मैहतानिसज
Mehtaensis

प्रो0 के.सी. मैहता के नाम पर जारी क्षेत्रीय केन्द्र के **सोध** का छमाही **न्यूज़लैटर**: संस्थापक: डा. सुब्रमण्यम. नागराजन

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Prof. K.C. Mehta (1892-1950)
Founder of the Flowerdale station

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सारांश/ Summary:

वेमौसमी/ग्रीष्म ऋतु (2013–14) के दौरान वेलिंगटन (तमिलनाडु), दलांग मैदान (हिमाचल प्रदेश) और लद्दाख (जम्मू व कश्मीर) में गेहूँ के सभी रतुओं को देखा गया। पीला और भूरा रतुआ सर्वप्रथम शिमला केन्द्र की गेहूँ रोग नर्सरी में क्रमशः 12.9.2014 और 6.10.2014 को देखा गया। पंजाब कृषि विश्वविद्यालय के वैज्ञानिकों ने दिनांक 19.12.2014 को पंजाब के आनंदपुर साहिब के निकट एक गांव दरोली में पीले रतुए की पहचान की। रोग नियन्त्रण के लिए रतुआ रोग से ग्रसित गेहूँ की फसल पर उपयुक्त रसायन का छिडकाव कर दिया गया है। इस अवधि के दौरान गेहूँ के रतुआ रोगों के 135 नमूनों को प्राप्त किया गया। अभी तक गेहूँ के तीनों रतुआ रोगों के 38 नमूनों का विश्लेषण किया जा चुका है। काले रतुऐ के दो 34–1 (10जी13), 40ए (62जी29) तथा पीले रतुए के दो प्रभेदो 46एस119, 46एस117(नया प्रभेद) की पहचान की गई। भूरे रतुऐ के 77–5 (121आर63–1), 77–11 (125आर28), 104–4 (93आर57) और 162–1 (93आर47) प्रभेदों की पहचान हिमाचल प्रदेश से प्राप्त नमूनों में की गई। तमिलनाडु से प्राप्त नमूनों में केवल प्रभेद 77–9 (121आर60–1) और 77–10 (377आर60–1) पाए गए।

शेष पेज 1 पर.....

गेहूँ एवं जौ की एवीटी, एनबीडीएसएन ओर इबीडीएसएन सहित 1070 से अधिक प्रविष्ठियों को रतुआ रोग के विभिन्न प्रभेदों के विरूद्व परखा गया। विभेदीय सेट पर विभेदों के संक्रमण प्रकार तथा एस एस आर मारकर की मदद से भूरे रतुऐ के प्रभेदों के बीच के अन्तर का विश्लेषण किया गया।

गेहूँ की रतुआ प्रतिरोधी किस्में तैयार करके तथा कुछ किश्मों को प्रजनिक क्षमता देखने हेतु 45 नये क्रोस बनाये गए। पिछले वर्षों के क्रोस से प्राप्त 50 से अधिक गेहूँ की लाईनों को रतुए के उपयुक्त विभेदों के खिलाफ रतुआ प्रतिरोध के लिए विश्लेषित किया गया। आनुवांशिक विश्लेषण और जीन पिरामिडिंग के अध्ययन के लिए उपयुक्त लाईनों को खेत में प्रत्यारोपित किया।

गेहूँ, जौ जई और अलसी के विभिन्न रतुआ रोगाणुओ/बिजाणुओं के प्रभेदों का रख–रखाव किया गया ओर आवश्यकतानुसार इनमें से कुछ प्रभेदों के रतुआ रोग पर कार्य करने वाले 39 वैज्ञानिकों/केन्द्रो को अनुसंधान कार्य के लिए भेजा गया। गेहूँ की विभिन्न बिमारियों तथा उनके फैलने की निगरानी हेतु विभिन्न स्थानों पर डब्ल्यूडीएमएन और सार्क डब्ल्यूडीएमएन नर्सरी को लगाया गया।

During the off season/summer crop (2013-14) all the rusts of wheat were observed at Wellington (Tamil Nadu), Dalang (Himachal Pradesh) and Ladakh (Jammu & Kashmir). Yellow and brown rusts were first observed on 12th of September and 6th of October, respectively on wheat disease monitoring nursery (WDMN) at Shimla. Scientists from PAU, Ludhiana have observed (19.12.2014) the occurrence of yellow rust of wheat in a farmer's field in village Daroli Upper near Anandpur Sahib in Punjab. The spot has been chemically treated to eradicate the focus of infection. During the period about 135 samples of wheat rusts were collected/received. So far 38 samples of all three rusts of wheat have been analysed.

Only two pathotypes each of black {34-1 (10G13) and 40A (62G29)} as well as yellow rust {46S119 and 46S117 (new pathotype)} of wheat were observed till date. Brown rust, pathotypes 77-5 (121R63-1), 77-11 (125R28), 104-4 (93R57) and 162-1 (93R47) were identified in Himachal Pradesh samples. In samples from Tamil Nadu only 77-9 (121R60-1) and 77-10 (377R60-1) were observed.

