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History of wheat cultivars released by Embrapa in forty years of research

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Abstract – In forty years of genetic breeding of wheat, Embrapa (Brazilian Agricultural Research Corporation) has developed over a hundred new cultivars for different regions of Brazil. Information regarding identification of these cultivars is often requested from Embrapa breeders. Data on year of release, name of pre-commercial line, the cross made, and the company unit responsible for indication of the cultivar are not always easily accessible and are often scattered throughout different documents. The aim of this study was to conduct a historical survey of all the wheat cultivars released by Embrapa, aggregating the information in a single document. Since 1974, Embrapa has released 112 wheat cultivars, including 12 by Embrapa Soybean - CNPSo (Londrina, PR), 14 by Embrapa Cerrado - CPAC (Brasília, DF), 9 by Embrapa Agropecuária Oeste - CPAO (Dourados, MS), and 77 by Embrapa Wheat - CNPT (Passo Fundo, RS).

Key words: *Triticum aestivum*, *germplasm*, *cross*.

INTRODUCTION

Genetic breeding of wheat in Brazil truly began in 1919 when the Ministério da Agricultura, Pecuária e Abastecimento (Ministry of Agriculture, Livestock, and Food) created experimental stations in Alfredo Chaves, RS (now Veranópolis, RS) and in Ponta Grossa, PR. It was at the station in Veranópolis, later incorporated in the Department of Agriculture of the State of Rio Grande do Sul (now the Fundação Estadual de Pesquisa Agropecuária – Fepagro [State Crop and Livestock Research Foundation]), that genetic breeding of wheat really begin in Brazil. These activities were led by the researcher Carlos Gaier. The first strategies were selections of wheat genotypes within local (colonial) cultivars and, soon after, in 1926, creation of the first hybrids. Crosses between the Polyssú wheat variety (Beckman 1954) and the Alfredo Chaves lines resulted in important cultivars at the beginning of the century in Brazil (Sousa 2004). Almost simultaneously, in 1937, the Instituto Agronômico de Campinas – IAC (Campinas Agronomical Institute) also carried out its first crosses with wheat. These two institutions, allied with the other Organizações Estaduais de Pesquisa Agropecuária - OEPAS (State Crop and Livestock Research Organizations), have contributed to genetic breeding of Brazilian wheat in various aspects,

but mainly through the genetic base developed. Some cultivars developed in the first half of the last century are used as sources of resistance to biotic and abiotic stresses in current hybridizations. In this respect, even now, the institutions cited above are either protagonists or partners of other breeders in the continual work of development of new wheat cultivars in Brazil.

In the 1970s, scientific research in wheat developed significantly from the creation of research centers by agricultural cooperatives in the state of Rio Grande do Sul (CEP/Fecotriga – currently CCGL TEC) and in the state of Paraná (Ocepar, currently Coodetec), responsible for the generation of dozens of wheat cultivars of economic importance. Examples of this were the cultivars CEP 24 (in Rio Grande do Sul) and CD 104 (in Paraná). Moreover, in that decade there was the creation of the Instituto Agronômico do Paraná – IAPAR (Agronomical Institute of Parana) and expansion of the work of the IAC. More than 70 wheat cultivars have already been released by IAPAR and IAC, which also shows their importance in the development of wheat in Brazil. In 1974, the Empresa Brasileira de Pesquisa Agropecuária – Embrapa (Brazilian Agricultural Research Corporation) was created (Sousa 1998), a milestone in crop and livestock scientific research in the country, which

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resulted in significant advances in agriculture, particularly in grain yields of many crops, and especially of wheat. The creation of private companies for wheat breeding, such as OR Sementes (in 1989), Biotrigo Genética Ltda (in 2008), and DNA Melhoramento Vegetal (also in 2008), among others, came to consolidate the system of genetic research of the cereal crop in Brazil in recent decades.

The Embrapa genetic breeding program for wheat also began in 1974, together with creation of the Centro Nacional de Pesquisa de Trigo (National Wheat Research Center), located in Passo Fundo, RS. Initially, the program was based on the germplasm incorporated from the Instituto de Pesquisas e Experimentação Agropecuárias do Sul – IPEAS (Southern Crop and Livestock Research and Experimentation Institute) to later carry out its own hybridizations (Sousa 2004). In 1975, the first wheat cultivar from Embrapa was released, called CNT 1 (Sousa 1998).

