ALFALFA VARIETY CHARACTERISTICS AND ADAPTATION IN CALIFORNIA

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Alfalfa is grown in virtually every county in the state. Climate and soil differences, rainfall and humidity, vary throughout its entire 800-mile length. Variety choice is one of the farmer's most perplexing problems, made difficult by this diversity and the great abundance of varieties available. Proper variety choice is not simple, and involves an individual needing knowledge of all of the characteristics of his own land and matching those with the known characteristics of the different alfalfa varieties and brands.

As an aid to producers and others interested in understanding factors affecting varietal adaptation, the information presented in this paper has been provided to define as accurately as possible the characteristics of varieties and brands sold in California. Undoubtedly there are omissions and some varieties may not have been listed. Their omission has been inadvertent and not deliberate. This information supplements that published in the proceedings of the First California Alfalfa Symposium, Fresno, 1971 and the Third California Alfalfa Symposium held in Imperial Valley, January 1974.

Variety and Brand Adaptation by Area

Historically, alfalfa varieties and brands have been classified in California, as well as other parts of the world, into three broad classifications:

(1) Winter dormant -- able to withstand extremely cold temperatures for long periods. These are often referred to as "northern" alfalfas. Even under California's mild weather conditions these alfalfas will not grow during the winter months, exhibiting a complete dormancy.

(2) Semidormant -- these alfalfas are referred to as "central" alfalfas, referring to the fact that they are adapted to a wide belt throughout the central part of the United States where the winters are not as severe and where plants can survive that have less and a shorter winter dormancy, and a greater fall and earlier spring growth than winter dormant varieties.

(3) Non winter dormant -- these alfalfas are referred to also as "southern" alfalfas, which will grow during the winter months under temperatures which prevail in southern California and the Central Valley of California. Certain varieties will recover more rapidly after cutting, and have more winter growth. Others have a slower rate of recovery and have less winter growth.

This classification is not completely satisfactory under California conditions. The rapid development of new varieties and brands during the last 20 years has given a much wider winter dormant habit and fall growth habit than this simplistic categorization would imply. Consequently, I have added several additional classifications to the above three main categories:

(1) Intermediate dormancy -- this class was created to describe varieties that are really semidormant in midwinter, but which exhibit more rapid regrowth and much later fal growth potential than a truly semidormant variety.

(2) Moderately nondormant -- this group describes varieties that have slightly more winter dormancy than Moapa 69, considered the standard for nondormant varieties. Moderately dormant varieties have late fall growth potential, but do become more dormant in the winter than Moapa 69. There are all scales of recovery in this group.

(3) Very non winter dormant -- varieties and brands in this category show considerably more rapid recovery in the summer and much more winter growth than a nondormant variety such as Moapa 69.

The classification of 71 varieties and brands for winter dormancy, fall regrowth, and principal areas of adaptation are to be found in Table 8.

Historically, classification by winter dormancy groups have assisted in knowing where varieties should be planted. This is not so simple now with the different kinds of dormancy presently available covering a wide range of growth types. However, traditionally the non winter dormant types have been adapted to the southern California low desert area, coastal valleys of central and southern California, and the San Joaquin Valley. They have, in the past, exhibited short stand life, winter growth, and little resistance to disease and insect problems. They respond better to shorter cutting intervals than do the semidormant varieties since they regrow from the crown 3 to 6 days earlier and much more rapidly.

Semidormant varieties have been adapted in some of the central California areas, particularly those with heavier soils. The Sacramento Valley has grown mostly semidormant alfalfas, but with the late fall growing types of semidormant varieties available now, their use has spread into the northern San Joaquin Valley and coastal valleys as well. They are not grown in the southern San Joaquin and the low desert valleys of southern California due to their lack of fall and winter growth and their consequent undesirability for late hay cuts and sheep and cattle winter pasture.

Winter dormant varieties have traditionally been grown in the colder winter areas of the mountain counties in northern and central California. Varieties such as Ranger and Vernal have been widely grown in our mountain areas in the past, since semidormant varieties like Lahontan were not frost-tolerant enough to escape damage to growing alfalfa leaves and stems due to spring frosts. Today we have a different set of dormant varieties with much more rapid regrowth potential, some with late fall growth, but with enough frost-tolerance to escape spring frosts. These varieties are now finding an area of adaptation in the Sacramento and northern San Joaquin Valleys, particularly those with phytophthora root rot resistance.