Seedling resistance test (SRT) of more than 1070 lines of wheat and barley, including AVT, NBDSN and EBDSN entries have been done against different pathotypes of three rusts of wheat and barley. Analysis of polymorphism among brown rust pathotypes based on SSR marker analysis and their infection types on brown rust differential sets and the clustering in the same was done in the form of dendrogram.

Forty five different crosses were attempted for inheritance studies and gene transfer for rust resistance. More than fifty populations/selections were analyzed for seedling resistance against suitable rust pathotypes and were transplanted in the field for advancement of generations for genetic analysis and gene pyramiding studies.

Repository of pathotypes of different rust pathogens of wheat, barley, oat and linseed was maintained and inoculum of wheat and barley rusts was supplied to 39 centers/Scientists.

For monitoring the occurrence/spread of different diseases of wheat, WDMN and SAARC-WDMN were planted at different locations.

1. Occurrence of rusts on summer and regular crop of wheat and barley

The off season wheat crop (2013-14) witnessed occurrence of all the three rusts of wheat at Wellington (Tamil Nadu), areas in Himachal Pradesh and Jammu & Kashmir. Both yellow and brown rusts were observed on many entries of wheat disease monitoring nursery, planted at regional station, IIWBR, Shimla. Yellow rust was first observed on 12th of September whereas brown rust first appeared on 6th of October on WDMN at Shimla. Like previous years high incidence of yellow rust was reported from many villages in Leh region of J. & K. However; black and brown rust were scanty in distribution. Dr. P.P.S Pannu, Senior Plant Pathologist, Department of Plant Pathology and Dr. (Mrs.) Jaspal Kaur, Plant pathologist wheat section, P.A.U., Ludhiana visited the field area on a route Ludhiana- Samrala-Chamkaur Sahib-Ropar-Kiratpur Sahib- Anandpur Sahib – Noorpur Bedi-Nangal-Garhshankar-Pozewal- SBS, Nagar-Rahon-Macchiwara. In most of the areas the crop condition was good, however yellow rust was reported in one field in the village Daroli Upper near Anandpur Sahib on unrecommended wheat variety Berbet. There was only one patch in an area of about 2 kanal field. The concerned farmer Mr. Bahadur Singh was advised to spray the fungicide. He immediately sparyed Propiconazole (Tilt) on 24-12-2014. He noticed this patch of infection 5 days back (Probably on 19.12.2014) .The disease prone areas in the sub- mountainous regions will now be regularly monitored to identify the initial foci of yellow rust infection to check its further spread.

2. Sample receipt of wheat and barley rusts

A total of 135 samples of wheat rusts was received during the period under report. Samples of barley rusts have not been collected/received so far. Maximum numbers of samples for black and brown rusts were received from Tamil Nadu and for yellow rust from Jammu & Kashmir followed by Himachal Pradesh (**Table 1**).

Table- 1: Samples of wheat and barley rusts received up to 31.12.2014

S. No.	States	Total no. of samples received	Rusts			
			Black	Brown	Yellow	
					Wheat	Barley
1	Tamil Nadu	48	22	16	10	0
2	Jammu & Kashmir	49	6	1	42	0
3	Himachal Pradesh	38	3	10	25	0
	Total	135	31	27	77	0

3. Pathotype distribution of *Puccinia* species on wheat

Of the 135 samples of wheat rusts, 38 have been analyzed till 31.12.14, others are being followed. In case of black rust as usual pathotype 40A (62G29) has been observed in 8 samples from Tamil Nadu and pathotype 34-1 (10G13) in 6 samples from Jammu and Kashmir. In samples received from Himachal Pradesh the black rust pathotype have not been identified till now **(Table 2).** Only two pathotypes i.e. 46S119 in six samples and 46S117 (new) in two samples of yellow rust were observed in the samples analyzed from Himachal Pradesh, whereas in two samples received from Tamil Nadu pathotype 46S119 was observed. This fact needs confirmation. The analysis of yellow rust samples received from Jammu and Kashmir is underway. For brown rust, pathotype 77-5 (121R63-1) in three samples and pathotypes 77-11 (125R28), 104-4 (93R57) and 162-1 (93R47) in one sample each was observed from Himachal Pradesh samples. From Tamil Nadu pathotype 77-9 (121R60-1) in nine samples and pathotype 77-10 (377R60-1) was identified in one sample only **(Table 2)**.

