Plant Variety Release Proposal

Crop name: Barley
Experimental designation of variety: DH140088
Proposed name: Flex
Inventor/breeder: Patrick Hayes
Description:

Growth Habit:	Facultative
Spike Type:	2-row, Lax
Awn Type:	Rough
Rachilla Hair:	Short
Aleurone Color:	White

History

DH140088 is a doubled haploid derived from the cross Violetta/Charles//Full Pint. Violetta is a winter 2-row malting type developed by Breun (Germany) and marketed in the US by Limagrain Cereal Seeds. Charles was developed by the USDA-ARS program based in Aberdeen, ID and was the first winter 2-row malting variety recommended by the American Malting Barley Association (AMBA). Full Pint is a spring 2-row from the OSU program. It is popular with some maltsters and brewers due to its unique contributions to beer flavor. These contributions were documented by Herb et al. (Journal of the American Society of Brewing Chemists, 2017). Full Pint, however, has not met with universal acceptance in the malting and brewing industries and is not an AMBA-recommended variety. Full Pint has the distinction of being an epiheterodendrin (EPH) null and therefore a non-producer of glycosidic nitrile (GN0). GN0 is a positive attribute for distillers, as detailed by Morrissy et al. (2023).

The cross was made in 2013 and the doubled haploid produced in 2014. DH140088 was advanced through mini-plot, preliminary, and advanced yield trials in the Willamette Valley of Oregon based on agronomic and malting quality performance. It then progressed to regional and national trials. It was in the 2017-18 and 2018-19 national Winter Malting Barley Trial

(WMBT). It was rated unsatisfactory in its first year of American Malting Barley Association (AMBA) Pilot testing (2018 crop): “This first year selection had good barley on 7/64, slightly high barley protein and beta-glucans, high wort viscosity and slightly low friability” but it was rated as eligible for another year of testing. The rating of the 2019 crop was again “Unsatisfactory” and no further testing of the selection was permitted: “This second-year selection had good barley on 7/64; high protein, viscosity and beta-glucans; and low extract.” Due to these negative ratings, we discontinued testing of the selection. Accordingly, the data we provide in Tables 1 – 3 are based on trials ending in 2019.

Origin Malt maintained an interest in the selection, notably due to its GN0 status and adaptation to their production environments. After extensive testing (Exhibit 1), in August of 2023, Origin Malt requested that that the variety be released because they would like to commercialize it. Origin Malt suggested the name “Flex” due to the facultative growth habit of DH140088. This name was approved by the USDA variety name agency (see Exhibit 2).

Based on the agreement between OSU and AMBA, all varieties developed with AMBA support, whether they are recommended by AMBA, will be released with a non-exclusive license. Therefore, per previous OSU malting barley variety releases, we propose that Flex be released with a non-exclusive license. There will be a one-time application fee of $250 for each non-exclusive license. Those interested in a license should contact Denis Sather at the OSU Office of Commercialization and Corporate Development (denis.d.sather@oregonstate.edu). Flex seed, for planting purposes, can only be sold as a class of certified seed with a royalty of $0.03/lb (approximately $0.067/kg). The $0.03/lb royalty will be paid on sale of this seed. All grain harvested from the certified production must be disposed of by malting or feeding, unless permission is obtained - in writing - from OSU to use the seed for other purposes, including re-

planting.

Plant Variety Protection will not be sought for Flex due to the special status of malting barley in the US, where the malting barley supply chain is based on sale of certified seed. By specifying that all sales for planting purposes must be a class of certified seed we will ensure that growers will be purchasing seed from the seed dealers with non-exclusive licenses. There is not an open market in the US for malting barley that is not grown from a class of certified seed: the risk to the maltster is too great. The variety will be protected by Federal Seed Law and OSU recognized as the owner of the variety. Furthermore, trademarks in states where Flex is sold will specify that the variety can only be sold under the name of "Flex".

