ASA, CSSA, and SSSA Virtual Issue Call for Papers:

Advancing Resilient Agricultural Systems: Adapting to and Mitigating Climate Change

Content will focus on resilience to climate change in agricultural systems, exploring the latest research investigating strategies to adapt to and mitigate climate change. Innovation and imagination backed by good science, as well as diverse voices and perspectives are encouraged. Where are we now and how can we address those challenges? Abstracts must reflect original research, reviews and analyses, datasets, or issues and perspectives related to objectives in the topics below. Authors are expected to review papers in their subject area that are submitted to this virtual issue.

Topic Areas

- Emissions and Sequestration
  - » Strategies for reducing greenhouse gas emissions, sequestering carbon
- Water Management
  - » Evaporation, transpiration, and surface energy balance
- Cropping Systems Modeling
  - » Prediction of climate change impacts
  - » Physiological changes
- Soil Sustainability
  - » Threats to soil sustainability (salinization, contamination, degradation, etc.)
  - » Strategies for preventing erosion
- Strategies for Water and Nutrient Management
  - » Improved cropping systems
- Plant and Animal Stress
  - » Protecting germplasm and crop wild relatives
  - » Breeding for climate adaptations
  - » Increasing resilience
- Waste Management
  - » Reducing or repurposing waste
- Other
  - » Agroforestry
  - » Perennial crops
  - » Specialty crops
  - » Wetlands and forest soils

Climate Change Virtual Issue

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Deadlines

Abstract/Proposal Deadline: Ongoing
Submission deadline: 31 Dec. 2022

How to submit

Submit your proposal to manuscripts@sciencesocieties.org

Please contact Jerry Hatfield at jerryhatfield67@gmail.com with any questions.

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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 F_2 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 F_5 head row in 1994 following pedigree selection for maturity, height, lodging resistance, resistance to shattering, and favorable head type in the F_2 through F_4 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. Charles was tested in the Western Winter Regional Barley trials over five location–years from 2001 to 2002 where it yielded 6961 kg ha^{-1} compared with 8842 kg ha^{-1} for Eight-Twelve. In University of Idaho Extension trials across five location–years from 2001 to 2002, Charles yielded 7469 kg ha^{-1} compared with 8202 kg ha^{-1} for Eight-Twelve.

Over 17 irrigated and rain-fed location–years, Charles averaged 67.0 kg hL^{-1} for test weight compared with 66.4 kg hL^{-1} for Eight-Twelve. Over nine irrigated location–years, its test weight was 69.1 kg hL^{-1} compared with 69.4 kg hL^{-1} for 88Ab536-B. Kernel plumpness was determined from samples collected over 17 irrigated and rain-fed environments. Kernels retained on a sieve with 0.24 by 1.9 cm slotted openings were considered plump (American Society of Brewing Chemists, 1992). Charles had 93% plump kernels compared with 88% for Eight-Twelve. Across nine irrigated environments, Charles averaged 97% compared with 87% for 88Ab536-B.

Charles heads 3 d later than 88Ab536-B and 1 d later than Eight-Twelve. When grown under irrigation, Charles is 8 cm shorter than 88Ab536-B and equal in height to Eight-Twelve. Under rain-fed conditions Charles is equal in height to Eight-Twelve.

Malting quality was assessed in laboratory tests at the USDA-ARS Cereal Crop Research Unit in Madison, WI, and in pilot scale tests by AMBA. In USDA-ARS trials from 1998 to 2001 and 2003, Charles was evaluated with 88Ab536-B in six tests. Compared with 88Ab536-B, Charles had greater malt extract (81.3 vs.78.9%), higher α-amylase activity [69.8 vs. 52.3 20°C dextrinizing units (DU)], lower β-glucan concentration (149 vs. 261 μg g^{-1}), higher wort protein (5.23 vs. 4.81%), and a higher ratio of soluble/total protein (45.4 vs. 40.1%). Charles and 88Ab536-B each met acceptable industry standards for grain protein (12.0 vs. 12.4%) and wort color (1.9 vs. 2.1). Charles is inferior to 88Ab536-B for diastatic power (114 vs. 141 °ASBC).

Charles was also evaluated in winter–spring drill strips with the spring two-rowed malt standard Harrington (Harvey and Rossnagel, 1984) in six tests from 1999 to 2001 and 2003. Charles had higher levels of malt extract (80.9 vs. 79.4%), α-amylase activity (71.0 vs. 58.9 20°C DU), and diastatic power (114 vs. 103 °ASBC), than Harrington. Charles had more favorable values of β-glucan concentration (177 vs. 400 μg g^{-1}) and grain protein (12.2 vs. 13.0%) compared with Harrington. Charles and Harrington both met industry standards for 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 pilot scale testing by AMBA in 2000 and 2002, Charles was superior to 88Ab536-B for malt extract (81.3 vs. 80.2%), α-amylase activity (72.8 vs. 66.0 20°C DU), and percentage of plump kernels (94 vs. 76%). Charles and 88Ab536-B both met malt industry standards for wort color (1.8 vs. 2.1), wort protein (5.42 vs. 5.53%), diastatic power (141 vs. 174 °ASBC), and the ratio of soluble/total protein (44.0 vs. 45.6%). Beta-glucan levels for both Charles and 88Ab536-B were unfavorable with values of 292 and 179 μg g^{-1}, respectively.

In Idaho, Charles is expected to be best adapted to the irrigated areas of the southern Snake River plain. It has excellent winter survival at Aberdeen in the absence of snow mold [caused by *Microdochium nivale* (ces. Ex Berl. & Vogl.) Samuels & Hallet]. Survival is significantly reduced by snow mold when extended snow cover occurs. Although there has been no incidence of barley stripe rust (causal agent *Puccinia striiformis* Westend. f. sp. *hordei* Ericks. & Henn.) on Charles, the occurrence of disease is so infrequent that it has not been present on any winter plots. The only incidence of barley strip rust has been in spring plots sown at locations different from those of the winter nurseries. Therefore, based on pedigree information only, we would not presume Charles to have resistance to stripe rust.

Breeder and Foundation seed of Charles will be maintained by the Idaho AES Foundation Seed Program. Requests for seed should be directed to the Coordinator, Foundation Seed Program, College of Agriculture, Kimberly Research and Extension Center, 3793 N 3600 E, Kimberly, ID 83341. Seed is also available for research purposes from the USDA-ARS National Small Grains Collection, Aberdeen, ID. It is requested that appropriate recognition of source be given when this cultivar contributes to research or development of new germplasm or cultivars.

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