Table- 2: Pathotype distribution of Wheat rust pathogen up to 31.12.2014

S.No.	State	Black Rust			Yellow rust			Brown rust						
		No. of Isolates analyzed	Pathotypes*		No. of Isolates analyzed	Pathotypes*		No. of Isolates analyzed	Pathotypes*					
			34-1	40 A		46S119	46S117		77-5	77-9	77-10	77-11	104-4	162-1
1	Himachal Pradesh	-	-	-	8	6	2	6	3	-	-	1	1	1
2	Tamil Nadu	8	0	8	2	2#	0	10	-	9	1	-	-	-
3	Jammu & Kashmir	6	6	0	-	-	-	-	-	-	-	-	-	-
Total		**14**	6	8	**10**	8	2	**16**	3	9	1	1	1	1
Grand Total		**40**												

*** Black/stem rust:34-1 (10G13)= MHGSF, 40A (62G29)=PTHSC, Brown/leaf rust:77-5 (121R63-1)=THTTM, 77-9 (121R60-1)=MHTKP, 77-10 (377R60-1)= MHTKQ, 77-11 (125R28)=MGTTL, 104-4 (93R57)=NHKTL, 162-1 (93R47)=KHTTM,#=Needs confirmation.**

4. Seedling resistance test in wheat and barley against rust pathotypes

More than 1070 lines of wheat and barley are being evaluated at seedling stage against different pathotypes of three rusts of wheat and barley. The lines includes advance varietal trial (AVT I and II), breeders material comprising of pyramiding for rust resistance as well as transferring of targeted rust resistance genes. Black, brown and yellow rust resistant lines and rust resistance gene characterization is to be done in 443 lines of AVT and other breeder's material. A wide spectrum of pathotypes of black rust (*Puccinia graminis tritici*), brown rust (*Puccinia triticina*) and yellow rust (*Puccinia striiformis*) of wheat, having different avirulence/virulence structure were used in the studies. The details of the material studied for seedling resistance test is depicted in table 3.

Table-3: Details of material for seedling rust resistance up to 31.12.2014

Sr. No.	Details of Lines	No. of Lines	Pathotypes		
			Black rust	Brown rust	Yellow rust
1	NBPGR	41	40A and Mix	77-5 and 104-2	46S119 and 78S84
2	Vijay Rana,HPKV	50	-	12-2, 77-2, 77-5 and 104-2	46S119 and 78S84
3	BARC	14	Multiple pathotypes	12-2, 77-2, 77-5 and 104-2	-
4	J.P. Jaiswal, GBPUA&T	166	-	12-2, 77-5 and 104-2	46S119 and 78S84
5	S.R. Verma,HAU	55	11, 40A, 40-3 and 117-6	12-2, 77-2, 77-5 and 104-2	46S119, 78S84, K and P
6	Rashmi Agarwal	33	34-1	77-5 and 104-2	-
7	AVT I & II	173	Multiple pathotypes	Multiple pathotypes	Multiple pathotypes
8	EBDSN	97	Selected	Selected	Selected
	NBDSN	136	Selected	Selected	Selected
9	Vikas, IARI	06	Multiple pathotypes	Multiple pathotypes	Multiple pathotypes
10	A.P. Agrawal, IGKV	50	11, 21A-2, 40A and 117-6	-	-
11	S.K.Singh,IIWBR	252	Multiple pathotypes	Multiple pathotypes	Multiple pathotypes
Total		**1071**			

5. Studies on DNA polymorphism in wheat rust pathotypes

Studies on molecular variability among yellow and brown rust pathotypes was carried forward during the period under report. Among the 26 yellow rust specific SSR (ST-SSR) primer pairs tested against selected yellow rust pathotypes, polymorphic ones were studied against predominant yellow rust pathotypes. The PCR product was resolved in 3% Super MT4 Agarose (Life Technologies). Some of the primers clearly differentiated among the yellow rust pathotypes (**Fig. 1**).

