UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE

in cooperation with

STATE AGRICULTURAL EXPERIMENT STATIONS

Results from the

UNIFORM OAT WINTER HARDINESS NURSERY

2018-2019

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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CONTENTS

COOPERATING AGRICULTURAL EXPERIMENT STATIONS AND PERSONNEL

Country	State	AES Location	Personnel
USA	AR	Fayetteville	E. Mason
USA	IL	Lawrenceville	L. Phillippe
USA	NC	Raleigh	D. Marshall/M. Fountain
USA	OK	Ardmore	J. Anderson
USA	SD	Brookings	M. Caffe-Treml
USA	TN	Knoxville	D. West
USA	TX	College Station	B. Simoneaux
Austria	Edelhof	Saatzucht Edelhof	S. Berger & H. Hofbauer
Canada	Saskatchewan	Oat Advantage	J. Dyck
Czech Republic	Kromeriz	Agricultural Research Inst. Kromeriz, Ltd.	M. Zavřelová
Germany	Bad Vilbel	Dottenfelderhof 1	B. Schmehe
Hungary	Martonvasar	Agric. Res. Inst. of Hungary Academy	O. Veisz
Poland	Blonie	Plant Breeding and Acclimatization Ins.	B. Lapinski

DIGEST

NUMBER OF TEST LOCATIONS: 13 (7 US States, 6 foreign countries)

NUMBER OF ENTRIES: 21

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

DATA RECORDED: Percent winter survival

DATA NOT USED IN ANALYSIS:

Wales, UK	No Data
Fayetteville, AR	No Data
Knoxville, TN	No Data
Brookings, SD	0% Survival
Saskatchewan, Canada	0% Survival
Ardmore, OK	100% Survival
Bad Vibel, Germany	100% Survival
Laurenceville, IL	100% Survival

US STATE/COUNTRY	LOCATION	COOPERATORS' COMMENTS
Okalahoma	Ardmore	Plots were no-till planted on November 30 following Sorghum Sudan summer cover crop. Planting was delayed because of excessive August - November moisture which measured 29 inches of rain. Winter temperatures were slightly below normal with coldest stretch of 3 consecutive mornings below 20 degrees recorded in early March. Above average rainfall was recorded during the growing season (32.7 inches). All plots survived with minimal to no winter damage with the exception of a spring oat check which winter killed.
North Carolina	Laurel Springs	Soil saturation of ~100% all winter caused 0% winter survival for most plots
Austria	Edelhof	relatively warm but dry winter months; cold temperatures in March, rarely snow
Germany	Dottenfelderhof	We had a very mild winter, so all entries survived. Loose smut was spotted in entry 5 in both replications and in entries 6 and 8 in the first replication.
Hungary	Martonvásár	The last winter was mild in the region of Martonvásár, no snow cover, and the average temperature was above 0 C.

Table 1. Entries in the 2018-2019 Uniform Oat Winter Hardiness Nursery.

Entry No.	Entry name	Pedigree	Yrs in Nursery	Contributors	
1	Fulgum (ck)	CI 708	81		
2	Norline (ck)	CI 6903	58		
3	Wintok (ck)	CI 3424	77		
4	Winter Turf (ck)	CI 3296	78		
5	NC15-4180	Gerard 224 / Gerard 229	2	Murphy	NC
6	NC17-6440	GERARD 229 / TX07CS3697	1	Murphy	NC
7	NC17-6485	TX05CS556 / GERARD 224	1	Murphy	NC
8	NC17-6563	NC10-5069 / RODGERS	1	Murphy	NC
9	TAMO411	TAMO 405/Plot Spike LA9339	1	Simoneaux	TX
10	TAMO 412	FL9708-P71=(Coker 92Ab719/Horizon 314)//TAMO 405	1	Simoneaux	TX
11	TX07CS1948	FL9701-P30=(Horizon 314/Chapman)//TAMO 405	1	Simoneaux	TX
12	TX14OCS5061	TX08CS2235//TX00D110	1	Simoneaux	TX
13	TX14OCS5098	TX02U7097/HORIZON 321	1	Simoneaux	TX
14	TX14OCS5212	FL0115-J4/TX02U7047	1	Simoneaux	TX
15	TX15OCS6039	FLO522//TX07CS2783	1	Simoneaux	TX
16	TX15OCS6133	FLO522//TAMO406	1	Simoneaux	TX
17	TX15OCS6142	FLO522//TX02U7682	1	Simoneaux	TX
18	TX15OCS6163	FLO522//TX07CS3701	1	Simoneaux	TX
19	RAH P11U3	(CW57 x Pendek) x [Leggett 95-43Cn4 x (Mirabel-Pendragon x A.macrostachya)]	1	Lapinsky	Poland
20	RAH 461D	(CW57 x Pendek) x [(Wintok x Avena macrostachya) x Leggett 95-43Cn4]	1	Lapinsky	Poland
21	RAH M9K5n	[(Mirabel-Pendragon x A. macrostachya) x A. nuda] x (Wintok x A. macrostachya)	1	Lapinsky	Poland

