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ALFALFA CULTIVAR YIELD TEST

FOR SOUTH DAKOTA:

1992 REPORT



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



ALFALFA CULTIVAR YIELD TEST FOR SOUTH DAKOTA: 1992 REPORT

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Public and commercial breeding programs have produced many alfalfa cultivars for the market in the past 15 years. Selecting the proper cultivar for your needs is no easy task, and you should have yield information from several different South Dakota locations before making your choice. 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

Alfalfa experiments were established in 1989 and 1991 at the Southeast Research Farm (Beresford) and the Central Crops and Soils Research Station (Highmore), in 1990 at the Northeast Research Farm (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 5-row planter with 6-inch row spacings. Seeding rate was 12 lb pure live seed (PLS) per acre in 1989 and 15

lb PLS per acre in 1990, 1991, and 1992. A pre-plant 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 ft² (3 ft X 25 ft) plot. Plots were fertilized after planting with 50 lb P₂O₅ per acre, or in accordance with SDSU soil test results for growth periods after the seeding year. Insect pests did not reach problem levels; chemical control was not used.

Harvesting was done with a flail-type forage plot harvester with a harvest area of 66 ft² 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 concentration. Mean dry-matter concentrations for each replicate were multiplied by fresh herbage weights for each experimental unit and then divided by harvest area to obtain forage dry-matter (DM) pro-

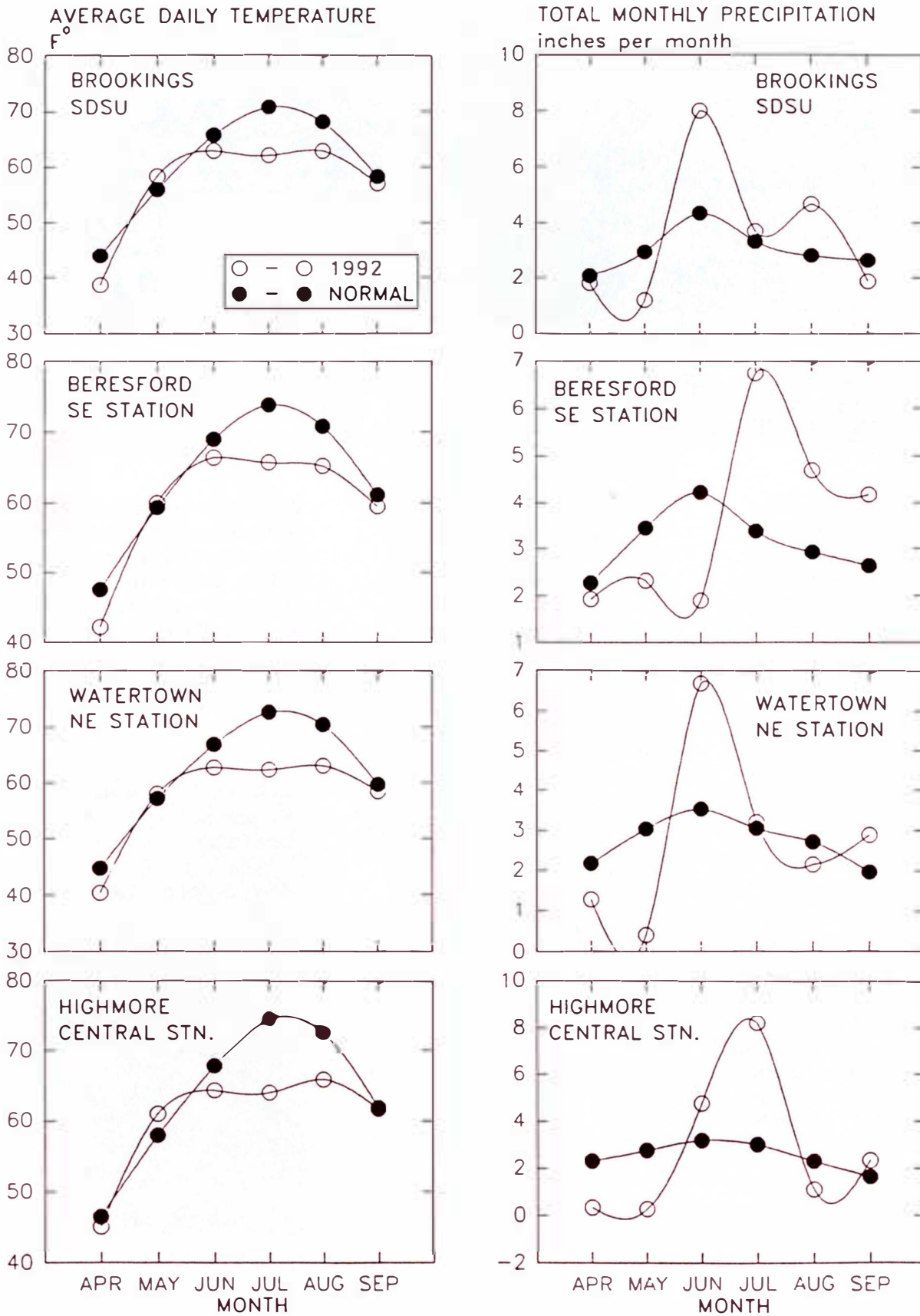
duction per unit area of harvest. These data were converted into tons of dry matter per acre (tons DM/A). Data were analyzed by analysis of variance, and dry matter yield differences among cultivars were tested by the least significant difference (LSD) procedure at the 0.05 level of probability. Rela-

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

^aKalu, B.A., and G.W. Fick. 1983. Quantifying morphological development of alfalfa for studies of herbage quality. *Crop Sci* 21:267-271.

