

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE

in cooperation with

STATE AGRICULTURAL EXPERIMENT STATIONS

Results from the

UNIFORM BARLEY WINTER HARDINESS NURSERY

2019-2020

Compiled by

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This is a joint progress report of an investigation underway in the State Agricultural Experiment Stations and the Agricultural Research Service of the U. S. Department of Agriculture. It contains preliminary data which have not been sufficiently confirmed to justify general release; interpretations may be modified with additional experimentation. Confirmed results will be published through established channels. The report is primarily a tool for cooperators, their staff and those with special interest in agricultural research program development.

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COOPERATING AGRICULTURAL EXPERIMENT STATIONS AND PERSONNEL

Country	State	AES Location	Personnel
USA	IL	Lawrenceville	L. Phillippe
USA	KS	Hays	G. Zhang
USA	MN	St. Paul	K.P. Smith
USA	NC	Raleigh	D. Marshall/M. Fountain
USA	NE	Mead	S.P.Baenziger
USA	OK	Ardmore	J. Anderson
USA	OR	Pendleton	P.Hayes
USA	TN	Knoxville	D.West
USA	VA	Blacksburg	C.A.Griffey

DIGEST

NUMBER OF TEST LOCATIONS: 9

NUMBER OF ENTRIES: 32

EXPERIMENTAL DESIGN: Single-row, 5-foot plot
Two replications
Randomized complete block

DATA RECORDED: Percent winter survival

DATA NOT USED IN ANALYSIS:

Mead, NE	No Data
Corvallis, OR	100% Survival
Lawrenceville, IL	100% Survival
Knoxville, TN	100% Survival
Ardmore, OK	100% Survival

COMMENTS:

Table 1. Entries in the 2019-2020 Uniform Barley Winter Hardiness Nursery.

Entry No.	Entry name	Pedigree	Yrs in Nursery	Contributors
1	Tenn. Winter(ck)	CI 6034	84	
2	Trebi (ck)	CI 936	80	
3	Kearney (ck)	CI 7580	72	
4	Kenosha (wht ck)	CI 14025	44	
5	Dicktoo (ck)	CI 5529	72	
6	Kentucky 1 (ck)	CI 6050	84	
7	DH130910	SHORT11-7 (TC6W265)/HERZ 29494/2991 (35)	2	Hayes
8	DH140088	Violetta/Charles//Full Pint	2	Hayes
9	DH140963	04_028_36/Archer	2	Hayes
10	DH141132	Violetta/Archer	1	Hayes
11	10.1492	Fridericus x Maja/Legacy//Maja/3/Doyce	1	Hayes
12	DH133783	OBADV10-13/Tamalpais	1	Hayes
13	DH140490	2Ab09-X05W048-378HL/DZ100289	1	Hayes
14	Dan (VA03H-61)	VA96-41-17 / SC872143	15	Griffey
15	Eve (VA01H-68)	SC860974 / VA94-42-13	17	Griffey
16	Amaze 10 (VA07H-31 WS)	Thoroughbred / SC872143	11	Griffey
17	VA14B-63	SPONT03-44 / VA01B-44	3	Griffey
18	VA14H-58	VA05B-58 // VA05B-65 / VA05B-74	3	Griffey
19	VA15H-73 (2R)	VA05H-03 / VA05H-128 // VA05H-158	2	Griffey
20	VA16M-81 (2R)	VA05H-147 /3/ Doyce // Baronesse / Doyce	1	Griffey
21	VA16M-84 (2R)	VA05H-147 /3/ Doyce // Baronesse / Doyce	1	Griffey
22	VA1BB-166 LA	SPONT03-44 / VA01B-44	1	Griffey
23	NB12437	NE98936/NE97891/NB04436=(NE97971/NE94738)	3	Baenziger
24	NB14422	NB99845/NB05419	3	Baenziger
25	NB15415	NB99845/NB08410	2	Baenziger
26	NB15420	NB99845/NB08410	2	Baenziger
27	NB15441	NB99845/NB08410	2	Baenziger
28	NB17431	NB07411/NB09410	2	Baenziger
29	NB11414	P-721/VA01H-5/Sangregado"S"/VA90-42-56/VA90-42-22/3/Pamunkey/4/SC890585(hullless)	1	Baenziger
30	NB14404	NB07410/NB018187	1	Baenziger
31	NB17401	NB08428/NB09410	1	Baenziger
32	NB17411	NB09410/NB09432	1	Baenziger