Top 10 ranked survival entries for 2018-2019

Rank	Ent No.	Entry	Pedigree	% Survival (across locations)
1	21	RAH M9K5n	[(Mirabel-Pendragon x A. macrostachya) x A. nuda] x (Wintok x A. macrostachya)	67
2	20	RAH 461D	(CW57 x Pendek) x [(Wintok x Avena macrostachya) x Leggett 95-43Cn4]	65
3	9	TAMO411	TAMO 405/Plot Spike LA9339	65
4	11	TX07CS1948	FL9701-P30=(Horizon 314/Chapman)//TAMO 405	62
5	14	TX14OCS5212	FL0115-J4/TX02U7047	62
6	12	TX14OCS5061	TX08CS2235//TX00D110	61
7	19	RAH P11U3	(CW57 x Pendek) x [Leggett 95-43Cn4 x (Mirabel-Pendragon x A.macrostachya)]	59
8	13	TX14OCS5098	TX02U7097/HORIZON 321	59
9	10	TAMO 412	FL9708-P71=(Coker 92Ab719/Horizon 314)//TAMO 405	58
10	4	Winter Turf (ck)	CI 3296	56
			LSD (0.05)	**11**

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

Ent. No.	Entry Name	Ranked Means	Means across loc	Laurel Springs NC, USA	Blonie Poland	Edelhof Austria	Martonvasar Hungary	Kromeriz Czech Republic
1	Fulgum (ck)	19	46	0	25	48	80	77
2	Norline (ck)	17	48	4	31	51	77	77
3	Wintok (ck)	14	50	0	48	59	79	62
4	Winter Turf (ck)	10	56	0	54	70	82	73
5	NC15-4180	18	48	1	42	52	80	65
6	NC17-6440	21	42	0	42	27	72	68
7	NC17-6485	13	51	0	30	64	80	81
8	NC17-6563	16	48	0	36	46	76	84
9	TAMO411	3	65	28	76	74	77	69
10	TAMO 412	9	58	0	87	45	68	93
11	TX07CS1948	4	62	1	67	91	80	74
12	TX14OCS5061	6	61	6	73	88	73	62
13	TX14OCS5098	8	59	0	80	62	77	74
14	TX14OCS5212	5	62	4	73	82	71	84
15	TX15OCS6039	12	53	1	48	77	78	64
16	TX15OCS6133	15	49	1	55	39	74	77
17	TX15OCS6142	11	54	11	55	61	80	65
18	TX15OCS6163	20	45	0	50	42	77	58
19	RAH P11U3	7	59	7	77	68	79	67
20	RAH 461D	2	65	4	95	80	73	76
21	RAH M9K5n	1	67	29	71	83	85	65
	Average		55	4	58	62	77	72
	LSD (0.05)		11	22	33	31	15	9.9
	CV(%)		9.7	-	27	24	9.3	6.6

Table 2b. Winter Oat Survival (%) at Various Stations (sorted by rank)

Ent. No.	Entry Name	Ranked Means	Means across loc	Laurel Springs NC, USA	Blonie Poland	Edelhof Austria	Martonvasar Hungary	Kromeriz Czech Republic
21	RAH M9K5n	1	67	29	71	83	85	65
20	RAH 461D	2	65	4	95	80	73	76
9	TAMO411	3	65	28	76	74	77	69
11	TX07CS1948	4	62	1	67	91	80	74
14	TX14OCS5212	5	62	4	73	82	71	84
12	TX14OCS5061	6	61	6	73	88	73	62
19	RAH P11U3	7	59	7	77	68	79	67
13	TX14OCS5098	8	59	0	80	62	77	74
10	TAMO 412	9	58	0	87	45	68	93
4	Winter Turf (ck)	10	56	0	54	70	82	73
17	TX15OCS6142	11	54	11	55	61	80	65
15	TX15OCS6039	12	53	1	48	77	78	64
7	NC17-6485	13	51	0	30	64	80	81
3	Wintok (ck)	14	50	0	48	59	79	62
16	TX15OCS6133	15	49	1	55	39	74	77
8	NC17-6563	16	48	0	36	46	76	84
2	Norline (ck)	17	48	4	31	51	77	77
5	NC15-4180	18	48	1	42	52	80	65
1	Fulgum (ck)	19	46	0	25	48	80	77
18	TX15OCS6163	20	45	0	50	42	77	58
6	NC17-6440	21	42	0	42	27	72	68
	Average		55	4	58	62	77	72
	LSD (0.05)		11	22	33	31	15	9.9
	CV(%)		9.7	-	27	24	9.3	6.6

Table 3. Uniform Oat Winter Hardiness Nursery Under a Controlled Environment Freeze Test

Entry #	Entry Name	Survival Rating[1]	% Survival[2]
1	Fulgum (ck)	1.4	48
2	Norline (ck)	3.6	90
3	Wintok (ck)	2.5	75
4	Winter Turf (ck)	1.7	63
5	NC15-4180	2.0	57
6	NC17-6440	0.4	40
7	NC17-6485	0.7	48
8	NC17-6563	0.5	43
9	TAMO411	2.5	78
10	TAMO 412	3.7	90
11	TX07CS1948	3.5	85
12	TX14OCS5061	1.9	63
13	TX14OCS5098	2.2	73
14	TX14OCS5212	3.0	88
15	TX15OCS6039	0.6	40
16	TX15OCS6133	0.8	53
17	TX15OCS6142	0.8	45
18	TX15OCS6163	1.3	55
19	RAH P11U3	2.1	75
20	RAH 461D	3.0	83
21	RAH M9K5n	2.6	78
	Average	1.9	65
	LSD (5%)	0.8	17.5
	CV	18.1	12.9

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; 500µmole light intensity
3 weeks at 3°C; 12 hours light/dark period; 500µmole light intensity
3 days @ -3°C in the dark (subzero acclimation)
Whole plants were frozen @ 1°C/hour to -12°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.

[1]Rating:
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

[2]Survival (%):
50% of plants with rating of 1plus all plants rated >2 divided by total number of plants frozen multipled by 100