There are always areas within a region that are peculiar and need a special type of alfalfa with special characteristics. For example, for many years producers in the Firebaugh-Dos Palos-Los Banos area have grown Lahontan or varieties with similar characteristics because of the heavy soils which promote the development of phytophthora root rot. Lahontan and its types have persisted where Moapa and similar types have died out in the heavy soils. Normally, in lighter textured soils, the nondormant varieties have been more productive, but the semidormants have been grown in this particular area due to persistence. Elevation also affects climate, mainly temperatures, and as a result the Mojave Desert area requires a more dormant variety in order to withstand the colder winter temperatures than the low desert valleys such as Imperial, Coachella, or Palo Verde.

Latitude also influences varietal adaptation due principally to temperature and rainfall differences. Normally, it doesn't make sense to have a variety in the Sacramento Valley that grows into November because rainfall and poor drying conditions make it difficult to harvest and cure hay past the middle of October. Dormant and semidormant varieties are better adapted to this area for several reasons: (1) Earlier fall dormancy eliminates fall grazing or late fall harvesting allowing these varieties to store carbohydrates late into the fall giving a much larger first cutting yield the next spring. (2) In heavy soils that become saturated with winter rains, and that saturation persists into the spring, nondormant and moderately nondormant varieties may die due to the saturated soil conditions which persist as these varieties are increasing in their oxygen requirement from the soil. Under similar conditions, semidormant and particularly winter-dormant varieties are much better persisting (see Table 1 and also Proceedings Fifth California Alfalfa Symposium, 1975, "Limiting Factors in Alfalfa Production and Adaptation North of the Tehachapi Mountains" by V. L. Marble).

Table 1. Effect of heavy, saturated soils on the spring vigor and stand life. Planted February 4, 1974. Readings taken April 28, 1975. Carl Schoner.

Dormancy class	Percent stand remaining	Vigor
Very nondormant	40	4.4
Nondormant	57	7.3
Intermediate	68	7.0
Semidormant	82	7.8
Dormant	81	7.7

1 = poor vigor; 10 = excellent vigor.

The data in Table 2 illustrates the response in the first cutting of the season to varieties that have a longer dormant period at Davis than the traditional nondormant varieties such as Moapa 69. This data shows that WL 318 and DeKalb Brand 131, both late fall-growing winter-dormant varieties, had the highest yield in the first cutting in the spring, particularly at the wider cutting intervals practiced the year before of cutting each five or six weeks and cutting the dormant varieties at 10 percent bloom. Lahontan did not respond normally due to its severe defoliation from the Egyptian alfalfa weevil, particularly at the shorter cutting intervals which had little or no root reserves to provide vigorous spring growth.

Table 2. 8 alfalfa variety and 6 harvest interval trial, University of California, Davis First cutting yields, April 20, 1976. Tons per acre.

Dormancy	Varieties	Harvest interval 3 weeks	4 weeks	5 weeks	6 weeks	1/10 Bloom DK Br. 131	Ave.	Duncan's multiple range, 5%
D	WL 318	2.08	1.75	2.11	2.24	2.46	2.22	a
D	DK Br. 131	1.73	1.62	1.97	1.95	2.42	2.01	b
D	Dawson	1.58	1.41	1.93	1.91	2.19	1.86	c
ND	WL 512	1.62	1.60	1.88	1.83	2.11	1.84	cd
MND	N-78 Br.	1.74	1.60	1.88	1.82	1.81	1.76	d
VND	UC Salton	1.56	1.83	1.69	1.90	1.77	1.76	d
ND	Moapa 69	1.33	1.44	1.74	1.78	1.62	1.60	e
SD	Lahontan	1.12	1.10	1.48	1.38	1.46	1.35	f
Average		1.59	.54	1.83	1.85	1.98	1.80	

LSD's:	.05	.01
Between harvests	0.09	0.12
Between harvest intervals	0.17	0.23
Between varieties for same harvest interval	0.23	0.30
Between varieties for different harvest intervals	0.27	0.30

Alfalfa Characteristics that Affect Varietal Adaptation

Alfalfa is attacked by a wide range of insect, disease and nematode pests. The most important, except the Egyptian alfalfa weevil and the alfalfa weevil, are listed in Table 9, along with the resistance characteristics of 71 alfalfas grown in California. The resistance characteristics of varieties and brands to the EAW were not made since there is no real true resistance present in any variety commercially grown in California. However, certain varieties that are more dormant, leafier, with greater axillary branching, have the ability to continue growing under heavy weevil attack. These characteristics are found mostly in winter-dormant varieties such as the three (WL 318, DeKalb Brand 131, and Dawson) listed in Table 2. As a matter of information, the yield response evident by these dormant varieties in Table 2 can also be attributed to their ability to withstand the ravages of the EAW and continue growing, whereas Moapa 69 and Lahontan were completely stripped of leaves with no new growth on the stem evident when harvested.