Fig 1. Average daily temperature and total monthly precipitation during the 1992 growing season.



tive 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 experiment planted in 1991. Ten shoots randomly selected from each plot were rated for maturity according to the mean-stage-by-count scheme (Kalu and Fick, 1983).

Experiments were harvested up to four times each year; however, growth conditions at some locations often limited harvest frequencies.

1991 Results

Southeast Research Farm, Beresford

Average daily temperatures were below normal during April, June, July, and August and were near normal during May and September (Fig 1). Precipitation was much below normal during April, May, and June. Precipitation during July was more than twice the normal amount, and during August and September it was about 1.5 times higher than normal.

Four harvests were obtained from the experiment planted in 1989. Average total DM yield was 5.82 T/A, and no significant differences were detected among the 40 entries (Table 1). This total yield was over 1 T/A higher than total yields reported in 1990 and 1991, probably because four harvests were taken in 1992 compared to three in each of the previous 2 years.

Average yields for the four harvests in 1992 ranged from 0.56 T/A for the second harvest to 2.12 T/A for the first harvest.

Three-year average yield for this experiment was 4.82 T/A, with no

Table 1. Forage yield of 40 alfalfa cultivars planted April 21, 1989, at the Southeast Research Farm, Beresford.

Cultivar	1989	1990	1991	1992				90 to 92 Average	% of 3-Year Average	
	1-Cut Total	3-Cut Total	3-Cut Total	Cut 1 6/4	Cut 2 7/9	Cut 3 8/18	Cut 4 10/1			4-Cut Total
----- tons DM / acre -----										
Centurion	1.31	4.76	5.15	2.56	0.92	2.18	1.34	6.99	5.63	117
Sure	1.28	4.98	4.59	2.27	0.96	2.44	1.38	7.05	5.54	115
Flint	1.30	4.80	4.90	2.53	0.92	1.96	1.09	6.48	5.39	112
DK 125	1.42	4.75	4.60	2.44	0.92	2.14	1.21	6.72	5.36	111
Victory	1.22	4.47	4.53	2.48	1.10	2.06	1.26	6.90	5.30	110
Arrow	1.21	4.77	4.83	2.32	0.80	1.87	1.06	6.04	5.21	108
5262	1.08	4.50	4.53	2.23	0.48	2.44	1.36	6.51	5.18	107
Garst 636	1.19	4.76	4.50	2.28	0.64	2.12	1.15	6.19	5.15	107
FSRC 88S (a)	1.19	4.70	4.34	2.29	0.63	2.08	1.34	6.34	5.12	106
Multi-plier	1.25	4.78	4.27	2.12	0.70	2.02	1.18	6.01	5.02	104
SDHL1 (a)	0.94	4.70	4.45	2.58	0.67	1.79	0.84	5.87	5.01	104
DK 135	1.10	4.58	4.47	2.17	0.38	2.10	1.33	5.97	5.01	104
Majestic	1.20	4.62	4.36	1.99	0.48	2.20	1.30	5.97	4.98	103
Action	1.19	4.56	4.27	2.07	0.42	2.03	1.25	5.76	4.86	101
VIP	0.90	4.56	4.37	1.98	0.43	1.97	1.20	5.57	4.84	100
Clipper	1.33	4.47	4.01	2.26	0.91	1.80	1.02	5.99	4.82	100
VS-775 (a)	1.17	4.67	4.06	1.90	0.60	1.98	1.21	5.69	4.81	100
WL 225	1.20	4.43	4.17	2.31	0.67	1.77	1.05	5.80	4.80	100
526	1.06	4.60	4.14	2.11	0.34	2.01	1.19	5.65	4.79	99
5472	1.12	4.24	4.11	2.07	0.51	2.15	1.29	6.02	4.79	99
Vernal	1.07	4.54	4.08	2.07	0.63	1.97	1.00	5.67	4.76	99
Aggressor	1.08	4.52	4.29	2.03	0.34	1.95	1.13	5.46	4.76	99
Trident II	1.17	4.36	4.06	2.07	0.52	1.98	1.24	5.81	4.74	98
Garst 630	1.06	4.41	4.23	1.94	0.35	2.01	1.23	5.53	4.72	98
WL 317	1.19	4.37	4.09	1.90	0.45	2.00	1.18	5.52	4.66	97
Dart	1.19	4.52	3.91	1.97	0.55	1.84	1.15	5.49	4.64	96
Allegiance	0.88	4.27	4.17	1.95	0.33	1.98	1.22	5.47	4.64	96
Saranac AR	1.14	4.38	4.20	2.06	0.24	1.85	1.16	5.31	4.63	96
Legend	1.10	4.23	3.96	2.16	0.69	1.72	1.11	5.68	4.62	96
Chief	1.00	4.29	4.12	1.99	0.41	1.88	1.14	5.42	4.61	96
Apollo Supreme	0.93	4.24	4.14	2.08	0.48	1.86	1.01	5.41	4.60	95
H-174 (a)	1.06	4.02	3.76	2.13	0.68	1.97	1.22	5.99	4.59	95
Ultra	1.07	4.11	3.79	2.04	0.70	1.92	1.09	5.75	4.55	94
Pacettter	1.22	4.49	3.68	1.90	0.57	1.84	1.15	5.46	4.54	94
Cimarron VR	1.02	4.24	3.92	1.95	0.38	1.91	1.19	5.43	4.53	94
Royalty	1.18	4.29	3.82	1.88	0.53	1.88	1.16	5.45	4.52	94
Dawn	1.07	4.26	3.80	2.02	0.34	1.80	1.07	5.22	4.43	92
WL 320	1.03	4.23	3.81	1.89	0.34	1.67	1.11	4.99	4.35	90
SDHS6 (a)	1.04	4.16	3.60	2.03	0.31	1.73	0.96	5.03	4.26	88
Sabre	1.13	3.95	3.63	1.94	0.31	1.77	1.05	5.06	4.21	87
AVERAGE	1.13	4.46	4.19	2.12	0.56	1.96	1.16	5.82	4.82	
Maturity (b)				4.70	4.70	4.80	3.30			
LSD (0.05)	NS (c)	NS	NS	NS	NS	0.40	0.22	NS	NS	