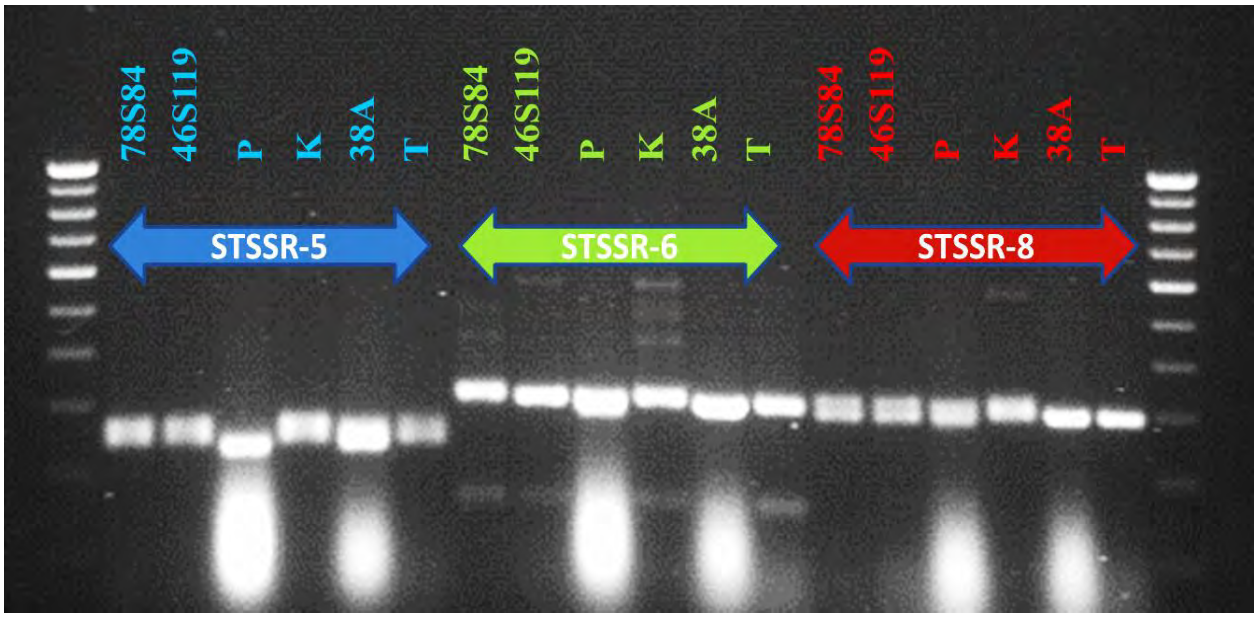

Figure 1. Variability among yellow rust races. Polymerase chain reaction (PCR) amplification was performed using the yellow rust Specific SSR Primer (STSSR-5, 6 and 8). PCR products were separated in 3% Super MT4 Agarose horizontal gel electrophoresis.

An analysis of polymorphism among brown rust pathotypes based on SSR analysis and their infection types on brown rust differential sets and the clustering in the same was done in the form of dendrogram (**Fig. 2**). To carry out analysis in NTSys, infection types of the pathotypes on differential sets, '0' and '1' was assigned for resistant and susceptible reaction, respectively.

