

CONTRIBUTION OF EXOTIC GERMPLASM IN WHEAT BREEDING IN INDIA

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Indian wheat programme has released/identified about 212 wheat varieties till date since 1965. Of these, 162 varieties have exotic germplasm in their pedigree either as a direct release or as a parent in a cross. An increasing reliance on exotic germplasm threatens our local material. A judicious use of local germplasm from different sources is suggested to make further gains in productivity.

Key words : Wheat, exotic germplasm, pedigree, direct selection

Introduction has always been an important breeding method in any crop. Early varietal improvement work has witnessed movements of plant material across the continents at massive scale. Indian agriculture has benefitted a great deal from this important tool of crop improvement. Some notable examples are Sonora 64, Lerma Rojo, Sonalika, Kalyansona (wheat), TN1, IR8, IR21, IR28 (Rice), Bonneville, Arkel (garden pea), Delcrest, Virginia Gold Tobacco (*N. tabacum*), Bragg, Lee (soybean), and Sioux (tomato) etc. The list is endless and very impressive as these have been the landmark varieties in their respective crops.

Establishment of International research institutes gave a further impetus to the movement of plant genetic material across the international boundaries. Wheat (*Triticum aestivum* L.) improvement work across the globe benefits from the movement of wheat germplasm affected through international nurseries and trials coordinated by International Center for Maize and Wheat Improvement (CIMMYT), Mexico. Indian wheat improvement work has also been

benefitted by these activities ever since its inception (Sharma and Mishra, 1999).

Indian wheat programme has so far released over 200 varieties till date during post green revolution phase (Table 1). Of these, about 76 per cent have exotic germplasm or foreign introductions in their pedigree either as direct release (Table 2) or as a parent (Table 3). About 28 per cent of all the released varieties are the direct release of foreign introduction or a selection in the introduction and an overwhelming 48 per cent of all the varieties involve exotic germplasm as a parent. A study conducted by Jag Shoran *et al.*, (1998) revealed that 40 per cent of advance test entries in All India Coordinated Wheat Improvement Trials during 1991-92 to 1995-96 were exotic germplasm, however it was interesting to note that among the final year test entries, the proportion of better yielding indigenous genotypes was quite high (32%) as compared to exotic material which stood at 23 per cent. However, an interesting observation has been that though the relative importance of exotic germplasm is coming down but its acceptability as a direct

Table 1. Number of wheat varieties released/identified in India after 1965

Period	Varieties involving exotic germplasm as			Others	Total
	Direct release	Parent in pedigree	Total		
1965-1970	7 (29.2)	13 (54.2)	20 (83.4)	4 (16.6)	24
1971-1980	15 (27.3)	30 (54.5)	45 (81.8)	10 (18.2)	55
1981-1990	15 (19.7)	44 (57.9)	59 (77.6)	17 (22.4)	76
1991-1999	23(40.4)	15 (26.3)	38 (66.7)	19 (33.3)	57
Total	60(28.3)	102(48.1)	162(76.4)	50(23.6)	212

Table 2. Wheat varieties released/identified in India from 1965 till date which are either direct introductions or selections from introductions

