Regulations of Cultivars

Registration of ‘Oklee’ Wheat

‘Oklee’ is a hard red spring wheat (Triticum aestivum L.) (Reg. no. CV-963, PI 634553) developed and released by the Minnesota Agricultural Experiment Station in cooperation with USDA-ARS in January 2003. It was named after a town in its region of adaptation in northwest Minnesota. Oklee was released on the basis of its high grain yield, high grain volume weight, high grain protein content, and early maturity. In addition, Oklee has moderate resistance to Fusarium head blight (FHB), caused primarily by Fusarium graminearum Schwabe.

Oklee was derived from the cross ‘2375’/SBF0670, made by the former Pioneer Hi-Bred spring wheat breeding program in the USA. The cultivar 2375 (PI 601477, syn. Pioneer 2375) has the pedigree Olaf/Era/Suqamuxi 68/3/Chris/ND487/Lark and was widely grown in Minnesota during the mid-1990s due to its moderate resistance to FHB. SBF0670 is an unreleased line whose pedigree contains hard red spring lines once prominent in the region including ‘Chris’ (Citr 13751, Heiner and Johnston, 1967), ‘Era’ (Citr 13986, Heiner and McVey, 1971), and ‘Butte’.

The F$_2$ population producing Oklee was selected for leaf rust (caused by Puccinia triticina Eriks.) and stem rust (caused by Puccinia graminis Pers.: Pers.) resistance in a field planting at St. Paul in 1993. The F$_2$ generation was advanced by single seed descent in a greenhouse. The selection resulting in Oklee was selected from a single plant in an F$_3$ headrow in 1994 and this seed was increased in a winter nursery in Arizona during 1994 and 1995. This selection was tested under the experimental designation MN95002 in trials from 1995 through 2000 and following purification as MN95002-A in 2001 and 2002. The purification process was initiated in 1999 when 100 heads from F$_4$ plants of MN95002 were harvested and grown as individual headrows in a winter increase in Arizona. Eighty of these rows were selected based on uniformity of height among and within rows. All selections were similar for other morphological and seed characteristics. The 80 selections were evaluated for agronomic characteristics, and reaction to Fusarium head blight, leaf rust, and stem rust at St. Paul in 2000. No significant differences in disease reaction were observed among the 80 lines. Nineteen of the 80 selections were discarded due to delayed heading and/or shorter height. Equal amounts of seed from the remaining 61 selections were bulked to form MN95002-A and MN95002-B were evaluated in replicated yield trials in 2001 and 2002. No significant differences ($P = 0.05$) in grain yield between MN95002 and MN95002-A were identified, although MN95002-A was more uniform for plant height and heading date than MN95002. Off-type plants that are approximately 10 cm taller occur in MN95002-A at a frequency of about 3 in 10,000. Approximately 1000 kg of Breeder seed of MN95002-A was produced in 2001 by the Minnesota Crop Improvement Association and further increased in California and in Minnesota in 2002. MN95002-A was released as Oklee in 2003.

Oklee has erect juvenile plant growth, a recurved flag leaf, white glumes with an apiculate shoulder, and an acuminate beak. The spike is awned, mid-dense, and tapering. The kernel is red and ovate in shape with angular cheeks and a narrow, mid-deep crease. The brush on the kernel has a collar and is medium in length.

Oklee was tested as MN95002 and MN95002-A in Minnesota statewide yield trials from 1998 through 2002. Oklee is relatively early maturing and produces spikes 1.3 d earlier than 2375 and 0.6 d earlier than Oxen (PI 596770), the most widely grown cultivar in Minnesota since the late 1990s. Oklee is a semidwarf cultivar and averages 75 cm, the same height as Oxen, and is 3 cm shorter than 2375 in Minnesota trials. In 35 Minnesota trials conducted from 1998 through 2002, Oklee yielded 3664 kg ha$^{-1}$ compared to 3482 kg ha$^{-1}$ for 2375 and 3825 kg ha$^{-1}$ for Oxen. Oklee was evaluated in 29 environments in the Uniform Regional Hard Red Spring Wheat Nursery in 1998 and 1999 and yielded an average of 3456 kg ha$^{-1}$ compared to an average of 3470 and 3503 kg ha$^{-1}$ produced by the check cultivars, 2375 and Verde (PI 592561, Busch et al., 1996), respectively. Oklee has moderately strong straw and a lodging rating of 2.3 when scored on a scale of 0 (erect) to 9 (lodged) in 21 environments at which lodging occurred from 1998 thru 2002. By comparison, the cultivars 2375, Oxen, and Verde had lodging ratings of 3.5, 2.6, and 2.1, respectively.

Oklee has moderate resistance to FHB in misted, inoculated field nurseries, similar to the resistance of 2375. In 11 FHB nurseries from 1998 through 2001, Oklee averaged 23.6% diseased spikelets, 16.7% visually scabby kernels (VSK), and 8.8 mg kg$^{-1}$ of the mycotoxin deoxynivalenol (DON). The cultivar 2375 averaged 22.7% diseased spikelets, 17.5% VSK, and 9.8 mg kg$^{-1}$ DON. In the same trials, the resistant check ‘BacUp’ (PI 596533, Busch et al., 1998) and the susceptible check ‘Wheaton’ (PI 469271, Busch et al., 1984) averaged 12.5 and 61.8% diseased spikelets, 8.5 and 45.5% VSK, and 6.1 and 38.3 mg kg$^{-1}$ DON, respectively. Oklee is resistant to currently prevalent races of stem rust as seedlings in greenhouse tests and as adults in field tests with the same races. Oklee is moderately susceptible in seedling plants to leaf rust race THBJ which is the most common race in the spring wheat area of Minnesota and the Dakotas, but is resistant in seedling plants to most other leaf rust races. Adult plants in the field are moderately resistant to prevalent races of leaf rust. Oklee is moderately resistant to the race 1 isolate PT2 (ATCC 44143) of tan spot [caused by Pyrenophora tritici-repentis (Died.) Drechs.] based on greenhouse assays. Field reaction to the foliar diseases tan spot and Septoria tritici blotch (caused by Septoria tritici Roberge ex Desmaz.) is moderate, better than 2375.

The USDA Spring Wheat Quality Laboratory, Fargo, ND, evaluated bread-making properties of Oklee grown in a total of 17 yield trial plots from 1998 through 2001. Oklee had an average grain volume weight of 78.84 kg hL$^{-1}$, grain protein of 150 g kg$^{-1}$, and loaf volume of 202.5 cm$^3$. Compared to 2375, Oklee is 1.35 kg hL$^{-1}$ higher in grain volume weight, 18 g kg$^{-1}$ higher in grain protein, and 6% greater in loaf volume. Compared to Oxen, Oklee is 2.73 kg hL$^{-1}$ higher in grain volume weight, 16 g kg$^{-1}$ higher in protein, and 0.8% greater loaf volume. Oklee has relatively weak mixing properties as indicated by mixograph patterns in which it was rated as 2.0 on a 1-to-9 scale (1 = weakest, 9 = strongest) whereas 2375 and Oxen were rated as 2.9 and 3.3, respectively. The industry evaluations by the Wheat Quality Council in 1999 (1 location) and 2000 (2 locations) indicated that Oklee was lower in quality than the high quality check, ‘Grandin’ (PI 531085). Compared with Grandin, Oklee was higher in protein (144 vs. 141 g kg$^{-1}$), lower in flour yield (71.8 vs. 73.3%),