Registration of Winter Wheat Germplasm Line RCATL33 with Fusarium Head Blight Resistance and Reduced Deoxynivalenol Accumulation

RCATL33 soft red winter wheat (*Triticum aestivum* L.) (Reg. no. GP-802, PI 641220) was developed by the Ridgetown Campus of the University of Guelph, Ridgetown, ON. The main criterion for selection was to combine two types of resistance to Fusarium head blight (FHB) [caused by *Fusarium graminearum* Schwabe; teleomorph *Gibberella zeae* (Schweinitz) Petch]. Those sources were ‘Sumai 3’ (PI 481542) from China and ‘Frontana’ (PI 500147, Ctr 12470) from Brazil. A second breeding objective was to obtain a genotype with a low level of symptom expression plus lower mycotoxin deoxynivalenol (DON) content.

RCATL33 was derived from the cross ‘Ruby’/‘Frontana #1’ // ‘AC Ron’/3/25R18/AC Ron. AC Ron (CAN-3552) has the pedigree ‘Harus’/‘Augusta’. The wheat cultivar 25R18 was developed by Pioneer Hi-Bred International and has the pedigree ‘WBGO195E2’//2510/2510. ‘WBGO195E2’ has Type 2 FHB resistance (resistance to spread within the spike) (Schroeder and Christensen, 1963; Mesterhazy, 1995) derived from the spring wheat landrace ‘Sumai 3’ from China. The parental line Ruby/Frontana #1 was developed by University of Guelph and has Type 1 FHB resistance (resistance to initial infection) (Schroeder and Christensen, 1963; Mesterhazy, 1995) derived from the spring wheat Frontana, which originated in Brazil. Frontana has the pedigree ‘Frontane’/‘Mentana’. Ruby has the pedigree ‘Frederick’/‘Priboi’.

The cross from which RCATL33 originated was made in 1999 at Ridgetown, ON. The F1 generation was grown in the growth room at University of Guelph to produce the F2 seed. The bulked population was planted from the F2 to F4 generations at Ridgetown, ON, in the 2003 growing season. A single F7 head row was ally threshed and planted in separate 2-m head rows at Ridgetown, ON, in the 2003 growing season. A single F2 head row was selected based on FHB resistance and harvested for seed increase.

RCATL33 was evaluated with 50 other breeding lines in ten *F. graminearum* inoculated field trials in the Northern Uniform Winter Wheat Scab Nursery (NUWWSN) in 2003 (Sneller and Lipps, 2003) and among 56 breeding lines in 15 inoculated field trials in 2004 (Sneller et al., 2004). RCATL33 was among the genotypes with the lowest FHB index ([severity][incidence])/100 and DON levels in the NUWWSN test in both years (Sneller and Lipps, 2003; Sneller et al., 2004). RCATL33 had an FHB index of 18.8% compared with 51.1% for a susceptible check (’Pioneer 2545’). Severity values (disease spread within the spike) were 23.0 and 42.3%, while for incidence (initial infection) they were 48.5% and 76.1%, for RCATL33 and Pioneer 2545, respectively. DON levels were 7.2 mg kg⁻¹ for RCATL33 and 11.0 mg kg⁻¹ for Pioneer 2545. The data were averaged over all locations for both years.

Alleles of the molecular markers that have been associated with quantitative trait loci for resistance to FHB, *barc* 45 (3A), *Xgwm* 5 (3A), *Xgwm* 533 (3BS), *barc* 147 (3BS), and *Xgwm* 493 (3BS), were determined for RCATL33. RCATL33 carries alleles from both parental sources of FHB resistance. RCATL33 contains the Frontana alleles (200 bp for *barc* 45 and 196 bp for *Xgwm* 5 on chromosome 3A [Steiner et al., 2004]) and the Sumai 3 alleles (160 bp for *Xgwm* 533, 123 bp for *barc* 147, and 213 bp for *Xgwm* 493 on chromosome 3BS [Waldron et al., 1999; Anderson et al., 2001]).

In 2004, RCATL33 was tested in replicated yield trials in Ridgetown and Woodstock, ON. RCATL33 is a tall (about 120 cm), early heading (144 and 156 d from 1 January to heading, in Ridgetown and Woodstock, respectively) wheat with awns. RCATL33 yielded 4700 kg ha⁻¹ in Ridgetown, and 4900 kg ha⁻¹ in Woodstock, compared to a test mean yield of 6400 kg ha⁻¹ in both locations. RCATL33 is lacking a high yield potential, so cannot be registered as a cultivar in Ontario. According to our best knowledge, RCATL33 is the first line that combines Sumai 3 and Frontana FHB resistance, so it is useful for FHB resistance breeding.

Quality testing conducted by the Grain Quality Laboratory (Agriculture and Agri-Food Canada, EZCORC, Ottawa, ON) indicated that RCATL33 and the check cultivar Augusta, had a falling number of 245 and 340, and a flour protein content of 14.0 and 8.5%, respectively (on a 14% moisture basis), from grain obtained from Ridgetown in 2003.

Seed (approximately 5 g) may be obtained from the corresponding author.

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