Seed/plant production

Breeder seed was produced from head row purification blocks at Hyslop Farm, near Corvallis, Oregon in 2019. Forty pounds of this seed was provided to Origin Malt in 2020 with a research Materials Transfer Agreement (rMTA). Origin Malt has continued testing with rMTAs and has contracted with Ohio Foundation Seeds (OFS) for pure seed multiplication. For the 2024 harvest, OFS will produce 10 acres of Foundation seed and 10 acres of Foundation seed will be produced in Kentucky with the Kentucky Seed Improvement Association. Because the variety release proposal will likely still be in review at OSU at planting time (fall, 2023), these increases will be conducted under rMTA with Origin Malt. Future Foundation seed increases will be handled by OFS as needed, based on expressions of interest from other maltsters interested in non-exclusive licenses for the variety.

References

1. Herb, D.W., Meints, B.M., Jennings, R., Romagosa, I., Moscou, M., Carey, D., Cistue, L., Filichkin, T, Fisk, S.P., Helgerson, L., Martens, C., Monsour, R., Thiel, R., Tynan, S., Thomas, W.T.B., Vinkemeier, K., Hayes, P.M. 2017. Effects of barley (*Hordeum vulgare* L.) variety and growing environment on beer flavor. J. Amer. Soc. Brew. Chem. 75:345-353

2. Morrissy, C.P., W. Thomas, H. Bettenhausen, S.P. Fisk, and P.M. Hayes. 2023. Glycosidic nitrile and ethyl carbamate in malting barley. Artisan Spirit. Winter 2023.

Acknowledgements
We would like to thank the following for their contributions to this proposed release.

- Rebecca Jennings, Vice President of Quality, Origin Malt, for her continued interest in this selection and willingness to proceed with a non-exclusive license.
- Scott Heisel and Ashley McFarland, American Malting Barley Association, for their continued support of OSU Malting barley research and willingness to develop a path forward for potential varieties that do not meet AMBA specifications.

Table 1. Agronomic performance of fall planted Flex (DH140088) compared to check cultivars. Average of 2015-2019 trials in Oregon.

Entry	Yield (bu/acre)	Test Weight (lbs/bu)	Plant height (in)	Lodging (1-9)	Stripe rust (%)	Scald (%)
Station yrs.	*9*	*10*	*10*	*10*	*5*	*10*
Flex	147	54.3	42	2.8	3	15
Endeavor	121	51.6	39	2.6	6	67
Wintmalt	126	51.4	39	2.5	22	42

Table 2. Agronomic performance of fall planted Flex (DH140088) compared to check cultivars. Average of the 2018 & 2019 Winter Malting Barley Trial (all available data as of 9/19/19).

Entry	Yield (bu/acre)	Heading (DOY)	Plant height (in)	Lodging (0-9)	Winter survival (%)	Net Blotch (0-9)	Powdery Mildew (0-9)
Station yrs.	*26*	*19*	*23*	*15*	*7*	*2*	*5*
Flex	83	126	30	2.1	65	2.8	5.9
Endeavor	81	125	31	2.4	49	2.8	1.4
Wintmalt	79	129	30	1.2	63	2.8	1.5

Table 3. Malt quality[1] of Flex (DH140088) and check cultivars using data from analyses of barley samples grown at multiple locations in the US (2014-2018).

Entry	Plump kernels (%)	Malt extract (%)	Barley protein (%)	Wort protein (%)	S/T (%)	DP (^{0}ASBC)	Alpha amylase (20°DU)	Beta glucan (ppm)	FAN (ppm)
Station yrs.	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*
Flex	98.4	81.5	11.2	4.96	46.4	132	98.1	101	256
Endeavor	79.5	81.9	10.4	4.94	51.9	164	101.7	201	232
Wintmalt	96.1	81.4	10.2	4.10	43.5	140	55.8	64	169

[1]Data courtesy of the USDA-ARS Cereal Crops Research Unit, Madison, WI.

Following pages:

- Exhibit A: Letter of interest from Rebecca Jennings, Origin Malt

- Exhibit B: Clearance of “Flex” as variety name

Dr. Patrick Hayes,

Re: Interest in OSU variety 140088

Hello Dr. Hayes,

On behalf of Ohio Crafted Malt House (OCMH), I would like to express my interest in a variety from Oregon State University (OSU). Variety 140088 has proven to do well in all quality and agronomic performance testing conducted with our MTA with OSU.

