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Multiple Diseases, Insect Pests Resistant Genotypes and Their Utilization in Breeding for Resistance in Wheat and Triticale

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ABSTRACT

A total of 347 numbers of genotypes of *Triticum aestivum*, 66 of *T. durum*, 8 of *T. dicoccum* and 18 of triticale possessing resistance against multiple diseases and insect pests resistance were taken for the study. These were identified resistant to biotic stresses through rigorous evaluation under artificially inoculated conditions at hot spot locations in six agro ecological zones of India during 1998-99 till 2011-12 cropping seasons. The diseases and insect pests targeted were three rusts (stem, leaf and stripe rust), Karnal bunt, flag smut, leaf blight, powdery mildew, loose smut, brown wheat mite, root aphid, foliar aphid and shoot fly. The seeds of these genotypes along with passport data on disease resistance were shared with breeders at 30 main wheat and triticale breeding centres in India. The percentage of centres utilized these genotypes for hybridization and resistance breeding ranged from 4.0-63.6%. The per cent utilization was maximum in case of *T. aestivum* followed by *T. durum, T. dicoccum*. The most preferred genotypes of *T. aestivum* were, 'DBW 18', 'DBW 32', 'GW 276', 'HD 2851', 'HD 2964', 'HD 2997', 'HP 1872', 'HW 2044', 'HW 3027', 'HPW 42', 'HPW 155', 'HPW 237', 'HPW 285', 'HUW 620', 'HS 295', 'HS 318', 'HS 345', 'HS 375', 'HS 420', 'HS 468', 'HS 493', 'HW 2045', 'HW 3083', 'HW 5037', 'HW 5208', 'K 9351', 'K 9441', 'MACS 295', 'MACS 2959', 'NW 3087', 'NW 1012', 'PBW 373', 'PBW 475', 'PBW 521', 'PBW 550', 'PBW 554', 'PBW 573', 'PBW 589', 'Raj 3765', 'Raj 4012', 'RAJ 4120', 'RAJ 4131', 'UP 2425', 'UP 2719', 'VL 801', 'VL 868' and 'VL 907'. In case of *T. durum,* 66 genotypes were utilized by 4.0-36% centres and most liked were, 'AKDW 4155', 'CDW 04', 'GW 1139', 'HD 4696', 'HI 8498', 'MACS 3313', 'PDW 267' and 'PDW 312'. Likewise, out of eight genotypes of *T. dicoccum*, 'MACS 2956' (32.0%) and 'MACS 2971' (15.0%) were used most. Utilization of 18 numbers of triticale genotypes was 4.0-14.8% only. It may be due to lesser preference of triticale as compared to bread and durum wheat for breeding. The major preference of breeders was on genotypes having resistance against three or two rusts depending on agro climatic zones. The genotypes having *Lr34* gene which is known for providing resistance to leaf rust were also found to be resistant to other diseases and aphids. The incorporation of resistance genes from resistant genotypes shared in breeding programme has helped greatly in management of diseases and insect pests using host resistance and avoided or reduced application of costly fungicides on wheat and producing pesticide free wheat in India. The deployment of resistant cultivars strategically in areas of prevalence of diseases and insect pests helped to further curtail losses in yield and quality of wheat and outbreak of rusts and other diseases thus ensure food self sufficiency as well as export of surplus wheat in future. These genotypes will be good source for molecular studies related to multiple disease and insect pests.

Agricultural crops benefit from resistance to pathogen that endures over years and generations of both pest and crop. Breeding for resistance to diseases and insect pests in wheat is an important component of crop improvement as well as containing diseases. Over years the deployment of host resistance has helped in countering the threats of epiphytotics of rusts and other diseases in wheat in India. The use of resistant cultivars has been the most effective and easy way to minimize losses due to biotic stresses in wheat. The long-term success of breeding for disease resistance is influenced by the nature of the pathogen and diversity of virulence in the population, availability, diversity and type of genetic resistance, screening methodology and selection environment for tracking resistance (Singh and Rajaram, 2014). Durable disease resistance, which may be partial or complete, can be controlled by several genes. Some of the most devastating fungal pathogens in wheat are leaf rust, stripe rust, and powdery mildew (Krattinger et al., 2009). The breeders are, however, in need of new sources of resistance to incorporate these in the future cultivars to tackle the threat of evolving new virulence of pathogens as well as insect species. The new entries of wheat in yield trials as well as in specific nurseries are tested against major diseases and insect pests at hot spot locations under artificially inoculated conditions and those found resistant consistently over a period of three years are identified and termed as truly resistant in India. Besides resistance to rusts both at seedling and adult stages, these genotypes also possess resistance to other biotic stresses therefore identified as 'multiple disease and insect pests resistant'. Since 1998-99, such genotypes are shared with breeders of major breeding centres of wheat and triticale in India. In past, listing of sources of resistance against rusts and individual disease have been published (Singh et al., 2001, 2002, 2003a; b, 2004, 2005, 2007, 2008). Khan et al. (2012) found wheat cultivar 'Cook' possessing multiple disease resistance genes in Australia. In North Dakota, USA, **(**Project report, 2014) a project is in operation aiming to characterize the genes/QTLs controlling resistance to three fungal diseases, including Fusarium head blight (FHB), tan spot, and Stagonospora nodorum blotch (SNB), in domesticated emmer wheat, to exploit the novel resistance genes for developing durum wheat germplasm adapted to the Northern Great Plains. The previously identified Persian wheat (*Triticum turgidum* L. sub sp. *carthlicum*) and cultivated emmer wheat (*T. dicoccum*) accessions with resistance to FHB, tan spot, and SNB are being used. The resistance genes are being transferred from some of these accessions into ND durum cultivars using the backcross method coupled with doubled haploid (DH) and single-seed descent (SSD). In West Asia and North Africa (WANA) region, resistance to rusts, septoria leaf blotch, and tan spot is essential. Virulence analysis of leaf rust (*Puccinia recondita*) showed that ten "*Lr*" resistance genes (*Lr1, Lr2a, Lr9, Lr15, Lr19, Lr24, Lr25, Lr26, Lr28, and Lr29*) were effective on bread wheat, six on durum wheat (*Lr1, Lr2a, Lr20, Lr25, Lr26, and Lr30*), and six among these "*Lr*" genes were effective on both crop species. Known resistance genes to yellow rust (*Puccinia striiformis* f.sp. *tritici)* were evaluated for their effectiveness against yellow rust in Syria, Lebanon, Turkey, Tajikistan, Uzbekistan, Iran, Ethiopia, and Yemen. Four resistance genes to yellow rust "*Yr*" were effective at all sites (*Yr8, Yrcv, Yr15, and Yr17*). For the diverse climatic conditions and cropping systems in Center West Asia amd North Africa (CWANA), the development of multiple disease resistance is essential. Durum wheat breeding nurseries were screened for multiple disease resistance. Genotypes that conferred resistance to combination of foliar diseases were identified (Yahyaoui et al., 2000). The present studies deals with the utilization of multiple disease and insect pests resistant genotypes in breeding for resistance in wheat in India. The spectrum of identified stem rust resistant genes were *Sr2+5+7b+8a+8b+9b+9e+10+11+12+13+23+24+26+31+* whereas leaf rust resistant genes were *Lr1+3+10+13+23+24+26+34+* in genotypes having resistance to rusts and other diseases as well as insect pests. Likewise stripe rust resistant genes were *Yr2+3+7b+9+18+27+.*

MATERIALS AND METHODS

A total of 347 numbers of genotypes of *Triticum aestivum*, 66 of *T. durum*, 8 of *T. dicoccum* and 18 of Triticale were identified possessing multiple disease and insect pests resistance through rigorous screening of these under artificially inoculated conditions and epiphytotics of diseases at hot spot locations in six agro ecological zones of India during 1998-99 till 2011-12 crop seasons. The diseases and insect pests against which these were resistant were stem rust (*Puccinia graminis* Pers.), leaf rust (*Puccinia triticina* Erikss.), stripe rust (*Puccinia striiformis* Westend.), Karnal bunt (*Tilletia indica* Mitra), flag smut (*Urocystis agropyri* Preuss A.A. Fisch. Waldh.), leaf blight (*Bipolaris sorokiniana* Sacc. Shoemaker), powdery mildew (*Erysiphe graminis* f. sp. *tritici* É.J. Marchal), loose smut (*Ustilago tritici* Pers. C.N. Jensen Kellerm. & Swingle), brown wheat mite (*Petrobia lateens* Müller), root aphid (*Tetraneura nigriabdominalis* Sasaki), foliar aphid *(Macrosiphum miscanthi* Tak.*),* and shoot fly (*Atherigona naqvii* Steyskal). The average coefficient of rusts was always ranging from 0-10 in rust resistant genotypes. The level of resistance to other diseases and insect pests was determined according to standard procedures followed in All India Coordinated Wheat and Barley Improvement Programme (Sharma *et al.,* 2012). The gene postulation for rust resistance was done at DWR RS Flowerdale, Shimla and data belonging to it were reproduced. The seeds of these genotypes along

with passport data on disease resistance were shared with breeders at 30 main wheat and Triticale breeding centres through 'National Plant Genetic Stock Nursery' (NGSN). The percentage of centres utilized for each genotype was calculated.

