Response of Winter Oat Varieties From Winter and Early Spring Seeding

SPRING OATS

WINTER OATS

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Timeliness of seeding oats has long been recognized as one of the most important factors in producing a satisfactory crop. It is even more important with winter oats than with spring oats.

The acreage of fall-sown oats has increased rather rapidly in the past few years, consequently some rather detailed tests to determine the reaction of winter oats from different dates of seeding seemed to be necessary. Earlier tests at this Station established September 15 to October 15 as the best seeding dates for winter oats. It was assumed that if oats were not seeded by October 15 or 20, best results would be obtained by waiting until spring and seeding a spring-sown variety. However, some preliminary tests made in 1946 and 1947 suggested that certain varieties might respond favorably from late-winter and/or early-spring seedings. Therefore tests were set up in the winter of 1947 to study these responses. These tests have been conducted for six years, 1948-1953.

Briefly the results are as follows:

1. Certain winter oat varieties produce higher grain yields and test weights from January and early February seedings than do spring oats from any seeding date. Tennex and Stanton Strain 1 have shown best results.
2. These varieties sown in January or early February will give better yields and test weights than spring varieties seeded at any time. However, best oat yields in Oklahoma usually are obtained from winter varieties sown at the proper time in the fall; that is, between September 15 and October 15.
3. Based on results of the last six years, more favorable days for seeding are available in January than in February and early March.
4. Winter oats seeded in January and/or early February are more readily harvested with a combine than when sown in the fall because they grow shorter and consequently are subject to less lodging.

HOW THE TESTS WERE MADE

From previous observations, it was apparent that these tests could not be confined to a single winter oat variety as is usually the case with date-of-seeding tests. The varieties were chosen to represent a range of winter hardiness in winter oats, a semi-spring, and a spring type.

These in order of winterhardiness were:

Wintok	C. I. 3424[1]	Winter
Tennex	C. I. 3169	Winter
Traveler	C. I. 4206	Winter
Stanton Strain 1	C. I. 3855	Winter
Kanota	C. I. 839	Semi-spring
Neosho	C. I. 4141	Spring

It soon became apparent that more varieties of winter oats were needed since the response to dates of seeding varied more than was at first anticipated; consequently other varieties were added to the tests beginning in 1952. These varieties included:

Fordedeer	C. I. 3170	Winter
Winter Fulghum Selection	C. I. 6570	Winter
Unnamed	C. I. 5106	Winter
Andrew	C. I. 4170	Spring

Andrew was added because it is a more productive and generally a better adapted oat for this area than is Neosho.

In the beginning it was planned to seed on six dates, starting on or about January 1 and making successive plantings at 20, 18, 16, 14, and 12 day intervals thereafter. Beginning the second year of the test (1949), this plan was revised somewhat so that the seeding dates would fall on December 15, January 15, February 1, February 15, March 1, and March 15. Weather and soil conditions did not always permit following this schedule. Actual seeding dates for the six-year period are shown in Table I. It can be noted, for example, that in 1948 no seedings could be made until March 26, that neither January nor February seedings could be made in 1949, and that in 1952 the March 1 seeding had to be postponed until March 14. **(Tables I to VIII appear on pages 9 to 13. Appendix Table I appears on pages 14 and 15.)**

All plantings were made in nursery plots of four rows, 10 feet long in either five or six replications of each variety for each date.

[1] Accession number of the Section of Cereal Crops, U.S.D.A.

After note-taking during the growing season on habit of growth, survival, dates of heading and maturity, height, etc., 8 feet of the two center rows of each plot were harvested by hand. After drying, all plots were threshed with a Vogel nursery thresher.

RESULTS OF THE TESTS

Grain Yields

The highest and lowest yielding varieties for each of the six years are shown in Table II. The detailed yield data are shown in Appendix Table I.