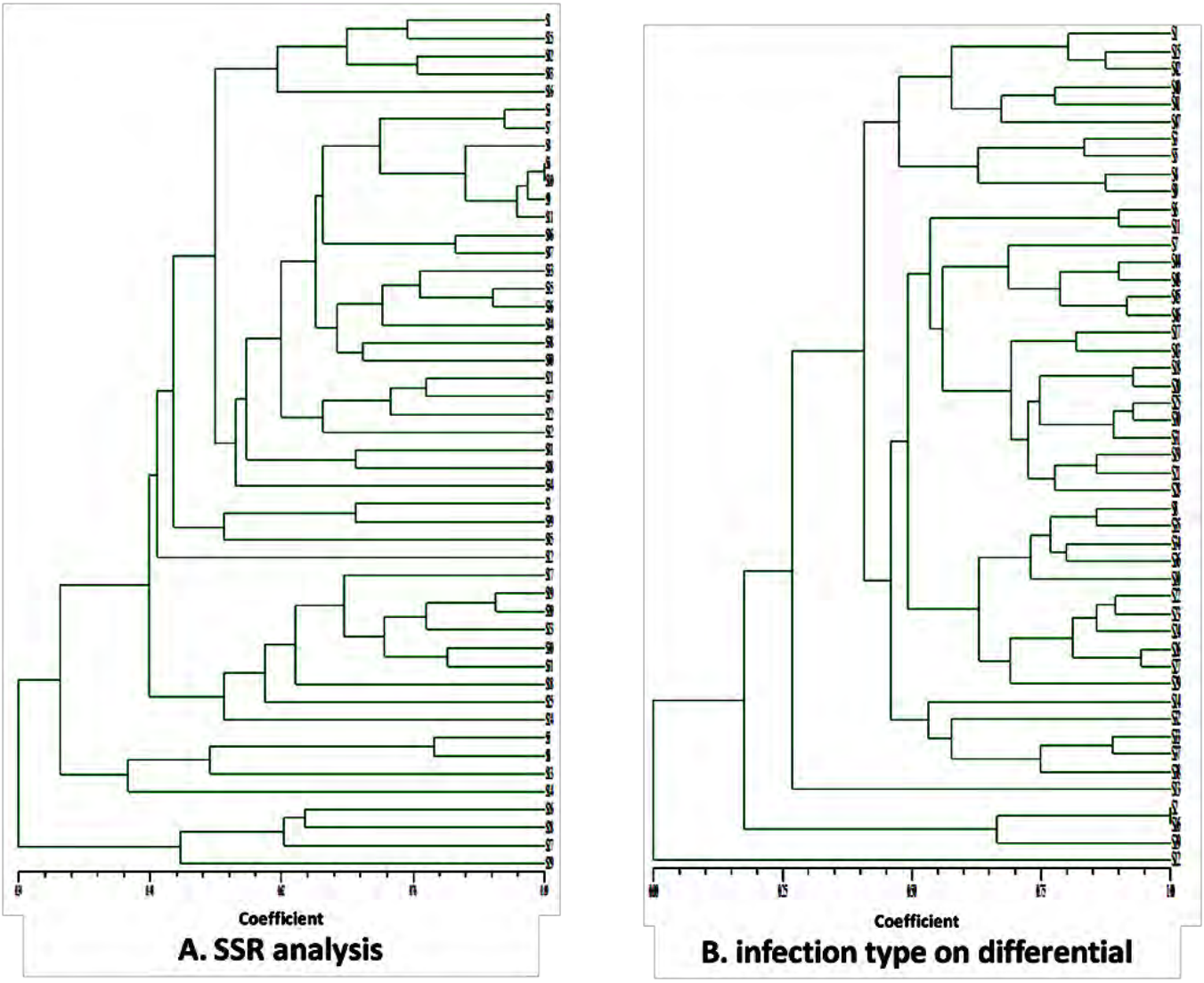

Fig. 2. Dendrogram Showing clustering of brown rust pathotypes on the basis of SSR marker analysis and Infection type on differentials (Sample Id's pathotypes are explained at Table 4**).**

Table 4. Description of Sample Id's used in the dendrogram.

Sample Id.											
S1	**10**	S9	**12-6**	S17	**77**	S25	**77-8**	S33	**104-1**	S41	**107-1**
S2	**11**	S10	**12-7**	S18	**77-1**	S26	**77-9**	S34	**104-2**	S42	**108**
S3	**12**	S11	**12-8**	S19	**77-2**	S27	**77-10**	S35	**104-3**	S43	**108-1**
S4	**12-1**	S12	**16**	S20	**77-3**	S28	**77-11**	S36	**104-4**	S44	**162**
S5	**12-2**	S13	**16-1**	S21	**77-4**	S29	**77-12**	S37	**104A**	S45	**162-1**
S6	**12-3**	S14	**17**	S22	**77-5**	S30	**77A**	S38	**104B**	S46	**162-2**
S7	**12-4**	S15	**20**	S23	**77-6**	S31	**77A-1**	S39	**106**	S47	**162-3**
S8	**12-5**	S16	**63**	S24	**77-7**	S32	**104**	S40	**107**	S48	**162A**

Grasses

Molecular detection of wheat rust samples from grasses, using yellow and brown rust pathogen specific SSR primers was also done during the period. But the observations were negative for the presence of wheat rusts on the grasses.

6. Genetic studies and development of rust resistant genetic stocks

i. Hybridization for inheritance studies and gene transfer for rust resistance:

Forty five different crosses were attempted during wheat season 2013-2014. Among the crosses made, six combinations were among *Triticum durum* genotypes, fifteen crosses between *T. aestivum* genotypes and for genetic analysis of stripe, leaf and stem rust resistance. Eighteen crosses were made for pyramiding of multiple rust resistance genes in suitable wheat background. Six inter-specific crosses were made using Triticale, *Secale cereale, T. tauschii* and *T. monococcum.*

ii. Advancement of generations for genetic analysis and gene pyramiding

More than fifty populations/ selections were analysed for seedling resistance against suitable rust pathotypes and were transplanted in the field. Eight populations were directly sown in the field for generation advancement. More than 250 selections from winter/spring segregating nurseries (9F3s and F4s) were screened for multiple resistance and the resistant selections were sown at fields of Tutikandi station of IARI.

iii. Development of rust resistant genetic stocks.

Six wheat rust resistant genetic stocks (FLW10, FLW16, FLW18, FLW21, FLW22 and FWW2) developed by DWR, Shimla were screened for seedling resistant test against virulent pathotypes of black, brown and yellow rusts. The seedling response of these stocks is depicted in Table 5. Multi location field evaluation (Table 5) of genetic stocks was conducted at Wellington (Tamil Nadu), Karnal (Haryana) and Shimla (Himachal Pradesh). All these stocks were found to be resistant to virulent pathotypes of wheat rusts and showed superiority in morpho-agronomic characters (Table 6). All these genetic stocks are in the pipeline for registration with National Bureau of Plant Genetic Resources (NBPGR, New Delhi) and will serve as the basic material for pyramiding of wheat rusts resistance genes. The major characteristics of these genetic stocks are summarised below.

FLW10 was derived from the cross between WH542 and Moro (*Yr*10). Wheat rust resistance genes like *Lr*26, *Sr*31, *Yr*9 and *Yr*10 have been confirmed in it. It was found to be resistant to all the pathotypes of black and yellow rusts. Yield per meter row was slightly less than WH542.

FLW16, developed from cross between UP2338 and *Triticum spelta album* (*Yr*5), was found to be resistant to virulent pathotypes of black (40A, 40-1 and 117-1) and yellow (78S84, 46S103 and 46S119) rusts. FLW 16 carries *Lr*26, *Sr31*, *Yr*9 and *Yr*5 genes for wheat rust resistance.

FLW18 is developed from cross between PBW343 and *Lr*39 (KS92WGRC15). It is completely resistant to black and brown rusts and partially resistant to yellow rust of wheat. In addition to *Lr*39 gene from KS92WGRC15 it also carries *Sr*31, *Yr*9 and *Yr27*. Its yield is slightly less than PBW343.