RESULTS AND DISCUSSION

The passport data related to resistance to different biotic stresses, pedigree and percentage of centres utilized for a particular genotype in breeding for resistance during 1998-99 till 2011-12 are presented in Table 1 . Amongst three species, the genotypes of *T. aestivum* were preferred for use in breeding for disease resistance at different centres. Forty six genotypes of *T. aestivum*, out of 347 were utilized at centres in the range of 33.3-63.6%. These were, 'DBW 18', 'DBW 32', 'GW 276', 'HD 2851', 'HD 2964', 'HD 2997', 'HP 1872', 'HW 2044', 'HW 3027', 'HPW 42', 'HPW 155', 'HPW 237', 'HPW 285', 'HUW 620', 'HS 295', 'HS 318', 'HS 345', 'HS 375', 'HS 420', 'HS 468', 'HS 493', 'HW 2045', 'HW 3083', 'HW 5037', 'HW 5208', 'K 9351', 'K 9441', 'MACS 295', 'MACS 2959', 'NW 3087', 'NW 1012', 'PBW 373', 'PBW 475', 'PBW 521', 'PBW 550', 'PBW 554', 'PBW 573', 'PBW 589', 'Raj 3765', 'Raj 4012', 'RAJ 4120', 'RAJ 4131', 'UP 2425', 'UP 2719', 'VL 801', 'VL 868' and 'VL 907'. In case of *T. durum,* 66 genotypes were utilized by 4.0-36% centres. However, only eight genotypes, 'AKDW 4155', 'CDW 04', 'GW 1139', 'HD 4696', 'HI 8498', 'MACS 3313', 'PDW 267' and 'PDW 312' were preferred (18.0-36.0%) better than others in breeding programme at centres. Eight genotypes of *T. dicoccum*, were utilized in the range of 4.0-32% at centres with maximum utilization of 'MACS 2956' (32.0%) and 'MACS 2971' (15.0%). Eighteen genotypes of triticale were used at centres in the resistance breeding and range was 4.0-14.8% only. Only six numbers of triticale genotypes, 'TL 2959', 'TL 2966', 'TL 2915', 'TL 2930', 'DT 132' and 'HPT 6' were used in the range of 10-14.8% centres. It may be due to lesser preference of triticale as compared to bread and durum wheat for breeding at thirty centres. The major preference of breeders was on genotypes having resistance against three or two rusts depending on agro climatic zones (Table1). Gurung et al. (2011) evaluated 633 winter wheat accessions for multiple resistance against leaf blight pathogens and found only fifty-six accessions were resistant to three or more diseases, and of these, five ('CItr16595', 'PI 278612', 'PI 351330', 'PI 361858', and 'PI 351983') were resistant to all four diseases. The disease targeted were Tan spot (TS, caused by *Pyrenophora tritici-repentis*), Stagonospora nodorum blotch (SNB, caused by *Phaeosphaeria nodorum*), spot blotch (SB, caused by *Cochliobolus sativus*), and Septoria tritici blotch (STB, caused by *Mycosphaerella graminicola*). These multiple disease resistance sources will be useful in wheat breeding programs. In another study, the cultivar 'Cook' was found to have multiple disease resistance genes for leaf and stripe rusts, powdery mildew and Karnal bunt (Khan et al., 2012). Ogbonnaya et al. (2008) tested a collection of 253 synthetic hexaploid wheats (SHWs) produced from 192 *Aegilops tauschii* accessions and 39 elite durum varieties to identify, characterise, and evaluate potentially untapped diversity of disease resistance in wheat. The diseases for which resistance was sought included cereal cyst nematode (CCN), root lesion nematode (RLN), *Stagonospora nodorum* blotch (SNB), *Septoria tritici* blotch (STB), and leaf, stem and stripe rusts. Five SHWs, 'Aus26860', 'Aus30258', 'Aus30294', 'Aus30301', and 'Aus30304', exhibited high levels of resistance to CCN, YLP, STB, LR, and SR, while 56 SHWs showed resistance to either 3 or 4 diseases. For the diverse climatic conditions and cropping systems in Center West Asia and North Africa (CWANA), the development of multiple disease resistance is essential. Durum wheat breeding nurseries were screened for multiple disease resistance. Genotypes that conferred resistance to combination of foliar diseases, were identified (Al Naimi et al., 2000). The development of wheat genetic maps based on microsatellite (SSR) markers is giving researchers an unprecedented view into genome organization and breeding population structure. When this DNA-based technology is coupled with phenotypic data, QTL analysis and trait mapping are facilitated. This ultimately enables design of experiments to assemble complex genotypes that pyramid multiple traits (Somers et al., 2007). Out of 64 genotypes of Indian origin tested, 'EGPSN 137', 'EGPSN-143', 'EGPSN-152', 'EGPSN-153', 'EGPSN-157', 'K-68', and 'Halna' showed the presence of potential resistant genes *viz*., *Lr46* and *Sr2* based on linked SSR markers and were resistant to all the prevailing races of leaf rust and stem rust thus termed as 'multiple rust resistant' genotypes (Sharma and Sharma, 2014).

The rust resistant gene (*Lr34+*) was found associated not only providing resistance against leaf rust but also other fungal diseases like spot blotch, Karnal bunt, powdery mildew, loose smut, flag smut and insect pests like foliar and root aphids during present study (Table 1). Such genotypes having multiple disease and insect pests resistance and *Lr34+* gene were 'HD 2501', 'HD 2733', 'HPW 42', 'HPW 185', 'HPW 191', 'HS 240', 'HS 295', 'HS 375', 'HS 420', 'K 9107', 'PBW 550', 'VL 738', 'VL 803', 'VL 804', 'VL 818', 'VL 829', 'VL 832' and 'VL 852' in case of *T. aestivum*. Earlier also *Lr34* gene has been reported to have some linkages with other genes providing resistance to other fungal disease in wheat (Risk et al., 2013).

The multiple resistant genotypes identified in India may serve as an important source of resistant genes for future resistance breeding as well as for genetic and molecular studies in future and may be tested against those pathogens not yet entered in India. These seeds have been stored in gene bank at DWR Karnal and NBPGR New Delhi. These may also serve as important sources for resistance for breeding resistant varieties in other countries. Many of these seeds are featuring in the pedigree of varieties recently promoted

in evaluation trials and also released in India by central as well as state varietal release committees. Such varieties are supposed to minimize losses in wheat and triticale yields further due to diseases in future.

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Table 1: Multiple disease and insect pests resistant genotypes and their passport data on the resistance in wheat and Triticale utilized by centres during 1998-99 till 2011-12 cropping seasons

S. No.	Name	Rust resistant genes postulated *			Pedigree	Resistant to	Per cent utilization
		Stem rust	Leaf rust	Stripe rust			
		Sr	*Lr*	*Yr*			
T. aestivum							
1	'CBW 23'	*31+5+2+*	*26+3+*	*9+*	WL 6736/2*WEAVER	SR, LR, KB,MR to LB	18.1
2	'CBW 38'	*5+*	*13+10+*	-	19ME 11 Q-02	LR,YR, KB	20.0
3	'DBW 15'	-	*13+*	*2+*	RAJ3765/PBW 343//HD 2402	SR, LR, KB, MR to LB	27.2
4	'DBW 18'	*31+5+*	*26+23+1+*	*9+*	PBW 343//TJB368.251/BCU/CUPN	Three rusts	59.0
5	'DBW 28'	*31+5+2+*	*26+*	*9+*	MILAN/PBW 343	Three rusts	13.0
6	'DBW 30'	*2+*	*23+1+*	-	PBW373/DBW11	Three rusts, FS	25.9
7	'DBW 31'	-	*23+1+*	-	DBW 14/PBW 343	Three rusts, PM, KB	20.0
8	'DBW 32'	*31+2+*	*26+23+1+*	*9+*	CBW9/PBW 435	SR, LR, KB, RA, SF	33.3
9	'DBW 37'	-	*13+1+*	*9+*	CMH80A.768*CNO79/4/CS/TH.SC-//3*PBN /3/MIRLO/PUC/5/PRINIA	Three rusts, MR to LB, FS, PM	25.0
10	'DBW 39'	*31+5+*	*26+23+10+*	*9+*	ATTILA/HUI	Three rusts	20.0
11	'DBW 49'	*31+*	*26+10+*	-	UP2338//KAUZ/ALTAR84	Three rusts, KB, FS	30.0
12	'DBW 50'	*31+*	*26+*	*9+*	KAUZ//ALTAR84/AOS/3/MILAN/KAUZ/4/HUITES	HR to SR, LR, BWM	30.0
13	'DBW 51'	-	-	-	SITE/MILAN	HR to SR, LR	15.0
14	'DBW 54'	-	-	-	PATOR/KAUZ	HR to SR, LR	25.0
15	'DWR 240'	-	*13+*	-	KAUZ*2//SAP/MON/3/KAUZ	SR, LR, FS	31.8
16	'DWR 246'	*2+5+31+*	*26+*	-	KAUZ*2/TRAP//KAUZ	SR, LR	9.0
17	'GW 276'	-	-	-	CPAN 1401//SKA-YACOR/HD2160	LR, SR,LB, KB,FS, FA, RA	36.0
18	'GW 349'	*2+*	-	-	WG 2878/ V22	SR, LR	13.6
19	'GW 373'	*2+*	-	-	HW 2008/J 505	SR, LR, FS	16.0
20	'GW 385'	*31+*	*26+3+*		PBW343/PH137//VEE'S'	Three rusts, KB, FS	22.2
21	'Harit 1'	-	-	-	Ciano/R143/Mexi "S"/3/T. tauschii (CI18)	LB	22.0
22	'HD 2501'	*9b+11+*	*23+34+*	*18+*	HD2189/HD2160	SR, LR, LS	27.3
23	'HD 2618'	-	-	-	PAPAG//SERI//BAU 'S'	SR,YR, KB, FS, RA	28.0
24	'HD 2733'	*31+*	*26+34+*	*9+18+*	ATTILA/3/TUI/CARC/CHEN/CHTO/4/ATTILA	LB	22.7
25	'HD 2747'	-	*23+1+*	-	HD2402/HW741/HD2663	Three rusts, KB	22.7
26	'HD 2755'	*24+*	*24+*	-	C306-HYB65 CPAN598 /HW2003	SR, LR, PM	4.5
27	'HD 2760'	*2+5+31+*	-	-	HAHN/2* WEAVER//PH 172	Three rusts, PM, KB	18.1
28	'HD 2770'	-	*26+23+*		WL 6736/2*WEAVER	three rusts	40.9
29	'HD 2780'	*31+*	*26+*	-	DUCULA /CHA GUAL /CA20	SR, LR	22.7
30	'HD 2784'	*2+*	-	-	ILTS-2264/4/CAR //KAL//BB/3/NAG/5/6/AA	Three rusts, KB	24.0
31	'HD 2819'	-	-	-	CPAN3004/WR447//HW2007(UNNATH HD2329)	Three rusts, KB, RA	8.0
32	'HD 2825'	-	*13+*	-	J1316/HD2631//CNO79/PRL/CHIL	LR, YR	20.0
33	'HD 2826'	-	*23+*	-	J 1316/HD 2347 /HD 2631// HD 2278	SR, LR, MR to LB	18.1
34	'HD 2830'	*5+*	*23+*	-	KAUZ// SERI/SEP 80120	Three rusts, RA, SF	38.1
35	'HD 2834'	-	-	*2+*	SNB /HD 2347 // J 1316	SR, LR, RA, BWM	18.1