(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.

Table 2. Forage yield of 36 alfalfa cultivars planted April 24, 1991, at the Southeast Research Farm, Beresford.

Cultivar	1992				% of
	Cut 1 6/4	Cut 2 7/9	Cut 3 8/18	3-Cut Total	1992 Average
	----- tons DM / acre -----				- % -
Magnum III	2.10	0.75	2.10	4.95	116
Asset	2.04	0.62	2.19	4.86	113
Victory	2.15	0.58	2.05	4.78	112
Webfoot MPR	1.93	0.56	2.23	4.72	110
Multi-plier	1.96	0.55	2.21	4.72	110
GH 755	2.06	0.59	2.01	4.66	109
Cimarron VR	2.04	0.59	1.97	4.59	107
WL 317	2.02	0.58	1.98	4.57	107
Arrow	2.14	0.48	1.93	4.55	106
Dawn	2.04	0.56	1.92	4.51	105
XAE92 (a)	1.88	0.54	2.05	4.46	104
120	1.92	0.44	2.08	4.44	104
DK 122	2.01	0.41	2.01	4.42	103
Dart	1.95	0.52	1.93	4.39	103
90792 (a)	1.89	0.49	2.00	4.37	102
GH 777	1.93	0.46	1.98	4.36	102
SX 217	1.66	0.62	2.08	4.35	102
Flagship 75	1.87	0.52	1.93	4.32	101
Crown II	1.73	0.43	2.09	4.25	99
88R20 (a)	1.78	0.45	1.97	4.21	98
2852	1.72	0.57	1.91	4.20	98
Garst 645	1.81	0.49	1.89	4.18	98
Guardsman	1.74	0.47	1.96	4.17	97
SDHL1L (a)	1.88	0.35	1.91	4.15	97
Milk Maker II	1.83	0.43	1.88	4.14	97
Baker	1.84	0.42	1.88	4.13	97
Riley	1.94	0.42	1.74	4.10	96
W90VSX (a)	1.78	0.46	1.86	4.10	96
Multistar	1.81	0.43	1.85	4.09	95
2833	1.74	0.45	1.90	4.09	95
Eclipse	1.77	0.48	1.83	4.08	95
5262	1.73	0.42	1.95	4.08	95
Vernal	1.79	0.41	1.86	4.06	95
Saranac AR	1.76	0.45	1.85	4.05	95
5364	1.67	0.42	1.89	3.98	93
Blazer XL	0.74	0.33	1.03	2.10	49
AVERAGE	1.85	0.49	1.94	4.28	
Maturity (b)	4.30	4.10	4.80		
LSD (0.05)	0.39	0.17	0.24	0.66	

(a) Experimental line, not currently marketed.

(b) Kalu and Fick (1983) index, mean stage by count.

significant differences detected among the entries even though a yield difference of 1.4 T/A occurred between the top and bottom cultivars. Apparently environmental variation in this experiment did not allow significant cultivar differences to be detected. Data collection from this experiment terminated this year.

Another experiment consisting of 36 cultivars was seeded in 1991 (Table 2). No data were collected in the establishment year, so 1992 was the first production year. Three harvests were taken, and average yields ranged from 0.49 T/A for the second harvest to 1.94 T/A for the third harvest.

Within each harvest, significant differences among cultivars were detected. The cultivar Blazer XL yielded significantly lower than all other cultivars for the first and third harvests and less than about half of the cultivars for the second harvest (Table 2). The low productivity of this cultivar was caused by poor establishment during the seeding year, even though there were repeated seeding attempts with two different seed lots.

Three-cut total yield was 4.28 T/A, with some significant cultivar differences. The above-normal precipitation received during the fall should promote good first-cutting yields in 1993.

SDSU Research Station, Brookings

Average daily temperatures were about normal during April, May, June, and September but were well below normal during July and August (Fig 1). Precipitation was variable throughout the year. It was below normal during April and May, above normal during June, July, and August, and slightly below normal during September.

The 1990 planting produced three harvests. Average yields for the three cuttings ranged from 0.81 T/A for the third cutting to 1.60 T/A for the first cutting (Table 3). For each cutting, significant differences among the cultivars were found.

