ITEMS FROM BRAZIL

BRAZILIAN AGRICULTURAL RESEARCH CORPORATION — EMBRAPA
Rodovia BR 285, km 294, Caixa Postal 451, Passo Fundo, RS, Brazil.

Wheat in Brazil – 2013 crop year.

Eduardo Caierão, Ricardo Lima de Castro, Márcio Só e Silva, and Pedro Luiz Scheeren.

In the 2013 crop year, Brazilian wheat production was about 6 x 10^6 tons (Conab 2014), which is enough to supply 50% of the domestic demand (Table 1). The deficit in production makes Brazil the largest wheat importer. The southern region, comprised of the states of Rio Grande do Sul, Santa Catarina, and Paraná, accounts for 95.3% of the national production. Nonetheless, due to the characteristics of the cultivation system, average grain yield in this region is not the highest in the country.

Table 1. Cultivated area, total production and grain yield of wheat in Brazil in 2013 (* estimated value - March, 2014. Source: CONAB. 2014. Companhia Nacional de Abastecimento. Central de Informações Agropecuárias/Grãos/Trigo. Available at: http://www.conab.gov.br/conabweb/index.php?PAG=131).

Region	Area (ha x 1,000)	Production (t x 1,000)	Grain yield (kg/ha)
North	—	—	—
Northeast	—	—	—
West-central	17.6	59.6	3,386.0
Southeast	88.1	210.6	2,390.0
South	2,104.1	5,257.7	2,499.0
Brazil [total]	2,209.8	5,527.9*	2,502.0*

In 2013, the wheat area cultivated was higher than in 2012 (2,209.8 versus 1,895.4). The total production and grain yield average/ha achieved in 2013 were 32.4% and 13.8% higher than that in 2012, respectively. Good weather conditions in the state of Rio Grande do Sul State important to the final wheat production in Brazil in the last crop season.

Reference.

CONAB. 2014. Companhia Nacional de Abastecimento. Central de Informações Agropecuárias/Grãos/Trigo. http://www.conab.gov.br/conabweb/index.php?PAG=131.

The history of wheat cultivars released from Embrapa in 40 years of research.

Eduardo Caierão, Pedro Luiz Scheeren, Márcio Só e Silva, and Ricardo Lima de Castro.

In 40 years of wheat genetic improvement, Embrapa developed over 100 new cultivars for different regions of Brazil. Too often, breeders demand information about the cultivars, such as year of release, name of precommercial line, genealogy, and the business unit responsible for the appointment, which are not always easily accessible and may be scattered in different papers. We conducted an historical survey of all cultivars released by Embrapa, aggregating into a single document the year of release, the name of pre-commercial line, the genealogy, and other information. Since 1974, Embrapa released 112 wheat cultivars (Table 2, pp. 6-8).

Table 2. Year of release, cultivar name, precommercial name, and genealogy of all wheat cultivars released by Embrapa, Passo Fundo, Brazil.