Embrapa, as a research institution, has a coordinator of the national project of genetic breeding of the cereal crop in the Embrapa Trigo (CNPT) unit, located in Passo Fundo, RS. However, as the variability of the climatic and soil conditions within the regions suitable for growing wheat is quite large, other units of the company contribute to genetic breeding of the cereal crop to overcome specific problems of the region where they are located and they operate as branches of the research effort of Embrapa Trigo. Three Embrapa units stand out in this role of collaboration in the national wheat project: the Embrapa Soja – CNPSo (Embrapa Soybean) unit, located in Londrina, PR, responsible for the release of cultivars adapted to the northeast of this state; the unit of the Centro de Pesquisa Agropecuária do Cerrado – CPAC (Crop and Livestock Research Center of the Cerrado), located in Brasília, DF, responsible for indication of cultivars of the dryland and irrigated regime for the Brazilian cerrado (tropical savanna); and the unit of the Centro de Pesquisa Agropecuária Oeste – CPAO (West Crop and Livestock Research Center), located in Dourados, MS, charged with indicating cultivars for that region.

Quite often, Embrapa wheat breeders are asked for information in regard to the year of release, the cross, the pre-commercial name, and the region for which the wheat cultivars released were indicated. Among those requesting this information, we may highlight the technical assistance sector, the academic sector connected with the agricultural areas, and the wheat segment itself connected with the company. Part of this information may be easily accessed, especially through folders distributed at the time of launching the cultivars and in some publications of the Comissão Brasileira de Pesquisa de Trigo e Triticale (Brazilian Wheat

and Triticale Research Commission). However, a significant part of this information is not available (or at least is not easily accessed), and there is no organized document that gathers the historical information of release of wheat cultivars of Embrapa in Brazil from the time of its creation.

All the wheat genetic breeding institutions, whether public or private, have made their contribution to the agronomic and qualitative development of the cereal crop in Brazil. The aim of this study was to carry out a historical survey of all the wheat cultivars released by Embrapa, compiling the main information for identification, and their contribution to wheat development in Brazil.

MATERIAL AND METHODS

The historical survey of the wheat cultivars indicated for growing in Brazil from 1974 to 2013 was carried out as based on guiding bibliographical documents. Publications arising from research meetings of the Comissão Brasileira de Pesquisa de Trigo e Triticale were consulted (Comissão 2004a, Comissão 2004b, Comissão 2004c, Comissão 2005a, Comissão 2005b, Comissão 2006, Comissão 2007, 2008, 2009, 2010, 2011, 2012), as well as books from different authors connected with the breeding programs (Sousa 1998, 2003, 2004), papers (Benin et al. 2013, Casassola et al. 2013), folders, audiovisual material, and annual research reports. Technical documents filed in other Embrapa units were solicited. Retired Embrapa researchers were also consulted so as to complement and systematize the information. The following information was gathered together for each cultivar indicated: a) year of release; b) commercial name; c) name of pre-commercial line; d) cross; e) Embrapa unit responsible for indication of the cultivar, and f) situation of the cultivar at the Serviço Nacional de Proteção de Cultivares (National Cultivar Protection Service) (if the cultivar is protected or not).

The wheat cultivars were grouped according to the Embrapa unit in which they were generated, and then by the year of release. Divergent information related to the same cultivar was checked in detail for the purpose of consistency of the document. The cultivars protected by the Ministério da Agricultura, Pecuária e Abastecimento (MAPA) were identified by accessing the site: <http://extranet.agricultura.gov.br/php/snpc>.

RESULTS AND DISCUSSION

From 1974 to 2013, Embrapa indicated 112 wheat cultivars for planting (Table 1). The largest number of indications was made by the CNPT (77 releases). The CPAC, CNPSo, and CPAO units made indication of 14, 12, and 9

cultivars, respectively. The proportionality of these releases is explained through two reasons. The first is related to the fact of the CNPT being the national leader of the wheat genetic breeding project of Embrapa and, consequently,

having the national mandate for development of the crop, with the greatest technical and physical structure available among the units. The second, though not less important, refers to the fact that most of the wheat-growing area in

Table 1. Number of wheat cultivars released by Embrapa (Brazilian Agricultural Research Corporation), classified by the decade of release and unit responsible for indication of the cultivar

Embrapa Unit	Decade					Total
	70-80	80-90	90-00	00-10	10-13	
CNPT	14	20	17	20	6	77
CPAC	1	5	6	2	-	14
CNPSO	-	-	-	9	3	12
CPAO	-	6	3	-	-	9
Total	15	31	26	31	9	112

CNPT - Centro Nacional de Pesquisa de Trigo; CPAC - Centro de Pesquisa Agropecuária do Cerrado; CNPSO - Centro Nacional de Pesquisa de Soja; CPAO - Centro de Pesquisa Agropecuária Oeste.