A third of the entries in this group were experimental lines, and as shown in Table 3, there was a wider variation in productivity among these lines than among marketed varieties. Three-cut total yield was 3.64 T/A, with significant cultivar differences detected. Total yields obtained in 1992 were about 0.7 T/A lower than those reported in 1991. Two-year average yield was 4.39 T/A, with no significant differences among cultivars.

Cultivars showed significant differences in maturity at the first cutting in 1992 (Table 4). Significant maturity differences among the cultivars were also observed in both 1990 and 1991. 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. Plots became well established because of above-normal precipitation during midsummer. Plots were clipped on July 8 and August 5 to control weeds, but no yield data were taken. After the last clipping, there was insufficient regrowth to warrant another harvest in 1992.

Northeast Research Farm, Watertown

Average daily temperatures were near normal during April, May, and September and much below normal during June, July, and August (Fig 1). Precipitation was variable throughout the growing season. It was well below normal during April and May, much above

Table 3. Forage yield of 32 alfalfa cultivars planted April 24, 1990, at the SDSU Research Station, Brookings.

Cultivar	1990	1991	1992				91 to 92 Average	% of 2-Year Average
	1-Cut Total	3-Cut Total	Cut 1 6/3	Cut 2 7/8	Cut 3 8/10	3-Cut Total		
----- tons DM / acre -----								- % -
VS-888 (a)	1.24	5.81	1.76	1.48	0.94	4.18	4.99	114
Garst 630	1.29	5.50	1.84	1.50	1.00	4.34	4.92	112
G-2833	1.38	5.52	1.76	1.29	0.85	3.89	4.70	107
DK 122	1.25	5.45	1.63	1.37	0.88	3.88	4.66	106
Multi-plier	1.29	5.46	1.66	1.35	0.84	3.85	4.66	106
Centurion	1.39	5.39	1.70	1.33	0.89	3.92	4.65	106
8837N (a)	1.15	5.51	1.60	1.28	0.88	3.75	4.63	105
Flint	1.32	5.29	1.69	1.32	0.91	3.92	4.61	105
SX 217	1.23	5.15	1.79	1.37	0.89	4.06	4.60	105
5262	1.17	5.36	1.53	1.35	0.93	3.81	4.58	104
5364	1.20	5.30	1.76	1.26	0.84	3.86	4.58	104
VIP	1.27	5.40	1.59	1.23	0.84	3.66	4.53	103
MultiKing 1	1.23	5.14	1.76	1.25	0.85	3.86	4.50	103
Crown II	1.37	5.36	1.60	1.21	0.83	3.64	4.50	102
8941N (a)	1.19	5.23	1.62	1.23	0.84	3.68	4.45	101
H-174 (a)	1.20	5.21	1.62	1.24	0.83	3.68	4.45	101
Dawn	1.18	5.11	1.76	1.21	0.80	3.77	4.44	101
Garst 645	1.17	5.20	1.58	1.25	0.82	3.65	4.42	101
G-2841	1.35	5.04	1.72	1.24	0.86	3.81	4.42	101
Aggressor	1.24	5.14	1.65	1.20	0.85	3.70	4.42	101
H-154 (a)	1.25	5.04	1.65	1.25	0.81	3.72	4.38	100
Allegiance	1.16	5.19	1.42	1.29	0.85	3.55	4.37	100
MN GRN-14 (a)	1.09	5.08	1.50	1.21	0.82	3.53	4.30	98
8832N (a)	1.19	5.21	1.43	1.12	0.76	3.30	4.26	97
120	1.35	5.07	1.53	1.12	0.78	3.43	4.25	97
Vernal	1.33	4.92	1.50	1.26	0.81	3.57	4.25	97
WL 317	1.17	4.87	1.56	1.21	0.78	3.55	4.21	96
WL 225	1.24	4.84	1.56	1.11	0.75	3.41	4.12	94
SDHS6 (a)	1.25	4.50	1.38	0.93	0.62	2.93	3.71	85
AFYF 88 (a)	1.06	4.32	1.43	1.00	0.57	3.00	3.66	83
MTO S82 (a)	1.32	4.62	1.31	0.84	0.55	2.69	3.65	83
SDHL1 (a)	1.25	4.29	1.38	0.98	0.62	2.98	3.63	83
AVERAGE	1.24	5.14	1.60	1.22	0.81	3.64	4.39	
LSD (0.05)	0.16	0.39	0.27	0.20	0.12	0.53	0.40	

(a) Experimental line, not currently marketed.

Table 4. Maturity (a) of 32 alfalfa cultivars planted April 24, 1990, at the SDSU Research Station, Brookings.