36	'HD 2837'	*31+*	*26+23+*	*9+*	PARA2/JUP/BJY/3/VEE*5/4/JUN/4/P60	Three rusts	4.0
37	'HD 2851'	*2+*	-	-	CPAN 3004/WR 426/HW 2007	Three rusts	40.9
38	'HD 2864'	-	-	-	DL 509-2/DL 377-8	SR, LR	13.6
39	'HD 2865'	-	*13+*	-	PBW 175/CR-3//HW 2004	Three rusts, RA, BWM, MR to LB	4.5
40	'HD 2866'	-	-	-	PARA-2/JUP/BJY/3/VEE#5/4/JUN/4/PGO	KR, YR	4.5
41	'HD 2867'	*2+*	-	-	HW 2004/T/SPH. DSP-1//HW 2003	SR, LR, MR to LB	13.6
42	'HD 2888"	-	-	*2+*	C306/T. sphaerococcum//HW 2004	Three rusts	22.7
43	'HD 2906'	*2+*	-	-	CHUM/8/2*BCN//BCN//HD 2642	Three rusts	18.1
44	'HD 2934'	-	-	-	PBW 175/CR-3//HW 2004	Three rusts	12.0
45	'HD 2937'	*31+*	*26+23+*	*9+*	TRAP# 1/B0W//PFAU/MILAN	Three rusts, KB, FS	13.0
46	'HD 2865'	-	*13+*	-	J1316/HD2631//CNO79/PRL/CHIL	LB	20.0
47	'HD 2891'	*2+*	-	-	WL 711//HD 2624	Three rusts	28.0
48	'HD 2952'	*2+*	-	-	HW2042/WR196(KS/T. turgidum//HD 1999	SR, LR	11.1
49	'HD 2954'	*31+*	*26+*	*9+27+*	DL 975-1/BAVIOCRA	SR, LR	11.1
50	'HD 2956'	*24+*	*24+*	-	DL 509-2DL 377-8//ATTILA/3/He.1/3*CNO79/*2SERI	SR, LR, FS, BWM	37.0
51	'HD 2957'	*24+2+*	*24+*	-	IWP72/NP 165/HW741//HW 741	SR, LR, FS, BWM	11.1
52	'HD 2959'	*24+*	*24+*	-	HW 2004/T.sph.Dsp-1//HW 2003	SR, LR	7.4
53	'HD 2962'	*13+*	*26+*	*9+*	PBW 343*2//KUNKUN	Three rusts	21.0
54	'HD 2963'	-	-	*27+*	PBW 343*2//KONK	Three rusts	13.0
55	'HD 2964'	*31+*	*26+23+1+*	*9+*	PBW 343*2//KHAVAKI	Three rusts	40.7
56	'HD 2978'	-	*23+1+*	-	HD 2705/DL 788-2	Three rusts, PM, KB	20.0
57	'HD 2986'	-	-	-	STAMPALLI/C 306/DL 153-2/HW 2003/WR 956	SR, LR	5.0
58	'HD 2987'	-	-	-	HI1011/HD2348//MENDOS//WP72/DL153-2	Three rusts, FS	15.0
59	'HD 2997'	*31+2+*	*26+23+10+*	*9+*	BOW//HD 2285//HD 2444	Three rusts	35.0
60	'HD 2998'	*8a+*	*23+*	-	RL6010/6*YR70//3*SERI82	Three rusts	10.0
61	'HD 3007'	-	-	-	HW2002/CPAN2044//EC414149	Three rusts, KB, FS	20.0
62	'HD 3012'	-	*26+*	*9+*	BOW/NAC//CNO79/PAL/3/CNO79*2/PRL	SR, YR	10.0
63	'HI 1454'	*2+*	-	-	HI1076/CC505/HI1136	SR, LR	18.2
64	'HI 1436'	*2+11+*	*13+*	-	Raj 1972/Raj 1923	SR, LR,KB, LB, FS, FA, BWM	27.2
65	'HI 1462'	-	-	-	NID96-46HD2449/RAJ3160	Three rusts, LB	15.0
66	'HI 1489'	-	-	-	VEE'S'/RL6010/2VR/3/2VEE'S'	SR, LR, FS	18.1
67	'HI 1514'	*2+*	-	-	HDR162/DA17	LR, YR	18.0
68	'HI 1531'	*2+*	-	-	HI 1182/CPAN 1990	SR, LR, FS, RA	20.0
69	'HI 1544'	*2+*	-	-	HINDI 62/BOB WHITE/CPAN 2099	SR, LR	20.0
70	'HI 1552'	-	-	-	HW 3260/MACS 2496	Three rusts	10.0
71	'HI 1560'	*31+*	*26+*	*9+*	SKAUZ*2/FCT	SR, LR	5.0
72	'HP 1731'	-	-	-	LIRA'S'//RRI'S'/TONI	LR,YR, SF	22.7
73	'HP 1761'	*31+*	*26+*	*9+*	RL6010/6*INIA 66//3*KAUZ	Three rusts, LB, FA	32.0
74	'HP 1872'	*31+*	*26+*	*9+*	HUW202/KS-64-KL REND//HD1944/3/RAJ 3077	Three rusts	36.8
75	'HP 1911'	*5+*	*23+10+*	-	PBW 343/RAJ 3777//WH 736	Three rusts, RA	25.0
76	'HW 2017'	-	-	*2+*	HD2402/7/TR38014*7/3AG14	SR, LR	31.8
77	'HW 2044'	*2+*	-	-	SUNSTAR 16/C 80-116/PBW 226	SR, LR, LB, KB	45.4
78	'HW 2045'	*2+*	-	-	SUNS+AR//6e80-1/5/HD2402	Three rusts	21.0
79	'HW 3007'	*31+*	*26+*	*9+*	UNAATH KAL/VEE "S"	Three rusts, LB, PM, FS	22.7
80	'HW 3024'	*2+*	-	-	PBW226*5/TR380-14*-14*7/3AG74	SR, LR, KB	13.6