#	Year	Culivar name	Precommercial name	Genealogy
1	1975	CNT 1	PF 70225	PF 11-1000-62/BH 1146
2	1975	CNT 2	PEL 14049-68	IAS 16/Norin 26
3	1975	CNT 3	PF 70194	IAS 20/IAS 46
4	1976	CNT 4	PEL 13014-65	Lerma 50 /3/ IAS 31//IAS 20/Reliance
5	1976	CNT 5	PF 6946	IAS 46/BH 546
6	1976	CNT 6	PF 69162	IAS 20/IAS 50
7	1976	CNT 7	PF 70546	IAS 51 // IAS 20/ND 81
8	1976	CNT 8	PEL-SL-1268-69	IAS 20/ND 81
9	1977	CNT 9	PEL 72016	IAS 46/IAS 49 // IAS 46/Tokai 66
10	1977	CNT 10	PEL 72018	IAS 46/IAS 49 // IAS 46/Tokai 66
11	1978	Moncho BSB	—	Wren/Gaboto//Kalyansona/Blue Bird, Moncho Sib
12	1979	Trigo BR 1	PF 70402	IAS 20/IAS 50
13	1979	Trigo BR 2	PF 7158	IAS 50/4/IAS 46/3/Vilela Sol*4//Egypt101/Timstein
14	1979	Trigo BR 3	PF 72518	IAS 50/4/IAS 46/3/Vilela Sol*4//Egypt101/Timstein
15	1979	Trigo BR 4	PF 73226	IAS 20*3/Sinvalocho Gama
16	1980	Trigo BR 5	PF 74354	IAS 59 // IAS 52/Gasta
17	1980	Trigo BR 6	PEL 73538	IAS 20/Toropi
18	1981	Trigo BR 7	PF 72206	IAS 20/Toropi
19	1983	Trigo BR 8	PF 75171	IAS 20/Toropi // PF 70100
20	1983	Trigo BR 9 - Cerrados	R 30469-77	BH 1146/IRN 595-71
21	1983	Trigo BR 10 - Formosa	R 30147-77	D6301/Nainari 60//Weique/Red Mace/3/Ciano*2//Chris, Alondra 4546 Sel
22	1984	Trigo BR 11 - Guarani	MS 7810	Bluebird//Tobari 66/8156
23	1985	Trigo BR 13	PF 782027	IAS 51 // IAS 20/ND 81, CNT 7 Sel
24	1985	Trigo BR 14	Multilinha*	IAS 63/Alondra Sib // Gaboto/Lagoa Vermelha
25	1985	Trigo BR 15	PF 79300	IAS 54*2/Tokai 80 // PF 69193
26	1985	Trigo BR 12 - Aruanã	—	Bucky/Maya 74 Sib/4/Blue Bird//HD 832-5-5-Olesen/3/Ciano/Penjamo
27	1986	Trigo BR 16-Rio Verde	PF 79678	PF 70402/Alondra Sib//PAT72160/Alondra Sib
28	1986	Trigo BR 19	PF 79502	CNT 1/CNT 10
29	1986	Trigo BR 17 - Caiuá	MS 7878	Tezanos Pinto Prec//IRN 46/Ciano/3/II-64-27
30	1986	Trigo BR 18 - Terena	PF 781148	Cruzamento desconhecido
31	1987	Trigo BR 20-Guató	PF 81189	BH 1146*3/Alondra Sib
32	1987	Trigo BR 21-Nhandeva	PF 79475	Cajeme 71/PF 70553
33	1987	Trigo BR 22	PF 7942	PF 81130/CNT 10
34	1987	Trigo BR 23	PF 8215	Corre Caminos/Alondra Sib /3/IAS54-20 /Cotiporã//CNT 8
35	1988	Trigo BR 24	PF 8150	IAS 58*2/Eagle
36	1988	Trigo BR 25	PF 81230	BH 1146*3/Alondra Sib
37	1988	Trigo BR 27	PF 80271	RC 7201/BR 2
38	1988	Trigo BR 28	PF 81330	IAS 55/PF 70553
39	1988	Trigo BR 32	PF 82345	IAS 60/Indus //IAS62/3/AlondraSib/4/IAS 59
40	1988	Trigo BR 26 - São Gotardo	CPAC 831243	Kavkaz/Buho Sib//Kalyasona/Blue Bird,Veery Sib
41	1988	Trigo BR 29 - Javaé	MS 8166	Siskin Sib/Pavon Sib

Table 2. Year of release, cultivar name, precommercial name, and genealogy of all wheat cultivars released by Embrapa, Passo Fundo, Brazil.