All of the yields reported are extremely low, because the rotation system of small grains on which these tests were planted was such that timely tillage was not possible. The only land available for this test was some that had been planted to late-growing summer legumes which were not harvested until fall; consequently, first tillage was not possible until November or December, resulting in a loose and trashy seedbed. Only in 1952 was it possible to utilize somewhat earlier tilled soil and this was reflected in good yields. Even though nearly all yields were low, it is doubtful that the relative yields between varieties or dates were affected. In four of the six years the highest yield was produced by a winter variety.

Kanota, a semi-spring type, was the top producer in 1953, probably because the winter was extremely mild. It is noteworthy that in 1949, when no seedings could be made in January and February, the highest yields were produced from Kanota from the March 17 seeding and from Stanton Strain 1 from the March 11 seeding. In view of the results of the other years, it seems reasonable that had it been possible to make January and February seedings in 1949 the grain yields would have been much higher from the winter oats.

Test Weights

Just as with grain yields, the highest test weights were produced from the early February and January seedings (see Table III). The six-variety average test weights are 30.4, 29.8, 28.8, and 27.8 pounds for the early February, January, mid-February, and December seedings, respectively. Contrasted with this, the early March seedings had an average test weight of only 22.5 pounds. Later dates produced grain with even lower test weights.

Height of Plants

A comparison of height of plants of three winter oat varieties grown from fall seeding and from seedings December through early February for the six years, 1948-1953, is given in Table IV. The plants averaged from 4.2 inches shorter for Wintok to 5.4 inches shorter for Tennex from the December to early February seeding than from the fall seeding.

Emergence, Heading, and Ripening

The seeding of winter oats in January and February, when temperatures are relatively low, delays full emergence of the seedlings, but the delay results in no particular disadvantage as long as full emergence is finally achieved. In fact, it has been observed that considerable root growth takes place long before full emergence when the seedings are made early. That fact is of considerable importance in relation to available moisture and tolerance to lodging due to the establishment of a good root system. The average number of days required for seedling emergence, heading, and ripening from specified dates of seeding in these tests are shown in Table V.

The time required between seeding and emergence is of some concern to the grower. The comment is frequently made that there is no advantage from early seeding because the oat crop "gains no time."

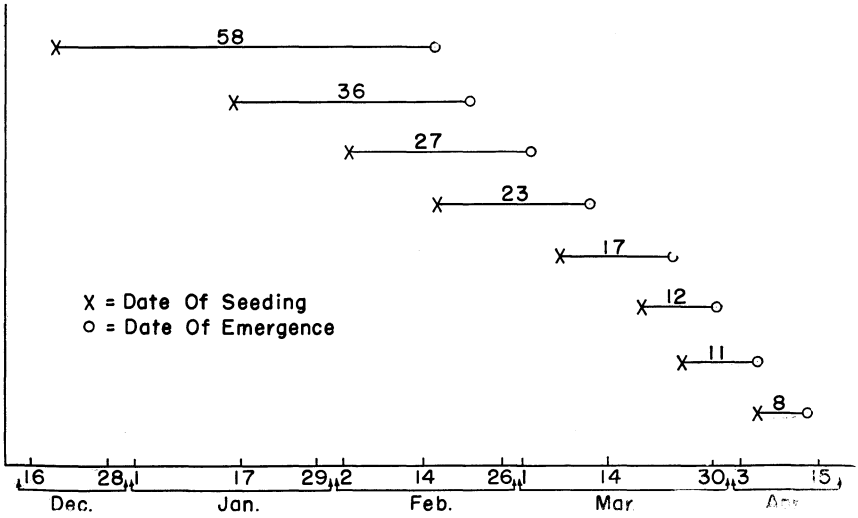

Figure 1.—Relationship of date of seeding and date of emergence of winter and spring oat varieties grown at Stillwater, Oklahoma, 1948-1953.

The facts do not bear this out. For example, some of the March seedings emerged as soon or almost as soon as some of the earlier seedings, yet the yields and test weights were considerably reduced from the late seedings. The average number of days required for emergence for all six varieties in the test is given by years in Table VI. The relationship between the dates of seeding and dates of emergence for the oats grown in the test is shown in Figure 1. Because of lower temperatures, a longer time is required for emergence from the December seedings than from the later seedings.