Sl. No.	Variety	Year	Pedigree	Sl. No.	Variety	Year	Pedigree
1	Sonora 64	1965	YT54/N10B//2*Y54	20	HP1102	1979	8156(B)/NAD63
2	PV 18	1966	KALYANSONA SIB	21	VL	1979	SN64//Y50E/GTO
3	Chhoti lerma	1967	LR64 SIB/HUAR		GEHUN421		
4	Sonalika	1967	MIDA-U/K-117A//2*TH3/FN/4*TH/4/A N/5/YT54/N10B//LR/6/B494	22	UP 2003	1980	BB/2*7C
5	Kalyansona	1967	PJ SIB/GB55	23	HW 517	1981	BB/CC/3/CNO/NO//PI
6	Safed Lerma	1968	Y50/N10B//L52/3/3* LR	24	RAJ 1482	1982	NAPO/TOB SIB//8156/3/KAL/BB
7	UP301	1970	LR64/SN64	25	ROHINI	1983	BON//CNO/SN64/3/KAL/BB.
8	UP310	1973	KLRE/RAF//LR64/2* SN64	26	MANGLA	1989	GLL/AUSTII61/157//CNO. NO/3/KAL/BB
9	UP319	1973	CNOSIB//SN64/KLRE/3/8156	27	PURBALI	1984	KVZ/TI//TITO
10	VL404	1973	KT/BAGE//FN/GU/3/ST464(DR)/P174106(DR)	28	MALVIYA 206	1985	KVZ/BUHO//KAL/BB
11	VL Gehun 401	1973	FKN/N10B	29	HW 741	1985	HW 517 SIB
12	K852	1973	SEL.S308=SKA SIB	30	CPAN 1796	1985	NAPO/TOB SIB//8156/3/KAL/BB
13	K816	1973	CNOSIB//SN64/KLRE/3/8146	31	GW 120	1985	INIA66/CNO/INIA66/BB/3/Y50E/3*KAL
14	Arjun (HD2009)	1974	LR64A/NAI60	32	GW 405	1985	CNO/INIA66//BB/3/CNO//PI/GLL
15	Shera	1974	LR64A/SON64	33	WL 2265	1985	NAPO/TOB SIB//8156/3/KAL/BB
16	UP215	1974	TZPP/SN64	34	HI 977	1988	GLL/AUSTII61.157//CNO/NO/3/Y50E/3*KAL
17	UP368	1974	LR64/SN64	35	HS 207	1989	KVZ/BUHO//KAL/BB
18	CC 464	1979	BB/CNO/SN64	36	HS 240	1989	AU//KAL/BB/3/WOP/4/PVN
19	GW40	1979	INIA66*2/7C	37	HS277	1991	KVZ/CGN

Sl. No.	Variety	Year	Pedigree
38	HS295	1991	CQT/AZ//IAS55/ALDML SIB/3/ALDML SIB/NAFN/4/PJN/SIB.PEL 1276.69
39	MACS 2496	1991	VEE#5
40	WH 542	1992	HPW 42
41	HPW 42	1992	VEE/3/PVN SIB/CNO SIB//JAR/ORZ SIB
42	SANGAM	1992	GLL/AUSTII61-157//CNO/ NO/3/VEE
43	WH533	1993	VEE#5
44	DWR 162	1993	KVZ/BUHO//KAL/BB
45	AKW 1071	1994	VEE/3/FLN/ACC//ANA
46	HP 1731	1995	URES//PRL "S"/TONI
47	DWR195	1995	SH1#4414/CROW"S"
48	PBW 343	1996	ND/VG7944//KAL//BB/3/ YACO"S"/4/VEE#5"S"
49	PBN 51	1996	BUC SIB/FLK SIB
50	PBW 373	1997	ND/VG7944//KAL//BB/3/ YACO"S"/4/VEE"S"
51	HD 2643	1997	VEE"S"/CPAN 2407/HD2329
52	HW 2004	1997	REGENT1974/3*CHZ//ZC 591/3P-19/C-281
53	NIAW 34	1997	CNO79/PRL"S"
54	VL 738	1997	NS12.07/LIRA"S"/VEE"S"
55	HP 1744	1997	CNO/PRL//CHILERE/ GARUDA
56	NW 1012	1998	PARANA//JUP/BJY"S"/3/ VEE//5"S"/JUN"S"
57	NW 1014	1998	HAHN"S"
58	DWR 1006	1998	SULA/CREX//AAZ
59	PBW 396	1999	CNO67/MFD//MOM "S"/VEE "S"

release has increased tremendously during nineties. Out of a total of 57 varieties released during 1991-1999, about 23 were direct release (Table 2). Plant breeding aims at accumulating all possible desirable alleles in one background. Exotic germplasm represents a very important source of desirable and diverse alleles for different traits. efforts need to be made to bring together these desirable alleles in one background by including a judicious selection of germplasm sources in breeders' crossing plots.