#	Year	Culivar name	Precommercial name	Genealogy
42	1988	Trigo BR 30 - Cadiuéu	MS 81128	Ciano/8156//Tobari/Ciano/4/NO/3/II-12300// Lerma Rojo 64/8156/5/Pavon Sib
43	1988	Trigo BR 31 - Miriti	Veery 1	Kavkaz/Buho//Kalyansona//BB, Giennson 81
44	1989	Trigo BR 34	PF 839204	Alvarez 110/2*IAS 54/6/Toropi /4/TZPP/ Sonora 64 //Napo /3/Ciano /5/PF 6968
45	1989	Trigo BR 35	PF 83144	IAC 5*2/3/CNT7*3/Londrina//IAC5/ Hadden
46	1989	Trigo BR 33 - Guará	CPAC 841222	Buckbuck Sib/Bluejay Sib
47	1990	Trigo BR 36-Ianomami	PF 84588	Jupateco 73*3/Amigo
48	1990	Trigo BR 37	PF 84431	Mazoe/F13279 // Pelado Marau
49	1990	Trigo BR 38	PF 83348	IAS 55*4/Agent//IAS 55*4/CI 14123
50	1991	Trigo BR 42-Nambi-quara	PF 85634	Jupateco 73*6//Lagoa Vermelha*5 /Agatha
51	1991	Trigo BR 43	PF 853031	PF 833007/Jacuí
52	1991	Trigo BR 39 - Paraúna	CPAC 841244	Dove Sib/Pewee Sib
53	1991	Trigo BR 40 - Tuiúca	MS 208-84	Anahuac 7/Huacamayo Sib
54	1991	Trigo BR 41 - Ofaié	GD 833	BH 1146*6/Alondra Sib
55	1992	Embrapa 15	PF 85137	CNT 10/BR 5//PF 75172/Tifton 72-59 Sel
56	1992	Embrapa 16	PF 86238	Hulha Negra/CNT 7// Amigo/CNT 7
57	1992	Embrapa 10 - Guajá	MS 21169-85	CNT 8*3/Sonora 64
58	1993	Embrapa 24	PF 87128	Tifton 72-59 Sel/PF79763/3/Nobeoka Bozu /3*Londrina//B7908
59	1993	Embrapa 21	CPAC 86133	PAT 10/Alondra Sib//Veery 5
60	1993	Embrapa 22	CPAC 841153	Veery Sib/3/KLTO Sib/PAT 19//Mochis/Jup. 73
61	1994	Embrapa 27	PF 869107	PF 83743/5/PF 83182/4/CNT10*4//Lagoa Vermelha*5/Agatha /3/ Londrina*4/Agent // Londrina*3/Nyu Bai
62	1995	Embrapa 40	PF 84316	PF 7650/NS 18-78 // CNT 8/PF 7577
63	1995	Embrapa 41	CPAC 88118	PF 813/Polo 1
64	1995	Embrapa 42	CPAC 88130	LAP 689/MS 7936
65	1996	Embrapa 52	PF 86242	Hulha Negra/CNT 7//Amigo/CNT 7
66	1996	BRS 49	PF 90120	BR 35/PF 83619//PF 858/PF 8550
67	1997	BRS 119	PF 9198	PF 82252/BR 35//Iapar 17/PF 8550
68	1997	BRS 120	PF 91205	PF 83899/PF 813//F27141
69	1999	BRS 176	PF 86247	Hulha Negra/CNT 7//Amigo/CNT 7
70	1999	BRS 177	PF 92093	PF 83899/PF 813//F27141
71	1999	BRS 179	PF 92140	BR 35/PF 8596/3/PF 772003*2/PF 813//PF 83899
72	1999	BRS 207	CPAC 91086	Seri 82/PF 813
73	2000	BRS 192	PF 93167	PF 869114/PF 8722
74	2000	BRS 194	PF 92231	CEP 14/BR 23//CEP 17
75	2000	BRS 193	PF 95068	Anahuac 75/PF 869100
76	2001	BRS 208	WT 96053	CPAC 89119/3/BR 23//CEP 19/PF 85490
77	2002	BRS 209	PF 940384	Jupateco 73/Embrapa 16
78	2002	BRS Angico	PF 960198	PF 87107/2*IAC 13
79	2002	BRS Figueira	PF 950262	Coker 762*2/CNT 8
80	2002	BRS Timbaúva	PF 950419	BR 32/PF 869120
81	2002	BRS 210	WT 96061	CPAC 89119/3/BR 23//CEP 19/PF 85490
82	2003	BRS 234	PF 950407	BR 35//Embrapa 27/Buck Ombu/3/PF 87511
83	2003	BRS Buriti	PF 950400	Embrapa 27/Klein Orion

Table 2. Year of release, cultivar name, precommercial name, and genealogy of all wheat cultivars released by Embrapa, Passo Fundo, Brazil.

