ALFALFA VARIETY AND BRAND ADAPTATION IN CALIFORNIA

Vern L. Marble
Extension Agronomist
University of California, Davis

Alfalfa is grown as a feed and a major cash crop in most counties of the state. Climate, including rainfall, temperature and humidity, and soils vary throughout the state's 800-mile length. Seven major alfalfa climate zones in California have been defined (Marble, Proc. 5th Calif. Alfalfa Symposium, p. 7-19, 1975). These include (1) low desert valleys of southern California; (2) high desert valleys of southern California; (3) coastal valleys of central and southern California; (4) San Joaquin Valley; (5) Sacramento Valley; (6) north coastal valleys; (7) high elevation mountain valleys. Major areas of alfalfa production include zones 1 and 2 (22% of state's acreage), the San Joaquin Valley (54%) and the high elevation valleys of northern California (13%). These three areas constitute approximately 89% of the acreage planted in California, and are the major growth areas of the last five years. There are now over 200 alfalfa varieties marketed in the United States, many of them with retail outlets in California, which constitute a tremendous, but perplexing resource to California farmers who must choose the variety specifically adapted to their own land.

Choosing a Variety

The proper varietal or brand choice, although only one of ten major factors influencing alfalfa yield and persistence, can make or break the successful production on a given soil. One would not be successful planting a Phythophthora root rot (PRR) susceptible variety on a heavy clay soil with slow internal drainage characteristics. Likewise, it is not possible to have successful alfalfa production on sandy soils with known root nematode problems if one plants a PRR-resistant variety that is susceptible to severe and rapid stand loss by nematodes. Proper varietal selection is possible only if one has all the facts about his own soils, climate, uses that he expects to make of the product, etc. By knowing completely the characteristics of a particular piece of land, and also knowing the characteristics of alfalfa varieties and brands that are offered for sale in a particular area, one can then make the most intelligent decision possible by matching these characteristics for the best expected result.

The information presented in Tables 6 and 7 of this paper is the third updating of alfalfa varieties and brands offered for sale in California (Marble, Alfalfa Variety Characteristics and Adaptation in California, Proc. 7th Calif. Alfalfa Symposium, p. 11-21, 1977; Marble, Varietal Characteristics and Adaptation in the Low Desert Valleys of the Southwest, Proc. 8th Calif./Ariz. Alfalfa Symposium, p. 23-33, 1978). Many varieties no longer being sold nave been deleted, and several that have been developed since 1978 have been added. The structure of the tables has been changed to simplify the classification of varieties according to tne major dormancy groups. All companies known to have marketing programs in California, and some without such programs, were contacted. Nearly all responded and some older varieties have now been reclassified as to their characteristics since new information has become available. Some varieties and brands may have been omitted inadvertently.

The company/individual supplying information on characteristics is indicated. In most instances their resistance designation has corresponded with observations made by our UC extension and research staff. Unless a serious discrepancy existed, the ratings were not challenged, but many discussions were made with individuals in justifying some of the ratings. A good example of difficulties involved with such a system are the resistance ratings for the blue alfalfa aphid (BAA). CUF 101, the first variety released with resistance to this insect pest, is classed as resistant (R). Resistance is defined in Table 7 as "The ability of plants to restrict the activities of a specified pest." While CUF 101 usually does an acceptable job in resisting attacks of the BAA, occasionally conditions favoring the BAA exist and numbers build up so that one would believe that CUF 101 may have to be treated with an insecticide. This has happened more frequently overseas, particularly in Australia and Argentina, than in California and the Southwest, but has led these two countries specifically to reclassify CUF 101 from resistant to tolerant (T). Thus, all varieties that have been indicated as having some resistance to the BAA should be reclassified. Nevertheless, the characteristics for the 81 varieties and brands indicated are provided as an aid to producers and others interested in understanding factors affecting alfalfa adaptation.

UC Variety and Brand Evaluation Program

The University of California variety and brand testing program is designed to provide information to aid in determining the areas of adaptation of alfalfas throughout the alfalfa-growing areas of the state. In addition, many valuable trials are being conducted throughout the state by private companies. The location of existing UC trials throughout the state as of November 1980 can be seen in Figure 1. The 27 replicated yield trials and 37 farm observational trials (not harvested for yield) collectively provide a great deal of information about the adaptation of alfalfas to our many environments. Readings are taken periodically on stand persistence, resistance to diseases and insects, nematode resistance, competition to weeds, and growth characteristics such as vigor, appearance, winter growth, fall growth, and summer regrowth capacity. Collectively these data, combined with data collected at private research facilities, have been the basis for the composition of Tables 6 and 7.

Dormancy Classification

The system of classifying alfalfa varieties and brands into six dormancy groupings presented in the 1978 classification system (Marble, Varietal Characteristics and Adaptation in the Low Desert Valleys of the Southwest, Proc. 8th Calif./Ariz. Alfalfa Symposium, p. 23-33, 1978) have been accepted by the alfalfa industry and are, therefore, used. These six include: (1) winter dormant (D); (2) semi winter dormant (SD); (3) intermediate winter dormant (ID); (4) moderately non winter dormant (NMD); (5) non winter dormant (ND); (6) very non winter dormant (VND). This classification, together with fall regrowth characteristics, principal areas of adaptation, distributor and/or owner/originator, and the individual supplying information are found in Table 6.

