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Agricultural Experiment Station
South Dakota State University
U.S. Department of Agriculture

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ALFALFA CULTIVAR YIELD TEST FOR SOUTH DAKOTA: 1993 REPORT

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Public and commercial breeding programs have produced many alfalfa cultivars in the last 15 years. That makes selecting the proper cultivar for your needs no easy task, for you should have yield information from several South Dakota locations before choosing. The Alfalfa Cultivar Yield Test reports relative forage production characteristics for available cultivars and experimental lines at several locations in South Dakota.

• Materials and Methods

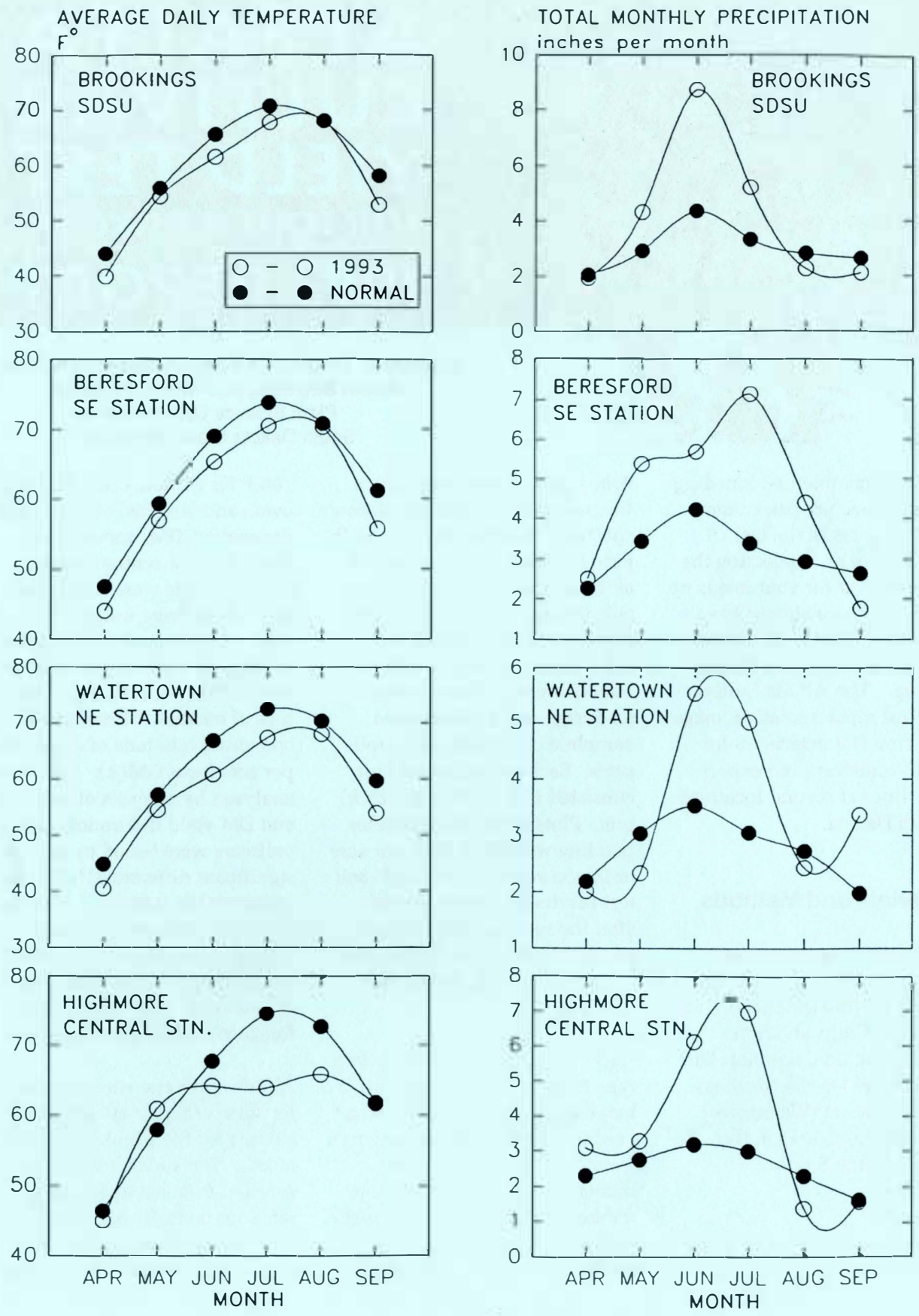
Field experiments were established in 1991 at the Southeast Research Station (Beresford) and the Central Crops and Soils Research Station (Highmore), in 1990 and 1993 at the Northeast Research Station (Watertown), and in 1990 and 1992 at the SDSU Research Station (Brookings).

Alfalfa was planted between mid-April and late May into a firmly packed seedbed using a five-row planter with 6-inch row spacings. Seeding rate was 15 lb pure live seed (PLS) per acre at all locations. A preplant herbicide (Eptam at 3 lb active ingredient per acre) was used for weed control during alfalfa establishment. The experimental design was a randomized complete block with four replicates. Each experimental unit consisted of a 75 ft^2 (3 ft x 25 ft) plot. Plots were fertilized after planting with 50 lb P_2O_5 per acre or in accordance with SDSU soil test results for growth periods after the seeding year. Insect pests did not reach problem levels, and chemical control was not used.

Harvesting was done with a flail-type forage plot harvester with a harvest area of either 44 or 66 ft^2 per plot. Fresh herbage weights were obtained for each plot immediately following herbage removal. Moisture samples were randomly taken from half of the entries in each replicate, dried at 100 F for 72 hours in a forced-air oven, and weighed to determine dry-matter (DM) concentration. Mean DM concentrations for each replicate were multiplied by fresh herbage weights for each experimental unit and then divided by harvest area to obtain forage DM production per unit area of harvest. These data were converted into tons of dry matter per acre (tons DM/A). Data were analyzed by analysis of variance, and DM yield differences among cultivars were tested by the least significant difference (LSD) procedure at the 0.05 level of probability. Relative performance among cultivars was calculated by dividing average total seasonal yield over years by the mean forage yield of a given location.