#	Year	Culivar name	Precommercial name	Genealogy
84	2003	BRS Camboatá	PF 970151	PF 93232 Sel 14
85	2003	BRS Guabijú	PF 970141	PF 86743/BR 23
86	2003	BRS Louro	PF 970128	PF 869114/BR 23
87	2003	BRS Umbu	PF 960243	Century/BR 35
88	2003	BRS 220	WT 98109	Embrapa 16/TB 108
89	2004	BRS Camboim	PF 980144	Embrapa 27*4/K. Cartucho//PF 869114/BR 23
90	2004	BRS Canela	PF 979064	BRS 120PF 91204*2//Anahuac 75
91	2004	BRS Guatambu	PF 970285	Amigo/2*BR 23
92	2004	BRS Tarumã	PF 970343	Century/BR 35
93	2004	BRS 229	WT 96168	Embrapa 27*3//BR 35/Buck Poncho
94	2005	BRS Guamirim	PF 990407	Embrapa 27/Buck Nandu//PF 93159
95	2005	BRS 254	PF 973047	Embrapa 22*3/Anahuac 75
96	2005	BRS 264	CPAC 98222	Buck Buck/Chiroca//Tui
97	2005	BRS 248	WT 99207	PAT 7392/PF 89232
98	2005	BRS 249	WT 00124	Embrapa 16/Anahuac 75
99	2007	BRS Pardela	WT 02094	Trigo BR 18/PF 9099
100	2007	BRS Tangará	PF 003295-A/B	BR 23*2/PF 940382
101	2008	BRS 276	PF 980537	Embrapa 27*3/Klein H3247 a 33400PF 93218
102	2008	BRS 277	PF 990423	OR 1/Coker 97.33
103	2009	BRS 296	PF 990283	PF 93232/Cook*4/VPM1
104	2010	BRS 327	PF 030027	CEP 24 Sel/BRS 194
105	2011	BRS Gaivota	WT 05106	PF 940301/PF 940395
106	2012	BRS 328	PF 023186-C=A	Klein H 3394 a 3110/PF 990744
107	2012	BRS 331	PF 015733-C	PF 99602/WT 98109
108	2012	BRS 374	PF 040310	PF 88618/Coker 80.33//Frontana/Karl
109	2012	BRS Parrudo	PF 070478	WT 98109/TB 0001
110	2012	BRS Gralha Azul	WT 07105	Jupateco F3/Embrapa 16//BRS Camboatá/LR 37
111	2013	BRS Marcante	PF 080310	PF 980533/PF 970227//BRS Guamirim
112	2013	BRS Sabiá	WT 08111	BRS 210/PF 980583

Performance of wheat cultivars in Rio Grande do Sul State, Brazil, 2012.

Ricardo Lima de Castro, Eduardo Caierão, Márcio Só e Silva, and Pedro Luiz Scheeren (Embrapa Trigo), and Jacson Zuchi and Rogério Ferreira Aires (Fepagro Nordeste, C.P. 20, 95.000-000 Vacaria, Rio Grande do Sul, Brazil).

The Brazilian Commission of Wheat and Triticale Research (CBPTT) annually conducts the State Test of Wheat Cultivars in Rio Grande do Sul State (EECT-RS) to support the identification of cultivars. This work had the objective to evaluate wheat cultivar grain yield performance of the EECT-RS in 2012. The yield grain performance of 32 wheat cultivars (Ametista, BRS 327, BRS 328, BRS 331, BRS 374, BRS Guamirim, CD 114, CD 121, CD 122, CD 123, CD 124, CD 1550, Fundacep Bravo, Fundacep Horizonte, Fundacep Raízes, JF 90, Marfim, Mirante, Quartzo, TBIO Alvorada, TBIO Iguaçu, TBIO Itaipu, TBIO Mestre, TBIO Pioneiro, TBIO Seleto, TBIO Sinuelo, TBIO Tibagi, TEC Frontale, TEC Triunfo, TEC Vigore, and Topázio e Turquesa) was studied in 13 environments (Cruz Alta – season 1, Cruz Alta – season 2, Júlio de Castilhos, Não-Me-Toque, Passo Fundo – seasons 1 and 2, Sertão, Vacaria, Augusto Pestana, Eldorado do Sul, Independência, and São Borja e São Luiz Gonzaga) in the state of Rio Grande do Sul in 2012. The experiments were in a randomized block design with three or four repetitions. Each plot consisted of five 5-m rows with a 0.2-m spacing between rows and a plant density of ~330 plants m^2. Grain yield data (kg/ha) were subjected to individual analyses of variance (for each environment) and to grouped analyses of variance (for all environments). The grouped analysis of variance was performed after the verification of homogeneity of residual variances, employing the mixed model (fixed