Top Ten Ranked Survival Entries

Top 10 ranked survival entries for 2019-2020

Rank	Ent No.	Entry	Pedigree	% Survival (across locations)
1	16	Amaze 10 (VA07H-31 WS)	Thoroughbred / SC872143	89
2	21	VA16M-84 (2R)	VA05H-147 /3/ Doyce // Baronesse / Doyce	85
3	14	Dan (VA03H-61)	VA96-41-17 / SC872143	81
4	19	VA15H-73 (2R)	VA05H-03 / VA05H-128 // VA05H-158	80
5	4	Kenosha (wht ck)	CI 14025	79
6	9	DH140963	04_028_36/Archer	79
7	10	DH141132	Violetta/Archer	79
8	11	10.1492	Fridericus x Maja/Legacy//Maja/3/Doyce	78
9	12	DH133783	OBADV10-13/Tamalpais	78
10	3	Kearney (ck)	CI 7580	76
LSD (0.05)				13

Table 2. Winter Barley Survival (%) at Various Stations (sorted by entry number)

Entry #	Entry Name	Ranked means	Means Across Loc.	Hays KS	Blacksburg VA	Raleigh NC	St. Paul MN
1	Tenn. Winter(ck)	16	74	98	93	5	100
2	Trebi (ck)	28	66	90	85	5	85
3	Kearney (ck)	10	76	98	93	15	100
4	Kenosha (wht ck)	5	79	100	93	23	100
5	Dicktoo (ck)	24	69	93	93	3	90
6	Kentucky 1 (ck)	17	74	98	83	15	100
7	DH130910	12	76	100	93	10	100
8	DH140088	13	76	100	93	10	100
9	DH140963	6	79	100	90	25	100
10	DH141132	7	79	100	90	25	100
11	10.1492	8	78	98	85	30	100
12	DH133783	9	78	98	88	43	85
13	DH140490	REMOVED FROM ANALYSIS DUE TO PRE-HARVEST SPROUT					
14	Dan (VA03H-61)	3	81	100	93	38	95
15	Eve (VA01H-68)	26	69	95	85	30	65
16	Amaze 10 (VA07H-31 WS)	1	89	100	95	63	100
17	VA14B-63	19	73	98	95	13	85
18	VA14H-58	11	76	100	93	28	85
19	VA15H-73 (2R)	4	80	95	88	38	100
20	VA16M-81 (2R)	20	73	90	95	10	95
21	VA16M-84 (2R)	2	85	85	88	68	100
22	VA1BB-166 LA	25	69	100	85	3	90
23	NB12437	23	70	100	90	5	85
24	NB14422	21	71	98	90	8	90
25	NB15415	27	68	100	93	20	60
26	NB15420	30	64	90	93	0	75
27	NB15441	31	61	98	88	3	55
28	NB17431	15	74	100	95	13	90
29	NB11414	18	73	100	98	10	85
30	NB14404	29	66	100	93	0	70
31	NB17401	22	71	100	88	10	85
32	NB17411	14	76	93	93	33	85
Average			74	97	91	19	89
LSD (0.05)			13.2	7.1	9.5	35.0	22.3
CV			7.8	3.6	5.1	89.0	12.3

Table 3. Winter Barley Survival (%) at Various Stations (sorted by rank)

Entry #	Entry Name	Ranked means	Means	Hays	Blacksburg	Raleigh	St. Paul	
			Across Loc.	KS	VA	NC	MN	
16	Amaze 10 (VA07H-31 WS)	1	89	100	95	63	100	
21	VA16M-84 (2R)	2	85	85	88	68	100	
14	Dan (VA03H-61)	3	81	100	93	38	95	
19	VA15H-73 (2R)	4	80	95	88	38	100	
4	Kenosha (wht ck)	5	79	100	93	23	100	
9	DH140963	6	79	100	90	25	100	
10	DH141132	7	79	100	90	25	100	
11	10.1492	8	78	98	85	30	100	
12	DH133783	9	78	98	88	43	85	
3	Kearney (ck)	10	76	98	93	15	100	
18	VA14H-58	11	76	100	93	28	85	
7	DH130910	12	76	100	93	10	100	
8	DH140088	13	76	100	93	10	100	
32	NB17411	14	76	93	93	33	85	
28	NB17431	15	74	100	95	13	90	
1	Tenn. Winter(ck)	16	74	98	93	5	100	
6	Kentucky 1 (ck)	17	74	98	83	15	100	
29	NB11414	18	73	100	98	10	85	
17	VA14B-63	19	73	98	95	13	85	
20	VA16M-81 (2R)	20	73	90	95	10	95	
24	NB14422	21	71	98	90	8	90	
31	NB17401	22	71	100	88	10	85	
23	NB12437	23	70	100	90	5	85	
5	Dicktoo (ck)	24	69	93	93	3	90	
22	VA1BB-166 LA	25	69	100	85	3	90	
15	Eve (VA01H-68)	26	69	95	85	30	65	
25	NB15415	27	68	100	93	20	60	
2	Trebi (ck)	28	66	90	85	5	85	
30	NB14404	29	66	100	93	0	70	
26	NB15420	30	64	90	93	0	75	
27	NB15441	31	61	98	88	3	55	
13	DH140490	REMOVED FROM ANALYSIS DUE TO PRE-HARVEST SPROUT						
Average			74	97	91	19	89	
LSD (0.05)			13.2	7.1	9.5	35.0	22.3	
CV			7.8	3.6	5.1	89.0	12.3	