Alfalfa cultivars were evaluated for stage of maturity at time of harvest for the Brookings experiments. Ten shoots randomly selected from each plot were rated for maturity according to the Kalu and Fick (1981, Crop Science 21:267-271) mean-stage-

Fig 1. Average daily temperature and total monthly precipitation during the 1993 growing season.



by-count scheme (Table 1). Experiments were harvested up to four times each year; however, growth conditions at some locations often limited harvest frequencies.

Table 1. Kalu and Fick[a] maturity index for phenological development of alfalfa.

Stage number	*Stage name*
0	Early vegetative
1	Mid-vegetative
2	Late vegetative
3	Early bud
4	Late bud
5	Early flower
6	Late flower
7	Early seed pod
8	Late seed pod
9	Ripe seed pod

[a]Kalu, B.A., and G.W. Fick. 1983. Quantifying morphological development of alfalfa for studies of herbage quality. Crop Sci. 21:267-271.

• 1993 Results

Southeast Research Station, Beresford

Average daily temperatures were below normal for all months except August, which was near normal (Fig 1). Precipitation during May and June was about 1.5 times higher than normal and in July was more than twice the amount normally received.

Three harvests were obtained from the trial seeded in 1991. Average three-cut total DM yield was 5.55 T/A, and some significant differences were detected among the 36 entries (Table 2). The 1993 total yield was over 1 T/A greater than total yields in 1992.

Table 2. Forage yield of 36 alfalfa cultivars planted April 24, 1991, at the Southeastern Research Station, Beresford, S.D.

	1992	1993					% of
	3-Cut	Cut 1	Cut 2	Cut 3	3-Cut	92 to 93	2-year
Cultivar	Total	6/15	7/28	9/1	Total	Average	Average
	tons DM / acre						- % -
Webfoot MPR (a)	4.72	3.11	1.98	1.31	6.41	5.57	113
DK 122	4.42	3.65	1.85	1.12	6.61	5.51	112
Asset	4.86	3.22	1.71	1.11	6.04	5.45	111
Multi-plier	4.72	3.37	1.71	0.97	6.06	5.39	110
Arrow	4.55	3.41	1.83	0.99	6.22	5.39	109
SX 217	4.35	3.10	1.96	1.32	6.38	5.37	109
88R20 (b)	4.21	3.24	1.93	1.19	6.36	5.28	107
Guardsman	4.17	3.44	1.83	1.09	6.36	5.26	107
GH 777	4.36	3.18	1.82	1.10	6.10	5.23	106
Dawn	4.51	3.13	1.73	1.00	5.87	5.19	105
Magnum III	4.95	3.05	1.62	0.72	5.39	5.17	105
Crown II	4.25	3.07	1.79	1.17	6.02	5.13	104
90792 (b)	4.37	2.85	1.77	1.17	5.78	5.08	103
Victory	4.78	3.11	1.50	0.75	5.36	5.07	103
GH 755	4.66	3.10	1.60	0.78	5.47	5.06	103
5262	4.08	3.14	1.73	1.17	6.04	5.06	103
5364	3.98	3.82	1.50	0.80	6.12	5.05	103
XEA92 (b)	4.46	2.65	1.86	1.12	5.62	5.04	102
Flagship 75 (a)	4.32	3.01	1.76	0.94	5.71	5.01	102
120	4.44	3.21	1.54	0.75	5.50	4.97	101
Multistar (a)	4.09	3.31	1.58	0.95	5.84	4.96	101
2852	4.20	3.22	1.54	0.92	5.67	4.94	100
Dart	4.39	2.75	1.64	1.09	5.47	4.93	100
WL 317	4.57	2.95	1.46	0.86	5.26	4.92	100
Cimarron VR	4.59	2.99	1.47	0.70	5.15	4.87	99
Eclipse	4.08	3.13	1.45	0.88	5.45	4.76	97
Milk Maker II	4.14	3.16	1.55	0.66	5.37	4.75	97
W90VSX (b)	4.10	3.16	1.54	0.71	5.41	4.75	97
Garst 645	4.18	2.88	1.47	0.96	5.31	4.75	96
Saranac AR	4.05	2.84	1.62	0.87	5.33	4.69	95
2833	4.09	2.44	1.52	0.80	4.76	4.42	90
Riley	4.10	2.86	1.22	0.54	4.62	4.36	89
Baker	4.13	2.98	1.17	0.41	4.55	4.34	88
SDHL1L (b)	4.15	2.81	0.94	0.47	4.22	4.18	85
Vernal	4.06	2.65	1.10	0.38	4.13	4.09	83
Blazer XL	2.10	1.89	1.29	0.86	4.04	3.07	62
AVERAGE	4.28	3.05	1.60	0.91	5.55	4.92	
Maturity (c)		5.1	6.0	4.8			
CV %	10.9	15.3	14.2	29.6	12.7	12.5	
LSD (0.05)	0.66	0.66	0.32	0.38	0.99	0.65	

(a) Variety entered as experimental, data may not reflect performance of commercial seed.
(b) Experimental line, not currently marketed.
(c) Kalu and Fick (1983) index, mean stage by count.

Average yields for the three harvests in 1993 ranged from 0.91 T/A for the third harvest to 3.05 T/A for the first harvest. These first-cutting yields are extremely high for this location; they can probably be attributed to above-normal precipitation received during May and early June.

Two-year average yield for this experiment was 4.92 T/A, with significant differences among the entries. The cultivar 'Blazer XL'

yielded significantly lower than all of the other cultivars except for '2833' on the first harvest. At both the second and third harvests, Blazer XL performed better in terms of relative ranking but still was one of the lower producing cultivars. In 1992 Blazer XL produced a three-cut total yield that was only about 50% that of other cultivars (Table 2). The low productivity of this cultivar was probably due to poor establishment during the seeding year.

Three of the other lowest yielding cultivars ('Riley', 'Baker', and 'Vernal') are all public cultivars that have been marketed for several decades.

SDSU Research Station, Brookings

Average daily temperatures were below normal for all months except August, which was normal (Fig 1). Precipitation was normal in April, slightly below normal in August and September, and much above normal during May, June, and July. Precipitation in July was more than double that normally received.

The 1990 planting produced four harvests. Average yields ranged from 0.90 T/A for the fourth cutting to 2.57 T/A for the first cutting (Table 3). For each cutting, differences among the cultivars were found.

