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The 2007 Georgia winter wheat crop was grown on about 320,000 planted acres. Yields of wheat grown by top producers were around 6000 kg/ha on resistant cultivars to stripe rust. Average yield for the state was 3,200 kg/ha. The growing season was characterized by drought conditions in the autumn, which delayed planting, and in the spring by very dry conditions during the grain-filling period. A lack of vernalization was a problem for late maturing varieties. A late freeze in April with low temperatures of –4°C during boot stage resulted in very low yields for early and medium-maturing cultivars.

Breeding.

Three wheat cultivars, GA951231-4E25 (**Oglethrope**), GA951231-4E26 (**AGS 2026**), and GA96693-4E16 (**AGS 2020**), which are high-yielding, broadly adapted cultivars, were released by the University of Georgia in 2007 for growers in the Southeast. These three soft red winter wheat cultivars are high yielding with excellent test weight, disease and insect resistance, and will offer new sources of resistance to both pathogens and insects. Olgethrope and AGS 2026 have excellent Hessian fly (*H13*) and stripe and leaf rust resistance (*Lr37 Yr17*). Both cultivars are medium-maturing soft wheats. AGS 2020 is stripe and leaf rust resistant and is a medium maturing soft wheat with excellent milling and baking quality. All three cultivars have good resistance to wheat soil-borne mosaic virus.

GA 96693-4E16 (AGS 2020) is an early maturing, white chaffed, medium height line. AGS2020 was derived from the cross 'GA 88151/Hickory//AGS 2000'. The maturity is 3 days earlier than that of AGS 2000. AGS2020 is moderately resistant to current biotypes of Hessian fly in Georgia, resistant to races of leaf rust and stripe rust in the southeast U.S, and also resistant to soil-borne mosaic virus and powdery mildew.

GA 951231-4E25 (Virgoro Olgethorpe) is a medium-maturing, white chaffed, medium height line. The line was derived from the cross 'GA881130/Coker 9134'. The pedigree of GA 881130 is 'KSH8998/FR 81-10//Gore'. KSH8998 was developed from the cross of a hard wheat with *Ae. tauchii* to transfer Hessian fly resistance (*H13*). FR 81-10 was selected due to its resistance to leaf rust (*Lr37 Yr17*) from the cross 'Novisad 138/4/(4) *Ae. ventricosa*/*T. persicum*/2/Marve*3/3/Moisson'. Maturity is similar to that of AGS 2000. Virgoro Olgethopre is resistant to current biotypes of Hessian fly in Georgia including biotype L and is resistant to races of leaf rust and stripe rust due to adult-plant resistance, resistant to soil-borne mosaic virus, and susceptible to powdery mildew.

GA 951231-4E26 (AGS 2026) is a medium-maturing, white chaffed, medium height line. AGS2026 was derived from the cross 'GA881130/Coker 9134'. The pedigree of GA 881130 is 'KSH8998/FR 81-1//Gore'. KSH8998 was developed from the cross of a hard wheat with *Ae. tauchii* to transfer Hessian fly resistance (*H13*). FR 81-10 was selected due to its resistance to leaf rust (*Lr37 Yr17*) from the cross 'Novisad 138/4/(4) *Ae. ventricosa*/*T. persicum*/2/ Marve*3/3/Moisson'. AGS2026 is similar in maturity to AGS 2000. This cultivar is resistant to current biotypes of Hessian fly in Georgia including biotype L, is resistant to races of leaf rust and stripe rust due to adult-plant resistance, also is resistant to soil-borne mosaic virus, and susceptible to powdery mildew.

Leaf and stripe rust

Leaf rust was very severe in 2007. We identified effective genes such as *Lr37 Yr17* and derived lines from AGS 2000.