81	'HW 3027'	*2+*	-	-	HD2285/HW1042	SR, LR, KB, FS	36.3
82	'HW 3061'	*2+9e+12+*	-	-	CPAN6120/CPAN6093	SR, LR	9.0
83	'HW 3064'	-	-	-	K.SONA//YR*6/WRT2385/TR38014*7/3AG14	SR, LR	27.2
88	'HW 3067'	*2+*	-	-	HW1042//C306	SR, LR, PM, CCN	22.7
89	'HW 3070'	-	-	-	HI1077//HW1042/C306	SR, LR, FS	13.6
90	'HW 3080'	-	-	-	UKS//BW1109	SR, LR, FS	13.6
91	'HW 3083'	*31+*	-	*9+*	BOW//BUC/BUL//CLRP-6	Three rusts, KB, FA, RA	32.0
92	'HW 4028'	-	-	-	PBW 226*5//C86-8/KALYANSONA F4	LR, YR	12.0
93	'HPW 42'	*31+*	*26+1+34+*	*9+18+*	VEE'S'/4/PVN 'S'/CBB//CNO"S"-/3/JAR/ORZ"S"	Three rusts	54.5
94	'HPW 93'	-	-	-	PJ/HN4/GLL/3/YACO "S"/4/VEE#8"S"	LR, YR, KB, MR to LB	22.7
95	'HPW 147'	*2+*	*13+*	-	CPAN1869/HIMIO-BA (WS)	LR, YR, KB, MR to LB	18.2
96	'HPW 155'	-	*13+*	-	BT 2594/FATH	Three rusts, FS	36.3
97	'HPW 184'	*2+31+*	*26+1+*	*9+*	ATTILA	MR to LB, KB, FA	12.0
98	'HPW 185'	-	*26+34+*	-	UPT74303/S308//CPAN1830//TL68/HS74//3/CPAN1922	Three rusts, LB, FS	31.8
99	'HPW 191'	-	*26+34+*	*9+18+*	CPAN1869/HB208	Three rusts, FS, PM	31.8
100	'HPW 217'	*31+5+2+*	*26+23+*	*9+*	HPW 42 /IBWSN 52	Three rusts, MR to LB	27.3
101	'HPW 224'	*2+*	*23+*	-	WW 4/LEHMI P-1	Three rusts, MR to LB	22.7
102	'HPW 226'	*31+5+*	*26+23+*	*9+*	264#112K99-247	LR, YR, PM	18.1
103	'HPW 228'	*31+5+*	*26+23+*	*9+*	262# 106K 99-245	Three rusts, LB	22.7
104	'HPW 236'	-	*23+13+3+*	-	WL 711/PGS 990//VL 780	KB, FS, RA	8.0
105	'HPW 237'	*31+*	*26+*	*9+*	W W 24XLEHMI PI	Three rusts, PM	40.9
106	'HPW 240'	*31+*	*26+3+*	*9+*	W W 24XLEHMI (O)	Three rusts, PM	31.8
107	'HPW 245'	*31+2+*	*26+1+*	*9+*	WW 24/LEHMI-P2	RA, FS	16.0
108	'HPW 251'	*31+2+*	*26+3+*	*9+*	WW 24/LEHMI P2-U 149	LR, YR, MR to LB	12.0
109	'HPW 254'	*31+5+2+*	*26+3+*	*9+*	OPATA/RAYON//KAUZ	SR, LR, FS, MR to LB	8.0
110	'HPW 285'	*31+2+*	*26+*	*9+*	CROC1AESQUARROSA -(205)//KAUZ/3/SASIA	Three rusts , KB, PM, FS	33.3
111	'HPW 296'	*31+*	*26+10+*	*9+*	PUNJAB 96	Three rusts, FS, FA, MR to LB,	30.0
112	'HPW 298'	-	*13+1+*	-	RDWG/MILAN	Three rusts, KB, FS, MR to LB	20.0
113	'HPW 308'	*5+8a+*	-	-	KEHAN10*2/3/OASIS/SKAUZ//4*BCN	Three rusts, FS	25.0
114	'HPW 309'	*5+8a+*	-	-	KEHAN10*2/3/OASIS/SKAUZ//4*BCN	Three rusts, KB, FS	5.0
115	'HPW 731'	*2+*	*13+3+*	-	CPAN 1796/CPAN 1922	SR, LR, FS	20.0
116	'HPW 143'	*2+*	*13+*	-	CPAN1869/HIMIO-BA	LR, YR, MR to LB	13.7
117	'HUW 468'	*2+*	*13+*	-	CPAN 1962/TONI//LIRA 'S'PRL 'S'	LR, YR, MR to LB	13.7
118	'HUW 510'	*2+24+*	*24+*	-	HD2278/HUW234/DL230-16	SR, LR, FS	4.5
119	'HUW 555'	-	-	-	BOW 'S'/URES/HUW 300/PRL	KR, YR	27.2
120	'HUW 564'	-	-	-	HUW 300/ WH 542	SR, LR	13.6
121	'HUW 567'	*31+5+*	*26+23+*	*9+*	HD 2189/HUW 234//HUW 284/HUW 300	Three rusts, LB, KB	27.2
122	'HUW 595'	-	-	-	ATTILA/RAJ 3765//HUW 280	Three rusts	28.0
123	'HUW 609'	*5+*	*13+*	-	RAJ 3879/HD 2733//HUW 395	SR, YR, FS, KB, LB	15.0
124	'HUW 620'	*31+*	*26+10+*	*9+*	KAUZ//ALTAR84/AOS/3/MILAN/KAUZ/4/HUITES	Three rusts	35.0
125	'HUW 626'	-	*26+*	-	GW291//PRL/VEE#10/3/WH542	Three rusts	30.0
126	'HW 3033'	*5+*	-	-	UKS//VER'S'	Three rusts, FS	27.2

127	'HW 3082'	-	-	-	BOW//BUC/BUL//CLRP-6	Three rusts, LB, KB	31.8
128	'HS 240'	*31+2+*	*26+34+*	*9+18+*	AU/KAL/BB/WOP"S"/PVN"S"	Three rusts, KB	24.0
129	'HS 295'	*2+8b+*	*23+ 34+*	*3+ 18+*	COT/AZ//IAS 55/ALD 'S'/NAFN/4/PIN 'S'/PEN SL 127	Three rusts, FS,	40.9
130	'HS 318'	*31+*	*26+*	*9+*	HUW206//HUW202/	Three rusts, KB	36.4
131	'HS 345'	*31+*	*26+23+1+*	*9+*	GH"S"/SONO++ARI	MR to LB	36.5
132	'HS 364'	*2+8b+9b+11+*	*13+10+1+*	*2(KA)+*	NAC/C/STW63/AGEL//ANZA/4/BOW"S"/CEP7780=ARA	Three rusts, LB, FA, RA	31.0
133	'HS 365'	*31+2+*	*26+1+*	*9+*	HS207/SKA	Three rusts	32.0
134	'HS 369'	*9b+11+*	*13+1+*	-	HD2385/BRSN27//HS208	Three rusts, PM	22.7
135	'HS 375'	*31+5+2+*	*26+34+*	*9+18+*	BB/G11/CJ71/TAESI//KAL/BB	Three rusts, KB, RA, MR to LB	45.5
136	'HS 420'	*2+*	*13+1+34+*	*18+*	LAJ 3302//CMH 73A-497/ 3* CN 079	Three rusts	40.9
137	'HS 424'	-	-	-	CPAN 3004//HPW(di) 30/HS286	Three rusts	13.6
138	'HS 431'	-	-	-	V81623//BUC/PVN	LR, YR	12.0
139	'HS 443'	-	-	-	PASTOR	Three rusts, RA, BWM, MR to LB	9.0
140	'HS 455'	-	-	-	ALTAR 84/AC.SQUAROSSA219//2*SERI	SR, LR, MR to LB	4.5
141	'HS 456'	-	*13+*	-	MILAN/SHAT	Three rusts, MR to LB, RA	9.0
142	'HS 459'	*31+2+*	*26+23+1+*	*9+*	VORONA/CND79//JACANA/3/BOW/PRL/BUC	SR, LR, FS, MR to LB	24.0
143	'HS 460'	*11+2+*	*13+*	-	RABE/6/WRM/4/FN/3*TH//K58/2/*N/3/AUS6889/5PEL/2380/ATR/1/1/2*RABE/8/WA36	Three rusts, MR to LB, RA	31.8
144	'HS 461'	*31+2+*	*26+23+1+*	*9+*	R 37/GHL121//KAL/BB/3/JUP/MUS/4/W3633	Three rusts, FS, PM	24.0
145	'HS 468'	*31+*	*26+*	*9+*	HS 345/HS 277	Three rusts, FS	50.0
146	'HS 471'	-	*23+1+*	*2+*	MUNIA/MILAN	Three rusts, KB, FS	14.8
147	'HS 472'	*31+2+*	-	*9+*	WRM/4/FN/3*TH//K 58/2*N/3//AUS-6869/5/PFL72380/IATR/1/6/SHA/SERI//SHA4/LRIA	Three rusts, LB, KB	31.8
148	'HS 473'	*5+*	*3+*	-	ZIDANE 89/3/PEG'S'// HD 2206/HORK 'S'	Three rusts, FS	22.7
149	'HS 484'	-	-	-	CNO79/4/CS/TH.CN//GLEN/3/ALD/PVN/5/GIS	Three rusts	24.0
150	'HS 485'	*31+2+*	*26+23+1+*	*9+*	HD 2380/HS 364	Three rusts, FS, MR to LB	24.0
151	'HS 490'	-	*23+*	-	HS 364/HPW 114//HS 240/HS 346	Three rusts, LB, FS	11.0
151	'HS 492'	*2+5+*	-	-	HPW 42/CPAN 2032//UNATH K.S.	SR, LR, KB, FS	15.0
152	'HS 493'	*31+*	*26+23+1+*	*9+*	HPW42/VL755	Three rusts, FS, RA	33.3
153	'HS 502'	-	*13+*	-	CON 79/4/CS/TH.CN//CH.CEN/3/ALD/PVN/5/GISVZ	LR, SR, FS	22.2
154	'HS 507'	-	-	-	KAUZ/MYANA/VUL//BUC/FLK/4/MILAN	HR to SR, LR	15.0
155	'HS 510'	*5+9b+11+*	*13+*	-	LONG 91-1211/SW 89.1862	LR, YR, KB, FS, MR to LB	20.0
156	'HS 511'	-	*13+*	-	F81513/MILAN	LR, YR	10.0
157	'HS 513'	*31+5+*	*26+23+10+*	*9+*	HS 413/HD 2643//HW 2044	Three rusts, PM, KB	30.0
158	'HS 521'	-	-	-	LONG91-291//MILAN/SHA	SR, YR, SF	15.0
159	'HS 523'	*31+*	*26+10+*	*9+*	MUNIA/CHTO/3/PFAU/BOW//VEE#9/4/CHEN/Ae. sq.(Taus)//BCN	SR, YR,	30.0
160	'HW 2004'	*2+24+*	*24+*	-	C306*7/TR380-14*7/3AG14	Three rusts, LB	20.0
161	'HW 2045''	*2+*	-	-	HD 2402*5/SUNSTAR*6/C801	Three rusts	50.0
162	'HW 3033'	*5+*	-	-	UKS//VER'S'	Three rusts, FS	27.2
163	'HW3061'	*2+9e+12+*	-	-	CPAN6120/CPAN6093	SR, LR	9.0