New alfalfas have an increasing resistance to specific pests as well as multiple-pest resistance to counteract many pests. Often two or more pests attack at the same time, creating synergistic or multiple effects that are difficult to measure. For example, at Davis the EAW, pea aphid, blue alfalfa aphid, common leaf spot, and some minor fungus diseases all attack the first and second cuttings. Pea aphids are again evident in September and October in damaging numbers in alfalfa fields. Table 3 summarizes the effect of season-long insect and foliage fungus control at Davis using an insecticide and fungicide on eight varieties of alfalfa. You will note that by spraying every two weeks through the season, an additional 1.34 tons per acre were obtained over the no spray treatment. Unfortunately, spraying was begun on March 15, a little late to completely eliminate the damage in the first cutting due to the EAW, but the response nevertheless was significant. Except for the early damage from EAW, no foilage diseases or insects were observed in treated plots throughout the season. Unsprayed plots had EAW, pea aphids, alfalfa caterpillars, and yellow striped armyworm infestations during the season.

Table 3. Season-long insect* and foliage fungus control. Average of eight varieties. V. L. Marble and G. Peterson, UC Davis, 1974.

Treatment	Tons dry matter per acre						
	4/24	5/27	6/27	7/29	8/30	10/1	Total
Spray	0.70	1.66	1.81	1.79	1.34	0.95	8.25
No spray	0.31	1.23	1.66	1.70	1.30	0.70	6.91
Difference	0.39	0.43	0.15	0.09	0.04	0.25	1.34
LSD (.05)	0.13	0.12	0.14	0.04	n.s.	n.s.**	0.28

* Benlate® at 2 lb/acre ai and Furadan® at 16 oz/acre ai applied at two-week intervals, March 15 through August 12; monthly, September 13 and October 17.
** Significant at the 8% level.

The most significant alfalfa pests affecting alfalfa performance in California are listed in Table 9. Some of the alfalfa pests listed in Table 9 are very significant and affect the survival of the alfalfa stand such as phytophthora root rot, and resistance to the spotted alfalfa aphid. Others are of less significance and affect only a small portion of the growing season, such as downy mildew during the first cutting. Multiple pest resistance is important since frequently it's difficult to assign a particular cause to the decline of an alfalfa stand, and a decrease in its productivity. One disease not even listed is stagonospora root rot which we are currently evaluating as a significant factor in causing a slow death of alfalfa roots over a several year period. We know of no resistance in any alfalfa variety, but hope to be able to learn how to evaluate resistance and select plants for resistance in the next few years.

Spotted Alfalfa Aphid. All varieties marketed in California, except in the northern mountain counties, must be resistant to the spotted alfalfa aphid. Varieties do have differing quantities of resistance but most marketed today have enough resistance to avoid damage. This may be due to the fact that the general level of population of the spotted alfalfa aphid and its biotypes have been reduced significantly by the 100 percent planting of resistant varieties. The advantage in having resistance to the SAA is illustrated in Table 4.

Table 4. Effect of SAA on yield of alfalfa varieties, UC Davis, 1961. E. H. Stanford.

Variety	Tons/acre	% of Caliverde
Moapa	10.2	173
Lahontan	8.8	149
African	8.2	139
Caliverde	5.9	100
LSD .05	1.4	
.01	1.9	

Most of us have forgotten the amount of damage the SAA can do to an alfalfa stand, not only in yield but in reduced quality, difficulty of harvest operations, etc. It's a tribute to our alfalfa breeders that they have continually been increasing the level of resistance to the SAA so it is no longer a problem except in some rare instances where we have a biotype change that keeps alfalfa breeders continually evaluating and increasing SAA resistance

Pea Aphid. The significance of the pea aphid is often overlooked since it does not cause the severe damage that the spotted alfalfa aphid does. Normally it attacks only in the spring, late summer, or fall and is frequently ignored by producers. The effect of a late summer-early fall infestation of pea aphids on alfalfa yields at Davis in 1977 is given in Table 5.