Stripe rust. Breeding lines and cultivars from universities and private companies (713 entries in 2006 and 380 entries in 2007) were evaluated in the field at Plains and Griffin, GA. Plots were inoculated with a local field culture of stripe rust. The races of stripe rust used for inoculation were collected in Georgia, identified and designated as PST 101 and 102 (Dr. X.M. Chen, Pullman, WA). Stripe rust infection type and percent severity data were assessed multiple times at each location. The results indicated that numerous cultivars and lines possess the resistant gene *Yr17* in SRWW. Other sources of seedling resistance were also identified in PIO26R61, Kinsco, and VA 270. A total of 102 lines from the field nursery were identified as having a level of resistance better than that of Pioneer 26R61. The first large-scale replicated screening of 591 breeding lines for stripe rust was undertaken early in 2007 using growth chambers. Eighty-nine lines were detected with some resistance. Again, the majority of the lines had the resistant gene *Yr17*. From field evaluations and a large seedling screening, a number of lines with adult-plant resistance were identified such as AGS 2031, AGS 2020, and PIO26R61. Additional evaluations are proposed to identify other sources of adult plant resistance.

Hessian Fly.

Wheat entries were evaluated at two locations, Griffin and Plains, GA. Several wheat cultivars showed good levels of Hessian fly resistance at Plains, GA, including aGS 2000, AGS 2010, AGS 2060, Jamestown, Pioneer 26R31, Pioneer 26R61, Coker 9152, SS 8641, AGS 2026, and Olgethorpe.

Scab.

Fusarium head blight is a potential devastating disease in the southeast region in the United States where low temperature and misted weather occurs frequently during SRWW flowering. Releasing new cultivars resistant to FHB is the most effective option to minimize the chance of FHB incidence and reducing DON contamination. Crosses were made since 2001 between AGS2000 or its derivatives and the FHB-resistant donor VA01-461 to introduce the exotic resistant genes into our widely local adaptive genetic background. Twelve advanced lines, 941523-E21, 991109-6E8, 991109-6A7, 991371-6E12, 991371-6E13, 031454-DH7, 031454-DH31, 031307-DH6, 031307-DH14, 031354-DH30, 981621-5E34, and 951306-2E13, derived from VA01W-461, which is a derivative of Sumai 3, were evaluated in scab nursery and field in 2006 and 2007 for FHB resistance and agronomy performances with Ernie and Coker 9835 as resistant and susceptible controls, respectively, under misted conditions in Griffin-Campus, GA. DNA markers, XGWM533, BARC133, XGWM493, and STS3B-256 for QTL on 3BS; BARC117, XGWM156, BARC186, and BARC56, for QTL on 5AS; BARC18, and BARC91 for QTL on 2BS were employed to genotype 12 new lines with the donor parent of VA01W-461.

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Wheat production.

According to the USDA National Agricultural Statistics Service, Indiana farmers harvested 150,000 hectares (370,000 acres) of wheat in 2007, down 18% from 2006. Wheat yields in Indiana averaged 3,830 kg/ha (57 bu/acre) in 2007, 15 bu less than the record high yield in 2005. Like most winters in Indiana since 1996, temperatures averaged above normal and winterkill due to low temperatures was limited. Unlike 2005 and 2006, growing conditions for winter wheat in 2007 were stressful; abnormally cool temperatures until late April, including a severe frost in mid-April that caused abandonment of some fields in southern Indiana. Beginning in early May, warm temperatures and increasingly dry soil with significant drought conditions developed by mid to late June, resulting in low grain yields and average to low test weight. Acreage prospects for 2007–08: preliminary reports are that 550,000 acres were seeded, and more acreage would have been seeded, but seed was limited. Wheat establishment was excellent and autumn growth was excellent prior to onset of winter.

Wheat disease summary.

Yellow dwarf, including BYDV and CYDV, were widespread and moderate to severe throughout the southern two-thirds of Indiana. Foliar diseases, including Fusarium head blight were present but not significant except in localized areas, likely due to unusually cool temperatures early in the spring growing season and dry conditions later in the growing season.

Performance of new cultivars.

Cultivar INW0731 yielded unusually well, ranking first or nearly first in multiple locations in Indiana and nearby regions, likely due to its demonstrated large root volume and moderate resistance to yellow dwarf. INW0731 has moderate resistance to Fusarium head blight from Freedom and Fundulea 201R, moderate resistance to leaf rust, resistance/tolerance to yellow dwarf, powdery mildew, Stagonospora nodorum blotch, Septoria leaf blotch, soil-borne wheat mosaic virus, and wheat spindle streak mosaic virus, and is susceptible to Hessian fly, stripe rust, and stem rust in Indiana.