

## Registration of 'Sequoia' Hard Red Winter Wheat

A. H. Carter,\* S. S. Jones, S. R. Lyon, K. A. Balow, G. B. Shelton, A. Burke, R. W. Higginbotham, W. F. Schillinger, X. M. Chen, D. A. Engle, and C. F. Morris

### Abstract

Stand establishment and emergence from deep planting are important traits for winter wheat (*Triticum aestivum* L.) cultivars produced in the US Pacific Northwest. The objective of this research was to develop an adapted winter wheat cultivar with a long coleoptile and the ability to emerge well from deep planting conditions in the dryland (<300 mm annual precipitation) regions of Washington State. 'Sequoia' (Reg. No. CV-1125, PI 678966) hard red winter wheat was developed and released by the Agricultural Research Center of Washington State University. Sequoia was tested under the population designations 2J040720, 3J040720, 2J061383, 3J061383, 4J061383, and 5J061383 and experimental designation WA8180, which were assigned through progressive generations of advancement. Sequoia is a tall cultivar adapted to the low-precipitation, rainfed wheat production regions of Washington with excellent emergence from deep planting. Sequoia has high-temperature, adult-plant resistance to stripe rust, average grain protein, high grain volume weight, high yield potential, and excellent end-use quality properties.

**M**OST WHEAT (*Triticum aestivum* L.) production in the Pacific Northwest region of the United States is conducted under rainfed (i.e., nonirrigated) conditions. Annual precipitation varies greatly across the region, ranging from as little as 150 mm of precipitation to >700 mm. In areas where annual precipitation is <300 mm, growers practice a winter wheat–summer fallow rotation. Optimum planting date for winter wheat is late August to early September, as delays in planting past this date result in decreasing seed-zone soil moisture (Donaldson, 1996) and lower grain yield potential (Higginbotham et al., 2011). In the driest years, seed-zone soil moisture is frequently very marginal. Thus, seed is sometimes placed as deep as 18 cm below the soil surface to reach moisture for germination and emergence.

Winter wheat seedling emergence in the dry areas is a major concern. Seeds planted deep should ideally have a long coleoptile with sufficient ability to push the coleoptile through the soil (Rebetzke et al., 2007; Schillinger et al., 1998). A frequent complication of seedling emergence is soil crusting caused by rain showers after planting and prior to emergence. One method to enhance wheat emergence from deep planting is to breed cultivars with very long coleoptiles, done primarily by selecting lines with wild-type alleles of the major dwarfing genes (Rebetzke et al., 2007; Schillinger et al., 1998; Whan, 1976). Another method is to speed up plant emergence, thereby limiting the number of days from planting to when a rain event could occur and induce crusting. To mitigate risk to growers, cultivars must have the ability to emerge from deep planting as quickly as possible (Mahdi et al., 1998). The objective of our cultivar development effort was to develop a hard red winter (HRW) wheat cultivar that could consistently emerge from planting depths greater than 15 cm.

'Sequoia' HRW wheat (Reg. No. CV-1125, PI 678966), which has excellent emergence from deep planting, was released in 2015 by the Agricultural Research Center of Washington State University (WSU) in cooperation with the USDA-ARS.

Copyright © Crop Science Society of America. All rights reserved.

Journal of Plant Registrations 11:269–274 (2017).

doi:10.3198/jpr2016.09.0052crc

Received 30 Sept. 2016.

Accepted 30 Jan. 2017.

Registration by CSSA.

5585 Guilford Rd., Madison, WI 53711 USA

\*Corresponding author (ahcarter@wsu.edu).

A.H. Carter, S.S. Jones, S.R. Lyon, K.A. Balow, G.B. Shelton, A. Burke, R.W. Higginbotham, and W.F. Schillinger, Dep. of Crop and Soil Sciences, Washington State Univ., Pullman, WA 99164-6420; X.M. Chen, D.A. Engle, and C.F. Morris, USDA-ARS Wheat Health, Genetics, and Quality Research Unit, Pullman, WA 99164-6420. Research was funded in part by the Washington State Grain Commission and the Otto and Doris Amen Dryland Research Endowment.

**Abbreviations:** HRW, hard red winter; IT, infection type; SKCS, single kernel characterization system; WSU, Washington State University.