In 1952 when the highest yields were obtained from the December seeding, 56 days were required for full emergence and only 44 days in 1950 when the lowest yields were obtained from the December seeding. Seedlings just emerged are more susceptible to freeze injury than are seedlings before emergence or after some growth has taken place. The effect of low temperatures just after emergence on survival and grain yields can be noted from the data in Table VII. Neosho, a true spring variety, had low survival and grain yields from temperatures between —5°F to 28°F just after emergence. The winterhardy winter varieties showed little or no ill effects from these (low) temperatures.

DISCUSSION

With the advent of winter oat production in Oklahoma, numerous questions were raised with respect to the most efficient production methods. One of the first questions to be answered was, "How winterhardy are winter oats?" After several years of testing, it was learned that winter oats generally were the least hardy of the winter cereals, but also that the amount of survival was highly correlated with time of seeding, seedbed preparation, fertility level, etc. The optimum dates were determined to be about two to three weeks earlier than the optimum seeding dates for winter wheat. It has now been established that with good management and the selection of proper varieties, fair to good crops of winter oats can be successfully grown in practically every section of Oklahoma.

Since winter oats possess a habit of growth similar to that of winter wheat, it was thought their responses to low temperatures and/or short days to produce heading were also similar. For example, it is well known that varieties of winter wheat will not head if sown too late in the spring. Observational seedings of winter oats in February and early March indicated that this may not be true for all varieties of winter oats. Frequent inquiries concerning the possibility of seeding winter oats in

the spring was the direct reason for setting up the tests described in this bulletin.

The results obtained showed that winter oats have lower requirements for low temperatures and/or short days to produce heading than do most varieties of winter wheat. It was also learned that certain winter oat varieties are more responsive than others to these requirements. Further, these requirements do not seem to be correlated with the degree of winterhardiness. For example, the data in Table VIII show that when seeded on April 3, 1948, Wintok, the most winterhardy oat strain, had an average heading of 11.3%, Tennex, also very winterhardy, 11.7% and Stanton Strain 1 only 2.2% on June 30. Traveler, about as winterhardy as Stanton, had 7.2% heading on June 30. Kanota, the semi-spring type, was 44% headed on June 30; whereas Neosho, a true spring oat, was fully headed by June 12.

Table I.—Seeding Dates of Oat Varieties from December through April, Stillwater, Oklahoma, 1948-1953.

Year	Dec. 12/15 to 12/30	Jan. 1/12 to 1/20	Early Feb. 2/1 to 2/6	Mid-Feb. 2/13 to 2/19	Early March (2/28) to 3/14	Mid-March 3/17 to 3/20	Late March 3/25 and 3/26	April
1948	12-30	1-20	---	---	---	---	3-26	4-3 and 4-10
1949	12-20	---	---	---	3-11	3-18	3-25	4-1
1950	12-19	1-17	2-2	2-16	3-1	3-17	---	---
1951	12-18	1-17	2-5	2-19	(2-28)	3-19	---	---
1952	12-18	1-12	2-1	2-13	3-14	---	3-25	---
1953	12-15	1-13	2-2	2-16	3-9	3-20	---	---

Table II.—Highest and Lowest Yielding Oat Varieties in Date-of-Seeding Tests, Stillwater, Oklahoma, 1948-53.

Crop year	Highest yield			Lowest yield		
	variety	bushels	seeding date	variety	bushels	seeding date
1948	Tennex Wintok	36.4	Jan. 20	4 winter vars. & Kanota	0.0	Apr. 3 & 10
1949	Kanota Stanton	40.1 40.0	March 17 March 11	Traveler	5.5	April 1
1950	Stanton	35.7	Feb. 16	Neosho	0.0	Dec. 19 & Feb. 16
1951	Tennex	37.5	Feb. 5	All 6 vars.	0.0	Dec. 18 & Jan. 17*
1952	Stanton	78.2	Dec. 18	Wintok	14.3	March 25
1953	Kanota	50.5	Dec. 15	Wintok	0.0	March 20

* No seedling emergence from these two dates of seeding.