Accurate classification as to winter dormancy allows an individual to know where varieties and brands should be planted. Readings on UC trials (Fig. 1) are made on summer regrowth potential by measuring the growth 2 weeks after cutting. Fall regrowth is measured 3 weeks after final harvest in the fall. Stand counts are made annually, usually in the spring and again in the fall, to document stand decline and estimate persistence. Truly winter dormant varieties can survive winter cold and freezing temperatures for long periods of time because under such temperature conditions and short daylength, their physiological makeup does not allow them to grow. These same varieties will grow only very slowly during the winter if planted in the Imperial Valley, where temperatures are adequate for growth but daylengths are not sufficient to break dormancy during the winter months. Varieties with winter dormant characteristics are slow growing, plants are more leafy, and they require longer cutting intervals to reach maximum yield. They begin slowing down in their growth even in the Central Valley by mid August with very little growth following a last cutting in mid October. They are adapted to the cold winter areas of northern California since warm summer temperatures correspond with a longer daylength so that high productivity can be obtained with three cuttings. In contrast non winter dormant varieties have more growth ability during cooler temperatures and shorter days. They will continue to grow during autumn months, even into the winter if temperatures are 45-65°F in the day and no frost occurs during the night. They are usually more rapid recovering with longer internodes between leaves, narrower crown and less prostrate, and have the capacity to be cut at shorter intervals for high productivity.

Stand Persistence Problems

Table 1 compares, on a percentage basis for each location and trial, the yielding capacity of different kinds of winter dormancy groups, at four typical areas where alfalfa is produced in California. These locations represent the traditional 3-cut area of the northern mountain valleys (Tulelake Field Station), the 5- or 6-cut areas of the Sacramento Valley (UC Davis), the 6- or 7-cut areas of the central San Joaquin Valley (West Side Field Station, Fresno County), and the 8- to 10-cut low desert valleys of southern California (Imperial Valley Field Station and growers' sites).

Northeast Mountain Valleys. As recently as 10 or 15 years ago many producers in these areas cut only twice per season. Demand for high-quality dairy hay and a series of time-of-harvest trials through the northeastern counties, demonstrated the increased productivity and quality of three cuts, with four possible in some lower elevation areas, using D and SD varieties. Recent variety evaluation programs in this area have demonstrated that SD varieties with high levels of frost resistance are more productive. The difference between the three groups grown in the area is not large, but varieties with multiple pest resistance and more rapid regrowth potential following cuttings, including more fall regrowth potential, will return the grower more tons of hay than old standard varieties such as Ranger and Vernal.

This is especially apparent when you look at the individual variety response with tne best semi dormant, over a 7-year testing period, outyielding the best dormant variety by 3% annually.

In this area Vernal has been the traditional standard variety, but when one compares Vernal with the best variety, a semi dormant, over 7 years, it only yields 92%, indicating progress in breeding varieties with better adaptation expressed through increased production. Over this 7-year test period, Vernal ranked 22nd out of 34 entries! Similar results over the same years occurred in a trial at Cedarville, Modoc County. In these trials varietal difference in yield has not been related to stand loss due to diseases, as all varieties have declined in a uniform way, from over 10 plants/ft^2 to less than 5. Important characteristics in alfalfas for this area include frost resistance, rapid recovery after cutting, fall growth, resistance to bacterial wilt, Phytophthora root rot, pea aphid and blue alfalfa aphid Information from yield trials over many years are available from farm advisors of counties in the northeastern intermountain area including Mono/Inyo counties.

Sacramento Valley. Variety testing has been carried on at UC Davis for over 50 years. More recently, since the mid 1960s, an extremely active testing program has been carried out between Cooperative Extension and the Department of Agronomy and Range Science. Figure 1 indicates trials being conducted currently in surrounding counties. An excellent summary is published on a regional basis annually presenting results of variety trials conducted at UC Davis. Other counties have locally adapted information. Traditionally, intermediate and semi dormant varieties have been highest yielding. Lack of resistance to Phytophthora root rot among the non dormant and very non dormant varieties traditionally has reduced stands severely and made them impractical to grow in rotations longer than three years. Newer varieties and experimental lines in the ND and VND class apparently have reversed this situation in a 20-entry trial conducted over four years at UC Davis. It has been demonstrated repeatedly at UC Davis that if high productivity is to be obtained from SD and D varieties, cutting intervals must be lengthened as dormancy increases. This trial penalized the more dormant types with its cutting frequency but was only harvested six times per season. When one looks at individual responses in Table 1 you can see clearly how Lahontan has fallen behind, being only 81% of the best variety in the trial, a ND variety with high resistance to Phytophthora root rot. There seems to be no need to use VND varieties in tne Sacramento Valley, but newer multiple pest resistant ND varieties can be used with equal success to the best SD, ID and MND varieties.