Table 2. Wheat cultivars released by Embrapa in the CNPT unit in the 1970s and 1980s, name of the pre-commercial line, and cross

Year	Cultivar	Line	Cross
1975	CNT 1	PF 70225	PF 11-1000-62/BH 1146
1975	CNT 2	PEL 14049-68	IAS 16/Norin 26
1975	CNT 3	PF 70194	IAS 20/IAS 46
1976	CNT 4	PEL 13014-65	Lerma 50 /3/ IAS 31//IAS 20/Reliance
1976	CNT 5	PF 6946	IAS 46/BH 546
1976	CNT 6	PF 69162	IAS 20/IAS 50
1976	CNT 7	PF 70546	IAS 51 // IAS 20/ND 81
1976	CNT 8	PEL-SL-1268-69	IAS 20/ND 81
1977	CNT 9	PEL 72016	IAS 46/IAS 49 // IAS 46/Tokai 66
1977	CNT 10	PEL 72018	IAS 46/IAS 49 // IAS 46/Tokai 66
1979	Trigo BR 1	PF 70402	IAS 20/IAS 50
1979	Trigo BR 2	PF 7158	IAS 50/4/IAS 46/3/Vilela Sol*4//Egypt101/Timstein
1979	Trigo BR 3	PF 72518	IAS 50/4/IAS 46/3/Vilela Sol*4//Egypt101/Timstein
1979	Trigo BR 4	PF 73226	IAS 20*3/Sinvalocho Gama
1980	Trigo BR 5	PF 74354	IAS 59 // IAS 52/Gasta
1980	Trigo BR 6	PEL 73538	IAS 20/Toropi
1981	Trigo BR 7	PF 72206	IAS 20/Toropi
1983	Trigo BR 8	PF 75171	IAS 20/Toropi // PF 70100
1985	Trigo BR 13	PF 782027	IAS 51 // IAS 20/ND 81, CNT 7 Sel
1985	Trigo BR 14	Multilinha*	IAS 63/Alondra Sib // Gaboto/Lagoa Vermelha
1985	Trigo BR 15	PF 79300	IAS 54*2/Tokai 80 // PF 69193
1986	Trigo BR 16-Rio Verde	PF 79678	PF 70402/Alondra Sib//PAT72160/Alondra Sib
1986	Trigo BR 19	PF 79502	CNT 1/CNT 10
1987	Trigo BR 20-Guató	PF 81189	BH 1146*3/Alondra Sib
1987	Trigo BR 21-Nhandeva	PF 79475	Cajeme 71/PF 70553
1987	Trigo BR 22	PF 7942	PF 81130/CNT 10
1987	Trigo BR 23	PF 8215	Corre Caminos/Alondra Sib /3/IAS54-20 /Cotiporã //CNT 8
1988	Trigo BR 24	PF 8150	IAS 58*2/Eagle
1988	Trigo BR 25	PF 81230	BH 1146*3/Alondra Sib
1988	Trigo BR 27	PF 80271	RC 7201/BR 2
1988	Trigo BR 28	PF 81330	IAS 55/PF 70553
1988	Trigo BR 32	PF 82345	IAS 60/Indus //IAS62/3/AlondraSib/4/IAS 59
1989	Trigo BR 34	PF 839204	Alvarez 110/2*IAS 54/6/Toropi /4/TZPP/ Sonora 64 // Napo /3/Ciano /5/PF 6968
1989	Trigo BR 35	PF 83144	IAC 5*2/3/CNT7*3/Londrina//IAC5/ Hadden

* Mass of the lines PF 79765, PF 79767, PF 79780, PF 79782, and PF 79799 not phenotypically distinguishable.

Brazil is located in the states of Rio Grande do Sul, Santa Catarina, and Paraná, and the crops developed by the CNPT are indicated for these states, especially in relation to adaptation and reaction to the main biotic and abiotic stresses.

Analyzing the contextualization per decade as of the

creation of Embrapa, the 1980s and the first decade of the twenty-first century were those that exhibited the greatest number of cultivars indicated for planting, regardless of the unit from which they were released (31 indications). In the past four years (2010 to 2013), 9 new wheat cultivars

Table 3. Wheat cultivars released by Embrapa in the CNPT unit from 1990 to 2013, name of the pre-commercial line, and cross