Four-cut total yield was 6.23 T/A, with significant cultivar differences detected. Total yields in 1993 were about 2.6 T/A higher than in 1992 and 1.1 T/A higher than in 1991. Three-year average yield was 5.01 T/A, with significant cultivar differences found.

Cultivars showed significant differences in maturity at the second, third, and fourth cuttings in 1993 (Table 4). Significant maturity differences have been observed in previous years. The relevance of significant cultivar differences for maturity is probably greater for forage quality characteristics than for yield.

Another experiment consisting of 28 cultivars was seeded in 1992. Two cuttings were obtained in 1993. Average two-cut total yield was 2.53 T/A, with significant cultivar differ-

Table 3. Forage yield of 32 alfalfa cultivars planted April 24, 1990, at the Crop Improvement Research Station, Aurora, S.D.

	1990	1991	1992	1993						% of
	1-Cut	3-Cut	3-Cut	Cut 1	Cut 2	Cut 3	Cut 4	4-Cut	91 to 93	3-Year
Cultivar	Total	Total	Total	6/11	7/13	8/10	9/27	Total	Average	Average
	tons DM / acre									- % -
Garst 630	1.29	5.50	4.34	2.69	1.90	1.33	0.97	6.89	5.57	111
VS-888 (a)	1.24	5.81	4.18	2.67	1.76	1.20	1.01	6.64	5.54	111
2833	1.38	5.52	3.89	2.74	1.79	1.16	0.90	6.59	5.33	106
8837N (a)	1.15	5.51	3.75	2.65	1.73	1.22	1.05	6.64	5.30	106
Centurion	1.39	5.39	3.92	2.71	1.76	1.18	0.94	6.59	5.30	106
DK 122	1.25	5.45	3.88	2.55	1.76	1.18	0.98	6.46	5.26	105
5262	1.17	5.36	3.81	2.51	1.82	1.25	1.02	6.59	5.25	105
Flint	1.32	5.29	3.92	2.52	1.74	1.23	1.04	6.52	5.24	105
SX 217	1.23	5.15	4.06	2.52	1.69	1.10	1.03	6.33	5.18	103
Multi-plier	1.29	5.46	3.85	2.64	1.56	1.11	0.90	6.22	5.18	103
5364	1.20	5.30	3.86	2.61	1.54	1.15	1.06	6.36	5.17	103
H 174 (a)	1.20	5.21	3.68	2.62	1.74	1.22	1.04	6.62	5.17	103
Crown II	1.37	5.36	3.64	2.59	1.78	1.17	0.97	6.50	5.17	103
VIP	1.27	5.40	3.66	2.49	1.63	1.17	1.00	6.29	5.12	102
Dawn	1.18	5.11	3.77	2.63	1.75	1.18	0.86	6.42	5.10	102
Aggressor	1.24	5.14	3.70	2.74	1.66	1.14	0.91	6.46	5.10	102
MultiKing 1	1.23	5.14	3.86	2.54	1.70	1.15	0.87	6.27	5.09	102
8941N (a)	1.19	5.23	3.68	2.54	1.71	1.16	0.94	6.35	5.09	101
Garst 645	1.17	5.20	3.65	2.56	1.73	1.16	0.94	6.40	5.08	101
Allegiance	1.16	5.19	3.55	2.51	1.75	1.21	0.96	6.44	5.06	101
2841	1.35	5.04	3.81	2.66	1.53	1.12	0.93	6.24	5.03	100
MN GRN-14 (a)	1.09	5.08	3.53	2.57	1.72	1.18	0.89	6.37	4.99	100
H 154 (a)	1.25	5.04	3.72	2.19	1.73	1.20	1.02	6.13	4.96	99
WL 317	1.17	4.87	3.55	2.61	1.67	1.15	0.91	6.34	4.92	98
Vernal	1.33	4.92	3.57	2.60	1.63	1.06	0.84	6.13	4.87	97
120	1.35	5.07	3.43	2.70	1.69	1.01	0.71	6.10	4.87	97
8832N (a)	1.19	5.21	3.30	2.44	1.60	1.09	0.87	6.00	4.84	97
WL 225	1.24	4.84	3.41	2.59	1.62	1.05	0.86	6.12	4.79	96
SDHS6 (a)	1.25	4.50	2.93	2.50	1.41	0.82	0.58	5.31	4.25	85
AFYF 88 (a)	1.06	4.32	3.00	2.53	1.37	0.81	0.57	5.28	4.20	84
SDHL1 (a)	1.25	4.29	2.98	2.41	1.23	0.79	0.64	5.06	4.11	82
MTO S82 (a)	1.32	4.62	2.69	2.43	1.30	0.70	0.47	4.89	4.07	81
AVERAGE	1.24	5.14	3.64	2.57	1.65	1.11	0.90	6.23	5.01	
CV %	9.1	5.5	10.3	6.1	8.9	7.5	15.0	5.5	5.8	
LSD (0.05)	0.16	0.39	0.53	0.22	0.21	0.12	0.19	0.48	0.39	

(a) Experimental line, not currently marketed.

Table 4. Maturity (a) of 32 alfalfa cultivars planted April 24, 1990, at the Crop Improvement Research Station, Aurora, S.D.