Table III.—Average Test Weights of Varieties by Seeding Periods, Stillwater, Oklahoma, 1948-1953.

Variety	Seeding period							
	Dec.	Jan.	Early Feb.	Mid-Feb.	Early March	Mid-March	Late March	April
Wintok	29.8	31.9	31.3	29.2	22.2	23.8	16.2	13.3
Tennex	29.0	31.2	31.0	29.8	22.8	21.6	19.1	16.5
Stanton Strain 1	26.5	28.2	28.2	27.5	18.8	23.2	16.8	13.8
Traveler	25.2	26.8	28.8	25.9	20.8	22.6	14.8	--
Kanota	29.0	31.0	32.2	30.6	25.4	23.0	21.2	17.2
Neosho	27.4	29.6	30.9	29.8	24.7	25.1	24.9	19.0
Average	27.8	29.8	30.4	28.8	22.5	23.2	18.8	16.0

Table IV.—Comparison of Height of Oat Varieties from Fall Seeding and from Seedings December Through Early February. (height of plants in inches)

Variety	Fall seeding		Dec. and early Feb. seeding		Difference
	range	average	range	average	
Wintok	20-36	27.5	20-28	23.3	4.2
Tennex	25-42	32.3	24-31	26.9	5.4
Stanton Strain 1	22-39	29.8	19-31	24.5	5.3

Table V.—Average Number of Days Required for Seedling Emergence, Heading, and Ripening For Oat Varieties in the Seeding Date Experiments, Stillwater, Oklahoma, 1948-1953.

Variety	December				January				Early February				Mid-February			
	E*	H	R	T	E	H	R	T	E	H	R	T	E	H	R	T
Wintok	58	86	29	173	36	84	27	147	27	77	27	131	23	72	24	119
Tennex	58	85	32	175	36	82	30	148	27	76	28	131	23	68	28	119
Stanton Strain 1	58	90	28	176	36	87	27	150	27	79	27	133	23	73	26	122
Traveler	58	90	29	177	36	88	27	151	27	81	27	135	23	73	26	122
Kanota	58	80	36	174	36	75	35	146	27	71	32	130	23	64	30	117
Neosho	58	94	26	178	36	89	26	151	27	80	26	133	23	73	26	122
Average	58	88	30	176	36	84	28	149	27	77	28	132	23	71	27	120

Table V—(continued)

Variety	Early March				Mid-March				Late March			
	E	H	R	T	E	H	R	T	E	H	R	T
Wintok	17	65	22	104	--	--	--	--	11	62	16	89
Tennex	17	62	25	104	12	68	15	95	11	56	22	89
Stanton Strain 1	17	68	22	107	12	67	19	98	11	64	18	93
Traveler	17	68	22	107	12	68	18	98	11	65	18	94
Kanota	17	57	29	103	12	55	26	93	11	54	22	87
Neosho	17	63	24	104	12	56	24	92	11	51	22	84
Average	17	64	24	105	12	63	20	95	11	59	20	89

* Letters indicate number of days required for:
E—seeding to emergence; H—emergence to heading; R—heading to ripening; T—(total) seeding to ripening.

Table VI.—Average Number of Days from Seeding to Emergence from Each Planting at Stillwater, Oklahoma, 1948-1953.*

Crop Year	Dec. 12/15 to 12/30	Jan. 1/12 to 1/20	Early Feb. 2/1 to 2/6	Mid-Feb. 2/13 to 2/19	Early March (2/28) to 3/14	Mid-March 3/17 to 3/20	Late March 3/25 and 3/26	April
1948	63	41	--	--	--	--	10	7
1949	77	--	--	--	16	11	13	9
1950	44	36	28	20	22	13	--	--
1951	+	+	26	15	24	14	--	--
1952	56	37	32	33	11	--	10	--
1953	49	28	28	24	14	11	--	--
Average	58	36	27	23	17	12	11	8

* Average of six varieties. Dates of emergence are only approximate inasmuch as these data were recorded for a seeding date as a whole and not by varieties within each date of seeding.