FLW21 is derived from double cross between UP2338/Centurk and UP2338/*Yr*15. Till date this stock along with FLW22 is the only wheat line or stock available in India having resistance to all the three rusts of wheat. In addition to *Yr*15, it also carries *Lr*24, *Lr*26, *Sr*24, *Sr*31, *Yr*9 and *Yr*15. This stock has red seed with test weight of 37.3 g.

FLW22 is developed through double cross between WH542/*Lr*28 and WH542/China84-40022. This stock is also resistant to all the three rusts of wheat. It carries *Lr*28+*Lr*26, *Sr*31, *Yr*9 and Yr China84 genes for wheat rusts resistance. Its average plant height is 90 cm and matures in about 118 days. The average yield per meter row is at par with WH542.

FWW2 is derived from cross between PBW343 and PH137. It is resistant to brown and black rusts. It carries *Lr*19, *Lr*26, *Sr31* and *Yr*9 genes for wheat rusts resistance. Average plant height of this stock is about 85 cm with test weight of 40.6 g. FWW2 matures in 118 days and it's per meter row yield is slightly less than PBW343.

Table 5. Seedling resistance test and field evaluation of genetic stocks with virulent pathotypes of brown, black and yellow rusts.

Genetic stock	Brown rust							Black rust						Yellow rust			
	SRT				APR			SRT			APR			SRT		APR	
	77-2	77-5	77-7	77-8	104-2	W-04	K-05	40A	40-1	117-1	W-04	K-05	78S84	46S103	46S119	W-04	K-05
FLW10	0;	3+	3+	0;	3+	40S	30S	2-	2-	2-	15MR	0	0;	0;	0;	R	R
FLW16	0;	3+	3+	3+	3+	40S	30S	2-	2-	2-	15MR	0	0;	0;	0;	R	R
FLW18	0;	0;	0;	0;	0;	R	R	2-	2-	2-	15MR	0	3+	0;	;2	10MR	R
FLW21	;	;1	;1	;1	;1	R	R	2-	2-	2-	10MR	0	0;	0;	0;	R	R
FLW22	0;	0;	0;	0;	0;	R	R	2-	2-	2-	10MR	0	0;	0;	0;	R	R
FWW2	0;	0;	0;	0;	0;	R	R	2-	2-	2-	5MR	0	;	0;	3+	R	20S

R	Resistance	**; ;1 ;2 2-**	Resistance	**77-2**	109R31-1	**40A**	62G29
MR	Moderate Resistance	**3+**	Susceptible	**77-5**	121R63-1	**40-1**	62G29-1
S	Susceptible	**W-04**	Wellington 2004	**77-7**	121R127	**117-1**	166G2
0	Free from rust/No rust response	**K-05**	Karnal 2004-05	**77-8**	253R31	**SRT**	Seedling resistance test
0;	Immune			**104-2**	21R55	**APR**	Adult plant resistance

Table 6 Specific and morpho-agronomic characters of genetic stocks.

Genetic stock	Pedigree	Specific character	Genes for rust resistance	Days to maturity	Plant height (cm)	1000 grain weight (g)	Yield/M row (g)	Grain colour
FLW10	{WH542/Moro (*Yr*10)}	Resistant to black and yellow rusts	*Lr*26(M), *Sr*31, *Yr*9+*Yr*10*	118	75	39.7	98	Amber
FLW16	{UP2338/*Triticum spelta album* (*Yr*5)}	Resistant to black and yellow rusts	*Lr*26 (M), *Sr*31, *Yr*9+*Yr*5*	120	78	38.1	93	Amber
FLW18	{PBW343/*Lr*39 (KS92WGRC15)}	Resistant to black and brown rusts	*Lr*26 (M)+*Lr*39*, *Sr*31, *Yr*9+*Yr*PBW343	125	89	38	98	Amber
FLW21	{UP2338/Centurk//UP2338/*Yr*15)	Resistant to brown, black and yellow rusts	*Lr*24+*Lr*26(M), *Sr*24+*Sr*31, *Yr*9+*Yr* china84*	122	91	37.3	118	Non-amber
FLW22	{WH542/*Lr*28//WH542/China84-40022}	Resistant to brown black and yellow rusts	*Lr*28+*Lr*26(M), *Sr*24+*Sr*31, *Yr*9+*Yr*15*	118	90	38.4	116	Amber
FWW2	(PBW343/PH137)	Resistant to black and brown rusts	*Lr*19+*Lr*26 (M), *Sr*31, *Yr*9**	118	85	40.6	138	Amber

*** Resistance derived from winter wheat**
****Additional resistance factor**
M Validated with molecular marker

7. Maintenance and supply of nucleus inoculum of wheat and barley rusts

A collection of 127 pathotypes of different rust pathogens of wheat, barley, oat and linseed was maintained in live culture as well as cryo-preserved. During the period nucleus/bulk inoculums of different rusts of wheat and barley was supplied to 39 centers/Scientists working under public and private sector across India (Table 7) for the smooth conduct of rust research.