	1990	1991			1992			1993			
	Cut 1	Cut 1	Cut 2	Cut 3	Cut 1	Cut 2	Cut 3	Cut 1	Cut 2	Cut 3	Cut 4
Cultivar	9/5	6/6	7/3	7/31	6/3	7/8	8/10	6/11	7/13	8/10	9/27
	index (a)										
120	3.6	3.1	4.0	3.5	3.5	3.9	3.7	4.0	3.8	3.9	2.6
2833	3.9	3.5	4.2	3.4	3.6	4.3	3.6	4.0	3.9	3.8	2.7
2841	4.1	3.5	4.3	3.5	3.4	4.3	3.6	4.1	3.8	3.9	2.9
5262	3.3	3.3	4.1	3.5	3.2	4.2	3.7	4.0	3.8	3.8	2.6
5364	4.0	3.4	4.1	3.6	3.2	4.4	3.7	3.9	3.8	3.9	2.7
8832N (b)	3.8	3.2	4.2	3.6	3.3	4.0	3.7	4.0	3.9	3.9	2.8
8837N (b)	3.9	3.2	4.1	3.5	3.4	4.4	3.5	3.9	3.9	3.9	2.8
8941N (b)	4.0	3.4	4.0	3.6	3.3	4.2	3.6	3.9	3.8	3.9	2.7
AFYF 88 (b)	3.0	3.4	3.7	3.2	3.5	4.4	3.8	3.9	3.5	3.8	1.8
Aggressor	3.8	3.4	4.1	3.7	3.4	4.2	3.7	4.0	3.8	4.0	2.8
Allegiance	3.6	3.3	4.4	3.7	3.1	4.3	3.6	4.0	3.9	4.0	2.7
Centurion	4.1	3.6	4.4	3.4	3.5	4.2	3.8	4.0	3.9	4.0	2.6
Crown II	3.7	3.7	4.1	3.6	3.4	4.2	3.6	4.0	3.9	3.9	2.7
DK 122	3.7	3.5	4.0	3.6	3.6	4.4	3.6	3.9	4.1	3.9	2.8
Dawn	3.9	3.4	4.1	3.6	3.3	4.2	3.6	3.8	3.8	4.0	2.7
Flint	3.7	3.2	4.2	3.5	3.3	3.8	3.7	3.9	3.8	3.9	2.7
Garst 630	3.9	3.6	4.0	3.5	3.4	4.4	3.7	4.0	3.8	3.9	2.7
Garst 645	3.9	3.3	4.3	3.8	3.4	4.3	3.6	3.9	3.9	3.8	2.9
H 154 (b)	3.7	3.1	4.0	3.6	3.3	4.3	3.4	4.0	3.9	3.9	2.7
H 174 (b)	3.9	3.2	4.1	3.6	3.7	4.3	3.9	4.0	3.9	3.8	2.8
MN GRN-14 (b)	3.5	3.5	4.3	3.6	3.4	4.4	3.8	3.9	3.9	3.9	2.7
MTO S82 (b)	3.2	3.5	3.7	3.0	3.6	4.2	3.7	3.9	3.7	3.6	1.9
Multi-plier	3.7	3.3	4.0	3.5	3.4	4.1	3.7	3.8	3.9	3.9	2.7
MultiKing 1	4.0	3.3	4.3	3.8	3.5	4.2	3.7	3.9	3.9	4.0	2.8
SDHL1 (b)	3.3	3.2	4.0	3.3	3.3	4.0	3.6	4.0	3.8	3.8	2.0
SDHS6 (b)	3.2	3.1	3.8	3.1	3.2	4.0	3.7	4.1	3.7	3.7	2.0
SX 217	3.8	3.4	3.9	3.6	3.2	4.4	3.6	4.0	3.8	3.9	2.5
VIP	3.8	3.4	3.8	3.6	3.4	4.5	3.7	4.0	3.8	3.9	2.5
VS-888 (b)	4.2	3.5	4.3	3.6	3.7	4.4	3.6	4.0	3.8	3.9	2.9
Vernal	3.4	3.4	4.2	3.4	3.2	4.1	3.9	4.0	3.7	3.9	2.7
WL 225	3.4	3.2	4.2	3.5	3.1	4.0	3.6	4.0	3.7	3.9	2.7
WL 317	3.7	3.4	4.2	3.5	3.6	4.4	3.7	3.9	3.8	3.9	2.7
AVERAGE	3.7	3.3	4.1	3.5	3.4	4.2	3.7	3.9	3.8	3.9	2.6
CV %	8.9	7.6	5.0	4.9	7.3	7.3	5.4	2.3	3.1	3.1	7.7
LSD (0.05)	0.5	NS (c)	0.3	0.2	0.3	NS	NS	NS	0.2	0.2	0.3

(a) Kalu and Fick (1983) index, mean-stage-by-count.
(b) Experimental line, not currently marketed.
(c) NS=Means among cultivars not significantly different at the 0.05 level of probability.

ences found (Table 5). Cultivar differences were also detected for each of the two individual cuttings in 1993. Cultivars differed in maturity at the second harvest but not at the first cutting.

Stand density ratings were taken on these 1992 seedings in June 1993. Large differences were apparent. These differences were mainly due to stand deterioration caused by the extremely wet conditions in 1993. Encroachment of grassy weeds into the plots was a secondary problem. It is interesting to note that, in most cases, the cultivars that had low stand density ratings also had low two-cut yields.

Northeast Research Station, Watertown

Average daily temperatures were below normal every month during the growing season (Fig 1). This deviation from normal was especially evident during June and July. Precipitation was variable throughout the growing season—below normal during April, May, and August and much above normal during June, July, and September.

Three harvests were obtained in the final year of an experiment planted in 1990. Average three-cut total DM yield was 4.59 T/A, with significant differences among the 36 entries (Table 6).

These yields were similar to yields obtained in 1992 but were about 2.5 T/A lower than yields in 1991. Average yields for the three harvests in 1993 ranged from 1.09 T/A for the third harvest to 1.96 T/A for the first harvest. Three-year average yield for this experiment was 5.30 T/A, with yields ranging from 4.78 to 5.93 T/A.

Another experiment consisting of 29 cultivars was seeded in 1993 (Table 7). Two harvests were made during the seeding year. First-cut yields averaged 1.28 T/A with significant cultivar differences detected. Yields for the second harvest averaged 1.0 T/A, but ranged from 0.56 to 1.27 T/A with significant differences observed. Two-cut total yields averaged 2.28 T/A, but

again there was a wide range in cultivar yields.

Next year will be the first full production year for this experiment, and the above-normal precipitation received during the fall should allow the first-cutting yields in 1994 to be optimum.

Central Research Station, Highmore

Average daily temperatures were normal for April and September at Highmore, slightly above normal for May, and were much below normal during June, July, and August (Fig 1). Precipitation was normal in September, slightly below normal in August, and above normal during April through July. Precipitation during June and July was more than double the amount normally received.

Four harvests were obtained from the experiment planted in 1991 (Table 8). Average yields for the four cuttings ranged from 1.04 T/A for the fourth cutting to 1.84 T/A for the second cutting. First and second cutting yields were high because of above-normal precipitation during late spring and early summer. Significant differences among cultivars were present for each of the four individual cuttings.

