays of Aliette @2.5 g/ lit.of water.	34.33	65.67	25.06
6	Control	100	-	23.64
	LSD at 0.05 level	4.27		1.95

Tuber yield

It is revealed from the statistically analyzed data presented in Table 35, that differences among all the treatments were found to be significant and maximum tuber yield 28.67 t/ha was observed in Treatment No.1. Control proved to be the least potato tuber yielder with a magnitude of 23.64 t/ha.

3. Chemical control of black scurf (*rhizoctonia sp*) through seed treatment.

A trial was laid out for the control of Rhizoctonia disease of potato tubers. The main objective was to search out the most effective fungicide as seed treatment of potato tubers proving to be economical in controlling potato tuber diseases. The experiment was sown on 11-10-2015 with RCBD design having plot size 2.8m x 6.0m. The test variety Cardinal was sown with three replications with six treatments viz: Monceren @1ml/kg seed tuber, Triton @8ml/100kg seed tuber, Benlate @ 3g/kg seed tuber, Topsin-M @ 2g/kg seed tuber, seed treatment with simple water and untreated seed (control). Data on all the parameters were recorded and potato seed was treated with the selected dose of fungicides before sowing whereas in case of control, seed was not treated with any chemical table 36.

Table No. 36. Performance of different fungicides against rhizoctonia disease

Treatments	Ave. dis. %	Percent dec./ over control	Yield T/ha.
T1 Monceren @ 1ml/kg seed tuber	2	98.90	25.86
T2 Triton @8ml/100kg seed tuber	6.33	93.09	25.04
T3 Benlate @ 3g/kg seed tuber	11.33	87.63	24.61
T4 Topsin-M @ 2g/kg seed tuber	26.66	70.91	24.19
T5(Seed treatment with simple water)	71.33	75.33	23.82
T6 Untreated seed(control)	91.66	-	22.90
LSD 5%	4.29		2.3

Rhizoctonia disease.

In treatment No.1, disease percentage decreased over control with a value of 98.90% followed by T2 with 93.09% disease percentage decreased over control whereas in T6, maximum disease incidence with the value of 91.66% was observed.

Tuber yield. The statistical analysis revealed differences among all the treatments that treatment No.1.possessed the maximum tuber yield as 25.86 t/ha followed by T2with the magnitude of 25.04 t/ha yield.T6 untreated seed (control) turned out to be the lowest potato tuber yielder as 22.90 t/ha.

4. Survey of black scurf/rhizoctonia and common scab disease incidence on potato at District Sialkot area for the year 2015-2016.

Table No. 37. Survey of black scurf and common scab diseases at different areas of Sialkot District.

Sr. No.	Farmer's Name	Place Vill./city	Variety sown	Source of Irrigation	Area/ Acre	Rhizoctonia Percentage	Scab Percentage
1	Ghulam Ali	Sahowali Sialkot	Rocco	Tubewell	10	60	40
2	Haji Ghulam Rasool	Sahowali Sialkot	Rocco+ Kuroda	=	6	25	30
3	ShafaatBajw a	ShowniS ulehrian Sialkot	Kuroda	=	12	15	25
4	ArshidSubha ni	Gurri	Rocco	=	18	7	8
5	M.Usman	Klaswala Pasrur	Kuroda	=	6	15	20
6	M.Shafique	Klaswala pasrur	Rocco+ Kuroda	=	15	10	35
7	Abdul Majeed	Kalasal aPasrur	Rocco+ Kuroda	=	10	15	25
8	M.Tahir	BhulairB ajwa Pasrur	Kuroda		8	10	15
9	M. Ali	BhulairB ajwaPasr ur	Rocco	=	5	10	25
10	M.Saleem	BhulairB ajwa - Pasrur	Rocco	=	8	5	10
11	Rana Naseer Ahmed	Bhoro ke Khurd	Rocco	=	5	10	20
12	Javed Iqbal Sahi	Bhoro ke Kalan	Kuroda	=	7	20	15
13	Zakaullah	Bhopal Wala Sambrial	Kuroda	=	8	10	12
14	Sarfraz Ahmed	Bhopal walaSam brial	Kuroda	=	4	15	10
15	M.Afzal	Bhopal walaSam brial	Kuroda	=	6	10	20

16	M.Tariq	Bhopal walaSam brial	Kuroda+ Rocco	=	5	15	12
17	M. Asif	Bhopal- WalaSam brial	Kuroda	=	10	10	10
18	Zafarullah	Bhopal- Wala Sambrial	Kuroda	=	15	10	12
19	M. Ashfaq	Bhopal- Wala Sambrial	Rocco	=	10	10	10
20	M.Arif	Bhopal walaSam brial	Rocco	=	12	10	15
21	M.Nawaz	Chak Khena Sambrial	Kuroda	=	8	25	10
22	M.Boota	Chak Khena Sambrial	Kuroda	=	6	10	15
23	M.Bashir	Chak Khena Sambrial	Rocco ,Kuroda	=	8	15	10
24	M.Ilyas	Chak Khena Sambrial	Kuroda	=	10	25	15
25	Qamar Abbas	Chak Khena Sambrial	Kuroda	=	7	30	20
26	Riasat Ali	Chak Khena Sambrial	Kuroda	=	8	25	12
27	Malik Babar	Najwal	Kuroda	=	15	10	10
28	Mirza Altaf	Chapprar	Kuroda	=	15	8	12
29	Malik Sohail	Pothien Sialkot	Bartina ,Rocco	=	60	4	5
30	M.Amjid	Sahowali, Sialkot	Kuroda, Rocco	=	10	15	10