Table 5. Effect of pea aphid on sixth cutting alfalfa yield. UC Davis, October 13, 1977. V. L. Marble.

Variety	Pea aphid rating	Yield T/A	Percent increase over Lahontan
WL 512	R	1.20	44.5
UC Salton	T	.98	18.1
N-78 Brand	T	.98	18.1
Moapa 69	S	.94	13.5
Lahontan	S	.83	0

Very few aphids, either live or parasitized, were found on WL 512, a variety with multiple pest resistance. Its 44.5% increase in yield over Lahontan is in part due to its greater nondormancy but the numbers of aphids present on WL 512 stems were less than 10 and the numbers of aphids on Lahontan and Moapa were more than 200 per stem. The yield increase over Moapa 69, which is about equal in dormancy to WL 512, is a significant reduction due to an insect that receives very little control attention except in extremely heavy, damaging numbers. Similar results have been obtained in the San Joaquin Valley in Fresno County on an October 10 cutting in 1972. Most producers do not notice a quarter ton yield reduction due to the pea aphid. It is mostly represented by leaf drop, reduced stem and leaf development, and under heavy pea aphid attack, a firing and drying of young shoots and stems at the crown of the plant. However, when you consider that this can happen two or three times during the season, it adds up to a sizable loss that needn't be suffered if a pea aphid resistant variety is chosen.

Blue Alfalfa Aphid. The damage from the blue alfalfa aphid is more severe than from the pea aphid. Its temperature requirements cause it to multiply at a slightly lower temperature, and this has brought greater damage in the more mild winter areas of southern California and the San Joaquin Valley at an earlier date than in other parts of the state. Determinations of yield loss from the BAA so far have been mostly obtained by comparing chemical spray treated areas with untreated areas. This loss has ranged from 30 to 100% for one or two cuttings, depending upon the area. With the development of CUF 101 by Bill Lehman of the University of California Imperial Valley Field Station, we now have a resistant variety that can be used to assess the advantage of planting a resistant variety compared to a susceptible one. Table 6 compares CUF 101, a resistant variety, with three susceptible varieties, and indicates that in the first cutting in Imperial Valley, there was a yield increase of 65% when comparing CUF 101 over Moapa, or 39% when compared to UC Cargo.

Table 6. Yield of alfalfa varieties grown under normal irrigation conditions. UC Imperial Valley Field Station, El Centro. 1976. W. F. Lehman.

	First cutting 2/20/76*			Seasonal
Variety	Yield T/A	Yield as % of UC Cargo	Yield as % of Moapa 69	yield as % of Moapa 69
CUF 101	1.49	139	165	42
UC Salton	1.19	118	129	117
UC Cargo	1.01	100	119	131
Moapa 69	0.85	84	100	100

* Blue alfalfa aphid damage severe prior to 2/20 cutting. No BAA damage after that date. Planting date October 3, 1975.

Several researchers have reported some carry-over effects in subsequent cuttings from BAA feeding damage. In one severe trial in Imperial Valley conducted by W. F. Lehman, the yield advantage of CUF 101 over UC 76, and experimental variety similar to UC Cargo, was 54% in the presence of BAA. The next cuttings, without the presence of BAA, were 26%, 11%, and 2% in favor of CUF 101, for the second, third and fourth cuttings respectively. No differences were detected in the fifth, sixth and seventh cuttings. Other tests have shown very little residual carry-over from BAA feeding.

There are many experimental varieties being developed with BAA resistance, and at least one variety, WL 514, that has been released with resistance to the BAA but not yet in commercial seed production.

Growers should not choose a BAA resistant variety over a nonresistant variety if the resistant variety lacks characteristics that are considered more essential to maintaining profitable production over a long period of time. The BAA can be controlled with chemicals, while such diseases as phytophthora root rot cannot.