Table 7. Details of rust inoculum supplied up to 31.12.2014

S. No.	Name	Place	Kind of rust/pathotypes supplied
1.	A.N. Mishra	Indore, MP	Black and Brown
2.	A.P. Agarwal	Bilaspur, Chhattisgarh	Black and Brown
3.	Achala Sharma	Ludhiana, Punjab	Brown and Yellow
4.	B.C. Game	Nasik, Maharashtra	Black and Brown
5.	B.K. Honrao	Pune, Maharashtra	Mixture of Black and Brown
6.	D.A. Gadekar	Nasik, Maharashtra	Black and Brown
7.	D.P. Walia	Tutikandi, HP	Yellow, Black and Brown
8.	Dhanvir Singh	Dhaulakuan, HP	Mixture of yellow and Brown
9.	J. Kumar	Shimla, HP	Brown and Yellow
10.	Jaspal Kaur	Ludhiana, Punjab	Brown and Yellow
11.	Javad Bahar Khan	Kanpur, UP	Brown and Yellow (Wheat & Barley)
12.	K.K. Mishra	Powarkheda, MP	Black and Brown
13.	Kamlesh Dhabi	Vijapur, Gujrat	Black and Brown
14.	Maharastra Hybrid Seed Co.	Karnal, Haryana	Black, Brown & Yellow Mix.
15.	M.S. Saharan	Karnal, Haryana	Yellow and Brown
16.	Mukesh Pandey	Jammu, J. & K.	Yellow and Brown
17.	N.V. Savant	Mahabaleshwar, Maharastra	Yellow, Brown and black
18.	Neelu Jain	New Delhi	Brown
19.	P.C. Mishra	Powerkheda, MP	Mixture of Black and Brown
20.	P.C. Sharma	Karnal, Haryana	Yellow, Black and Brown
21.	P.V. Patel	Dharwad, Karnataka	Black and Brown

22.	Pradeep Shekhawat	Jaipur, Rajasthan	Yellow and Brown (Barley)
23.	Praveen Chuneja	Ludhiana, Punjab	Brown
24.	R .Selva Kumar	Karnal, Haryana	Yellow, brown and Black
25.	Rajendra	Kanpur, UP	Brown Mix
26.	Rajvir Yadav	New Delhi	Yellow Mix
27.	Rashmi Agrawal	New Delhi	Black, Brown, and Yellow
28.	Ritu Bala	Ludhiana, Punjab	Yellow and brown
29.	Rudra Naik, V.	Dharwad, Karnataka	Brown Mix
30.	S.I. Patel	Mehsona, Gujarat	Black and Brown
31.	S.K. Jain	Almora, Uttarakhand	Yellow mix (Wheat & Barley)
32.	S.K. Rana	Malan, HP	Brown and yellow mix
33.	S.S. Karwasara	Hissar, Haryana	Brown and yellow mix. (Wheat and Barley)
34.	S.S. Vaish	Varanasi, UP	Yellow and Brown
35.	Sabana Parveen	Karnal, Haryana	Brown and yellow mix
36.	Satinder Kaur	Ludhiana, Haryana	Brown mix
37.	T.R. Sharma	New Delhi	Brown multiple
38.	Vaibhav Singh	New Delhi	Yellow, brown , Black + seed
39.	Vinod Kumar	New Delhi	Yellow, brown and, Black

8. Monitoring of wheat and barley rusts

To monitor the occurrence of wheat and barley rusts off season (2013-14) wheat disease monitoring nurseries (WDMNs) were conducted at Dalang Maidan (H.P.), Sangla (H.P.), Kukumseri (H.P.) and Leh (J. & K.). For main crop season (2014-15), WDMN have been planted at more than 50 locations in the areas bordering to neighboring countries, hotspot locations and main wheat belt areas of the country. To monitor the occurrence of different diseases of wheat in SAARC countries, SAARC-WDMN has been planted at 28 locations across the six SAARC countries viz. Afghanistan, Bangladesh, Bhutan, India, Nepal and Pakistan. So far rusts have not been reported on any of the entry of these nurseries.

9. Request for collection and mailing of rust samples of wheat and barley

To monitor pathotype distribution of wheat and barley rusts effectively and to detect new pathotypes in the initial stages in different agro-ecological regions of India, rust samples are analyzed for the identification of pathotypes. Therefore, help of all the cooperators is solicited for collecting wheat rust samples from different regions, farmers' fields and disease monitoring nurseries representing different cultivars/lines in this endeavour to combat wheat and barley rusts in the region.