164	'HW 3064'	-	-	-	K.SONA//YR*6/WRT2385/TR38014*7/3AG14	SR. LR	27.2
165	'HW 3070'	-	-	-	HI1077//HW1042/C306	Sr, LR, FS	13.6
166	'HW 3080'	*2+*	-	-	UKS// BW 1109	SR, LR	13.6
167	'HW 3082'	-	-	-	BOW//BUC/BUL//CLRP-6	Three rusts, LB, KB	31.8
168	'HW 3083'	*31+*	-	*9+*	BOW//BUC/BUL//CLRP-6	Three rusts	45.4
169	'HW 3094'	-	-	-	HD 2646//HW 2002A/CPAN 3057	SR, LR, FS, BWM, MR to FA	22.2
170	'HW 5001'	*2+*	-	-	HD 2646 //HW 2002A/CPAN 3057	LR, SR	31.8
171	'HW 5010'	-	-	-	LOK-1//WH 542	Three rusts	31.8
172	'HW 5018'	-	-	-	HW 3049//HW 3014-2	Three rusts, PM	31.8
173	'HW 5021'	-	-	-	MACS 2496*1//MC 10	Three rusts	27.2
174	'HW 5027'	-	-	-	PBW 343/PH 137//HW 1085	KB,PM	18.1
175	'HW 5028'	*2+*	-	-	HW 3018/HW 2045	Three rusts, FA, SF, RA	20.0
176	'HW 5037'	*2+*	-	-	UNI 5439//MC 10	LR, YR, LS	36.0
178	'HW 5042'	*31+*	*26+1+*	*9+*	PBW 343/PH 137 //Veery'S	Three rusts	28.0
179	'HW 5103'	*31+*	*26+*	*9+*	PBW 343/PH 137//HW 3039	SR, LR, FS, RA	25.9
180	'HW 5104'	*31+*	*26+*	*9+*	PBW 343/PH 137//VW 9897	SR, LR, FS, RA	25.9
181	'HW 5205'	*31+2+*	*26+*	*9+*	HW 3020/HD 2669	Three rusts , PM, KB	25.0
182	'HW 5207'	-	-	-	HW 3029/Yr15	Three rusts, FS	5.0
183	'HW 5208'	*13+10+*	-	-	ATTILLA//OLIGO	Three rusts	33.3
184	'HW 5210'	-	-	-	HW 3081/HW2084	Three rusts	15.0
185	'HW 5213'	-	-	-	HW 3083/HW 3084	Three rusts, KB	15.0
186	'JKW 20'	*31+*	*26+*	*9+*	PBW 343/PH 137//SONALIKA/CLRP 6	KB, FS	11.0
187	'JKW 37'	*13+10+*	*8a+9b+11+*	-	CGSS99B00015F-099Y-099M-099Y-099M-35Y-OB	LR, SR	14.0
188	'K 0124'	-	*13+*	-	HD 2402/NW 1011	Three rusts, RA, BWM, MR to LB	27.2
189	'K 0402'	-	*13+*	-	HP 1731/UP 2425	Three rusts	18.5
190	'K 0615'	-	*13+10+*	-	K 8027/WH 147	Three rusts, PM, KB	15.0
191	'K 0716'	-	*13+*	-	K9351/K9843	SR, YR, FA	10.0
192	'K 8962 '	*11+*	-	-	K7401/HD2160	YR, Head Scab, FS	9.1
193	'K 9107 '	*2+5+8b+11+*	*34+*	*2+18+*	K8101/K68	SR, LB, KB	27.3
194	'K 9351'	-	-	-	K72/K8026//K72	SR, LR	40.9
196	'K 9441'	*2+11+*	*23+10+*	-	K8565/K7917	Three rusts, LB	37.0
197	'KRL 213'	*26+*	*9+*	*31+*	CNDO/R143//ENTE/MEXI2/3/AEGILOPS-SQUARROSA(TAUS)/4/-WEAVER/5/2/*KAUZ	Three rusts, KB, RA	18.5
198	'KRL 238'	-	*13+*	-	HW 3014/WR 765	Three rusts, KB, FS, MR to LB	10.0
199	'KRL 239'	*31+*	*26+1*	*9+*	K 9565/GW 326	Three rusts	5.0
200	'KRL 240'	*31+*	*26+*	*9+*	RAJ 3307/CPAN6207// HI 8498	Three rusts, KB	20.0
201	'KRL 249'	*31+*	*26+*	*9+*	MILAN/TUI	Three rusts, FS	15.0
202	'LOK 42'	*2+*	-	-	HW2006//HW2002/LOK-1	SR, LR, KB	18.2
203	'LOK 54'	-	-	-	LOK 1/J.24/SONALIKA"S"//HW2006/RW 2358/HW2002	SR, LR	16.0
204	'LOK 59'	*24+*	*24+*		1493/HD2358	SR, LR	20.0
205	'MACS 3424'	*9e+*	*23+*	-	AUK/GUIL//GREEN/CHTO/4/ATTILA	LR, SR, KB	13.6
206	'MACS 2956'	*11+*	-	-	KRT 5/ *2/NP 200	LR, SR, PM, WBM, RA, MR	36.8

						to LB	
207	'MACS 2959'	*11+*	-	-	KRT 5/ *2/NP 200	Three rusts, MR to LB	40.9
208	'MACS 5009'	-	*13+*	-	NP 200 Mutant	SR, LR	15.0
209	'MACS 6198'	*11+2+*	*13+1+*	-	MACS 2406/HD 2189//HD 2189-3*PUN13 /METRO20/BVC	RA, FA	12.0
210	'MACS 6222'	*31+*	*26+*	*9+*	HD2189*2/MACS2496	SR, LR	25.0
211	' MACS 6240'	*31+*	*26+*	*9+27+*	OPATA/RAYON//KAUZ	SR, YR, KB	15.0
212	'MACS 6221'	*31+*	*26+*	*9+*	HD 2189*2//MACS 2496	SR, LR, FS, KB	10.0
213	'MACS 6272'	-	*13+1+*	-	VORONA/CON 79//KAUZ/3/MILAN	SR, LR, MR to LB	15.0
214	'MACS 6273'	-	*1+*	-	KAUZ*2/CHEN//BCN/MILAN	Three rusts, FS	5.0
215	'MP 1156'	-	-	-	PKD 93 / CPAN 3031	SR, LR	13.6
216	'MP 1194'	*8a+9b+11+*	*13+*	-	CMH81.38/2*KAUZ/ATTILA	LR, SR,RA, FS, MR to LB	7.4
217	'MP 1212'	-	*13+*	-	WEAVER/MANGO// BORL. 195	SR, YR	15.0
218	'MP 3211'	-	-	-	Skauz/2/FCT	MR to LB	15.0
219	'MP 3223'	*24+*	*24+*	-	MP 3054/ HD 1748	Three rusts	23.0
220	'MP 4080 '	*31+*	*26+*	*9+*	SKAUZ*2/FCT	SR, LR, SF	20.0
221	'NIAW 1188'	-	*13+*	-	CHOX/STAR/3/HEI/3*CNO79//2*SERI	LR, SR, KB,FS	18.5
222	'NW 3087'	*31+*	*26+*	*9+*	ATTILA*2/STAR	Three rusts, KB, FS	45.0
223	'NW 1012'	-	*2+*	-	EARANA//2//JUP/BJY"S"/3/VEE//5"S"/JUN"S"	Three rusts, KB	40.0
224	'NW 2026'	-	-	-	KT/BAGE	LR, YR	12.0
225	'NW 3073'	-	*13+*	-	BJY/COC/PRL/BOW	LR, SR, FS, RA	23.0
226	'NW (S) 02-4'	-	*13+*	-	NS 732/NER//KAUZ	LB, KB, FS	28.0
227	'PBW 373'	*26+*	*31+5+2+*	*9+27+*	ND/VG1944//KAL/BB/3/YACO"S"/4/VEE#5'S'	MR to LB	59.1
228	'PBW 383'	*8b+*	-	-	BOW/PRL//BUC	Three rusts, KB, FS	31.8
229	'PBW 485'	*31+*	*26+*	-	PBW343/PBW154//HD2160	SR, LR	18.1
230	'PBW 486'	*31+*	*26+*	*9+*	PBW343/PBW154/HD2160	SR, LR, KB	12.0
231	'PBW 475'	*5+31+*	*26+*	*9+*	W4671/PBW54	Three rusts	45.4
232	'PBW 486'	*31+2+*	-	*2+*	PBW343/PBW154/HD2160	MR to LB, KB, PM, FA,RA	27.2
233	'PBW 491'	*2+31+*	*26+*	*9+*	PBW2821/CPAN3005//DL788-2	SR, LR, RA,	20.0
234	'PBW 493'	*31+*	*26+23+*	*9+*	PBW154/PBW343//WH542	Three rusts	24.0
235	'PBW 498'	*31+2+*	*26+23+*	*9+*	WL 6736/*2 WEAVER	Three rusts, RA	28.0
236	'PBW 500'	*31+2+*	*26+23+*	*9+*	PBW 351/W 4387	Three rusts, RA, MR to LB	18.0
237	'PBW 509'	*31+*	*26+*	*9+*	W1634/PBW381	Three rusts	18.0
238	'PBW 510'	-	-	-	W485/PBW154//WH542	LR, YR	4.0
239	'PBW 521'	-	-	-	WH 494/RAJ 3814//W485	Three rusts	36.3
240	'PBW 524'	*24+2+*	*24+*		PBW343/HUW235	Three rusts	31.8
241	'PBW 525'	*31+5+*	*26+23+1+*	*9+*	WH 594/RAJ 3814//W 485	Three rusts, SF, RA	31.8
242	'PBW 530'	*31+5+*	*26+23+1+*	*9+*	Not Communicated	Three rusts, RA	27.2
243	'PBW 547'	*2+*	-	-	WH594/RAJ3814//DL788-2	Three rusts	27.2
244	'PBW 549'	*31+2+*	*26+23+1+*	*9+*	W 7543/PBW 343	Three rusts	32.0
245	'PBW 550'	*31+*	*26+34+*	*9+18+*	WH 594/RAJ 3856//W 485	Three rusts, RA	34.0
246	'PBW 550'	-	-	-	WH 594/RAJ 3856//W 485	Three rusts	32.0
247	'PBW 554'	-	-	-	PBW 343/W 5349	Three rusts, FS, FA	36.0
248	'PBW 559'	*2+*	-	-	W 485/PBW 343//HD 2660	Three rusts, FS, RA	28.0
249	'PBW 563'	*31+*	*26+*	*9+*	F6KB 90/PBW 343	SR, LR	20.0
250	'PBW 568'	*31+*	*26+*	*9+*	W 485/PBW 343//HD 2160	SR, LR	21.0
251	'PBW 570'	*31+*	*26+*	*9+*	PBW 457/W 9217	Three rusts, LB, FS	18.0