Survey was conducted during the growing season of Potato crop for the year 2015-2016 in the adjacent locality of district Sialkot. Thirty farmer's field survey report revealed that the maximum disease incidence of Rhizoctonia and Common Scab diseases was 60% and 40% respectively. Where as minimum common Scab disease incidence of 5% was observed in the farmer's field. It was noticed that where the seed tubers of potato were treated with the fungicides before sowing by the farmers, only 4% Rhizoctonia disease incidence was recorded. Use of "Monceren" proved to be most effective in controlling the Black Scurf/Rhizoctonia disease of Potato.

3. AGRONOMIC STUDIES

Potato Research Station, Sahowali (Sialkot)

1. Drought tolerance study in potato starsins.

The trial was laid out on 11-10-2015 to check the clones with drought tolerance according to split plot design with plot size of 2.8m x 6.0. The trial was conducted with 3 varieties and 3 irrigation intervals as 15, 25 and 35 days. Data regarding emergence percentage and growth was recorded. The trial was harvested on 28-2-2016 and data presented table 38.

Table No. 37. Performance of potato strains at different irrigation intervals during 2015-2016.

Sr.No	Strains/ Varieties	Irrigation Intervals	Emergence (%)	Tuber grades (%)			Yield T/ha
				>55mm	35-55mm	<35mm	
1	SH-5	15days	100	11.33	65.56	23.11	25.95
		25days	99	13.14	67.49	19.37	23.57
		35days	97	10.38	69.11	20.51	21.41
2	SH-718	15days	100	9.47	72.17	18.36	28.75
		25days	98	10.12	69.73	20.15	26.16
		35days	100	11.95	70.21	17.84	23.63
3	SH-1195	15days	100	14.20	66.56	19.24	29.48
		25days	100	13.84	65.16	21.00	27.23
		35days	100	12.00	64.10	23.90	24.92

Table No. 38. Variety X Treatment Interaction

Varieties/Lines	Irrigation Levels			Yield T/ha
	15days	25days	35days	
SH-1195	29.49	27.38	24.94	27.27
SH-718	28.77	26.16	23.44	26.12

SH-5	25.94	23.55	21.38	23.62
Mean	28.06	25.69	23.25	
LSD at 0.05 level				
Varieties	=	0.884		
Treatments	=	1.697		
Varieties/treatments	=	2.551		

The statistically analyzed data presented in table 5 showed that maximum yield of 29.49 T/ha in 15 days intervals was recorded in case of SH-1195 followed by SH-718 which produced 28.75 T/ha with irrigation level of 25 days, 27.23 T/ha more tuber yield was recorded in case of SH-1195 as compared to SH-718 and SH-5 with irrigation interval of 35 days lowest tuber yield of 21.41 T/ha was observed in case of SH-5 compared with other potato strains of SH-718 and SH-1195.

4. FOOD TECHNOLOGICAL STUDIES

Potato Research Institute Sahiwal

1. Screening of varieties /strains for high dry matter contents and specific gravity

Samples (potato tubers) of **19** different strains/varieties were collected from the field after harvesting the crop. The specific gravity and dry matter content data were recorded by potato Hydro meter. Results are presented below in Table No. 39.

Table 39. Performance of different strains regarding dry matter at PRI, Sahiwal

Rank	Varieties Name	Specific gravity	Dry matter
1	FD 74-30	24.2	1.100
2	N-9625	22.0	1.089
3	FD 78-15	19.9	1.079
4	Kastell	19.8	1.079
5	Monte Carlo	19.6	1.078
6	Miss Andes	19.0	1.076
7	Simply red	18.6	1.074
8	Sante	18.6	1.073
9	FD 81-1	18.6	1.073
10	FD 76-59	18.2	1.072
11	Amarin	18.0	1.070
12	Miss migonne	18.0	1.070
13	Ludmilla	18.0	1.070
14	N-34	17.8	1.070
15	Focus basic	17.6	1.069

16	Asterix	17.6	1.069
17	SH-5	17.6	1.068
18	FD 73-44	-	-
19	FD 78-104	-	-

The objective of this study was to evaluate the strains for processing industry to make value added food products like Potato chips, French fries. As shown in Table No.39., the potato strain “FD 74-30” gave high dry matter content and specific gravity (**24.2% & 1.1 respectively**) in comparison to all other varieties and stood at the top in the ranking position followed by the strain N-9625 which also showed high dry matter content and specific gravity (**22.0% & 1.089**). The check varieties Simply Red, Sante & Asterix remained at 7th, 8th & 16th ranking position respectively. Keeping in view the above table, three local potato strains performed better regarding dry matter contents **and** specific gravity as compared to the check varieties / imported varieties and can fulfill the demands for food processing industry to make potato Chips and French fries.