\+ Seeded but no emergence of any variety.

Table VII.—Effect of Emergence and Low Temperatures on Plant Survival and Grain Yield.

Year	Seeding date	Number of days for emergence	Low temperature	Effect on variety (yield)
1948	Dec. 30	63	—5°F on March 12	Neosho—3.0 bushels Kanota—16.1 bushels
1949	Dec. 20	77	23°F on March 16	Neosho—16.8 bushels
1950	Dec. 19	44	8°F on Feb. 1 19°F on Feb. 14	Neosho—No survival Kanota—6.1 bushels
1950	Feb. 16	20	14°F on March 13	Neosho—No survival
1950	March 1	22	28°F on March 29	Neosho—9.3 bushels
1953	Dec. 15	49	19°F on Feb. 21	Neosho—30.1 bushels

Table VIII.—Heading Dates and Percentage of Heading on Specified Dates for Six Varieties of Oats Grown in a Date-Of-Seeding Test at Stillwater, Oklahoma, 1948.

Variety	C.I. No.	Seeding date (date headed)			Seeding date (4-3-48) Percent headed on			Seeding date (4-10-48) Percent headed on		
		(12-30-47)	(1-20-48)	(3-26-48)	June 12	June 18	June 30	June 12	June 18	June 30
Wintok	3424	5-16	5-17	6-6	0.7	5.2	11.3	*	**	0.2
Tennex	3169	5-13	5-16	6-1	4.2	10.0	11.7	1.0	4.0	4.0
Stanton Strain 1	3855	5-21	5-22	6-10	0.3	1.7	2.2	**	**	0.7
Traveler	4206	5-21	5-21	6-10	0.8	3.5	7.2	**	0.3	0.5
Kanota	839	5-10	5-8	5-29	38.0	44.0	44.0	5.2	13.0	13.0
Neosho	4141	5-24	5-22	5-26	100.0	---	---	100.0	---	---

* = Very light trace; about 0.1%.
** = Trace; about 0.5%.

Appendix Table I.—Grain Yields of Oat Varieties Seeded at Different Dates at Stillwater, Oklahoma, 1948-1953.

Variety	Seeding period: Dec.	Jan.	Early Feb.	Mid-Feb.	Early March	Mid-March	Late March	April	Variety average
				1948					
Wintok	29.2	36.4	---	---	---	---	15.3	0.0	20.2
Tennex	31.0	36.4	---	---	---	---	17.4	0.0	21.2
Stanton Strain 1	22.1	34.7	---	---	---	---	9.4	0.0	16.6
Traveler	21.7	32.0	---	---	---	---	7.1	0.0	15.2
Kanota	16.1	31.0	---	---	---	---	24.7	0.0	18.0
Neosho	3.0	27.2	---	---	---	---	32.4	25.3	22.0
Average	20.5	33.0	---	---	---	---	17.7	2.1*	---
				1949					
Wintok	33.1	---	---	---	28.0	20.9	12.1	7.5	20.3
Tennex	36.7	---	---	---	33.8	32.8	21.2	14.9	27.9
Stanton Strain 1	35.4	---	---	---	40.0	34.9	29.6	11.9	30.4
Traveler	19.0	---	---	---	28.9	23.6	15.2	5.5	18.4
Kanota	29.6	---	---	---	39.3	40.1	35.9	17.9	32.6
Neosho	16.8	---	---	---	39.7	36.5	34.3	15.1	28.5
Average	28.4	---	---	---	35.0	31.5	24.7	12.1	---
				1950					
Wintok	21.2	25.2	31.5	32.6	21.9	19.3	---	---	25.3
Tennex	42.8	33.9	25.1	15.6	27.0	27.9	---	---	28.8
Stanton Strain 1	37.1	33.8	24.2	20.4	13.7	28.0	---	---	27.8
Traveler	28.6	29.9	28.8	32.6	22.1	20.8	---	---	27.1
Kanota	6.1	25.8	21.3	26.7	16.3	32.2	---	---	21.4
Neosho	0.0	29.4	31.8	0.0	9.3	32.3	---	---	17.1
Average	18.1	28.5	28.9	26.9	18.4	26.8	---	---	---
				1951					
Wintok	**	**	25.6	25.9	16.3	18.2	---	---	14.3+
Tennex	**	**	37.5	31.3	28.1	33.0	---	---	21.7+
Stanton Strain 1	**	**	19.3	20.4	11.1	24.0	---	---	12.5+
Traveler	**	**	37.3	30.0	24.0	33.9	---	---	20.9+