Four-cut total yields in 1993 were about two times higher than those of 1992, when only two cuttings were taken. Four-cut total yields ranged from 3.69 T/A to 7.36 T/A, with significant cultivar differences detected.

Table 5. Forage yield, maturity (a), and stand density ratings (b) of 28 alfalfa cultivars planted May 1, 1992, at the SDSU Research Station, Brookings, S.D.

	1993			% of			1993
	Cut 1	Cut 2	2-Cut	1993	1993 Maturity (a)		Stand
Cultivar	6/3	7/8	Total	Average	Cut 1	Cut 2	Density (b)
	--tons DM / acre ---			- % -	----- index -----		- rating -
Dart	1.57	1.40	2.98	118	3.7	4.7	9.3
DK 122	1.55	1.39	2.94	116	3.8	4.5	7.8
Apollo Supreme	1.42	1.37	2.78	110	3.9	4.4	7.0
5246	1.42	1.32	2.74	108	3.8	4.4	8.3
Webfoot MPR (c)	1.54	1.21	2.74	108	3.7	4.7	7.0
Guardsman	1.41	1.29	2.70	107	3.6	4.7	7.5
Dominator	1.36	1.33	2.69	106	3.7	4.6	7.5
Magnum III	1.54	1.13	2.67	105	3.9	4.5	7.0
DK 133 (c)	1.37	1.27	2.64	104	3.7	4.7	7.0
LG-9323	1.34	1.25	2.59	102	3.8	4.6	6.5
WL 322 HQ	1.40	1.18	2.58	102	3.5	4.6	7.5
5454	1.47	1.11	2.58	102	3.6	4.5	8.5
Allegiance	1.39	1.18	2.58	102	3.8	4.6	7.5
Thrive	1.31	1.27	2.57	102	3.7	4.7	6.3
Garst 645	1.40	1.18	2.57	102	3.6	4.6	6.3
Multi-plier	1.42	1.10	2.52	100	3.6	4.5	5.5
120	1.42	1.07	2.50	99	3.5	4.1	5.8
Dawn	1.25	1.23	2.48	98	3.8	4.5	6.0
Profit	1.40	1.04	2.44	96	3.8	4.4	6.0
Riley	1.29	1.14	2.43	96	3.6	4.5	6.3
Saranac AR	1.30	1.10	2.40	95	3.8	4.2	4.8
SDHL1LL (d)	1.41	0.99	2.39	95	3.6	4.2	5.5
Clipper	1.37	1.01	2.38	94	3.7	4.5	5.0
WI9125 (d)	1.45	0.92	2.37	94	3.6	4.1	4.3
Wisfal (d)	1.67	0.69	2.36	93	3.5	3.8	1.8
Vernal	1.28	0.95	2.24	88	3.6	4.2	5.3
Baker	1.28	0.81	2.09	83	3.5	3.9	4.5
SDHS6S (d)	1.05	0.96	2.01	79	3.4	3.8	3.0
AVERAGE	1.39	1.14	2.53		3.6	4.4	6.2
CV %	11.9	15.7	10.0		4.5	5.8	29.3
LSD (0.05)	0.23	0.25	0.35		NS (e)	0.4	2.6

(a) Kalu and Fick (1983) index, mean-stage-by-count.
(b) Visual stand density rating; 10=vigorous, solid stand, 0=dead stand.
(c) Variety entered as experimental, data may not reflect performance of commercial seed.
(d) Experimental line, not currently marketed.
(e) NS=Means among cultivars not significantly different at the 0.05 level of probability.

Two-year average yield was 4.40 T/A, and again significant cultivar differences were observed.

• Discussion

For most locations, average daily temperatures were slightly below normal in April and May. During June, July, and August, temperatures were well below normal (Fig 1). During August and September, temperatures were normal or slightly below normal at all locations.

The growing season began with near-normal precipitation at

Table 6. Forage yield of 36 alfalfa cultivars planted May 4, 1990, at the Northeast Research Station near Watertown, S.D.

Cultivar	1990 1-Cut Total	1991 4-Cut Total	1992 3-Cut Total	1993 Cut 1 6/14	1993 Cut 2 7/29	1993 Cut 3 8/30	1993 3-Cut Total	91 to 93 Average	% of 3-year Average
	tons DM / acre								- % -
Garst 630	1.52	7.56	4.92	2.21	1.76	1.33	5.30	5.93	112
5364	1.58	7.39	4.85	2.11	1.75	1.19	5.05	5.76	109
5262	1.49	7.30	4.72	2.09	1.69	1.27	5.05	5.69	107
MN GRN-14 (a)	1.42	7.11	4.87	2.16	1.57	1.28	5.00	5.66	107
Dawn	1.56	7.54	4.36	2.14	1.61	1.19	4.93	5.61	106
Garst 645	1.65	7.24	4.40	2.16	1.63	1.23	5.01	5.55	105
SDHL1 (a)	1.51	6.63	5.04	2.21	1.60	1.11	4.92	5.53	104
VS-888 (a)	1.66	7.71	4.01	2.02	1.68	1.16	4.86	5.53	104
MultiKing 1	1.64	7.40	4.51	1.91	1.51	1.19	4.60	5.50	104
WL 317	1.45	6.99	4.63	2.06	1.55	1.19	4.80	5.47	103
Wrangler	1.53	7.04	4.51	2.16	1.65	1.05	4.85	5.47	103
Allegiance	1.47	7.18	4.37	2.01	1.46	1.22	4.69	5.41	102
H 174 (a)	1.48	7.44	3.95	1.98	1.62	1.21	4.81	5.40	102
Perry	1.55	7.20	4.53	1.94	1.44	1.03	4.42	5.38	102
Multi-plier	1.67	7.68	3.77	1.92	1.59	1.13	4.64	5.36	101
8837N (a)	1.53	7.33	3.96	1.96	1.61	1.18	4.75	5.35	101
Aggressor	1.46	7.13	4.05	2.01	1.60	1.07	4.68	5.29	100
SX 217	1.58	7.29	4.00	1.95	1.54	1.08	4.57	5.28	100
2841	1.63	7.44	3.77	2.03	1.54	1.07	4.63	5.28	100
120	1.54	7.23	3.97	1.98	1.57	1.06	4.61	5.27	99
Saranac AR	1.42	7.16	4.24	1.85	1.41	1.10	4.36	5.26	99
DK 122	1.59	7.42	3.68	1.95	1.56	1.10	4.60	5.23	99
Centurion	1.59	7.60	3.56	1.80	1.55	1.16	4.51	5.22	99
MTO S82 (a)	1.50	6.40	4.77	2.03	1.47	0.88	4.38	5.18	98
Flint	1.63	6.92	4.19	1.85	1.46	1.07	4.38	5.16	97
SDHS6 (a)	1.63	6.55	4.48	2.06	1.49	0.90	4.45	5.16	97
2833	1.59	7.50	3.54	1.82	1.53	1.08	4.42	5.15	97
Baker	1.58	7.22	3.96	1.82	1.40	0.93	4.15	5.11	96
Crown II	1.63	7.33	3.43	1.83	1.61	1.13	4.56	5.11	96
VIP	1.66	7.47	3.45	1.81	1.45	1.02	4.27	5.06	96
8832N (a)	1.49	7.02	3.87	1.71	1.42	1.04	4.16	5.01	95
WL 225	1.52	7.23	3.50	1.84	1.45	0.98	4.27	5.00	94
Vernal	1.54	6.77	3.99	1.76	1.46	0.90	4.12	4.96	94
H 154 (a)	1.55	7.09	3.41	1.83	1.50	1.03	4.35	4.95	93
8941N (a)	1.57	7.24	3.29	1.71	1.41	1.03	4.15	4.89	92
AFYF 88 (a)	1.59	5.95	4.45	1.95	1.30	0.68	3.93	4.78	90
AVERAGE	1.56	7.19	4.14	1.96	1.54	1.09	4.59	5.30	
Maturity (b)			3.9	4.3	5.2				
CV %	8.5	5.7	11.9	12.4	10.5	12.4	10.6	5.7	
LSD (0.05)	NS (c)	0.57	NS	0.23	0.19	0.68	0.56		