Table 3. Wheat varieties released/identified in India from 1965 till date which have foreign introductions in their pedigrees

Sl. No.	Variety	Year	Pedigree
1	C 306	1965	RGN/CSK31/2*C591/3/C21 7/NI4//C281
2	DURGAPURA 65	1965	RS31*5//TH/NP 165
3	HYB 663	1965	LOCAL//KC6042/GUL
4	NI 747-19	1965	RFP196/MOY3
5	NI 917	1965	C591//KC6042/GUL
6	NP 818	1965	DO/C518//SPP/NP114/3/W IS245 SIB
7	NP 846	1965	RN/NP760
8	NP 852	1965	KF/2*NP761
9	GANGA SONAHERI	1966	EG953/RS31
10	KHARCHIA 65	1966	KHLC*5/EG593
11	SHARBATI SONARA	1968	AMBER MUTANT OF SONARA 64
12	NP 884	1969	KC6042//GUL//PLT/3/K58/ N/4/NP755
13	HIRA	1970	YT54/N10B//SN64
14	NARBADA 4	1971	GB-AUS/NI4/3/PW5//TH/N P165
15	PUSA LERMA	1971	AMBER MUTANT OF LERMA ROJO 64
16	MOTI	1971	YT54/N10B//NP852
17	GAUW 10	1973	S308/WS217
18	GIRIJA	1973	CJ60/3/SPO/MTA//MQ/2*R NW
19	NI 5643	1973	N/NI345 SIB
20	WG 357	1973	PV 18/C273
21	WG 377	1973	WG143/USA265//PV18
22	DESHRATNA	1974	S503/NP835
23	JANAK	1974	YT54/N10B//HD845
24	HD 2135	1975	BB SIB/5/SL BIB/NP853/4/PJ SIB/P14//KT54B/3/K65
25	SHAILAJA	1975	PJ SIB/P14//KT54B/3/KA
26	RAK 821	1977	NP875//LR64/2*SN64

Sl. No.	Variety	Year	Pedigree	Sl. No.	Variety	Year	Pedigree
27	RAJ1114	1977	SKA/INIA66	50	MLKS-11	1981	MULTILINE (KALYANSONA) OF EIGHT COMPONENTS
28	UP 262	1977	S308/BJ66	51	MALVIYA 37	1982	KAL/S331//HD1982
29	WH 147	1977	PJ SIB/P14//KT54B/3/C286/ C273/4/S339/PV18	52	PBW 12	1982	CNO SIB/GLL//WL 711
30	WH 157	1977	NP876/S308//CNO/8156	53	SKML 1	1982	MULTILINE (SONALIKA) OF SIX COMPONENTS
31	BITHOOR	1978	MULTILINE (KALYANSONA) OF NINE COMPONENTS	54	HD 2281	1983	HD2160//7/36896//CJ54/ P4160E/E/HUAR/6/KAL SIB/5/SL SIB/NP852/4/PJ SIB/P14//KT54B/3/K65
32	HD 2177	1979	SL SIB/NP852/4/PJ SIB/P14//KT54B/3/K65/5/ KAL	55	K 72	1983	PV18/K68
33	HD 2189	1979	36896/CJ54//P4160E/3/SN6 3/5/MY54/N10B//LR64/3/T ACSIB/4/LR64//TLPP/Y54	56	MALVIYA 55	1983	PJ SIB/P14//KT54B/3/HD1982 /4/INIA66/5//HD2189
34	HD 2204	1979	BJ66 SIB//NAD63/LR64A/5/SL SIB/NP852/4/PJ SIB/P14//KT54B/3/K65	57	PARVATI	1983	CNO SIB NO/3/C273//NP875/PI SIB/6/36896//CJ54/P4160E/ 3/HUAR/4/KAL/5/SL SIB/NP852/4/F SIB/P14/KT54B/3/K65
35	HP 1209	1979	N10B/Y53//Y50/3/KT54B/4/ PJ KLRE/NP830	58	SAGARIKA	1983	NP798/KAL
36	HW 657	1979	TG/K65	59	UTKALIKA	1983	DG65/C306// FAO1061-68R
37	K-POORVI	1979	K816 SIB/KAL	60	GW 89	1984	KAL SIB/LR64A//SKA
38	MALVIYA 12	1979	NP876/CNO]	61	HUW 234	1984	HUW12/SPRW//HUW12
39	TAWA 267	1979	BB/7C	62	RAJ 1972	1984	C306/NP852/3/GB-AUS/ N10B//2*LR/5/SL SIB/NP852/4/PJ SIB/P 14//KT54B/3/K65/5/ HD 2160
40	UP115	1979	RIDLEY/NP710/3/PJ SIB/P14//KT54B/4/PJ SIB/GB856//TZPP/NAI60	63	UP 2121	1984	NAI60//KAL//UP301/3/ SAM68
41	WL 410	1979	SN63/4/36896//CJ54/P4160 E/3/HUAR/5/KAL	64	HD 2285	1985	3689//CJ54/P4160E/3/ HUAR/4/KAL SIB/5/SL SIB/NP852/4/PJ SIB/P14//KT54B/3/K65/6/ HD2160/7/SL SIB/NP852/4/PJSIB/P14// KT54/3/K65/5/2*SKA
42	WL 711	1979	S308/CHR//KAL	65	HD 2337	1985	SL SIB/NP852/4/PJ SIB/P14//KT54/3/K65/5/ SKA/6/HD2160
43	WL 1562	1979	KAL/JN//UP301				
44	AJANTA	1981	PW5/Y53				
45	IIS 86	1981	TII/MIDA-U//MCM/EX/3/ S227/4/S308				
46	KEERTHI	1981	SKA.TOB				
47	KSHIPRA	1981	CNO SIB/NO/3/C273//NP875/PI SIB/4/HD 1981				
48	KSML-3	1984	MULTILINE (KALYANSONA) OF SIX COMPONENTS				
49	LOK-1	1981	S308/S331				