252	'PBW 573'	*31+2+*	*26+*	*9+*	WH 594/RAJ 3814	Three rusts, FS, RA	33.3
253	'PBW 574'	*31+*	*26+*	*9+*	HD 2643//CS/AE. Sq.	SR, LR	20.0
254	'PBW 580'	*31+*	*26+23+1+*	-	UP 2338/MEI 319	Three rusts, KB, PM, SF, MR to LB	20.0
255	'PBW 582'	*31+5+*	*26+23+*	*9+*	PBW 343/PBW 346	Three rusts	11.0
256	'PBW 583'	*31+5+*	*26+*	*9+27+*	CPAN 3048/DL 788-2	Three rusts	22.2
257	'PBW 585'	*31+5+1+*	*26+23+*	*9+*	PBW 342/HD 2652	Three rusts	21.0
258	'PBW 587'	*31+5+*	*26+23+*	*9+27+*	PBW 443/PBW 470	SR, LR	22.2
259	'PBW 588'	*31+5+*	*26+23+1+*	*9+*	RL6043/RAJ 3765	Three rusts	22.0
260	'PBW 589'	*31+*	*26+23+*	*9+27+*	WH581/PBW346//CC527	Three rusts	51.8
261	'PBW 590'	*31+5+*	*26+*	*9+27+*	WH 584/RAJ 3814//W 485	Three rusts , PM, KB, BWM	15.0
262	'PBW 593'	*31+2+*	*26+23+1+*	*9+*	WH 581/PBW 346//CC527	Three rusts	25.0
263	'PBW 599'	-	-	*27+*	WH581/PBW346// CC 527	Three rusts, RA	10.0
264	'PBW 607'	-	-	-	PBW 343/PBW447//WG 5953 wh 5953	Three rusts, PM, KB	15.0
265	'PBW 610'	*31+*	*26+23+1+*	*9+*	W 13334/IBWSN 92//PBW 496	Three rusts, FS	15.0
266	'PBW 611'	-	-	*27+*	W 9931/PBW 373//PBW 495	Three rusts	30.0
267	'PBW 612'	-	*13+*	-	NIAW 34//BAU/KAUZ	Three rusts, FS	30.0
268	'PBW 621'	-	*10+*	-	KAUZ/ALTAR 84/AOS/3/MILAN/KAUZ/4/HUITES	HR to SR, LR	15.0
269	'PBW 629'	*31+*	*26+*	*9+*	CHIL/ALD//JUP/COC/3/PVN/4/GEN/5 /KAUZ/CHO//BUC	R to LB	15.0
270	'Raj 1555 '	*9e+*	-	-	COCORITS/RAJ911	LR, YR, FS, LB	4.5
271	'Raj 3765'	*2+*	*13+10+*	*2(KS)+*	HD2402/VL639	Three rusts	50.0
272	'Raj 3856'	*2+31+*	-	*9+*	BAU 'S'	Three rusts, LB, LS, FS	16.0
273	'Raj 3896'	*2+*	-	-	Raj 1972/WH 283	SR, LR, LB, KB, PM, FA	32.0
274	'Raj 4012'	*2+*	-	-	WD 232/RAJ 3077	Three rusts	36.3
275	'RAJ 4027'	*2+*	-	-	HD 2594/DL 788-2	Three rusts	28.0
276	'RAJ 4028'	*2+*	-	-	HD 2596/PBW323	SR, LR, KB, RA	24.0
277	'RAJ 4083'	*13+ 10+*	-		PBW 343/UP2442//WR258/UP2425	Three rusts	31.8
278	'RAJ 4101'	-	-	-	RAJ 3765/DL 775-2	SR, LR	20.0
279	'RAJ 4119'	*2+*	-	*27+*	RAJ 3777/WR 413	Three rusts, FS, RA	29.6
280	'RAJ 4120'	-	-	-	PBW 373/V 1	Three rusts	40.0
281	'RAJ 4124'	*2+*	-	-	RAJ3777/WR413	Three rusts, KB	22.2
282	'RAJ 4129'	-	*23+*	*27+*	HP1721/RAJ3077	SR, LR, BWM	22.2
283	'RAJ 4131'	*2+*	-	-	HI1457/SARC12	Three rusts, FS	33.3
284	'RAJ 4132'	*24+*	*24+*	-	RAJ 3777/WH 671	LR, SR, FS	18.5
285	'RAJ 4161'	-	*23+*	-	WR 413/RAJ 3077	Three rusts	25.0
286	'RAJ 4188'	-	-	-	K 9406/LOK 1	Three rusts, PM, KB	10.0
287	'UP 2425'	*2+31+*	*26+23+1+*	*9+*	HD2320/UP2263	Three rusts	63.6
288	'UP 2473'	-	*13+10+*	-	HD2550/WH540//VEE'S' BOW'S'	LR, YR, LB	27.2
289	'UP 2565'	*2+*	-	-	PBW 352/CPAN 4020	LR, SR	31.8
291	'UP 2571'	*2+*	-	-	PBW352/WH595	LR, YR	18.0
292	'UP 2594'	*31+*	-	-	DL 802-1/RAJ 3077	Three rusts, RA, BWM	4.5
293	'UP 2596'	-	*13+*	-	CPAN 3004 M	SR, LR	13.6
294	'UP 2600'	*11+*	*23+*	-	BL1496/3/HE//3*CNO79//2*SERI	Three rusts	24.0
295	'UP 2601'	-	-	-	PASTOR/ENEIDA//WH576	Three rusts	18.0