CORRECTION: In 1950, above, substitute

Tennex	**25.5**	**29.1**	**29.5**	**33.5**
Stanton Strain 1	**27.2**	**31.3**	**30.6**	**35.7**

Appendix Table I.—(Continued).

Variety	Seeding period: Dec.	Jan.	Early Feb.	Mid-Feb.	Early March	Mid-March	Late March	April	Variety average
Kanota	**	**	28.1	23.4	21.4	29.6	---	---	17.1+
Neosho	**	**	34.3	27.4	27.2	31.5	---	---	20.1+
Average	0	0	30.4	26.4	21.4	28.4	---	---	---
1952									
Wintok	71.1	59.6	51.8	38.6	24.6	---	14.3	---	43.3
Tennex	61.4	69.0	49.0	46.5	26.3	---	26.1	---	46.4
Stanton Strain 1	78.2	61.5	49.3	47.5	26.8	---	21.4	---	47.5
Traveler	75.3	61.7	49.9	43.0	24.1	---	26.4	---	46.7
Kanota	70.8	64.9	48.8	41.5	33.2	---	36.6	---	49.3
Neosho	67.1	58.5	54.6	49.9	43.1	---	42.4	---	52.6
Forkedeer	73.3	70.1	52.7	49.7	26.6	---	22.5	---	49.2
W. Fulg. Sel.	69.5	64.5	43.9	38.6	23.4	---	9.0	---	41.5
C. I. 5106	***	***	***	48.4	35.1	---	30.9	---	---
Andrew	***	***	***	49.1	44.3	---	48.8	---	---
Average	71.1++	63.8++	50.1	45.2	30.8	---	27.8	---	---
1953									
Wintok	39.1	37.5	23.3	13.7	4.9	0.0	---	---	20.6
Tennex	42.8	33.9	25.1	15.6	6.4	1.7	---	---	20.9
Stanton Strain 1	37.1	33.8	24.2	20.4	2.3	1.1	---	---	19.8
Traveler	35.8	30.2	25.9	15.9	4.1	1.1	---	---	18.8
Kanota	50.5	47.1	39.4	35.4	20.4	6.0	---	---	33.1
Neosho	30.1	24.8	22.7	18.4	11.3	10.9	---	---	19.7
Forkedeer	43.3	36.0	27.4	20.4	11.4	1.7	---	---	23.4
W. Fulg. Sel.	32.4	22.7	14.3	7.1	1.7	0.0	---	---	13.0
C. I. 5106	40.3	41.5	28.5	23.4	10.1	4.5	---	---	24.7
Andrew	34.1	29.6	28.3	21.4	13.3	12.8	---	---	23.3
Average	38.6	33.7	25.9	19.2	8.6	4.0	---	---	---
Combined Average	29.5	31.8	34.2	29.4	22.5	22.5	23.4	5.5	---

* Average of April 3 and April 10 seedings.
** No emergence.
\+ Average of six dates.
*** Little or no seed germination.
++ Average of eight varieties.