UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE

in cooperation with

STATE AGRICULTURAL EXPERIMENT STATIONS

Results from the

UNIFORM OAT WINTER HARDINESS NURSERY

2015-2016

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	AR	Fayetteville	E. Mason
USA	IL	Lawrenceville	L. Phillippe
USA	NC	Laurel Springs/Waynesville	D. Marshall/M. Fountain
USA	TN	Knoxville	D. West
USA	LA	Baton Rouge	S. Harrison
USA	OK	Ardmore	J. Anderson
Poland	Blonie	Plant Breeding and Acclimatization Ins.	B. Lapinski
Hungary	Martonvasar	Agric. Res. Inst. of Hungary Academy	O. Veisz
Austria	Edelhof	Saatzucht Edelhof	S. Berger & H. Hofbauer
Germany	Bad Vilbel	Dottenfelderhof 1	B. Schmehe
UK	Wales	IBERS Aberystwyth University	S. Cowan
Canada	Saskatchewan	Oat Advantage	J. Dyck

DIGEST

NUMBER OF TEST LOCATIONS: 12 (6 US States, 6 foreign countries)

NUMBER OF ENTRIES: 13

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

DATA RECORDED: Percent winter survival

DATA NOT USED IN ANALYSIS:

Knoxville, TN	No Data
Baton Rouge, LA	No Data
Wales, UK	No Data
Fayetteville, AR	No Data
Saskatchewan, Canada	No Data
Martonvásár, Hungary	100% Survival
Bad Vibel, Germany	100% Survival
Raleigh, NC	100% Survival
Ardmore, OK	100% Survival
Radzikow, Poland	0% Survival

US STATE/COUNTRY	LOCATION	COOPERATORS' COMMENTS
Hungary	Martonvásár	The last winter was very mild in the region of Martonvásár, no snow cover, and the average temperature was above 0C.
Poland	Radizkow	Radzików: The winter without snow, with minimal ground surface temperature -14.0 C. No plant survived. Some oat lines from beyond the UOWHN survived the low temperatures, but died later due to solarization. Sun operation at low temperatures without snow protection for ca. 2 months completely destroyed chlorophyll and plants were not able to regenerate. Gubalowka (foothills of the Tatra mountains): No UOWHN plant survived.
Austria	Edelhof	very warm winter, little snow on very few days, nearly no closed snow layer throughout the whole winter 2 days very cold conditions, dry conditions
Germany	Bad Vilbel	Again a very mild winter, with almost no snow. Lodging started at a very early stage (55) in all check varieties, later they lodged completely. All NC-varieties had no or almost no lodging until harvest. Loose smut spotted in entry 5 (NC09-4503N)
Oklahoma	Ardmore	Planted on Sept 14. Forage Clipping for forage quality was on Nov 20 with the entire plot clipped to a 2 in height. Grain was hand harvested on May 23. 50 lbs N/A was applied pre-plant and topdressed on Feb 1. MCPA was applied on Feb 19 for broadleaf weed control. Our weather was warm for much of the fall and early winter and spring was mild with plenty of moisture. No winterkill was seen in any oat or barley.

Table 1. Entries in the 2015-2016 Uniform Oat Winter Hardiness Nursery.

Entry No.	Entry name	Pedigree	Yrs in Nursery	Contributors	
1	Fulgum (ck)	Cl 708	78		
2	Norline (ck)	Cl 6903	55		
3	Winter Turf (ck)	Cl 3296	75		
4	Wintok (ck)	Cl 3424	75		
5	NC10-5069y	SC961246 / Rodgers	3	Murphy	NC
6	NC09-4503N	TX98D666/CABALLO // FLLA95131	2	Murphy	NC
7	NC12-3578	SS76-40 / NC02-7989 // LA98105B	1	Murphy	NC
8	NC12-3742	NC02-7989 / SC961246 // Gerard 224	1	Murphy	NC
9	NC12-3753	NC02-7989 / SC961246 // Gerard 224	1	Murphy	NC
10	NC13-6579	NC01-3981/WN10B//NC01-3981	1	Murphy	NC
11	NC13-6584	NC01-3981/WN10B//NC01-3981	1	Murphy	NC
12	NC13-6589	NC01-3981/WN10B//NC01-3981	1	Murphy	NC
13	NC13-6664N	WN10B/NC01-3981	1	Murphy	NC

Top 10 ranked survival entries for 2015-2016

Rank	Ent No.	Entry	Pedigree		% Survival (across locations)
1	4	Wintok (ck)	Cl 3424		80
2	8	NC12-3753	NC02-7989 / SC961246 // Gerard 224		74
3	5	NC09-4503N	TX98D666/CABALLO // FLLA95131		73
4	6	NC12-3578	SS76-40 / NC02-7989 // LA98105B		71
5	1	Fulgum (ck)	Cl 708		69
6	7	NC12-3742	NC02-7989 / SC961246 // Gerard 224		69
7	12	NC12-3922	Rodgers / NC03-2421		68
8	3	Winter Turf (ck)	Cl 3296		68
9	10	NC12-3447	NC02-8005 / AR02133 // Gerard 224		67
10	13	NC12-3963	Gerard 224 / SS76-40		65
				LSD (0.05)	**25**

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

Ent. No.	Entry Name	Ranked Means	Means across loc	Edelhof Austria	Laurenceville IL
1	Fulgum (ck)	5	69	79	60
2	Norline (ck)	11	55	80	30
3	Winter Turf (ck)	8	68	77	60
4	Wintok (ck)	1	80	100	60
5	NC10-5069y	3	73	85	60
6	NC09-4503N	4	71	92	50
7	NC12-3578	6	69	77	60
8	NC12-3742	2	74	88	60
9	NC12-3753	13	52	44	60
10	NC13-6579	9	67	75	60
11	NC13-6584	12	54	47	60
12	NC13-6589	7	68	77	60
13	NC13-6664N	10	65	70	60
	Average		67	76	57
	LSD (0.05)		25	50	0
	CV(%)		17	30	0

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

Ent. No.	Entry Name	Ranked Means	Means across loc	Edelhof Austria	Laurenceville IL
4	Wintok (ck)	1	80	100	60
8	NC12-3742	2	74	88	60
5	NC10-5069y	3	73	85	60
6	NC09-4503N	4	71	92	50
1	Fulgum (ck)	5	69	79	60
7	NC12-3578	6	69	77	60
12	NC13-6589	7	68	77	60
3	Winter Turf (ck)	8	68	77	60
10	NC13-6579	9	67	75	60
13	NC13-6664N	10	65	70	60
2	Norline (ck)	11	55	80	30
11	NC13-6584	12	54	47	60
9	NC12-3753	13	52	44	60
	Average		67	76	57
	LSD (0.05)		25	50	0
	CV(%)		17	30	0

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

Entry #	Entry Name	Survival Rating[1]	% Survival[2]
1	Fulgum (ck)	0.7	30
2	Norline (ck)	2.3	78
3	Winter Turf (ck)	1.5	58
4	Wintok (ck)	1.7	63
5	NC10-5069y	0.8	38
6	NC09-4503N	2.2	80
7	NC12-3578	1.9	68
8	NC12-3742	2.3	80
9	NC12-3753	0.7	25
10	NC13-6579	2.2	63
11	NC13-6584	1.7	60
12	NC13-6589	1.6	65
13	NC13-6664N	1.0	48
	Average	1.6	58
	LSD (5%)	0.2	10
	CV	6.4	8.3

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 -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