296	'UP 2632'	*31+*	*26+23+1+*	*2+9+*	TR 380/UP 2435	LB, KB, FS	32.0
297	'UP 2642'	*2+*	*13+*	-	PBW 352/WH 592	Three rusts	22.6
298	'UP 2687'	*11+*	*13+*	-	[NAC/3/STW163/AGEL//ANZA/4/-BOW "S" /CEP 7788// HPW 42	Three rusts	23.0
299	'UP 2691'	*31+*	*26+*	*9+*	UP2377/HW1085	SR, LR, FS, KB, LB	15.0
300	'UP 2696'	*31+5+*	*26+23+1+*	*9+*	CDWR 9510/NW 1027	Three rusts	16.0
301	'UP 2719'	*31+*	*26+10+*	*9+*	CPAN 3048/RAJ 3765	Three rusts, KB, FS	37.0
302	'UP 2747'	-	*13+*	-	MILAN/KAUZ// PRINIA/S/BABAX	Three rusts, PM	15.0
303	'UAS 295'	-	*13+1+*	-	SNI/TRAP#1/BAV 92	Three rusts, KB, SF	17.3
304	'UAS 305'	*31+*	*26+23+*	*9+*	CMH84.3379/CMH 78.578//MILAN/HD 2189	SR, YR, PM, FS	20.0
305	'UAS 419'	*9e+*	*23+*	-	GALLI-1/BOOMER-20//BANSI/DWR1006	HR to YR, R to SR, LR	10.0
306	'VL 738'	-	*26+23+ 34+*	-	NS 12.07/LIRA "S"//VEE "S"	LR, YR, FS, MR to LB	27.3
307	'VL 796'	*11+*	*13+34+*	-	WEMBBELY/VL404	Three rusts, LB, PM, KB, FS	22.0
308	'VL 796'	-	*13+1+*	-	WEMBBELY/VL 404	SR, LR, LB, PM, KB, FS	25.9
309	'VL 801 '	-	*26+23+1+*	-	HS 240/CPAN 3031	Three rusts	37.0
310	'VL 803'	*2+31+*	*2+6+34+*	-	SERI/CPAN2099	Three rusts, FS	18.1
311	'VL 804'	*5+31+*	*2+6+34+*	-	CPAN3018/CPAN3004//PBW65	Three rusts, FS, LS	45.4
312	'VL 809'	*2+*	-	*2+*	WONLRA 47/CPAN3031	Three rusts, FS	9.0
313	'VL 818'	*5+2+*	*13+1+34+*	*18+*	SPINEBILL"S"/CPAN2045	MR to LB, PM, FA	12.0
314	'VL 824'	*2+*	*13+*	*2+*	Raj 3302/TURACO//TURACO	Three rusts, KB, RA	20.0
315	'VL 829'	*31+5+*	*26+23+1+34+*	*9+*	IBWSN149/CPAN2099	Three rusts, LR, RA, MR to LB	18.0
316	'VL 832'	*8b+9b+11+2+*	*13+34+*	-	PBW 65/CPAN 3031	LR, YR	22.7
317	'VL 852'	*8b+9b+11+2+*	*13+1+34+*	-	ALFROG#4/HD 30//CPAN 3031	LR, YR, KB	13.6
318	'VL 864'	*31+5+2+*	*26+3+*	*9+*	ALFROG#4/HD30/CPAN3031	Three rusts, PM, FA, MR to LB	18.0
319	'VL 865'	*31+2+*	*26+*	*9+*	AL-FROG#4/HD 30//CPAN 3031	LB, KB, LS	13.6
320	'VL 867'	*31+5+2+*	*26+*	*9+*	CPAN 3031/VW 92139	Three rusts, MR to LB	27.2
321	'VL 868'	*31+2+*	*26+23+1+*	*9+*	RAJ 3734/CPAN 2051//PBW 65	Three rusts, MR to LB, RA	36.3
322	'VL 869'	*2+*	-	-	EMV/RMV/HD30//HW2032	SR, LR,PM, KB	12.0
323	'VL870'	*2+*	*23+1+*	-	CPAN3031/PMF/MAYA/YACO//VL755	KB, FS, RA	20.0
324	'VL 875'	*2+*	-	-	WH542/PBW226	KB, FS	22.7
325	'VL 890'	*31+*	*26+23+1+*	*9+*	VW 9548/PBW 373	SR, LR, PM, KB, MR to LB	32.0
326	'VL 892'	*13+10+*	-	-	WH 542/PBW 226	Three rusts	23.0
327	'VL 898'	*31+*	*26+23+1+*	*9+*	OPATA/RAYON//KAUZ	Three rusts, RA	25.9
328	'VL 900'	*31+5+*	*26+23+1+*	*9+*	KAUZ/3/MYNA/BUL/FLK/4/MILAN	Three rusts, PM, KB, SF	25.0
329	'VL 901'	*13+*	*11+*	-	PERSENS-CARIBOZ	LR, YR, LS	8.0
330	'VL 907'	*31+*	*26+23+10+*	*9+*	DYBR 1982-83/842ABVD50/VW9365// PBW343	HR to SR, LR	35.0
331	'VL 912'	*31+2+*	*26+1*	*9+*	PERSENS-CARIBOZ 618/PBW 65//UP 2338	Three rusts, KB, FS, RA, MR to LB	29.6
332	'VL 913'	*2+*	*13+10+*	-	HS295/HD2669//HP1744	Three rusts, FS	22.2
333	'VL 916'	-	-	-	VW9917/ID13.1/MLT	SR, YR, SF	14.0
334	'VL 920'	*31+*	*26+10+*	*9+*	PARA2//JUP/BJY/3/VEE/JUN/4/ 2*KAUZ/5/BOW/PRL//BUC	Three rusts, PM, FS	15.0
335	'VL 922'	*31+*	*26+23+*	*9+*	HS 341/JNGW 4//F35.70/3	Three rusts, KB	20.0
336	'VL 923'	*31+2+*	*26+23+*	*9+*	HD 2687/90ZHONG 65	SR, YR, FS, KB, PM, LS	25.0

337	'VL 924'	*8a+9b+11+*	*10+*	-	PBW 373/VL 795	LR, YR	10.0
338	'VL 926'	*31+*	*26+23+*	*9+*	UP2425/HS341//HS375	Three rusts, FS	10.0
339	'WH 147'	-	-	-	E4870/C303//S339/PV-18	SF	15.0
340	'WH 601'	-	-	-	PRV/WW15/3/BJ'S'/2*ON/BON/4/NAC	Three rusts, LB, FA	20.0
341	'WH 913'	*9e+*	-	-	DWL5023/YAV79	Three rusts, LB, PM, KB, FS	25.9
342	'WH 1021'	*31+*	*26+1+*	*9+*	NYOT 95/SONAK	Three rusts, KB, FS	30.0
343	'WH 1061'	*31+*	*26+1+*	*9+*	WEAWER/WL2926//SW89.3064	Three rusts, FS	10.0
344	'WH 1062'	*31+*	*26+1+*	*9+*	WEAWER/WL2926//SW89.3064	Three rusts, FS	10.0
345	'WH1063'	-	-	-	BARBET 1 SELECTION	Three rusts, KB, FS	15.0
346	'WH 1076'	-	*23+10+*	-	NI5663/K9330//RAJ3765	Three rusts	20.0
347	'WH 1078'	*31+*	*26+23+*	*9+*	HD2285/SONAK	Three rusts	10.0
T. durum							
1	'AKDW 2997-16 '	*2+*	-	-	CPAN 6140/RAJ 1555	LR, YR, LS, RA, SF, MR to LB	8.0
2	'AKDW 3795-3'	-	*23+*	-	AKW 38-5/4502	Three rusts, PM, KB, BWM, SF, LS	10.0
3	'AKDW 4155'	*2+7b+*	-	-	RASCON37/TARRO-2//RASCON37	LR, YR	36.0
4	'AUKD-2'	*9e+2+*	*23+*	-	KYDRANASS A 30 /SILVER-5	KR, YR	4.5
5	'AUKD -3'	-	-	-	MAGH 72/RUFO//ALG86/RU/3/ALTAR 84 /ALD/4	SR, LR	4.5
6	'CDW 04'	-	*23+*	-	SU-CULLUGU6	Three rusts, KB, FS, RA	23.0
7	'DDW 11'	*9e+*	*23+*	-	IDYN100/RAJ 1555	Three rusts, KB, FS, RA	11.1
8	'DDW 15'	*9e+2+*	*23+*	-	IDSN 80/RAJ 1555	LR, YR, RA	15.0
9	'DWR 1001'	*2+9e+*	-	-	LOCAL DIC*4//LOCAL DIC/RAJ1555	KB	9.0
10	'DWR 1005'	*2+9e+*	-	-	ALTAR/HD4502//RAJ-1555	Three rusts, LB, LS and FS	32.0
11	'DWR 1006'	*9e+*	-	-	SULA/CREX//AAZ	Three rusts, LB, PM, KB, FS	7.4
12	'DWR1013'	*2+9e+*	-	-	CHEN/ALTER / V-103 /INIA	LR, YR	4.5
13	'GW 1139'	*2+*	-	-	MACS2340//W5070	Three rusts, LS, FS	18.2
14	'GW1170'	*9e+*	-	-	P5556/3/GALL//FINCH/IL189	Three rusts	9.0
15	'GW1171'	*2+9e+*	-	-	IWP5061/M/811965	Three rusts	13.6
16	'GW 1189'	*9e+12+*	-	-	SU-CULLUGU-7/VD90-12	Three rusts	12.0
17	'GW 1244'	-	*23+*	-	GW 1148/HI 8494	Three rusts, PM, KB, LS	10.0
18	'HD 4672'	*2+9e+*	-	-	BRED/PBW 34 //ALTAR 84	Three rusts, PM,RA, LS, FS, KB	13.6
19	'HD 4687'	*2+11+*	-	-	HI 8162/DON-LRA60	LR, YR, KB, PM, FS	4.5
20	'HD 4696 '	*9e+2+*	-	-	AAZ/MORUS-1	Three rusts	18.0
21	'HI 8498'	*2+*	-	-	RAJ6070/RAJ 911	LS, BWM, FS, KB, RA	18.1
22	'HI 8550'	-	-	-	HI8059/CPAN6126	PM, KB, FS, LS	4.5
23	'HI 8498'	*2+*	-	-	RAJ6070/RAJ911	Three rusts, LS, KB	8.0
24	'HI 8591'	*2+11+*	-	-	HI 8144/ NI 8625	Three rusts, PM	12.0
25	'HI 8627'	*11+2+*	-	-	HD4672/PDW233	KB, FS	4.1
26	'HI 8630'	*9e+2+*	-	-	HI 8381/RAJ 1555	KB	4.5
27	'HI 8672'	*9e+*	-	-	HD 4672/PDW 233	Three rusts, FS, KB	7.4
28	'HI 8678'	*9e+*	*23+*	-	HD 4672/PDW 233	Three rusts, FS	3.7
29	'HI 8680'	*11+*	*23+*	-	HI8177/HI8185	Three rusts, KB, FS	10.0