(a) Experimental line, not currently marketed.
(b) Kalu and Fick (1983) index, mean stage by count.
(c) NS=Means among cultivars not significantly different at the 0.05 level of probability.

each location. From May through August, however, all locations received above-normal rainfall. Precipitation during September was normal or above at all locations except Beresford. Summer and fall precipitation allowed soil moisture to be above normal going into winter months at all locations. Since soil moisture supplies are adequate, a highly productive first cutting is anticipated in 1994.

But at the end of summer, a management factor enters in. Improper fall harvest management can threaten stand longevity. If you want to harvest all possible forage, make the last cutting after a hard frost when there is little chance for regrowth. On the other hand, omitting the fall harvest will permit stubble to catch snow. Snow insulates the crown and provides moisture for plant growth the following spring.

Cultivar Selection

The large number of alfalfa cultivars on the market increases your difficulty in choosing the "right" cultivar for your particular situation. When evaluating alfalfa cultivar test information, consider the characteristics of each cultivar before reaching your decision. Major characteristics include yield, fall dormancy, disease resistance, and cost per unit of pure live seed.

Yield

Yield information in this and other reports represents seeding year or post-seeding-year averages. Generally, yield data representing several years of production are the most meaningful. You should also use data from test locations that most nearly resemble growing conditions on your farm. Yield performance

data from appropriate locations are more valuable than are data collected at other locations.

To measure significant differences in yield between cultivars, a statistical measure known as the least significant difference (LSD) is used. If the difference in yield between any two cultivars equals or exceeds the LSD value, the higher-yielding cultivar is significantly higher in yield and should be favored. If the yield difference is less than the LSD value, the two cultivars do not significantly differ, and both cultivars are approximately equal in yielding ability. In some cases an LSD value is not presented, and the designation NS (non-significant) indicates significant yield differences among the cultivars were not detected.

Table 7. Forage yield of 29 alfalfa cultivars planted May 12, 1993, at the Northeast Research Station, Watertown, S.D.

	1993			% of
	Cut 1	Cut 2	2-Cut	1993
Cultivar	8/6	9/28	Total	Average
	----- tons DM / acre ----			- % -
Garst 645	1.60	1.27	2.89	127
ABI 9126 (a)	1.58	1.23	2.80	123
Dawn	1.58	1.23	2.80	123
Dominator	1.47	1.22	2.69	118
Arrow	1.40	1.29	2.68	118
Dart	1.43	1.20	2.61	114
Saranac AR	1.35	1.21	2.59	113
5262	1.39	1.17	2.58	113
ABI 9222 (a)	1.48	1.05	2.51	110
Defiant (b)	1.43	1.07	2.48	109
WL 322 HQ	1.30	1.14	2.44	107
STX6 (a)	1.33	1.05	2.39	105
ABI 8939 (a)	1.35	1.05	2.38	104
Majestic	1.28	1.08	2.37	104
MS92 (a)	1.30	1.02	2.30	101
Baker	1.28	1.02	2.30	101
3452-ML	1.30	0.98	2.26	99
5246	1.30	0.91	2.20	97
W6040 (a)	1.16	0.98	2.14	94
WL 323	1.16	0.93	2.10	92
Vernal	1.17	0.90	2.09	92
SDHL1-SSL (a)	1.23	0.85	2.08	91
5454	1.18	0.89	2.05	90
LegenDairy	1.18	0.86	2.02	88
Riley	1.06	0.81	1.84	81
Wisyn-C (a)	1.02	0.80	1.82	80
SDHL1-LLL (a)	0.96	0.68	1.65	73
SDHL1-SSS (a)	1.02	0.61	1.64	72
SDHL1-LLS (a)	1.00	0.56	1.55	68
AVERAGE	1.28	1.00	2.28	
Maturity (c)	4.2	2.7		
CV %	22.6	28.3	24.6	
LSD (0.05)	0.4 (d)	0.40	0.79	

(a) Experimental line, not currently marketed.
(b) Variety entered as experimental, data may not reflect performance of commercial seed.
(c) Kalu and Fick (1983) index, mean stage by count.
(d) Cultivar main effect significant at the 0.08 level of probability.