Year	Cultivar	Line	Cross
1990	Trigo BR 36-Ianomami	PF 84588	Jupateco 73*3/Amigo
1990	Trigo BR 37	PF 84431	Mazoe/F13279 // Pelado Marau
1990	Trigo BR 38	PF 83348	IAS 55*4/Agent//IAS 55*4/CI 14123
1991	Trigo BR 42-Nambiquara	PF 85634	Jupateco 73*6 // Lagoa Vermelha*5 /Agatha
1991	Trigo BR 43	PF 853031	PF 833007/Jacuí
1992	Embrapa 15	PF 85137	CNT 10/BR 5 // PF 75172/Tifton 72-59 Sel
1992	Embrapa 16	PF 86238	Hulha Negra/CNT 7 // Amigo/CNT 7
1993	Embrapa 24	PF 87128	Tifton 72-59 Sel/PF79763/3/Nobeoka Bozu /3*Londrina//B7908
1994	Embrapa 27	PF 869107	PF 83743 /5/PF 83182/4/CNT 10*4//Lagoa Vermelha*5 / Agatha /3/ Londrina*4/Agent // Londrina*3/Nyu Bai
1995	Embrapa 40	PF 84316	PF 7650/NS 18-78 // CNT 8/PF 7577
1996	Embrapa 52 ^P	PF 86242	Hulha Negra/CNT 7//Amigo/CNT 7
1996	BRS 49 ^P	PF 90120	BR 35/PF 83619//PF 858/PF 8550
1997	BRS 119 ^P	PF 9198	PF 82252/BR 35//Iapar 17/PF 8550
1997	BRS 120 ^P	PF 91205	PF 83899/PF 813//F27141
1999	BRS 176 ^P	PF 86247	Hulha Negra/CNT 7//Amigo/CNT 7
1999	BRS 177 ^P	PF 92093	PF 83899/PF 813//F27141
1999	BRS 179 ^P	PF 92140	BR 35/PF 8596/3/PF 772003*2/PF 813//PF 83899
2000	BRS 192 ^P	PF 93167	PF 869114/PF 8722
2000	BRS 194 ^P	PF 92231	CEP 14/BR 23//CEP 17
2002	BRS 209 ^P	PF 940384	Jupateco 73/Embrapa 16
2002	BRS Angico ^P	PF 960168	PF 87107/2*IAC 13
2002	BRS Figueira ^P	PF 960262	Coker 762*2/CNT 8
2002	BRS Timbaúva ^P	PF 950419	BR 32/PF 869120
2003	BRS 234 ^P	PF 950407	BR 35//Embrapa 27/Buck Ombu/3/PF 87511
2003	BRS Buriti ^P	PF 950400	Embrapa 27/Klein Orion
2003	BRS Camboatá ^P	PF 970151	PF 93232 Sel 14
2003	BRS Guabijú ^P	PF 970141	PF 86743/BR 23
2003	BRS Louro ^P	PF 970128	PF 869114/BR 23
2003	BRS Umbu ^P	PF 960243	Century/BR 35
2004	BRS Camboim ^P	PF 980144	Embrapa 27*4/K. Cartucho//PF 869114/BR 23
2004	BRS Canela ^P	PF 979064	BRS 120PF 91204*2//Anahuac 75
2004	BRS Guatambu ^P	PF 970285	Amigo/2*BR 23
2004	BRS Tarumã ^P	PF 970343	Century/BR 35
2005	BRS Guamirim ^P	PF 990407	Embrapa 27/Buck Nandu//PF 93159
2008	BRS 276	PF 980537	Embrapa 27*3/Klein H3247 a 33400PF 93218
2008	BRS 277	PF 990423	OR 1/Coker 97.33
2009	BRS 296 ^P	PF 990283	PF 93232/Cook*4/VPM1
2010	BRS 327 ^P	PF 030027	CEP 24 Sel/BRS 194
2012	BRS 328 ^P	PF 023186-C=A	Klein H 3394 a 3110/PF 990744
2012	BRS 331 ^P	PF 015733-C	PF 99602/WT 98109
2012	BRS 374 ^P	PF 040310	PF 88618/Coker 80.33//Frontana/Karl
2012	BRS Parrudo ^P	PF 070478	WT 98109/TB 0001
2013	BRS Marcante ^{EP}	PF 080310	PF 980533/PF 970227//BRS Guamirim

^P = Cultivar protected in the National Cultivar Protection Service - MAPA

were indicated, almost exclusively indicated by the CNPT. In Tables 2 and 3 are listed all the cultivars indicated by the CNPT. In Table 4 are the cultivars indicated by the CPAC. Table 5 shows the cultivars indicated by the CNPSO and, finally, in Table 6 are the cultivars developed by the CPAO.

The cultivars indicated by the CNPT went through four steps in relation to their commercial name. From 1975 to 1977, they were called “CNT” (Table 2). From 1979 to 1991, they were called “Trigo BR” (Table 2 and 3). From 1992 to 1996, they were called “Embrapa” (Table 3). As of 1997, with the advent of the Cultivar Protection Law (Lei de Proteção de Cultivares), they came to be called “BRS” (Table 3). These name changes occurred through the years due to the legal and strategic modifications of the company. The first decade of releases by the CNPT was highly influenced by the germplasm coming from the now extinct Instituto Agronômico do Sul (IAS), located in Pelotas, RS, present in almost all the cultivars indicated in this period (Table 2). From 1986 to 2002, the germplasm used for generation of the new cultivars was highly varied, from different origins.