Cultivar	1990	1991			1992		
	Cut 1 9/5	Cut 1 6/6	Cut 2 7/3	Cut 3 7/31	Cut 1 6/3	Cut 2 7/8	Cut 3 8/10
	----- index (a) -----						
5262	3.25	3.30	4.10	3.53	3.20	4.20	3.68
5364	3.98	3.40	4.08	3.58	3.20	4.38	3.65
8832N (b)	3.83	3.18	4.23	3.60	3.25	4.03	3.70
8837N (b)	3.85	3.23	4.10	3.50	3.35	4.38	3.50
8941N (b)	3.95	3.35	3.98	3.58	3.28	4.23	3.63
AFYF 88 (b)	3.03	3.35	3.68	3.15	3.45	4.40	3.75
Aggressor	3.75	3.43	4.10	3.70	3.38	4.23	3.68
Allegiance	3.58	3.28	4.38	3.73	3.08	4.33	3.63
Centurion	4.13	3.55	4.38	3.40	3.53	4.18	3.78
Crown II	3.73	3.65	4.05	3.55	3.40	4.15	3.63
120	3.63	3.10	4.00	3.53	3.50	3.93	3.73
DK 122	3.68	3.48	3.98	3.60	3.55	4.40	3.63
Dawn	3.90	3.40	4.05	3.55	3.33	4.20	3.58
Flint	3.65	3.20	4.18	3.50	3.28	3.78	3.68
G-2833	3.90	3.50	4.20	3.43	3.58	4.25	3.63
G-2841	4.05	3.48	4.25	3.48	3.40	4.33	3.55
Garst 630	3.88	3.63	3.95	3.48	3.38	4.35	3.70
Garst 645	3.93	3.25	4.28	3.78	3.40	4.33	3.60
H-154 (b)	3.68	3.08	3.98	3.60	3.30	4.30	3.43
H-174 (b)	3.85	3.23	4.05	3.58	3.68	4.28	3.88
MN GRN-14 (b)	3.50	3.45	4.25	3.60	3.40	4.38	3.80
MTO S82 (b)	3.18	3.48	3.65	3.03	3.58	4.15	3.73
Multi-plier	3.73	3.28	4.03	3.53	3.43	4.05	3.73
MultiKing 1	4.00	3.33	4.30	3.80	3.50	4.15	3.73
SDHL1 (b)	3.30	3.18	3.98	3.25	3.28	4.00	3.63
SDHS6 (b)	3.15	3.10	3.83	3.05	3.18	4.03	3.70
SX 217	3.78	3.35	3.85	3.60	3.23	4.43	3.63
VIP	3.75	3.43	3.83	3.55	3.43	4.50	3.68
VS-888 (b)	4.15	3.50	4.30	3.58	3.73	4.43	3.58
Vernal	3.38	3.35	4.15	3.38	3.23	4.10	3.85
WL 225	3.40	3.20	4.23	3.45	3.13	4.03	3.55
WL 317	3.70	3.35	4.23	3.53	3.60	4.43	3.65
AVERAGE	3.69	3.34	4.08	3.50	3.38	4.23	3.66
LSD (0.05)	0.50	NS (c)	0.28	0.24	0.34	NS	NS

(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.

normal during June, near normal during July and August, and slightly above normal in September.

An experiment consisting of 36 cultivars was planted in 1990 (Table 5). Three harvests were made in 1992, with average yields ranging from 1.05 T/A for the third cutting to 1.75 T/A for the second cutting. Within each cutting there were significant differences among the cultivars. The three-cut total yield in 1992 was 4.14 T/A, and the 2-year average yield was 5.66 T/A, with significant cultivar differences observed in each case.

Average total yields obtained in 1992 were about 3 T/A lower than those reported in 1991, probably because three cuttings were taken in 1992 compared to four in 1991. Also, during the winter of 1991-92, there was inadequate snow cover; some stand deterioration was noted for the early spring growth.

All plots were visually rated for stand density on May 14, 1992. A healthy stand (100%) was given a rating of 10, a 50% stand was given a rating of 5, and a dead stand was given a rating of 0. Results from this visual observation indicated that there were large differences among some cultivars for stand density (Table 5).

Some plots looked bad during the early part of the spring but seemed to recover well. For the second and third cuttings, most of the plots looked fairly uniform in terms of the alfalfa canopy. There may have been differences in actual stand density, but to accurately measure this, plots would have had to be excavated and roots counted. It should also be noted that there was little or no weed encroachment in the plots that suffered severe stand deterioration. This experiment has been a meaningful one because it demonstrates the influence of winter injury on a highly productive alfalfa stand.

Central Research Station, Highmore

Average daily temperatures were near normal during April, May, and September (Fig 1). During June, July, and August, however, temperatures were well below normal. Precipitation was below normal during April, May, and August, much above normal during June and July, and about normal during September.

Three harvests were obtained from the experiment planted in 1989 (Table 6). Average yields for the three cuttings ranged from 0.95 T/A for the first cutting to 2.09 T/A for the second cutting. Second cutting yields were the highest because of the above normal precipitation during June and July, and also because the cultivars were harvested at a later maturity stage relative to the other two cuttings. Significant differences among cultivars were present for the second and third cuttings but not for either the first cutting or the three-cut total yield.

Total yields in 1992 were about 0.70 T/A higher than those reported in 1990 but about 2 T/A lower than those reported in 1991. Three-year average yield was 4.25 T/A, with some significant cultivar differences detected.

Another experiment consisting of 28 cultivars was planted in 1991 (Table 7). During April and May 1992, the alfalfa plots contained an abundance of winter annual weeds. In an attempt to control these weeds, the entire plot area was mowed on June 11, 1992. No data were collected on this date.

Due to abundant precipitation after mowing, the alfalfa regrew rapidly, and the first cutting was taken on July 28. The average cultivar yield for this cutting was 1.92 T/A, with no significant differences detected. The second cutting was taken September 3, and cultivar yields ranged from

Table 5. Forage yield of 36 alfalfa cultivars planted May 4, 1990, at the Northeast Research Farm, Watertown.