**Table 4. 2019-20 Uniform Barley Winter Hardiness Nursery
Under a Controlled Environment Freeze Test**

Entry #	Entry Name	Survival Rating ¹	% Survival ²
4	Kenosha (wht ck)	4.2	100
14	Dan (VA03H-61)	3.9	98
12	DH133783	3.6	95
18	VA14H-58	3.8	95
29	NB11414	3.7	93
10	DH141132	3.3	90
24	NB14422	3.3	90
32	NB17411	3.3	90
11	10.1492	3.1	88
16	Amaze 10 (VA07H-31 WS)	3.3	88
21	VA16M-84 (2R)	3.0	88
9	DH140963	3.0	85
3	Kearney (ck)	3.0	83
30	NB14404	3.3	83
31	NB17401	3.2	83
19	VA15H-73 (2R)	2.8	80
8	DH140088	2.9	78
23	NB12437	2.5	75
22	VA1BB-166 LA	2.2	68
6	Kentucky 1 (ck)	2.4	65
17	VA14B-63	2.2	65
25	NB15415	2.4	65
28	NB17431	2.6	63
7	DH130910	2.4	60
20	VA16M-81 (2R)	2.3	60
26	NB15420	2.1	58
15	Eve (VA01H-68)	2.1	50
27	NB15441	2.0	50
5	Dicktoo (ck)	1.2	40
2	Trebi (ck)	1.2	38
1	Tenn. Winter(ck)	1.0	28
13	DH140490 (REMOVED DUE TO PRE-HARVEST SPROUT)		
	Average	2.7	74
	LSD(0.05)	0.6	12
	CV	10.0	8

Parameters:

2 reps/10 plants per rep planted in cone-tainers (Livingston et al. 2005, Crop Science, 45:1545-1558)
 5 weeks at 13°C; 12 hours light/dark period; 400µmole light intensity
 3 weeks at 3°C; 12 hours light/dark period; 350µmole light intensity
 3 days @ -3°C in the dark (subzero acclimation)
 Whole plants were frozen @ 1°C/hour to -14°C for 3 hours
 Thawed @ 2°C/hour to 3°C
 Plants were watered once with 0.001% (v/v) Vitavax fungicide solution
 Plants were allowed to recover for 3 weeks in the greenhouse
 Whole plants were rated for regrowth after 21 days by visually assessing leaves and roots.

¹Rating:

- 0 = Completely dead
- 1 = 1 survived (green) shoot or 1 primary root
- 2 = 1 or 2 survived (green) shoots or 1 survived shoot and 1 or 2 primary roots
- 3 = 1 or 2 survived shoots with developed roots (primary and secondary roots)
- 4 = 95% survived shoots with well developed roots
- 5 = 100% survived with very little or no sign of freeze damage; same as unfrozen plants

²Survival (%):

50% of plants with rating of 1 plus all plants rated >2 divided by total number of plants frozen multiplied by 100

**Table 5. Across Location Percent Survival Means for
Check Cultivars in Previous Winter Hardiness Nurseries**

Nursery Year	Tenn. Winter	Trebi	Kearney	Kenosha	Dicktoo	Kentucky 1	LSD (0.05)
2000-01	50	35	56	87	58	58	14
2001-02	49	10	95	94	92	87	24
2002-03	76	61	91	100	86	93	29
2003-04	96	69	90	97	100	97	48
2004-05	43	22	62	89	65	64	23
2005-06	59	28	76	94	81	74	21
2006-07	32	7.6	59	94	50	59	14
2007-08	50	35	72	96	76	74	27
2008-09	53	31	66	98	75	68	6
2009-10	55	23	65	96	69	65	11
2010-11	33	17	67	96	65	43	13
2011-12	79	41	86	91	79	85	9
2012-13	94	48	100	98	88	88	8
2013-14	73	46	83	-	69	63	11
2014-15	41	33	75	86	40	44	11
2015-16	93	61	93	83	93	88	15
2016-17	40	53	85	88	58	45	15
2017-18	30	43	73	100	40	65	14
2018-19	No Data Due to Heavy Flooding at Many Locations						
2019-20	74	66	76	79	69	74	13
Avg.	59	38	77	93	71	70	