Collection of rust samples

A good rust sample needs following treatment:

I. Small bits (2-3") of rust infected fresh leaves/stems should be shade dried/ overnight at room temperature.

II. Shade dried samples should be put in paper envelops separately or wrapped in newspaper and sent immediately by post.

III. Following information may be given on each envelope

a. Type of rust: brown/black/yellow
b. Details of host: wheat/barley, variety/line
c. Place of collection
d. Date of collection
e. Name and address of the co-operator

IV. Since samples from lines/varieties having little rust or from rust resistant material are important from analysis point of view, therefore, these should be treated on priority.

Precautions to be taken

I. Samples should be representative of a locality, variety and not repetitive.

II. Samples should not be taken from moist, dried or dead plant parts/plants.

III. Only fresh uredial infections may be sent, as old and dried plant parts may not have viable spores.

IV. Samples should be sent at the earliest possible.

Very Important

I. Glossy paper/polythene envelopes should not be used for collecting or mailing samples.

II. Samples should not be taken from the sites of artificial inoculations; otherwise it should be mentioned accordingly.

10. Visitors and news

i. Directorate of wheat research has been upgraded and renamed as ICAR-Indian Institute of Wheat and Barley Research (IIWBR-ICAR) from 2014.

ii. Dr. Achla Sharma, Assistant Plant Breeder, Department of Plant Breeding & Genetics, PAU, Ludhiana, visited the station on Nov. 27th 2014.

iii. Dr. R.P.S. Verma, Barley Breeder at ICARDA, visited the station Dec. 12, 2014.

iv. Dr Hanif Khan Scientist at ICAR-IIWBR, R S Shimla visited The University of Sydney Plant Breeding Institute, Cobbitty, Australia as Endeavour Fellow from June 16, 2014 to December, 15 2014.Under this 2014 Research Fellowship by Government of Australia he was associated with Dr. Harbans Bariana. Dr Khan got exposure on phenotypic and molecular characterization of wheat lines for stripe, leaf and stem rusts. He also got hands on experience on double haploid production technology in wheat.

v. Dr. Om Prakash Gangwar, Scientist visited Kenya to attend "Standardization of stem rust field notes and germplasm evaluation, with discussions on stripe and leaf rust" at Kenya Agricultural Research Institute (KARI) Research Station, Njoro, Kenya from September 23rd - October 3rd, 2014.

vi. **Hindi Divas**

The station celebrated Hindi divas on 16.9.2013. The day was marked with interactive discussions. Different staff members put forth their views. Messages of President ICAR, Home Minister, Govt. of India were read. Activities and efforts to promote Hindi in day to day activities were discussed. A satisfaction was felt on the achievements made during the preceding year.

Annexure I

Constitution of differential sets 0, A and B for the binomial designation of brown, black and yellow rust pathotypes

Set-0	Set-A	Set- B
Brown rust (*Puccinia triticina*)		
IWP 94	*Lr*14a	Loros (*Lr*2c)
Kharchia Mutant	*Lr*24	Webster (*Lr*2a)
Raj 3765	*Lr*18	Democrat (*Lr*3)
PBW 343	*Lr*13	Thew (*Lr*20)
UP 2338	*Lr*17	Malakoff(*Lr*1)
K 8804	*Lr*15	Benno (*Lr*26)
Raj 1555	*Lr*10	HP 1633 (*Lr*9+)
HD 2189	*Lr*19	
Agra Local	*Lr*28	
Black rust (*Puccinia graminis tritici*)		
*Sr*24	*Sr*13	Marquis (*Sr*7b+)
NI 5439	*Sr*9b	Einkorn (*Sr*21)
Sr25	*Sr*11	Kota (*Sr*28+)
DWR 195	*Sr*28	Reliance (*Sr*5+)
HD 2189	*Sr*8b	Charter (*Sr*11+)
Lok 1	*Sr*9e	Khapli (*Sr*7a,*Sr*13, *Sr*14)
HI 1077	*Sr*30	Tc*6/*Sr31*/*Lr26* (*Yr*9)
Barley Local	*Sr*37	
Agra Local		
Yellow rust (*Puccinia striiformis*)		
WH147	Chinese 166 (*Yr*1)	Hybrid 46 (*Yr*4)
Bilara	Lee (*Yr*7)	Heines VII (*Yr*2+)
WH416	Heines Kolben(*Yr*6)	Compair (*Yr*8)
HD2329	Vilmorin 23(*Yr*3)	*T.spelta album* (*Yr*5)
HD2667	Moro (*Yr*10)	Tc*6/*Lr*26 (*Yr9*)
PBW343	Strubes Dickkopf	Sonalika (*Yr*2+)
HS240	Suwon92 X Omar	Kalyansona *Yr*2(KS)
Anza	Riebesel47/51(*Yr*9+)	
A-9-30-1		

Binomial designations are based on the binomial values arrived at on Set A and B whereas - indicates the number of susceptible line in O set. Some of the genes show temperature sensitivity like those on locus *Lr*2, *Lr*10, *Lr*17, *Lr*18 ; *Sr*13 etc.