cultivar effect and randomized environment effect). The grain yield performance of wheat cultivars was evaluated by analysis of adaptability and stability, employing the method of distance from the ideal cultivar, weighted by the coefficient of residual variation, proposed by Carneiro (1988). In this analysis, the ideal cultivar was considered as the cultivar with high grain yield, high stability, low sensitivity to adverse conditions of unfavorable environments, and able to respond positively to improvement of favorable environments. The general average of the EECT-RS in 2012 was 3,699 kg/ha. The experiment conducted in Augusto Pestana had the highest average of wheat grain yield of 5,575 kg/ha. The maximum of wheat grain yield was 7,021 kg/ha in Augusto Pestana (Quartzo cultivar). The Quartzo, TBIO Itaipu, and Mirante cultivars had adaptability and stability in favorable environments (environments with average of wheat grain yield higher than the general average). Cultivars TEC Triunfo and TEC Frontale were adaptable and stable in unfavorable environments (environments with average of wheat grain yield lower than the general average). In general, for the average of all environments, cultivars TBIO Sinuelo (4,286 kg/ha), TBIO Mestre (4,121 kg/ha), and BRS 327 (3,950 kg/ha) came closest to the definition of the ideal cultivar.

Reference.

Carneiro PCS. 1998. New methodologies for analyzing the stability and adaptability of behavior (PhD thesis in Genetics and Breeding). Federal University of Viçosa, 168 pp.

Wheat crop in the state of Rio Grande do Sul, Brazil, 2012.

Ricardo Lima de Castro, Eduardo Caierão, Aldemir Pasinato, Pedro Luiz Scheeren, and Márcio Só e Silva.

The state of Rio Grande do Sul is one of the main wheat-producing states in Brazil. Our objective was to analyze the wheat crop in Rio Grande do Sul in 2012. In 2012, Rio Grande do Sul harvested 961,502 ha of wheat (50.3% of the total area harvested in Brazil) producing 1,866,254 tons of wheat (42.2% of the Brazilian production) with an average grain yield of 1,941 kg/ha (369 kg/ha below the Brazilian average of 2,310 kg/ha). Among the geographical mesoregions in Rio Grande do Sul (Fig. 1), the RS Northwest mesoregion harvested the largest wheat area, 761,248 ha (79.2% of the cropped area in the state), and had the largest production, 1,385,194 tons of wheat grain (74.2% of the state production) (Table 3). However, the average of wheat grain yield obtained in this mesoregion was the lowest of the State, 1,820 kg/ha (121 kg/ha below the state average) (Table 3). The RS Western Center mesoregion harvested 81,298 ha of wheat (8.5% of the cropped area in the state), produced 206,772 tons of wheat grain (11.1% of the state production), and had the highest average wheat grain yield in the state (2,543 kg/ha, 602 kg/ha above the state average) (Table 3). The wheat crop in Rio Grande do Sul in 2012 was hampered by adverse weather, such as a late frost, strong winds, and hail. Comparing the wheat crop data with the results of the State Test of Wheat Cultivars in Rio Grande do Sul State (EECT-RS) in 2012, we observed that the average of wheat grain yield of commercial crops was 1,758 kg/ha below the average of the EECT-RS (3,699 kg/ha).

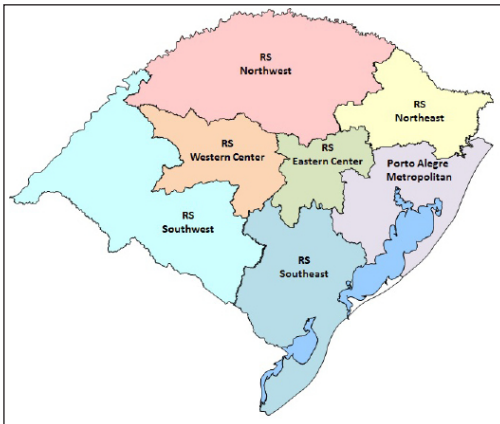

Fig. 1. Mesoregions in the state of Rio Grande do Sul, Brazil.

Table 3. Area harvested, production, and average of grain yield of wheat per mesoregion in the state of Rio Grande do Sul, Brazil, in 2012 (Source http://www.sidra.ibge.gov.br/bda/tabela/listabl.asp?z=t&o=11&i=P&c=1612 (In Spanish, English translation of web site available)).