As of 2002, Embrapa Trigo established a partnership with the Fundação Pró-Sementes de Apoio à Pesquisa (Pro-Seeds Research Support Foundation), with the goal of adapting to the need of a greater experimental network for determination of the Value for Cultivation and Use (VCU) trials of its lines for purposes of protection. The Foundation cited was responsible for bringing about the experimental network of the lines that originated in the unit and, in return, the producers connected with the institution were given priority in acquisition of the basic seed of the new cultivars for commercialization. In this period of partnership, 19 cultivars

were indicated for planting, namely, in chronological order (Table 3): BRS Angico, BRS Figueira, BRS Timbaúva, BRS Buriti, BRS Camboatá, BRS Guabijú, BRS Louro, BRS Umbú, BRS Camboim, BRS Canela, BRS Guatambu, BRS Tarumã, BRS Guamirim, BRS 276, BRS 277, BRS 327, BRS 328, BRS 331, and BRS 374. The complete description of some of these cultivars can be found in the published papers (Caierão et al. 2013, Scheeren et al. 2014). As a marketing strategy, most of them were given names of trees, and only at the end of the partnership did they come to be designated with numbers in series. The partnership between Embrapa Trigo and the Fundação Pró-Sementes de Apoio à Pesquisa ended in 2006. In spite of that, up to 2012, cultivars originating from the partnership were still indicated because the lines had already been included in the Annual Work Plans at the time the contract was terminated.

Of the 77 cultivars released by Embrapa Trigo in the forty years of research, some had great expression in the crops of Rio Grande do Sul, coming to be the most planted cultivars. We may cite especially CNT 10, in 1982; CNT 8, from 1985 to 1987; Trigo BR 23, from 1990 to 1994; Embrapa 16, from 1995 to 1998; BRS 49, in 2000; BRS 179, in 2002 and 2003 (Sousa 2004); and BRS Guamirim, in 2009. The cultivar BRS 179, for example, was notable for increase in the level of grain yield and tolerance to fusarium head blight, and it is used yet today in hybridizations for resistance to this fungus of the wheat spike. For its part, the cultivar BRS Guamirim established a different plant size parameter at the time of its release. Of low stature and very early cycle, it exhibited broad adaptation to all the wheat-growing regions of Brazil, with a rapid rise in planted area. The situation of the cultivar BRS Tarumã is noteworthy, indicated in 2004 (Table 3), with a dual-purpose profile, in

Table 4. Wheat cultivars released by Embrapa in the CPAC unit from 1974 to 2013, year of release, name of pre-commercial line, and cross

Year	Cultivar	Line	Cross
1978	Moncho BSB	-	Wren/Gaboto//Kalyansona/Blue Bird, Moncho Sib
1983	Trigo BR 9 - Cerrados	R 30469-77	BH 1146/IRN 595-71
1983	Trigo BR 10 - Formosa	R 30147-77	D6301/Nainari 60//Weique/Red Mace/3/Ciano*2 //Chris, Alondra 4546 Sel
1985	Trigo BR 12 - Aruanã	-	Bucky/Maya 74 Sib/4/Blue Bird//HD 832-5-5-Olesen/3/Ciano/Penjamo
1988	Trigo BR 26 - São Gotardo	CPAC 831243	Kavkaz/Buho Sib//Kalyasona/Blue Bird, Veery Sib
1989	Trigo BR 33 - Guarã	CPAC 841222	Buckbuck Sib/Bluejay Sib
1991	Trigo BR 39 - Paraúna	CPAC 841244	Dove Sib/Pewee Sib
1993	Embrapa 21	CPAC 86133	PAT 10/Alondra Sib//Veery 5
1993	Embrapa 22	CPAC 841153	Veery Sib/3/KLTO Sib/PAT 19//Mochis/Jup. 73
1995	Embrapa 41	CPAC 88118	PF 813/Polo 1
1995	Embrapa 42	CPAC 88130	LAP 689/MS 7936
1999	BRS 207 ^P	CPAC 91086	Seri 82/PF 813
2005	BRS 254 ^P	PF 973047	Embrapa 22*3/Anahuac 75
2005	BRS 264 ^P	CPAC 98222	Buck Buck/Chiroca//Tui