Fall Dormancy

Fall dormancy ratings (Appendix) range from values of 1 (early dormancy) to 9 (non-dormant). Fall dormancy is thought to be related to winterhardiness. Severe South Dakota winters necessitate that winterhardiness be a major consideration in cultivar selection.

Cultivars with a fall dormancy rating of 1 or 2 generally are very winterhardy and should persist under South Dakota conditions. Forage yield under optimum conditions may be lower, however, than for less dormant types. Very winterhardy cultivars should be used if stand longevity is of primary concern.

Cultivars with a rating of 3 to 4 are winterhardy to moderately winterhardy, and you can expect at least 3 to 4 years of excellent production.

Cultivars with ratings of 5 to 8 are generally not winterhardy enough to survive several South Dakota winters. These cultivars may be used as annual forages.

Disease Resistance

Disease resistance ratings (Appendix) are important indicators of a cultivar's potential to

Table 8. Forage yield of 28 alfalfa cultivars planted May 8, 1991, at the Central Crops and Soils Station, Highmore, S.D.

	1992	1993						% of
	2-Cut	Cut 1	Cut 2	Cut 3	Cut 4	4-Cut	92 to 93	2-year
Cultivar	Total	5/26	7/6	8/4	9/2	Total	Average	Average
	tons DM / acre							- % -
Garst 645	3.51	2.38	2.05	1.41	1.51	7.36	5.43	123
Multi-plier	3.38	2.21	2.02	1.27	1.32	6.82	5.10	116
Guardsman	3.40	2.22	1.99	1.33	1.21	6.74	5.07	115
Multistar (a)	3.22	2.27	2.01	1.05	1.51	6.83	5.03	114
Magnum III	3.03	1.94	2.05	1.57	1.34	6.89	4.96	113
Dart	3.25	1.81	1.86	1.47	1.39	6.52	4.88	111
Flagship 75 (a)	3.49	1.87	1.93	1.25	1.22	6.27	4.88	111
90792 (b)	3.22	2.02	1.90	1.31	1.12	6.34	4.78	109
Asset	3.18	1.91	1.88	1.30	1.28	6.37	4.77	108
Dawn	3.39	1.69	1.89	1.43	0.99	6.00	4.69	107
DK 122	3.07	1.84	1.96	1.30	1.21	6.31	4.69	107
Eclipse	3.16	1.95	1.86	1.02	1.14	5.98	4.57	104
Arrow	3.18	1.75	1.89	1.39	0.92	5.94	4.56	104
120	3.05	1.83	1.88	1.18	0.92	5.82	4.44	101
Vernal	3.06	1.82	1.76	1.22	0.99	5.78	4.42	100
Blazer XL	2.81	1.64	1.96	1.27	1.07	5.94	4.37	99
Cimarron VR	2.90	1.65	1.81	1.30	0.99	5.74	4.32	98
GH755	2.41	1.79	1.89	1.26	1.28	6.22	4.31	98
W90VSX (b)	2.94	1.66	1.76	1.18	1.07	5.66	4.30	98
Crown II	2.71	1.81	1.87	1.16	0.99	5.82	4.27	97
Saranac AR	2.70	1.73	1.79	1.01	1.09	5.61	4.16	94
Milk Maker II	2.66	1.59	1.80	1.24	0.87	5.49	4.07	93
SDHL1L (b)	3.10	1.58	1.63	0.94	0.82	4.97	4.04	92
Riley	2.65	1.53	1.69	1.30	0.88	5.40	4.02	91
Baker	2.41	1.54	1.62	1.08	0.60	4.84	3.62	82
GH 777	2.54	1.23	1.63	0.99	0.52	4.38	3.46	79
SDHS6S (b)	2.39	1.44	1.61	0.85	0.50	4.39	3.39	77
88R20 (b)	1.67	0.91	1.41	0.96	0.41	3.69	2.68	61
AVERAGE	2.95	1.77	1.84	1.22	1.04	5.86	4.40	
Maturity (c)		3.9	4.3	3.9	4.3			
CV %	27.8	23.5	10.5	19.5	35.5	17.3	19.1	
LSD (0.05)	NS (d)	0.59	0.27	0.33	0.52	1.42	1.22	

(a) Variety entered as experimental, data may not reflect performance of commercial seed.
(b) Experimental line, not currently marketed.
(c) Kalu and Fick (1983) index, mean stage by count.
(d) NS=Means among cultivars not significantly different at the 0.05 level of probability.

perform in situations where specific diseases may limit production. Major diseases that may affect the productivity of alfalfa in South Dakota include bacterial wilt and *Phytophthora* root rot. Resistance to these diseases should be considered when choosing a cultivar.

Bacterial wilt is generally not observed until after the second production year. Infection occurs in spring or early summer via cracks and wounds in the roots and crowns. Eventually, the water-conducting tissues of the roots become plugged, causing the top growth to wilt, especially during periods of moisture stress. Symptoms include yellow leaves, stunted growth, and a yellow to brown discoloration of the root tissue beneath the outer layer. Many cultivars are resistant to bacterial wilt, and disease problems can be avoided by their use.

Phytophthora root rot is a fungal disease which occurs in wet, poorly drained soils after excessive precipitation or irrigation. Symptoms include deteriorated root or crown tissue in areas of the field where you will also see the stand is thinning. Top growth symptoms generally include wilting, yellowing, and lack of vigorous growth. Early symptoms of this disease sometimes resemble damping-off of alfalfa seedlings.

Verticillium wilt is a fungal disease which produces initial temporary wilting of upper leaves on warm days at pre-bud to floral stages of maturity. Affected leaves will generally turn yellow and then drop off. Eventually, the stems die as well. Yellow to brown discoloration is usually present in the woody cylinder of the tap root. *Verticillium* wilt has not yet been documented in South Dakota; however, it has been observed in several surrounding states and its appearance in South Dakota is expected.

Planting a resistant cultivar is the most effective control. Other diseases, such as anthracnose, leaf spots, *Fusarium* wilt, and other root and crown rots may be problems at particular sites. In these situations, use

cultivars with resistance to the particular disease, if possible.

For many diseases, the only practical means of minimizing economic loss is to use resistant cultivars. Reducing stress by using multiple-disease resistant cultivars can result in long-term increases in yield and quality.