This variety has been tested several years in multiple locations that would best suit the needs of OCMH. Below is a summary of the data obtained from these trials

Crop year	OH Spring 2021	OH Winter 2022	Auburn winter 2021 location 1	Auburn winter 2021 location 2
MOISTURE (<13.5%)	13.19	11.97	13.23	14.95
PROTEIN (9%-13%)	13.14	11.3	9.05	9.58
STARCH	52.65	54.13	52.7	51.73
TEST WEIGHT (>48 lb/bu)	43.71	45.47	39.49	38.07
CHAFF (<2%)	0.0	0.1	0.2	0.3
THRU	0.7	2.4	1	1.6
5/64	2.5	4.5	0.9	0.8
5.5/64	8.4	11.5	1.8	1.6
6/64	58.0	68	25.2	18.3
7/64	30.4	13.5	70.9	77.4
PLUMP (>90%)	88.4	81.5	96.1	95.7
THIN(<5%)	3.20	7.00	2.10	2.70
GE (>96%)	98	97	99	98
DON (<1 ppm)	3.30	0.8	0.12	0.23
NOTES	32.5 bu/acre	59.14 bu/acre	95 bu/acre	83 bu/acre

Crop year	Auburn winter 2022 location 1	Auburn winter 2022 location 2	MSU spring 2021	MSU winter 2021	KY
MOISTURE (<13.5%)	14.79	15.62	12.23	11.75	
PROTEIN (9%-13%)	9.65	9.49	14.84	10.87	
STARCH	51.94	51.26	51.37	53.27	
TEST WEIGHT (>48 lb/bu)	39.06	37.24	34.8	41.82	46.4
CHAFF (<2%)	0.1	0.1	0.1	0.1	
THRU	1	0.7	1.6	0.2	
5/64	0.4	0.7	4.5	0.3	
5.5/64	2.3	2.3	10	0.8	
6/64	16.6	32.6	57.4	12.4	
7/64	79.6	63.6	26.4	86.2	
PLUMP (>90%)	96.2	96.2	83.8	98.6	
THIN(<5%)	1.50	1.50	6.20	0.60	
GE (>96%)	99	98	99	99	
DON (<1 ppm)	0.12	0.01	0.11	0.33	
NOTES	64 bu/acre	32 bu/acre			91.1 bu/acre
	159 days to head	152 days to head			198 days to head

We would like to plant a seed increase this fall with about 20 acres.

Please reach out with any questions or concerns.

OCMH looks forward to working with OSU on this variety. It fits very well into our market and we look forward to getting it into our customer hands in the very near future.

Sincerely,

Rebecca Jennings

VP of Quality for OCMH

United States Department of Agriculture
Agricultural Marketing Service
Science and Technology Program
Seed Regulatory and Testing Division
801 Summit Crossing Place, Suite C
Gastonia, North Carolina 28054
704-810-8870
www.ams.usda.gov/rules-regulations/fsa

August 24, 2023

Dr. Patrick Hayes
Oregon State University
Dept of Crop and Soil Science
3050 Campus Way
Corvallis, Oregon 97331

Dear Dr. Hayes:

In response to your inquiry concerning variety names, we have checked our variety name database and have found the following:

Name Cleared: 'Flex' for barley has been cleared.

We are no longer doing Trademark searches on proposed variety names. The Trademark database can be accessed via the Internet at the following web site: "www.uspto.gov". Because there is no variety registration system, we cannot assure you that these names are free of conflicts. Moreover, our clearance confers no legal precedence.

We are happy to help you in this matter. **Please inform us about your new variety releases, including the kind, release date, and experimental designation(s) of the new varieties. Also, please indicate which names you decline to use so that they may be returned to the pool of available names.**

Sincerely,

Stephen R. Malone, Ph.D., CCA/CPAg
U.S. OECD Seed Schemes Program Manager