Phytophthora Root Rot. Stand longevity is considered by many to be related to phytophthora root rot resistance. The accuracy of this consideration is presently being challenged by plant pathologists who are investigating the effect of stagonospora root rot on stand persistence. However, we do know that phytophthora root rot can effect stand decline very markedly, especially when it is in conjunction with the stand reducing "scald" disease associated with hot weather and reduced oxygen availability in the root zone. Alfalfa breeders have developed some very resistant varieties to phytophthora root rot in the last ten years, and especially in the last three or four years. I have seen experimental selections with a tremendous amount of resistance to phytophthora root rot which, when they are available in commercially released varieties, will make Lahontan look like a tolerant or susceptible variety! Still, on heavy soils in the San Joaquin and Sacramento Valleys, Lahontan is considered to be the standard against which others have to be compared. In our observational and yield trials scattered throughout the Central Valley, some of these newer improved varieties with phytophthora resistance are demonstrating their ability to live under adverse conditions, often with more persistence than Lahontan. Some of these are too new to have been included in a variety trial planted at the West Side Field Station in the fall of 1973. This trial was effected severely by phytophthora root rot in the spring of 1974, and later by scald in the summer months of that same year. Table 7 gives stands ratings, expressed as a percent of original stand remaining in the spring of 1977, three complete cutting seasons, and four winters after planting.

Table 7. Alfalfa variety and brand stand persistence ratings. University of California West Side Field Station. April 20, 1977. Planted October 31, 1973. V. L. Marble

Variety	% stand remaining	Variety	% stand remaining
Lahontan	84	Diablo Verde	65
AS-13R	79	WL 600	63
UC Isom 71 PX	75	WL 508	61
UC 76	75	Moapa 69	60
DeKalb Brand 185	72	Imperial 70 Brand	57
Moapa	71	Lew	55
UC Salton	69	Hayden Cycle II	55
DeKalb Brand 183	66	El Unico	51
WL 451	66	Sonora 70	47
Pioneer Brand 572	65	Arizona MSTT	37
LSD .05	10.0		

Ratings taken immediately after first cutting when no regrowth present.

As you can see from the ratings in Table 9, by looking in the phytophthora root rot column, there are a number of varieties that have excellent resistance to phytophthora root rot in addition to those listed in Table 7. This development is extremely encouraging and will allow producers to maintain their stands longer in the future than they have been able to do in the past and plant more adapted varieties in all ranges of dormancy classification

Summary

The above cited instances of disease and insect resistance and area of adaptation are given as examples of what multiple pest resistance can mean in the future to alfalfa producers. Additional examples could be given for most of the pests cited in Table 9.

As I said in the beginning of this discussion, the great number of alfalfa varieties and brands offered to the California alfalfa grower is sometimes perplexing. On the other hand, I would not like to leave the impression that this is bad. On the contrary, I believe the ever-increasing number of new alfalfas made available is creating a much greater choice of alfalfa types to suit a grower's individual needs for dormancy and resistance to specific destructive alfalfa pests.

I am indebted to many individuals who assisted in developing information that has been used in this paper. The variety and brand characterization of pest resistance was done by a responsible individual from the company who either owns, originated or distributes the alfalfa. In some few instances, public varieties have been characterized by assembling different source documents. Nearly all of the alfalfa growth characterization and area of adaptation data were done in cooperation with a responsible party from the companies involved. Some few varieties and brands were not, and I take the responsibility for those characterizations. If anyone has any question about a character listed, I would be happy to discuss that with them in private.

Table 8. Alfalfa variety and brand growth characteristics and principal areas of use.