30	'HI 8681'	*11+*	*23+*	-	CD91195/HI8381//CPAN6225/HI8335	Three rusts, KB, FS	5.0
31	'HI 8682'	*11+*	-	-	HI8498/PDW233	HR to SR, LR	5.0
32	'HI 8690'	-	-	-	(HI8416/Sarangapur Local)/HI8498	Three rusts, PM, FS	10.0
33	'HI 8693'	*31+*	*26+*	*9+*	(Guji 's'/PDW251)/MACS3125	SR, LR, RA	10.0
34	'HI 8696'	-	*23+*	-	RAJ6070/RAJ911	HR to SR, LR	10.0
35	'HI 8699'	-	-	-	WH921/HI8498	HR to SR, LR	10.0
36	'MACS 2846'	*9e+*	-	-	CPAN 6079//MACS 2340	LS	9.0
37	'MACS 2884'	-	-	-	DURUM AVT TS RAJ1555 /2/CPAN6063	SR, LR	13.6
38	'MACS 3313'	-	-	*2+7b+*	DWL 5023/CPAN 6120//MACS 2479	SR, LR, LB	19.0
39	'MACS 3660'	-	*23+*	-	DWR 89.3064+2/ BORL 95	SR, LR, RA	10.0
40	'MACS 6086 '	*2+*	-	-	HW2004 (C306*7/LR24)	Three rusts, FS	9.0
41	'MPO 1153'	-	-	-	MOJO/AIRON	KB	4.5
42	'MPO 1204'	*9e+*	*23+*	-	HUI/YAV.1//LOTUS.5/3/RESCON.20	LR, SR, FS, KB, RA	7.4
43	'MPO 1220'	-	*23+*	-	GW1167/RAJ6550	LR, YR, SF	15.0
44	'MPO 1226'	*2+*	*23+*	-	RAJ6552/DWR 1012	Three rusts, KB, FS	10.0
45	'NIDW 15'	*2+9e*	-	-	DOM 50	Three rusts, KB	13.7
46	'NIDW 295'	-	-	-	BOOMER 33/ PLATA 8	Three rusts, SF, RA, MR to LB	9.0
47	'NIDW 309'	*9e+2+*	-	-	YAVA ROS-79	Three rusts, KB, MR to LB	3.9
48	'NIDW 505'	*9e+*	-	-	RASCON 21/KNAR 3//PLATA8	LR, SR, KB, FS	11.1
49	'PDW 215'	*9e+*	-	-	DL5013/DWL5002	LR, YR, LB, FS, KB	11.1
50	'PDW 267'	-	-	-	CHI'S'/APO'S'//ALTAR84/3/CD69635	Three rusts, LB, FS, FA, RA	20.0
51	'PDW 269'	-	-	-	PDW 218/PBW34	SR, LR, LB, PM, KB, FS	17.0
52	'PDW 274'	*2+11+*	-	-	DWL 6018/KARPASIA	LR, YR, KB	4.5
53	'PDW 276'	-	-	-	BYE/TC*5/ / GS "S"/5/ GS "S"/ 4/D.BUCK //T.MS/TC/3/LAK 16/ DWL 7649	Three rusts	13.6
54	'PDW 278'	*9e+*	-	-	TRYNG –5	LR, YR, KB, FS	4.5
55	'PDW 283'	*9e+2+*	-	*2+*	AJAIA12/F3LOCAL(SEL.ETHIO135-8) /CHEN/ALTAR 84	SR, LR, FS, RA	4.0
56	'PDW 289'	-	-	-	AJAIA 12/F3LOCAN(SEL.ETHIO.135.85) //PLATA13	LB	4.5
57	'PDW 304'	-	-	-	HI 8072/PDW 250	LR, YR, LS	8.0
58	'PDW 316'	-	-	-	D497/D296	Three rusts, KB, FS	10.0
59	'PDW 312'	-	-	-	WH 913/PDW 266	SR, LR, RA	20.0
60	'RAJ 6557'	*2+9e+*	-	-	YAVAPOS 79	Three rusts, KB, FS	4.5
61	'RAJ 6566'	*9e+2+*	-	-	RAJ 6496 /PDW 215	Three rusts, RA, BWM, SF	4.5
62	'UAS 410'	*2+7b+*	-	-	GODRIN/GUTROS//DUKEM	LR, SR, FS, KB, RA	11.0
63	'UAS 414'	*9e+*	-	-	E90040/MFOWL13/LOTAIL6//DWR 1006	Three rusts, HR to KB, FS	3.7
64	'UAS 2021'	*2+*	-	-	THB/CEP7780//2*MUSK-4	LR, YR	8.0
65	'WHD 896'	*11+2+*	-	-	BISU-1/PLATA-16//RISSA	LR, YR, KB, PM, FS, LS	9.0
66	'WHD 938'	*2+*	-	-	BICHENA-1/GRD-2/…….	LR, SR, FS, KB	13.0
T. diccocum							
1	'DDK 1025 '	-	-	-	DDK1013/DDK 1001//278-13	SR, LR,KB, FS, PM, MR to LB	13.6
2	'DDK 1031'	-	-	-	KADUR DICOCCUM// 243-3//264-7	SR, LR, KB, FS	6.0
3	'DDK 1032'	-	-	-	DDK-1016/212-16//DK-253-13	SR, LR, KB, FS, LS	4.0
4	'HW 1097'	*11+*	-	-	NP 202(25 Kr)	Three rusts, PM, KB, LS	5.0

5	'MACS 2956 '	-	-	-	KRT 5/ *2/NP 200	SR, LR, KB, LS	32.0
6	'MACS 2971'	-	-	-	KRT 5*2/NP 200	SR, LR, FS, KB, PM	15.0
7	'MACS 2980'	-	-	-	NP 200-30 KR-O-744-13-0	SR, LR, PM, FS	7.4
8	'MACS 2981'	-	-	-	NP 200-20 KR-0-327-13-0	SR, LR, PM	10.0
Triticales							
1	'DT 74'	-	-	-	TL85/C306//TL125	Three rusts, LB, PM, FS, FA, RA	4.0
2	'DT 90'	-	-	-	TL1210/TR8513.6	SR, LR, LB, PM, KB, FS, SF	4.5
3	'DT 91'	-	-	-	TL 1210/TR 125	Three rusts, KB, PM, FS	4.5
4	'DT 132'	-	-	-	TL68/DTS940	Three rusts	14.0
5	'HPT 6'	-	-	-	JINT76/CPAN1922	SR, LR,LB, PM, KB, FS	14.8
6	'TL 2861'	-	-	-	JINT123/TL 2523	SR, LR, LB, KB, PM, FS, RA	12.0
7	'TL 2877'	-	-	-	TL 2597/HD2428//TL1210	SR, LR,LB, KB, PM, FS	7.4
8	'TL 2908'	-	-	-	TL2614/JINT141	Three rusts	9.0
9	'TL 2915'	-	-	-	JNIT 141//TL 551/M78-9224 /3/TL 2727	Three rusts	13.6
10	'TL 2930'	*2+*	-	-	JINT 141/3/TL 553/M 78.9224	Three rusts, PM, KB	13.6
11	'TL 2934'	*2+*	-	-	TL 2748/3/DT 24/JNIT 128//TL 2434	Three rusts, KB, PM, FS, MR to LB	4.0
12	'TL 2935'	*2+*	-	-	DT58/TL2614//JINT141	Three rusts, FS, RA, BWM	4.5
13	'TL 2942'	-	-	-	TL 2732/DT 54	Three rusts, KB, FS	4.0
14	'TL 2945'	-	-	-	TL 1210*3/JNIT 125/K 185-2Y	Three rusts, PM, FS	3.0
15	'TL 2949'	-	-	-	JNIT 123/TL 1241//TL 2704	Three rusts, KB, PM, FS, LB	5.5
16	'TL 2959'	-	-	-	T 1838/JNIT 128//TL 2433/DT 87	SR, YR, FS, KB, PM	10.0
17	'TL 2961'	*2+*		-	TL 2882/DT 92	SR, YR, LS	5.0
18	'TL 2966'	-	-	-	DT57/TL2619//JINT141/3/TL2902	Three rusts, PM, FS, BWM	10.0

*Done at DWR RS Flowerdale, Shimla. Abbreviations: SR: Stem rust, LR: Leaf rust. YR: Yellow rust, KB: Karnal bunt, FS: Flag smut, LB: Leaf blight, MR: Moderately resistant, HR: Highly resistant, PM: Powdery mildew, LS: Loose smut, BWM: Brown Wheat Mite, RA: Root Aphid, FA: Foliar aphid, SF: Shoot fly