

Registration of 'Herald' Barley

'Herald' (Reg. No. CV-331, PI 642403) is a low-phytate six-rowed spring feed barley (*Hordeum vulgare* L.) cultivar developed cooperatively and released in 2006 by the Agricultural Research Service, U.S. Department of Agriculture, and the Idaho Agricultural Experiment Station. It is the first released representative of a novel class of barley germplasm that provides enhanced phosphorus (P) digestibility and mineral nutrition for humans and non-ruminant animals.

Herald has the pedigree 'Colter'//Pmut422/Colter. The parent Colter (Wesenberg et al., 1993) is a six-rowed feed barley developed by the USDA-ARS in Aberdeen, ID. The parent Pmut422 is a sodium-azide generated mutant induced in the two-rowed malting cultivar 'Harrington' (Dorsch et al., 2003). Harrington (Harvey and Rosnagel, 1984) was developed at the University of Saskatchewan, Saskatoon, Canada, and is the current North American malting quality standard for two-rowed barley (as defined by the American Malting Barley Association, Milwaukee, WI, USA). Pmut422 can be distinguished from Harrington by the presence of the recessive mutation *lpa1-1*, located on the long arm of chromosome 2H. This mutation, based on measurements in BC₄-derived lines in the Harrington background, has negligible effects on agronomic performance, except for a reduction in test weight of approximately 3% (Bregitzer and Raboy, 2006a). The *lpa1-1* mutation has been shown to reduce phytate (*myo*-inositol 1,2,3,4,5,6-hexakisphosphate) by approximately 50% (Dorsch et al., 2003) and analysis of grain produced in the Bregitzer and Raboy study (2006a) showed a reduction in total grain P of approximately 10%, and an increase in inorganic P of greater than 400% (Bregitzer and Raboy, 2006b). Studies have shown that these changes are associated with increased feed quality and reduced environmental impacts when fed to non-ruminant animals, based on increased P digestibility and reduced fecal P content (reviewed in Bregitzer and Raboy, 2006a, b).

Herald was developed via a backcross/pedigree breeding scheme. Subsequent to backcrossing pmut422/Colter F₁ plants, single spike selections were made within BC₁F₂, BC₁F₃, and BC₁F₄ populations, followed by selection among BC₁F_{4.5} progeny rows. Herald was selected as progeny row #1550 in 2000, and entered replicated small-plot trials at Aberdeen and Tetonia, ID in 2001, under the line designation 00ID1550. The initial spike and row selections were based on visual observations for favorable plant and spike characteristics, and for high levels of grain inorganic P that are associated with *lpa1-1*. The selection of 00ID1550 for advanced yield testing was based on comparisons among selected sib lines of yield and other agronomic characteristics conducted in replicated small-plot trials at two locations in 2001. Subsequent testing from 2002–2005 has been conducted at three irrigated and three rain-fed Idaho locations that are diverse with respect to elevation above sea level, growing season, temperature, and water availability. These locations offered very little disease pressure; thus, no meaningful data on resistance to fungal or viral pathogens are available.

Comparisons to Colter (18 location-years) and 'Baronesse' (23 location-years) showed Herald, relative to Colter and Baronesse, to be 1.7 d later and 4.6 d earlier to heading; 104% and 113% for height; 102% and 101% for grain yield; 98% and 93% for test weight; and 115% and 92% for percentage plump kernels. At locations where lodging was observed, Herald showed 44% and 60% of that recorded for Colter and Baronesse, respectively.

Herald, relative to cultivars without the *lpa1-1* mutation, has a slight reduction in total grain P, a large reduction in grain phytate (*myo*-inositol 1,2,3,4,5,6-hexakisphosphate), and greatly elevated grain inorganic P. Based on measurements of grain grown in four Idaho locations in 2005, total P content was 3.07 mg g⁻¹ (91% of Colter and 88% of Baronesse), phytate P content was 1.2 mg g⁻¹ (55% of Colter and 56% of Baronesse), and inorganic P was 0.88 mg g⁻¹ (383% of Colter and 366% of Baronesse).

Herald has a semi-lax spike that remains upright at maturity. Awns are smooth, rachilla hairs are long, glume hairs are banded, and hulls are slightly wrinkled. Kernels have a transverse crease at the base and the aleurone is white.

Approximately 300 uniform F_{8.9} progeny rows were bulked to produce Breeders seed. Breeder and Foundation seed of Herald will be maintained by the Idaho Agricultural Experiment Station, 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. It is requested that appropriate recognition of source be given when this cultivar contributes to research or development of new breeding lines or cultivars.

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References

- Bregitzer, P., and V. Raboy. 2006a. Effects of four independent low-phytate mutations on barley (*Hordeum vulgare* L.) agronomic performance. *Crop Sci.* 46:1318–1322.
- Bregitzer, P., and V. Raboy. 2006b. Effects of four independent low-phytate mutations in barley (*Hordeum vulgare* L.) on seed phosphorus characteristics and malting quality. *Cereal Chem.* 83:460–464.
- Dorsch, J.A., A. Cook, K.A. Young, J.M. Anderson, A.T. Bauman, C.J. Volkmann, P.P.N. Murthy, and V. Raboy. 2003. Seed phosphorus and inositol phosphate phenotype of barley *low phytic acid* genotypes. *Phytochemistry*. 62:691–706.
- Harvey, B.L., and B.G. Rosnagel. 1984. Harrington barley. *Can. J. Plant Sci.* 64:193–194.
- Wesenberg, D.M., D.E. Burrup, J.C. Whitmore, and B.L. Jones. 1993. Registration of Colter barley. *Crop Sci.* 33:1401.

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doi:10.2135/cropsci2006.07.0480
Published in *Crop Sci.* 47:441–442 (2007).