^P = Cultivar protected in the National Cultivar Protection Service - MAPA

spite of not appearing in the official seed production statistics. This cultivar exhibits characteristics differentiated from conventional wheat, adapted to crop-livestock integration, with tolerance to animal trampling, high tillering capacity, and capacity for creating new shoots when subjected to grazing. In the ten years after its release, the official seed volume produced was never significant, although increasing. In spite of that, it is estimated that in Rio Grande do Sul, approximately 10% of the area is planted to BRS Tarumã, especially in the dairy cattle regions. One of the factors that explain this absence in the official statistics is the fact of this cultivar being more used by small producers, who save its seed and thus multiply it. In 2012 and 2013, Embrapa Trigo indicated the cultivars BRS Parrudo and BRS Marcante, characterized by qualitative stability and bread improver profile. The cultivar BRS Parrudo provides an innovative proposal in the aspect of plant ideotype, combining stems resistant to lodging, upright leaves, high vigor in initial development of the plant and excellent resistances to the main biotic stresses of wheat. The cultivar BRS Marcante, for its part, stands out through high grain yield, without impairment of flour/gluten strength, a combination difficult to find in wheat breeding. Of the 77 cultivars indicated for

planting by Embrapa Trigo, 30 are protected (MAPA 2013), and one is in the process of obtaining protection (Table 3).

In spite of the effort already made in the Brazilian cerrado for development of wheat cultivars of an irrigated and dryland regime, both by Embrapa and other breeders, the area occupied in the region is not yet significant in comparison to the traditional areas of the south of Brazil. Since 1974, 14 wheat cultivars have been released for the region, of which only BRS 207, BRS 254, and BRS 264 are protected in MAPA (Table 4). Currently, the CPAC concentrates its efforts on development of wheat cultivars for the irrigated regime, with BRS 254 and BRS 264 standing out for high grain yield potential, a characteristic indispensable for disputing the space under irrigation pivots against vegetable crops. For several years, the cultivar Trigo BR 33 - Guarã was the cultivar most planted in Goiás and the Distrito Federal, mainly through its agronomic characteristics and resistance to lodging under irrigation (Sousa 2004). Due to cooperative efforts with the CNPT, some lines called "PF" resulted in cultivars indicated for dryland growing in Central Brazil, such as CNT 7, Trigo BR 8, Trigo BR 16 - Rio Verde, Trigo BR 24, and Trigo BR 25 (Sousa 2004). As of 2012, a specific program began in Uberaba,

Table 5. Wheat cultivars released by Embrapa in the CNPSo unit from 1974 to 2013, year of release, name of pre-commercial line, and cross

Year	Cultivar	Line	Cross
2000	BRS 193 ^P	WT 95068	Anahuac 75/PF 869100
2001	BRS 208 ^P	WT 96063	CPAC 89118/3/BR 23//CEP 19/PF 85490
2002	BRS 210 ^P	WT 96061	CPAC 89118/3/BR 23//CEP 19/PF 85490
2003	BRS 220 ^P	WT 98108	Embrapa 16/TB 108
2004	BRS 229 ^P	WT 96168	Embrapa 27*3//BR 35/Buck Poncho
2005	BRS 248 ^P	WT 99207	PAT 7392/PF 89232
2005	BRS 249 ^P	WT 00124	Embrapa 16/Anahuac 75
2007	BRS Pardela ^P	WT 02094	Trigo BR 18/PF 9099
2007	BRS Tangará ^P	PF 003295-A/B	BR 23*2/PF 940382
2011	BRS Gaivota ^P	WT 05106	PF 940301/PF 940395
2012	BRS Gralha Azul ^P	WT 07105	BRS 209//BRS Camboatá/LR 37
2013	BRS Sabiá ^P	WT 08111	BRS 210/PF 980583

^P = Cultivar protected in the National Cultivar Protection Service - MAPA

Table 6. Wheat cultivars released by Embrapa in the CPAO unit from 1974 to 2013, year of release, name of pre-commercial line, and cross

Year	Cultivar	Line	Cross
1984	Trigo BR 11 - Guarani	MS 7810	Bluebird//Tobari 66/8156
1986	Trigo BR 17 - Caiuá	MS 7878	Tezanos Pinto Prec//IRN 46/Ciano/3/II-64-27
1986	Trigo BR 18 - Terena	PF 781148	Unknown cross
1988	Trigo BR 29 - Javaé	MS 8166	Siskin Sib/Pavon Sib
1988	Trigo BR 30 - Cadiuéu	MS 81128	Ciano/8156//Tobari/Ciano/4/NO/3/II-12300//Lerma Rojo 64/8156/5/Pavon Sib
1988	Trigo BR 31 - Miriti	Veery 1	Kavkaz/Buho//Kalyansona//BB, Giennson 81
1991	Trigo BR 40 - Tuiúca	MS 208-84	Anahuac 75/Huacamayo Sib
1991	Trigo BR 41 - Ofaié	GD 833	BH 1146*6/Alondra Sib
1992	Embrapa 10 - Guajá	MS 21169-85	CNT 8*3/Sonora 64

from creation of a Tropical Wheat Research Station, also connected with Embrapa Trigo, for development of wheat cultivars for dryland conditions. The program has its own structure in Minas Gerais, from which promising results are expected through aggregation of the germplasm developed up to now, with additional multidisciplinary actions, and through cultivars, which exhibit greater adaptation to the growing system in the region.