Cultivar	1990	1991	1992				91 to 92 Average	% of 2-year Average	Stand (a) Density
	1-Cut Total	4-Cut Total	Cut 1 6/10	Cut 2 7/21	Cut 3 8/28	3-Cut Total			
	----- tons DM / acre -----								
Garst 630	1.52	7.56	1.58	2.00	1.34	4.92	6.24	110	7.3
5364	1.58	7.39	1.62	1.96	1.27	4.85	6.12	108	8.3
5262	1.49	7.30	1.54	2.00	1.19	4.72	6.01	106	8.5
MN GRN-14 (b)	1.42	7.11	1.60	1.97	1.29	4.87	5.99	106	8.0
MultiKing 1	1.64	7.40	1.53	1.82	1.15	4.51	5.95	105	7.5
Dawn	1.56	7.54	1.41	1.81	1.15	4.36	5.95	105	6.0
Perry	1.55	7.20	1.56	1.87	1.10	4.53	5.87	104	7.8
VS-888 (b)	1.66	7.71	1.24	1.76	1.01	4.01	5.86	104	6.5
SDHL1 (b)	1.51	6.63	1.82	2.12	1.10	5.04	5.83	103	9.0
Garst 645	1.65	7.24	1.43	1.87	1.10	4.40	5.82	103	7.0
WL 317	1.45	6.99	1.53	1.90	1.20	4.63	5.81	103	7.8
Allegiance	1.47	7.18	1.43	1.76	1.19	4.37	5.78	102	9.0
Wrangler	1.53	7.04	1.54	1.88	1.09	4.51	5.77	102	8.5
Multi-plier	1.67	7.68	1.09	1.64	1.05	3.77	5.73	101	6.3
Saranac AR	1.42	7.16	1.34	1.81	1.10	4.24	5.70	101	7.8
H-174 (b)	1.48	7.44	1.20	1.68	1.07	3.95	5.69	101	6.0
8837N (b)	1.53	7.33	1.26	1.62	1.07	3.96	5.64	100	6.5
SX 217	1.58	7.29	1.21	1.72	1.07	4.00	5.64	100	6.5
G-2841	1.63	7.44	1.14	1.68	0.95	3.77	5.60	99	5.5
120	1.54	7.23	1.27	1.75	0.96	3.97	5.60	99	8.3
Baker	1.58	7.22	1.30	1.70	0.97	3.96	5.59	99	6.5
Aggressor	1.46	7.13	1.30	1.71	1.04	4.05	5.59	99	6.5
MTO S82 (b)	1.50	6.40	1.77	1.98	1.02	4.77	5.58	99	9.0
Centurion	1.59	7.60	1.03	1.54	1.00	3.56	5.58	99	5.5
Flint	1.63	6.92	1.34	1.78	1.07	4.19	5.55	98	7.5
DK 122	1.59	7.42	1.11	1.57	1.01	3.68	5.55	98	5.8
G-2833	1.59	7.50	1.06	1.53	0.95	3.54	5.52	98	5.5
SDHS6 (b)	1.63	6.55	1.62	1.94	0.93	4.48	5.52	97	9.3
VIP	1.66	7.47	0.94	1.59	0.92	3.45	5.46	96	5.8
8832N (b)	1.49	7.02	1.27	1.60	1.00	3.87	5.44	96	7.0
Crown II	1.63	7.33	0.99	1.53	0.91	3.43	5.38	95	5.8
Vernal	1.54	6.77	1.36	1.70	0.93	3.99	5.38	95	8.3
WL 225	1.52	7.23	1.06	1.50	0.94	3.50	5.37	95	6.0
8941N (b)	1.57	7.24	0.99	1.40	0.90	3.29	5.26	93	5.8
H-154 (b)	1.55	7.09	0.99	1.45	0.97	3.41	5.25	93	4.0
AFYF 88 (b)	1.59	5.95	1.74	1.82	0.90	4.45	5.20	92	9.0
AVERAGE	1.56	7.19	1.34	1.75	1.05	4.14	5.66		7.1
Maturity (c)			4.00	4.10	4.10				
LSD (0.05)	NS (d)	0.57	0.30	0.26	0.18	0.69	0.56		1.2

(a) All plots rated for stand density on 14 May 1992. Healthy stand=10 (100% stand), 50% stand=5, 10% stand=1, and dead plots=0.

(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.

Table 6. Forage yield of 36 alfalfa cultivars planted May 11, 1989, at the Central Crops and Soils Station, Highmore.