Sl. No.	Variety	Year	Pedigree
66	HD 2329	1985	SL SIB/NP852/4/PJ SIB/P14//KT54B/3/K65/5/ SKA/6/UP262
67	HP 1493	1985	KLRE/NP830
68	MALVIYA 213	1985	NO/MOTI//HD2160
69	PRAGATI	1985	LR64/2*SN64//S308
70	RAJ 2184	1985	SN64/Y50E//GTO/3/8156/ 4/HD2135 SIB
71	UP 2113	1985	UP 301//KAL/HY65/3/WG377
72	WH392	1985	SHERA/3/N10B/K68//BB
74	TRIVENI	1986	KAL/HD 1982
75	VL 616	1986	SKA/P46
76	PBW 65	1987	USA255/K816/3/S738/ C306//KAL
77	AKW381	1988	SKA/NI5439
78	HD 2270	1988	SL SIB/NP852/4/PJ SIB/P14//KT54B/3/K65/5/ CNO SIB/NO/3/C273//NP875/ PI SIB/6/TOB/CNO SIB//BB/4/NAI60 SIB*2//TT/SN64/3/LR/ SN64
79	HD 2402	1988	HD 2177//CNO67/BB/3/HD216 0/4/HD2236
80	MAGHAR	1988	NP875/4/N10B/Y53//Y50/3/ KT54B/5/2*K852
81	HD 2380	1989	HD2135 SIB//SKA/3/TOB/CNO SIB//BB/4/NAI60*2//TT/SN 64/3/LR64/SN64/5/HD2160 /HD2170
82	PBW 175	1989	HD2160/4/JN/GAGE//JN/ KAL/3/PV18/C273
83	PBW 226	1989	C591/RN//JN/3/CIIR/HIRA
84	GW 496	1990	HD2285/4/CNO/NO//CC/ INIA66/KAL/BB
85	GW 503	1990	TOB SIB//NAPO//CC//INIA66 SIB/3/CNO/NO/4/CTFN/ CNO SIB/3/JAR SIB//MENG/856

Sl. No.	Variety	Year	Pedigree
86	HDR 77	1990	PTZ/2*HD2204
87	RAJ 3077	1990	HD2177/3/CNO67/BB//HD 2160/4/RAJ1482/5/BB//INIA 66 SIB/NAPO
88	HUW 318	1991	HUW206//KAL/MUS
89	K 88	1991	VEE/WL711
90	PBW 299	1992	BB/KAL//WL711/PBW65
91	SONALI	1992	TH*6/TF//6*SKA
92	GW 190	1993	VEE/3/BB SIB//SKA//ARJUN
93	K 8962	1993	K816 SIB/PV18//HD2160
94	VAISHALI	1993	KAL*4//TR380/27*4/3AG3/ 3/HD2281
95	HD 2610	1993	VEE'S//HD2402
96	HD 2643	1997	VEE'S//CPAN2407/ HD2329
97	HP 1761	1997	RL6010/6*INIA66// 3*KAUZ
98	DL788-2	1997	K7537/HD2160/HD2278// L24K-4-14
99	HS 365	1997	HS207/SONALIKA
100	HPW 89	1997	INTERMEDIO RODI/HD2248
101	PBW 435	1998	HD2160/CALIDAD
102	HW2044	1999	SUNSTAR/6/C80-1/6/ PBW226

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