Variety or brand	Winter[1] dormancy	Fall[2] growth	Principal[3] areas of use	Distributor or owner or originator	Information supplied by:
Abunda Verde Brand	VND	7	1	Northrup King	Bill Knipe
Amador	ID	5	2,5,6	" "	" "
Anchor	D	2	8	North American Plant Breeders	Jim Moutray
Apollo	D	3	6,8	" "	" "
Ardiente	ND	6	1,3,4,5	Ferry-Morse	Phil Robnett/Tony Wilson
AS-13	MND	5	2,3,4,5,6	" "	" " " "
AS-13R	ND	6	3,4,5,6	" "	" " " "
AS-49	SD	4	2,3,5,6	" "	" " " "
AS-49R	SD	4	2,3,5,6	" "	" " " "
AS-63	D	2	8	" "	" " " "
Atra 55	D	2	8	Arnold-Thomas Seed Service	Marvin Miller
Aztec	SD	3	6,8	Asgrow Seed	Dick Norton/Ike Kawaguch
Aztec II	SD	3	6,8	" "	" " " "
Caliente	VND	7	1,4	Ferry-Morse	Phil Robnett/Tony Wilson
Caliverde 65	ID	4	2,3,5,6	Uni. of Calif.	Vern Marble
Condura 73 Brand	ID	4	2,3,5,6	Continental/ Pioneer Intl.	Jim Kautz/Marvin Miller
Converde 95 Brand	VND	7	1,3,4,5	" "	" " " "
CUF 101	VND	8	1,4,5	Uni. of Calif.	Bill Lehman
Dawson	D	2	8	USDA/Uni. of Nebraska	Bill Kehr
DeKalb Brand 123	D	1	8	Ramsey Seed/ Cal/West	Trevor Bower/Don Smith
DeKalb Brand 131	D	3	6,8	" "	" " " "
DeKalb Brand 167	SD	4	2,3,5,6	" "	" " " "
DeKalb Brand 183	ND	6	4,5,6	" "	" " " "
DeKalb Brand 185	MND	5	4,5,6	" "	" " " "
Diablo Verde	ND	6	3,4,5,6	Asgrow Seed	Dick Norton/Ike Kawaguchi
El Unico	VND	7	1,4	Uni. of Ariz.	Mel Schonhorst
Eureka Brand	SD	3	2,5,6	Security Seed	Bill Rusconi
Gladiator	D	2	8	Northrup King	Bill Knipe
Hayden	VND	7	1,4	Uni. of Ariz.	Mel Schonhorst
Imperial 70 Brand	VND	7	1,4	Security Seed	Bill Rusconi
Joaquin 11	MND	5	2,3,4,5,6	" "	" "
Kodiak	D	2	8	Asgrow Seed	Dick Norton/Ike Kawaguchi
Lahontan	SD	3	2,3,5,6	USDA/Uni. of Nevada	Joe Hunt
Lew	VND	7	1,3	Uni. of Ariz.	Mel Schonhorst
Matador	ND	6	1,4,5	Northrup King	Bill Knipe
Mesa Sirsa	VND	7	1	Uni. of Ariz.	Mel Schonhorst
Moapa 69	ND	6	1,3,4,5,6	USDA/Uni. of Nevada	Joe Hunt
Pioneer Brand 540	D	3	7,8	Pioneer Hi-Bred International	Marvin Miller
Pioneer Brand 572	VND	7	1,3,4,5	" "	" "
Pioneer Brand 581	ID	4	2,3,5,6	" "	" "
Ranger	D	1	8	USDA/Uni. of Nebraska	Vern Marble
Resistador II	ID	4	2,5,6,7,8	Northrup King	Bill Knipe
SD 76 Brand	SD	4	2,5,6,8	Garner Seed	Bob Shotwell
Sonora	VND	7	1	Uni. of Ariz.	Mel Schonhorst
Sonora 70	VND	7	1	" " "	" "
Thor	D	2	8	Northrup King	Bill Knipe
UC Cargo	VND	7	1,4	Uni. of Calif.	Bill Lehman
UC Salton	VND	7	1,4	" " "	" "

Table 8. (continued)

Variety or brand	Winter[1] dormancy	Fall[2] growth	Principal[3] areas of use	Distributor or owner or originator	Information supplied by:
WL 215	D	2	8	Germains/ Waterman-Loomis	Ike Kawaguchi
WL 216	D	2	8	" "	" "
WL 219	D	3	8	" "	" "
WL 220	D	2	8	" "	" "
WL 306	SD	3	8	" "	" "
WL 309	SD	3	6,8	" "	" "
WL 310	SD	2	2,8	" "	" "
WL 311	SD	3	2,8	" "	" "
WL 312	SD	3	2,8	" "	" "
WL 318	SD	4	2,5,6,8	" "	" "
WL 450	MND	5	3,5,6	" "	" "
WL 451	MND	5	3,5,6	" "	" "
WL 501R (Eldorado R)	ND	6	4,5,6	" "	" "
WL 508	ND	6	1,3,4,5,6	" "	" "
WL 512	ND	6	1,3,4,5,6	" "	" "
WL 514	MD	6	1,3,4,5,6	" "	" "
WL 600	ND	6	1,4,5	" "	" "
819 Brand	ND	6	1,4,5	Northrup King	Bill Knipe
919 Brand	ID	5	3,4,5,6	" "	" "
1019 Brand	SD	4	2,3,4,5,6	" "	" "
Vanguard	SD	4	6,8	North American Plant Breeders	Jim Moutray
Vernal	D	1	8	Uni. of Wisc.	Vern Marble
Washoe	SD	3	2,4,5,6,8	USDA/Uni. of Nevada	Joe Hunt