Cultivar	1990	1991	1992				90 to 92 Average	% of 3-Year Average
	3-Cut Total	3-Cut Total	Cut 1 6/11	Cut 2 7/28	Cut 3 9/3	3-Cut Total		
	----- tons DM / acre -----							- % -
Chief	4.03	7.96	1.83	2.47	1.53	5.84	5.39	127
Flint	4.02	8.11	1.79	2.46	1.57	5.81	5.38	127
Ultra	4.06	7.63	1.50	2.52	1.40	5.43	5.21	123
Victory	3.76	6.72	1.50	2.22	0.93	4.65	4.87	115
Sure	3.70	7.25	1.06	2.40	1.21	4.68	4.86	114
WL 225	3.53	7.18	1.25	2.21	1.09	4.54	4.70	111
VS-775 (a)	3.49	7.26	1.10	2.28	1.25	4.63	4.68	110
Pacesetter	3.43	7.64	1.10	2.30	1.38	4.78	4.66	110
Apollo Supreme	3.59	6.65	1.09	2.15	1.12	4.36	4.65	109
Garst 630	3.83	6.45	0.80	2.22	1.11	4.13	4.64	109
Action	3.62	6.73	0.92	2.20	1.05	4.18	4.59	108
Centurion	3.44	6.48	0.79	2.32	1.14	4.25	4.55	107
Clipper	3.12	6.92	1.29	2.27	1.14	4.70	4.44	105
Legend	3.44	7.03	1.06	2.01	1.09	4.16	4.44	104
Sabre	3.40	6.58	0.90	2.07	1.01	3.97	4.43	104
Dawn	3.35	6.11	1.08	2.11	0.99	4.18	4.36	103
Multi-plier	3.21	6.80	0.86	2.15	1.13	4.14	4.34	102
WL 317	3.36	6.38	0.93	2.19	1.03	4.16	4.29	101
Majestic	3.20	5.88	0.89	1.99	0.90	3.78	4.08	96
5472	3.31	5.80	0.72	1.97	0.95	3.64	4.06	95
Trident II	2.92	5.79	0.91	2.08	0.92	3.91	4.04	95
Royalty	3.29	5.69	0.66	1.97	0.91	3.54	4.02	95
H-174 (a)	3.06	5.64	0.90	2.07	0.97	3.94	3.98	94
VIP	3.33	5.43	0.80	1.84	0.66	3.30	3.94	93
5262	2.77	5.71	0.83	2.13	0.92	3.88	3.91	92
Aggressor	3.13	5.94	0.71	1.81	0.74	3.26	3.89	92
Saranac AR	3.26	5.66	0.64	1.92	0.92	3.47	3.88	91
Arrow	2.87	5.67	0.78	2.03	0.82	3.64	3.86	91
SDHL1 (a)	2.80	5.74	0.89	1.98	0.80	3.68	3.77	89
526	2.92	5.59	0.63	1.96	0.67	3.26	3.72	87
Dart	2.83	4.99	0.71	2.27	0.71	3.69	3.72	87
Garst 636	2.91	5.48	0.69	1.77	0.62	3.09	3.66	86
Vernal	2.87	5.56	0.71	1.92	0.73	3.37	3.64	86
SDHS6 (a)	2.85	5.31	0.43	1.75	0.46	2.63	3.51	83
Cimarron VR	2.71	5.16	0.71	1.70	0.62	3.03	3.47	82
FSRC 88S (a)	2.50	5.05	0.58	1.57	0.70	2.86	3.27	77
AVERAGE	3.28	6.28	0.95	2.09	0.98	4.02	4.25	
Maturity (b)			3.50	5.70	4.80			
LSD (0.05)	0.90	1.96#	NS (c)	0.51	0.60#	NS	1.56#	

(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.

Significant at the 0.09 level of probability.

0.57 to 1.33 T/A, with no significant differences. Average cultivar yield for this cutting was about 1 T/A lower than the first cutting, probably because the alfalfa was not as mature as it was on the first cutting. Two-cut total yields ranged from 1.67 to 3.51 T/A, with no significant cultivar differences observed.

Discussion

For most locations, average daily temperatures were about normal during April and May. However, during June, July, and August they were well below normal (Fig 1). The growing season began with below normal precipitation at each location. At Brookings, Watertown, and Highmore, the dry conditions were alleviated by above normal precipitation during June. At Beresford, dry conditions persisted throughout June. During the rest of the growing season, however, Beresford received above-normal rainfall. At the other locations, rainfall was about normal during the late summer. Precipitation during the summer and fall replenished soil moisture supplies to above normal entering the winter at all locations.

Since soil moisture supplies are adequate, a productive first cutting is anticipated in 1993.

Improper fall harvest management threatens stand longevity. Producers that wish to harvest all possible forage should harvest after a hard frost when there is little chance for regrowth. However, avoiding harvest in the fall will permit stubble to catch snow. Snow insulates the crown and provides moisture for plant growth the following spring.

Cultivar Selection

A large number of alfalfa cultivars are available from public and commercial sources. Consequently, South Dakota producers have

many choices in cultivar selection. When evaluating alfalfa cultivar test information, look at several characteristics before reaching a decision. Major characteristics include yield, fall dormancy, disease resistance, and cost per unit of pure live seed.

Yield

Yield information presented in this and other reports represents seeding year or post-seeding-year averages. Generally, yield data for several years of production are the most meaningful for use in cultivar selection.

Use data from test locations that most nearly resemble growing conditions on your farm. Yield performance data from these locations are more valuable to you than 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.

Fall Dormancy

Fall dormancy ratings (Appendix) range from values of 1 (early dormancy) to 9 (non-dormant). Fall dormancy is thought to be related

Table 7. Forage yield of 28 alfalfa cultivars planted May 8, 1991, at the Central Crops and Soils Station, Highmore.