• Conclusions

No single factor, even yield, will make an alfalfa cultivar or small group of cultivars consistently superior to any others. You should evaluate several characteristics before selecting an alfalfa cultivar.

Although yield from 1- to 3 year-old stands serves as a good measure of economic production, stand longevity and tolerance to stress and disease are also important.

Yield response data collected over several years and locations can be useful indicators of stress tolerance, longevity, and economic production. Fall dormancy has a significant influence upon winterhardiness, stress tolerance, and yield potential and is related to stand longevity in stressful environments. Multiple disease resistance also benefits stand longevity and yield. Finally, seed cost per unit PLS should also be considered when selecting alfalfa cultivars.

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Appendix. Listing of alfalfa cultivars, developers, suppliers, and agronomic characteristics.*

Developer/ Supplier	Cultivar	FD[b]	Disease & Insect Resistance[c] BW	VW	FW	An	PRR	PA
AgriPro Seeds	Dart	3	HR	R	HR	R	HR	R
	Dawn	3	HR	R	HR	R	HR	--[d]
	Defiant	2	HR	HR	HR	R	HR	R
	Dominator	4	HR	R	HR	HR	HR	R
Allied Seed	Centurion	3	HR	R	R	R	R	R
	Asset	4	HR	R	R	R	HR	R
America's Alfalfa								
	Aggressor	4	HR	R	HR	HR	HR	HR
	Apollo Supreme	4	HR	R	HR	HR	R	HR
	Arrow	3	HR	R	HR	MR	HR	R
Arrow Seed/Fontanelle Hybrids								
	Flagship 75	2	HR	R	HR	R	HR	MR
Beachley-Hardy Seed								
	Victory	3	HR	R	HR	HR	MR	--
Cargill	Crown II	3	HR	R	HR	HR	HR	R
Cenex/Land O'Lakes								
	Blazer XL	3	R	R	HR	HR	HR	R
	LegenDairy	3	HR	HR	HR	HR	HR	HR

Developer/ Supplier	Cultivar	FD[b]	Disease & Insect Resistance[c] BW	VW	FW	An	PRR	PA
CIBA-GEIGY	2833	3	HR	R	HR	HR	HR	R
	2841	3	HR	R	R	R	R	R
	2852	4	HR	R	R	HR	R	R
	Profit	2	HR	R	HR	MR	R	MR
Dairyland Seed								
	Magnum III	4	R	MR	R	MR	R	--
Dekalb Plant Genetics								
	120	3	HR	--	R	LR	R	R
	DK 122	2	HR	R	R	HR	HR	R
	DK 133	4	HR	R	HR	HR	HR	R
Domestic Seed								
	Majestic	3	R	HR	HR	HR	MR	--
FFR								
	Multistar	3	HR	R	HR	HR	HR	--
Garst / ICI Seeds								
	630	4	HR	MR	R	MR	R	--
	645	3	HR	R	R	HR	HR	R
Golden Harvest								
	GH 777	3	HR	R	HR	R	HR	--
	GH 755	4	HR	R	HR	HR	HR	R
Great Lakes Hybrids								
	Thrive	3	HR	R	HR	HR	HR	R
	Webfoot MPR	3	HR	R	R	HR	HR	--
Great Plains Research								
	Cimarron VR	5	HR	R	HR	HR	R	HR
Jacques Seed	Multi-plier	3	HR	R	HR	HR	HR	R
Keltgen Seed	Allegiance	3	R	R	R	HR	R	R
MBS Inc.	Milk Maker II	2	R	--	MR	--	R	R
New York Agric. Exp. Stn.								
	Saranac AR	4	MR	--	R	HR	--	--
Northrup King	MultiKing 1	3	HR	R	HR	R	R	MR
Old's Seed	3452-ML	2	HR	R	HR	R	HR	HR
Payco Seeds/ Interstate								
	Clipper	2	HR	R	HR	R	R	R

Developer/ Supplier	Cultivar	FD[b]	Disease & Insect Resistance[c] BW	VW	FW	An	PRR	PA
Pioneer Hi-Bred Int'l.								
	5246	3	HR	R	HR	HR	HR	R
	5262	2	HR	LR	MR	--	R	R
	5364	4	R	MR	R	MR	MR	HR
	5454	4	R	MR	HR	HR	HR	R
Plant Genetics	Flint	4	R	LR	HR	HR	R	MR
Public Cultivars								
	Vernal	2	R	--	MR	--	--	--
	Baker	2	HR	--	R	LR	--	HR
	Wrangler	2	R	LR	R	LR	HR	HR
	Perry	3	R	--	R	LR	MR	--
	Riley	4	HR	LR	--	MR	--	HR
Research Seeds								
	VIP	3	HR	R	R	R	R	HR
Sexauer	Guardsman	3	HR	HR	HR	HR	HR	--
	SX 217	4	R	--	HR	MR	MR	--
Shissler Seed								
	LG-9323	4	HR	R	HR	R	HR	R
WD Seed Growers								
	Eclipse	4	HR	R	HR	HR	HR	--
W-L Research								
	WL 225	2	HR	R	HR	MR	HR	R
	WL 317	3	HR	R	HR	R	HR	HR
	WL 322 HQ	4	HR	R	HR	MR	R	HR
	WL 323	4	HR	R	HR	HR	HR	R

[a] Ratings obtained from: (1) Alfalfa Varieties, 1991 Edition, Alfalfa Variety Characterization. Certified Alfalfa Seed Council, Davis, CA 95617-1017. (2) Alfalfa marketers.

[b] FD = Fall Dormancy Index, 1 = greatest fall dormancy; 9 = absence of fall dormancy.

[c] Refer to pest resistance rating below:

BW = Bacterial Wilt
VW = Verticillium wilt
FW = Fusarium wilt
An = Anthracnose
PRR = Phytophthora Root Rot
PA = Pea Aphid

Pest Resistance Rating % Resistance plants	Resistance class
0-5%	Susceptible (S)
6-14%	Low Resistance (RS)
15-30%	Moderate Resistance (MR)
31-50%	Resistance (R)
> 50%	High Resistance (HR)

[d] Blank spaces indicate cultivar is susceptible or has not been adequately tested.

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