Embrapa Soja (CNPSo) has a fundamental role as the research body connected with the national project of wheat breeding coordinated by Embrapa Trigo. From its activities, 12 wheat cultivars have been developed since 2000, with all of them under the protection of MAPA (Table 5). Practically all the cultivars originating from this unit were derived from “WT” lines developed in Londrina and adapted to the main problems of the northwest region of Paraná, important in wheat production in the state. The cultivars BRS 208 and BRS 220 may be highlighted and, more recently, the cultivars BRS Tangará and BRS Pardela. All the cultivars developed by Embrapa Soja, except for BRS 193 and BRS 208, resulted from a partnership with the Fundação Meridional de Apoio à Pesquisa (Meridional Research Support Foundation), in a manner similar to the partnership of Embrapa Trigo with the Fundação Pró-Sementes in Rio Grande do Sul. Nevertheless, in contrast with what occurred in RS, the partnership of Embrapa Soja with the Fundação Meridional still exists, and three other cultivars have been released in recent years: BRS Gaivota, BRS Galha Azul, and BRS Sabiá. The germplasm used in the genetic makeup of the cultivars indicated by Embrapa Soja is quite varied - Mexican materials (Anahuac 75 and Jupateco F3), Argentinian materials (Buck Poncho), and

Histórico de cultivares de trigo lançadas pela Embrapa em quarenta anos de pesquisa

Resumo – Em quarenta anos de melhoramento genético de trigo, a Embrapa (Empresa Brasileira de Pesquisa Agropecuária) desenvolveu mais de uma centena de novas cultivares, para diferentes regiões do Brasil. Com muita frequência, os melhoristas da Embrapa são demandados por informações de identificação dessas cultivares. As informações de ano de lançamento, nomenclatura de linhagem pré-comercial, cruzamento e unidade da empresa responsável pela indicação nem sempre são de fácil acesso além de estarem dispersas em diferentes documentos. O objetivo do trabalho foi realizar um levantamento histórico de todas as cultivares de trigo lançadas pela Embrapa. Desde 1974, a Embrapa lançou 112 cultivares de trigo, sendo 12 pelo Centro Nacional de Pesquisa de Soja - CNPSo (Londrina, PR), 14 pelo Centro de Pesquisa Agropecuária do Cerrado - CPAC (Brasília, DF), 9 pelo Centro de Pesquisa Agropecuária Oeste - CPAO (Dourados, MS) e 77 pelo Centro Nacional de Pesquisa de Trigo - CNPT (Passo Fundo, RS).

Palavras-chave: *Triticum aestivum*, germoplasma, cruzamento.

REFERENCES

- Beckman I (1954) Sobre o cultivo e melhoramento do trigo (*Triticum aestivum*) no sul do Brasil. *Agronomia Sulriograndense* 1: 64-72.
- Benin G, Storck L, Marchioro VS, Franco FA, Shuster I and Travizan DM (2013) Improving the precision of genotype selection in wheat

lines and cultivars from Embrapa and from other breeders, such as Fundacep (CEP).

Another research branch in genetic breeding of wheat from Embrapa is the Centro de Pesquisa Agropecuária Oeste, located in Dourados, MS. From there, 9 wheat cultivars have been indicated since 1984 (Table 6). Nevertheless, since 1992, no other cultivar has been developed. The reason is that the program lost strength because of small demand for the cereal crop in Mato Grosso do Sul and surrounding region. Of all the cultivars indicated through the CPAO, undoubtedly, Trigo BR 18 – Terena is the most important, and it is even internationally relevant. Developed for the dryland regime in 1986, it is still a reference for growing under the dryland regime for the entire region of Mato Grosso do Sul, Goiás, and Minas Gerais because of its tolerance to heat and to low water availability, together with its characteristics of quality and good plant architecture. Although its origin is unknown, it is still highly used in crosses in breeding programs. Because of the time since release, none of these cultivars indicated by the CPAO are protected and they have origin mainly in lines from Mato Grosso do Sul (MS lines).