[1]Winter Dormancy

VND = Very non winter dormant
ND = Non winter dormant
MND = Moderately non winter dormant
ID = Intermediate winter dormant
SD = Semi winter dormant
D = Winter dormant

[2]Fall Growth Similarities

1 = Vernal
2 = Thor
3 = Lahontan
4 = Caliverde 65
5 = WL 451
6 = Moapa 69
7 = UC Cargo
8 = CUF 101

[3]Principal Areas of Use

1 = Low desert valleys of southern California.
2 = High desert valleys of southern California.
3 = Coastal valleys of central and southern California.
4 = Southern San Joaquin Valley.
5 = Northern San Joaquin Valley.
6 = Sacramento Valley.
7 = North coastal valleys.
8 = High elevation mountain valleys.

Table 9. Alfalfa variety and brand ratings for pest resistance.*

Variety or brand	SAA	PA	BAA	PRR	Sc	Rz	BW	FW	S An	CLS	DM	SN	RKN
Abunda Verde Brand	HR	T	T	T	T	--	S	T	S	--	--	S	--
Amador	R	S	S	R	--	--	S	--	S	--	T	S	T
Anchor	S	R	S	S	S	S	R	S	S	T	R	T	S
Apollo	T	R	S	R	S	S	R	R	R	T	T	S	S
Ardiente	T	T	--	T	T	--	T	--	--	T	T	R	--
AS-13	T	--	--	T	T	--	T	--	S	T	T	T	--
AS-13R	T	--	--	R	R	--	T	--	--	T	T	R	--
AS-49	T	S	--	R	T	--	R	--	S	T	T	R	--
AS-49R	T	--	--	R	T	--	R	--	--	T	T	R	--
AS-63	--	--	--	S	--	--	R	--	S	T	T	--	--
Atra 55	S	S	S	S	S	S	R	--	S	R	T	S	--
Aztec	R	R	S	S	--	--	R	HT	T	T	T	MR	--
Aztec II	R	R	MT	S	--	MT	R	T	T	T	T	MR	--
Caliente	T	T	--	S	S	--	T	--	S	T	T	S	--
Caliverde 65	HR	S	S	MT	--	--	R	--	S	MT	MT	HT	--
Condura 73 Brand	R	T	S	R	S	S	R	--	S	T	T	R	--
Converde 95 Brand	R	R	S	S	S	S	S	--	S	S	R	S	T
CUF 101	HR	R	R	T	T	--	S	R	--	--	T	S	--
Dawson	R	R	S	S	--	--	MR	--	S	MR	S	--	--
DeKalb Brand 123	S	S	--	S	--	--	R	--	S	T	R	S	--
DeKalb Brand 131	R	S	S	S	--	--	MR	--	S	T	R	S	--
DeKalb Brand 167	R	T	S	MR	--	--	T	--	S	T	T	T	--
DeKalb Brand 183	R	S	S	T	--	--	S	--	S	T	T	S	--
DeKalb Brand 185	R	T	S	T	--	--	S	--	S	T	T	S	--
Diablo Verde	R	R	S	S	--	--	T	MR	MT	MT	T	S	--
El Unico	R	S	T	S	S	S	--	--	--	S	T	S	T
Eureka Brand	R	R	S	R	--	--	R	--	--	--	--	R	--
Gladiator	S	T	S	S	--	--	R	--	T	--	R	MT	--
Hayden	R	S	S	S	S	S	--	--	--	S	T	S	T
Imperial 70 Brand	R	--	S	T	--	--	--	--	--	--	--	S	S
Joaquin 11	R	S	S	T	--	--	T	--	S	S	S	T	T
Kodiak	MR	MR	S	S	--	--	R	T	T	T	--	T	--
Lahontan	T	S	S	MR	S	S	R	S	S	S	S	R	S
Lew	R	S	S	S	S	S	--	--	--	S	T	R	--
Matador	HR	S	S	T	--	--	MR	--	S	--	T	S	--
Mesa Sirsa	R	S	S	S	S	S	--	--	--	S	T	T	T
Moapa 69	T	S	S	S	S	S	S	MR	S	S	S	S	T
Pioneer Brand 540	R	S	S	R	S	S	R	--	S	R	R	S	--
Pioneer Brand 572	R	T	T	T	T	S	S	--	S	S	HR	S	--
Pioneer Brand 581	R	R	T	R	T	S	R	--	S	T	R	--	--
Ranger	S	S	S	S	--	--	T	--	S	MT	HT	S	--
Resistador II	R	MT	S	T	--	--	HT	--	S	T	HT	R	--
SD 76 Brand	R	R	MT	MR	--	T	R	MR	MR	T	T	HT	--
Sonora	T	S	S	S	S	S	--	--	--	S	T	S	T
Sonora 70	T	S	S	S	S	S	--	--	--	S	S	S	T
Thor	S	S	S	S	--	--	HR	--	S	R	R	S	--
UC Cargo	R	T	S	T	T	S	S	HR	--	--	--	S	--
UC Salton	R	T	S	T	T	S	S	HR	--	--	--	S	--
WL 215	T	T	S	S	--	--	R	MR	MR	MR	T	S	--
WL 216	MR	R	T	S	S	T	R	T	T	T	T	MR	S
WL 219	MR	HR	S	T	--	T	R	MR	T	T	T	S	--
WL 220	MR	HR	S	MR	--	T	R	MR	MR	T	T	S	--
WL 306	R	R	S	S	--	--	R	HT	T	T	T	MR	--
WL 309	R	R	T	S	--	MT	R	T	T	T	T	MR	--
WL 310	R	R	T	S	--	HT	R	MR	T	S	T	R	--
WL 311	R	HR	HT	T	--	HT	R	MR	MR	MR	T	T	--
WL 312	R	R	MT	R	--	HT	R	MR	MR	MR	T	MR	--
WL 318	R	HR	MT	R	--	T	R	MR	R	T	MR	MR	--
WL 450	R	MR	S	T	S	S	MT	MR	T	T	R	R	T

