Registration of ‘Charles’ Barley

‘Charles’ (Reg. no. CV-321, PI 637845), a two-rowed winter malting barley (Hordeum vulgare L.) released in 2005, was cooperatively developed and released by the USDA-ARS, Aberdeen, ID, and the University of Idaho Agricultural Experiment Station (AES). Charles was named in honor of Dr. Charles F. ‘Chuck’ Murphy (deceased), former USDA-ARS National Program Leader for Small Grains. Dr. Murphy was instrumental in the success of the oat and barley breeding program at Aberdeen for many years. Charles was released as the first two-rowed winter malting barley that putatively meets malting and brewing industry standards.

Charles was tested as experimental line 94Ab1274 and is a selection from the cross ‘Bearpaw’/81Ab1702. Bearpaw is a two-rowed spring barley released by the Montana AES in 1989 (Hockett et al., 1990). The parent 81Ab1702 originated as a selection made in 1981 from the Aberdeen winter bulk designated Bulk 5. Bulk 5 originated as an F2 bulk of the three crosses ‘Malta’ (PI 345518)/74Ab10082, ‘Malta’/‘Moravian III’ (CIho 15812)/72Ab3482, and WN 4170/12222/‘Moravian III’/72Ab3482. 74Ab10082 has the pedigree ‘Moravian’/60Ab1810, and 72Ab3482 has the pedigree ‘Piroline’/60Ab1810 (McKay, 1969). 60Ab1810 has the pedigree ‘Betzes’ (PI 129430)/‘Domen (CIho 9562) and is the cross from which the selection leading to ‘Klages’ (Wesenberg et al., 1974) was derived. WN 4170/12222 is an elite breeding line from Washington State University tested at Aberdeen in 1974–75 winter hardiness evaluations. The pedigree of WN 4170/12222 is unknown. Charles has rough awns with a moderately lax spike. The kernel has short rachilla hairs, a wrinkled hull with prominent veins, and white aleurone.

Charles was selected as an F3 head row in 1994 following pedigree selection for maturity, height, lodging resistance, resistance to shattering, and favorable head type in the F2 through F4 generations grown under irrigated conditions at Aberdeen, ID. The head row designated no. 1274 was selected due to favorable head type and resistance to lodging and shattering. It was evaluated in replicated yield trials from 1998 to 2004 at Aberdeen, ID. It was tested in 2001 and 2003 in the Western Winter Regional Barley Trials and University of Idaho Extension trials. It was entered into American Malting Barley Association (AMBA) pilot scale quality evaluation trials in 2000 and 2002 and received favorable ratings each year. Following the favorable rating in 2002, it was recommended for advancement to plant scale malting and brewing evaluation.

Charles has shown excellent yield potential compared with ‘88Ab536-B’ (Wesenberg et al., 1998), the only current winter barley with suitable malting quality characteristics adapted to the intermountain west area. 88Ab536-B is a six-rowed winter line released as germplasm. Charles was tested over seven location–years from 1998 and 2000 to 2004, where it averaged 8654 kg ha\(^{-1}\) compared with 9568 kg ha\(^{-1}\) for the feed barley check ‘Eight-Twelve’ (Wesenberg et al., 1992) and 7901 kg ha\(^{-1}\) for 88Ab536-B. Eight-Twelve has consistently performed well in Idaho and is a long-term check cultivar in USDA-ARS trials.

Malting quality was assessed in laboratory tests and on a sieve with 0.24 by 1.9 cm slotted openings were retained on a sieve with 0.24 by 1.9 cm slotted openings were selected from 5 tests from 1999 to 2001 and 2003, Charles was evaluated with 88Ab536-B. Compared with 88Ab536-B, Charles had greater malt extract (81.3 vs. 78.9%), higher α-amylase activity [69.8 vs. 52.3 mg dextrinizing units (DU)], lower β-glucan concentration (261 μg g\(^{-1}\)), higher wort protein (5.23 vs. 4.81%), and a ratio of soluble/total protein (45.4 vs. 40.1%). Charles and Harrington both met acceptable industry standards for diastatic power (12.0 vs. 12.4%) and wort color (1.9 vs. 1.6) and were superior to 88Ab536-B for diastatic power (11.4 vs. 10.3% ASBC).

In pilot scale testing by AMBA in 2000 and 2002, Charles was superior to 88Ab536-B for malt extract (80.9 vs. 79.4%), wort color (1.9 vs. 1.6), wort protein (5.14 vs. 4.94%), and the ratio of soluble/total protein (43.7 vs. 40.3%).

In the spring two-rowed malt standard Harrington (Rossnagel, 1984) in six tests from 1999 to 2001, Charles had higher levels of malt extract (80.6 vs. 79.2% ASBC), α-amylase activity (71.0 vs. 59.6% ASBC), and β-glucan concentration (114 vs. 103 ASBC), than Harrington. Charles met favorable values of β-glucan concentration (12.2 vs. 13.0%) and grain protein (12.2 vs. 13.0%) compared with Harrington. Charles and Harrington both met industry standards for diastatic power (10.5 vs. 12.1%) and wort color (1.9 vs. 1.6) and were superior to 88Ab536-B for diastatic power (11.4 vs. 10.3% ASBC).

In Idaho, Charles is expected to be best suited to irrigated areas of the southern Snake River plains for winter survival at Aberdeen in the absence of extensive snow cover. Charles is resistant to Microdochium nivale (ces. Ex Berl. & W. Hallett). Survival is significantly reduced by 50% when extended snow cover occurs. Although the incidence of barley stripe rust (causal agent Puccinia striiformis f. sp. hordei) in the intermountain west area is so infrequent that it has not appeared in any winter plots. The only incidence of barley stripe rust recorded in spring plots sown at locations different from those of the winter nurseries. Therefore, based on pedigrees, we would not presume Charles to have resistance to barley stripe rust.