CONCLUSION

Grouping of the release information of all the wheat cultivars of Embrapa from 1974 to 2013, with the year of release, the name of the pre-commercial line, the cross, and other additional information, will be useful for the production, academic, and even research segments, whatever the purpose may be. In addition, it is an important historical document of the work already performed by Embrapa in genetic breeding of wheat in Brazil.

performance trials. *Crop Breeding and Applied Biotechnology* 13: 234-240.

- Caierão E, Só e Silva M, Scheeren PL, Eichelberger L, Nascimento Jr A, Guarienti EM, Miranda MZ, Costamilan L, Santana FM, Maciel JLN, Pires JL, Lau D, Pereira PR, Carginin A and Castro RL (2013) BRS

- 374 - Wheat cultivar. **Crop Breeding and Applied Biotechnology** **13**: 212-214.
- Casassola A, Brammer SP, Chaves MS, Wietholter P and Caierão E (2013) Parental selection of wheat lines based on phenotypic characterization and genetic diversity. **Crop Breeding and Applied Biotechnology** **13**: 49-58.
- Comissão Brasileira de Pesquisa de Trigo e Triticale (2007) **Informações técnicas para trigo e triticale - safra 2008**. CNPT, Passo Fundo, 147p.
- Comissão Brasileira de Pesquisa de Trigo e Triticale (2008) **Informações técnicas para trigo e triticale - safra 2009**. CNPT, Passo Fundo, 172p.
- Comissão Brasileira de Pesquisa de Trigo e Triticale (2009) **Informações técnicas para trigo e triticale - safra 2010**. Fepagro, Veranópolis, 170p.
- Comissão Brasileira de Pesquisa de Trigo e Triticale (2010) **Informações técnicas para trigo e triticale - safra 2011**. Coodetec, Cascavel, 170p.
- Comissão Brasileira de Pesquisa de Trigo e Triticale (2011) **Informações técnicas para trigo e triticale - safra 2012**. CPAO, Dourados, 204p.
- Comissão Brasileira de Pesquisa de Trigo e Triticale (2012) **Informações técnicas para trigo e triticale - safra 2013**. Fundação Meridional, Londrina, 220p.
- Comissão Centro Brasileira de Pesquisa de Trigo (2004a) **Informações técnicas para a cultura do trigo na região do Brasil Central - Safras 2005 e 2006**. CNPAF, Goiânia, 82p.
- Comissão Centro Sul-Brasileira de Pesquisa de Trigo e Triticale (2005a) **Informações técnicas da Comissão Centro Sul-Brasileira de Pesquisa de Trigo e Triticale**. CNPSO, Londrina, 234p.
- Comissão Centro Sul-Brasileira de Pesquisa de Trigo e Triticale (2004b) **Informações técnicas das Comissões Centro Sul-Brasileira de Pesquisa de Trigo e de Triticale para a safra de 2004**. Iapar, Londrina, 218p.
- Comissão Sul-Brasileira de Pesquisa de Trigo e Triticale (2004c) **Indicações técnicas da Comissão Sul-Brasileira de Pesquisa de Trigo (Trigo e Triticale – 2004)**. CNPT, Passo Fundo, 152p.
- Comissão Sul-Brasileira de Pesquisa de Trigo e Triticale (2005b) **Indicações técnicas da Comissão Sul-Brasileira de Pesquisa de Trigo (Trigo e Triticale – 2005)**. Fundacep, Cruz Alta, 162p.
- Comissão Sul-Brasileira de Pesquisa de Trigo e Triticale (2006) **Informações técnicas para safra 2007: trigo e triticale**. CNPT, Passo Fundo, 147p.
- MAPA - Ministério da Agricultura, Pesca e Agropecuária (2013) **Lista de cultivares de trigo protegidas no Serviço Nacional de Proteção de Cultivares**. Available at <<http://extranet.agricultura.gov.br/php/snpc>>. Accessed on Dez 20, 2013.
- Scheeren PL, Caetano VR, Caierao E, Só e Silva M, Nascimento Jr A, Miranda MZ and Brammer SP (2014) BRS 328 – Double haploid bread wheat cultivar. **Crop Breeding and Applied Biotechnology** **14**: 65-67.
- Sousa CNA (1998) Criação de cultivares de trigo no Centro Nacional de Pesquisa de Trigo - período de 1986 a 1990. **Pesquisa Agropecuária Brasileira** **33**: 553-563.
- Sousa CNA (2003) **Cultivares de trigo no Brasil: cultivares estrangeiras não renomeadas no Brasil e indicadas para cultivo após 1970**. Embrapa Trigo, Passo Fundo, 64p.
- Sousa CNA (2004) **Cultivares de trigo indicadas para cultivo no Brasil e instituições criadoras**. Embrapa Trigo, Passo Fundo, 138p.