Table 9. (continued)

Variety or Brand	SAA	PA	BAA	PRR	Sc	Rz	BW	FW	S An	CLS	DM	SN	RKN
WL 451	R	T	S	T	S	S	R	HT	T	T	T	T	S
WL 501R (Eldorado R)	R	MR	S	S	S	S	MR	R	T	T	T	S	S
WL 508	HR	R	S	T	S	T	S	MR	MR	T	R	S	HT
WL 512	HR	R	MT	MR	S	T	MR	R	--	--	MR	R	T
WL 514	R	--	R	T	--	--	MR	MR	--	--	--	T	--
WL 600	R	R	MT	S	S	T	T	MR	T	T	MR	S	--
819 Brand	R	S	S	S	MT	--	S	--	S	--	S	S	MT
919 Brand	R	S	S	T	--	--	S	--	S	--	T	S	T
1019 Brand	R	S	S	T	--	--	HT	--	S	--	HT	R	S
Vanguard	T	S	S	S	S	S	R	T	R	T	T	S	S
Vernal	S	S	S	S	--	--	R	--	S	T	HT	S	HT
Washoe	R	MR	S	R	--	--	R	S	S	S	S	R	S

Pests and Diseases

SAA = Spotted alfalfa aphid
PA = Pea aphid
BAA = Blue alfalfa aphid
PRR = Phytophthora root rot
Sc = Scald
Rz = Rhizoctonia stem and root canker
BW = Bacterial wilt
FW = Fusarium wilt
S An = Southern anthracnose
CLS = Common leaf spot
DM = Downy mildew
SN = Stem nematode
RKN = Root knot nematode species

Ratings

HR = Highly resistant
R = Resistant
MR = Moderately resistant
HT = Highly tolerant
T = Tolerant
MT = Moderately tolerant
ST = Slightly tolerant
S = Susceptible
-- = No data available

Definitions

I = Immune. Not subject to attack for a specified pest. Immunity is absolute.
R = Resistant. Ability of plants to restict the activities of a specified pest.
T = Tolerant. Ability of plants to endure a specified pest or an adverse environmental condition, performing and producing in spite of the disorder.
S = Susceptible. Inability of plants to restrict the activities of a specified pest, or to withstand an adverse environmental condition.

* The author assumes no responsibility for accuracy of the data supplied by the different contributors.