Cultivar	1992			% of
	Cut 1 (a)	Cut 2	2-Cut	1992
	7/28	9/3	Total	Average
	----- tons DM / acre -----			- % -
Garst 645	2.26	1.25	3.51	119
Flagship 75	2.16	1.33	3.49	118
Guardsmen	2.16	1.24	3.40	115
Dawn	2.23	1.17	3.39	115
Multi-plier	2.15	1.23	3.38	114
Dart	1.96	1.29	3.25	110
Multistar	1.92	1.30	3.22	109
90792 (b)	2.02	1.21	3.22	109
Arrow	2.11	1.07	3.18	108
Asset	2.14	1.04	3.18	108
Eclipse	2.15	1.01	3.16	107
SDHL1L (b)	2.20	0.91	3.10	105
DK 122	1.98	1.10	3.07	104
Vernal	2.08	0.98	3.06	104
120	2.08	0.97	3.05	103
Magnum III	2.00	1.03	3.03	103
W90VSX (b)	2.14	0.80	2.94	100
Cimarron VR	1.81	1.09	2.90	98
Blazer XL	1.77	1.04	2.81	95
Crown II	1.73	0.98	2.71	92
Saranac AR	1.78	0.93	2.70	92
Milk Maker II	1.72	0.95	2.66	90
Riley	1.68	0.97	2.65	90
GH 777	1.76	0.78	2.54	86
GH 755	1.44	0.97	2.41	82
Baker	1.59	0.82	2.41	82
SDHS6S (b)	1.78	0.61	2.39	81
88R20 (b)	1.11	0.57	1.67	57
AVERAGE	1.92	1.02	2.95	
Maturity (c)	5.00	3.80		
LSD (0.05)	NS (d)	NS	NS	

(a) The entire study was mowed on 11 June 1992 because of excessive winter annual weeds. No data were collected.

(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.

Appendix. Alfalfa cultivars, developers, suppliers, and agronomic characteristics^a.

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	R
Allied Seed	Centurion	3	HR	R	R	R	R	R
	Majestic	3	R	HR	HR	HR	MR	R
	Sabre	4	HR	HR	HR	HR	HR	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
Brown's Seed Farms								
	Pacesetter	2	HR	R	HR	HR	HR	R
Cargill	Crown II	3	HR	R	HR	HR	HR	R
	Royalty	3	HR	R	HR	HR	HR	R
	Trident II	3	HR	R	R	R	HR	MR
Cenex/Land O'Lakes								
	Sure	3	HR	R	HR	HR	R	HR
	Blazer XL	3	R	R	HR	HR	HR	R
	Legend	4	HR	R	HR	HR	HR	R
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
Dairyland Research Int'l.								
	Magnum III	4	R	MR	R	MR	R	R
Dekalb Plant Genetics								
	120	3	HR	R	R	LR	R	R
	DK 122	2	HR	R	R	HR	HR	R
	DK 125	3	HR	R	R	HR	R	R
	DK 135	4	R	MR	R	MR	MR	R
FFR								
	Multistar	3	HR	R	HR	HR	HR	R
Garst / ICI Seeds								
	630	4	HR	MR	R	MR	R	R
	636	2	HR	R	R	MR	R	R
	645	3	HR	R	R	HR	HR	R

to winterhardiness of an alfalfa cultivar. The severe winters of South Dakota require you to make winterhardiness 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 yields of these types under optimum conditions, however, may be lower than those for less dormant types. Consequently, 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 perform where specific diseases may limit production. Major diseases that may affect the productivity of alfalfa in South Dakota include bacterial wilt, Phytophthora root rot, and Verticillium wilt. Resistance characteristics 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 bacte-

rial wilt, and you can avoid disease problems with these selections.

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 where you will also notice stand 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 symptoms of 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 a particular disease, if possible. For many diseases, the only practical means of minimizing economic loss is to use resistant cultivars. Reduced stress from use of 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 must evaluate several characteristics

Appendix. Alfalfa cultivars, developers, suppliers, and agronomic characteristics^a, continued.

Developer/ Supplier	Cultivar	FD ^b	Disease & Insect Resistance ^c					
			BW	VW	FW	An	PRR	PA
Golden Harvest								
	GH 777	3	HR	R	HR	R	HR	--
	GH 755	4	HR	R	HR	HR	HR	R
Great Lakes Hybrids								
	Webfoot MPR	3	HR	R	R	HR	HR	--
Great Plains Research								
	Cimarron VR	5	HR	R	HR	HR	R	HR
Hytest Seeds								
	Victory	3	HR	R	HR	HR	MR	--
Jacques Seed								
	Multi-plier	3	HR	R	HR	HR	HR	R
	Chief	4	HR	R	R	R	HR	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
Payco Seeds/ Interstate								
	Clipper	2	HR	R	HR	R	R	R
	WL 225	2	HR	R	HR	MR	HR	R
	WL 317	3	HR	R	HR	R	HR	HR
	WL 320	4	R	MR	HR	MR	R	MR
Pioneer Hi-Bred Int'l.								
	526	2	HR	--	MR	--	LR	R
	5262	2	HR	LR	MR	--	R	R
	5364	4	R	MR	R	MR	MR	HR
	5472	4	HR	MR	HR	MR	MR	HR
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
	Action	4	R	MR	R	HR	R	R
SeedTec								
	Ultra	3	HR	R	HR	HR	R	R

Appendix. Alfalfa cultivars, developers, suppliers, and agronomic characteristics^a, continued.

Developer/ Supplier	Cultivar	FD ^b	Disease & Insect Resistance ^c					
			BW	VW	FW	An	PRR	PA
Sexauer	Guardsman	3	HR	HR	HR	HR	HR	--
	SX 217	4	R	--	HR	MR	MR	--
United AgriSeeds								
	Allegiance	3	R	R	R	HR	R	R
WD Seed Growers								
	Eclipse	4	HR	R	HR	HR	HR	--

^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 = Verticilium Wilt FW = Fusarium Wilt An = Anthracnose PBR = 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.

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 data collected over several years and locations may 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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