Mesoregion	Area harvested		Production		Grain yield
	ha	%	tons	%	kg/ha
RS Northwest	761,248	79.2	1,385,194	74.2	1,820
RS Northeast	45,125	4.7	112,437	6.0	2,492
RS Western Center	81,298	8.5	206,772	11.1	2,543
RS Eastern Center	13,393	1.4	25,586	1.4	1,910
Porto Alegre Metropolitan	1,078	0.1	2,253	0.1	2,090
RS Southwest	49,160	5.1	112,364	6.0	2,286
RS Southeast	10,200	1.1	21,648	1.2	2,122
Rio Grande do Sul state	**961,502**	**100.0**	**1,866,254**	**100.0**	**1,941**

Reference.
IBGE. 2014. Sistema IBGE de Recuperação Automática - SIDRA. Available at < http://www.sidra.ibge.gov.br/bda/tabela/listabl.asp?z=t&o=11&i=P&c=1612 >, 28 March 2014. Note: Bank of aggregate data studies and research conducted by IBGE.

ITEMS FROM GERMANY

LEIBNIZ–INSTITUT FÜR PFLANZENGENETIK UND KULTURPFLANZENFORSCHUNG — IPK GATERSLEBEN
Correnstraße 3, 06466 Stadt Seeland, Germany.

A. Börner, F. Arana-Ceballos, A. Bakhsh, Yu.V. Chesnokov, A.M. Castro, G. Gerard, E.I. Gordeeva, C. Jaenicke, T. Kartseva, E.K. Khlestkina, S. Landjeva, J. Ling, U. Lohwasser, V. Morozova, M. Nagel, S. Navakode, S.V. Osipova, A.V. Permyakov, M.D. Permyakova, T.A. Pshenichnikova, M.A. Rehman Arif, M.S. Röder, A. Sanabria, A. Shishparenok, L.V. Shchukina, M.R. Simon, A.V. Simonov, O.G. Smirnova, M. Taylor, Chr. Volkmar, Chr. K. Zaynali Nezhad, and D. Zanke.

Grain size QTL region QTgw.ipk-7D in wheat: sequence analysis and synteny to related grass species.

The previously described QTL for 1,000-kernel weight *QTgw.ipk-7D* associated with microsatellite marker *Xgwm1002-7D* was originally detected in a BC_2F_3 advanced backcross population of the winter wheat cultivar Prinz and the synthetic wheat line W-7984 (lab designation: M6). We developed near-isogenic lines (NILs) carrying introgressions of M6 in the genetic background of Prinz with varying size on chromosome 7DS. The BC_4F_3 NILs had a 10% increase in 1,000-kernel weight compared to the control group and the recurrent parent Prinz. The same QTL was detected in another population of the winter wheat Flair and a synthetic wheat XX86. By using homozygous recombinant lines developed from both populations, it was possible to fine-map *QTgw.ipk-7D* to an interval of approximately 1 cM flanked by markers barc126, wmc405, and gwm44 on wheat chromosome arm 7DS. From a chromosome arm 7DS-specific BAC library (provided by J. Dolezel and H. Simkova), BACs covering the region of *QTgw.ipk-7D* were isolated, and their sequences were obtained by 454 sequencing. Of the sequenced BACs, new microsatellite markers were developed and used for anchoring the BACs to the genetic map. Finally, the region of *QTgw.ipk-7D* was delimited to 10 BACs carrying at least 12 predicted genes. Good synteny to the genomic sequences of rice, *Brachypodium*, and *Sorghum* was observed. A BAC contig covering the respective genomic region in barley was identified and also completely sequenced. A detailed comparison of the barley sequence to the wheat sequence with respect to genome evolution is currently conducted.

Genetic architecture of heading date in European winter wheat.

A genome-wide association study (GWAS) for heading date (HD) was performed with a panel of 358 European winter wheat and 14 spring wheat cultivars through the phenotypic evaluation of HD in field tests in eight environments in collaboration with breeding companies (2009 and 2010 in Andelu (FR), Seligenstadt (DE) and Wohlde (DE); 2010 in Janville (FR) and Saultain (FR)). Genotyping data consisted of 770 mapped microsatellite (SSR) loci and 7,934 mapped SNP markers derived from the Infinium 90K iSelect wheat chip. Best linear unbiased estimations (BLUEs) were calculated across all eight environments and ranged from 142.5 to 159.6 days after 1 January with an average value of 151.4 days. For association mapping, a mixed linear model corrected with a kinship matrix for population stratification was employed. Considering only associations with a –log10 (P-value) ≥ 3.0, a total of 358 SSR and 2,983 SNP marker-trait associations (MTAs) were detected. After Bonferroni correction for multiple testing, a total of 90 SSR and 438 SNP