It is no longer necessary to plant lower yielding alfalfas--Lahontan, for example--in order to have persistence on the deep, Yolo clay loam soils at UC Davis. Other areas in the Sacramento Valley with poor internal drainage still require SD or ID or even D varieties with high levels of resistance to Phytophthora root root and bacterial wilt, as evidenced by persistency results from observation and yield trials scattered throughout the Sacramento Valley.

The importance of PRR and persistence, in comparison with characteristics such as resistance to the blue alfalfa aphid, is presented in Table 2. This trial was the same as that presented for UC Davis in Table 1, where varieties were easily classified as R, T, or S for PRR resistance. Stand density ratings for percent of a normal stand remaining after four years were taken on October 28, 1980. PRR-susceptible varieties had a very meager 26% of their stands left compared to 70% for resistant varieties after four production years. The production difference between resistant and tolerant varieties was negligible, but susceptible varieties declined tremendously in the fourth year of production. When one compares the highest two resistant varieties with the two most susceptible varieties, the stand and yield differences are accentuated. Although the second cutting of 1980 suffered a tremendous attack by the BAA, the productivity of the second cutting taken one day after the BAA ratings indicates that PRR resistance in a very wet spring was a greater factor in higher yields than BAA resistance. This response is clouded due to the fact that the new BAA resistant varieties are at least tolerant to PRR, as indicated by the lower score for BAA for tolerant varieties. In fact, the two highest yielding varieties for the second cutting were both resistant to PRR, but susceptible to BAA. Considering the wet spring in tne Sacramento Valley in 1980, there was almost a 0.5 tons/A advantage in the second cutting to alfalfas with resistance to PRR.

San Joaquin Valley. Variety and brand trials have been conducted continuously since 1961 at West Side Field Station in Fresno County on Panoche clay loam soils. This area represents the west side of the San Joaquin Valley, and also accurately represents the sandier soils on the east side of the San Joaquin Valley that have no known nematode problems.

Observational plots with three replicates have been used throughout California (Fig. 1) to determine differences in persistence, and to obtain adaptation information over a wide range of soil and climate sites not possible with a single testing location at a field station.

Eight observational trials with large numbers of entries have been planted on east side sandy, sandy loam and fine sandy clay loam soils in the past ten years. Six of these sites have had a large complex of nematodes, some with heavy populations of various nematodes but predominately root knot nematode spp. Usually such nematode problems occur together with other fungal diseases including PRR, bacterial wilt and Stagonospora root rot, complicating interpretation of stand decline and persistence. Table 4 summarizes the percent of a normal stand which remained after 2½ years in one such observational trial on a well drained sandy loam soil in Tulare County, a few miles east of Visalia. Some bacterial wilt was observed, and nematodes encountered are listed in Table 4. Since Lahontan, Amador and AS-49R are resistant to both PRR and bacterial wilt, as are the four varieties with the best stand remaining (UC PX 1971 is not resistant to PRR), one would appear confident in concluding that the difference in stand persistence was related mainly to the variety's ability to cope with nematode species present. It appears highly probable that the stand decline problem on the east side of the San Joaquin Valley involves to a certain degree, if not a major degree, a complex of root nematodes possibly interacting with diseases.

Historically Lahontan has been our most persistent variety planted on loam, clay loam, and clay soils in California. On Panoche clay loam soils of the West Side Field Station, Fresno County, after five years Lahontan had 68% of the normal stand remaining, AS-13R--63%, UC PX 1971--0%, WL 451--43%, and Moapa 69--50% stand remaining. These values should be compared with the Tulare County trial in Table 4 where Lahontan had only a 13% stand remaining after 18 months.

The selection of the proper dormancy group for the central San Joaquin Valley using the test cited for the West Side Field Station in Table 1, is heavily weighted to the ND and VND types. Dormant varieties are completely unadapted, and semi dormant and intermediate types could only be justified with specific situations such as potential waterlogged soils through several months of the winter, when a semi dormant variety is not growing and will persist, and a ND or VND variety would not persist or have extremely low production the first cutting. Alfalfa on heavy textured soils grows slower during the summer than on sandy soils resulting in a slower growing, higher quality, leafier, finer stemmed hay. SD, ID and MND types are better adapted to these sites. ND and VND types are better adapted to well drained soils including heavy soils. Over a 4-year period, the best ND variety yielded 30% more than Lahontan, but only 7% more than Moapa 69 (Table 3).

Table 3 has some good examples of the danger in using one year's experience, particularly the first year, to base your opinion about the performance of a variety or brand over a 3- or 4-year life of stand. The experimental selection A-21R, in first place in 1978 and 1979, was only 14th in 1977. Similar examples could be cited in the reverse direction.

Low Desert Valleys. The low desert valleys of southern California have some problem peculiar to their area, due mainly to hot summers, water and soils. To assume that a variety adapted to one area of the low desert suits every other area in the low desert would be making a serious mistake. Table 1 cites two trials in Imperial Valley, one on the Imperial Valley Field Station and the other a grower location on very well drained but heavy soil. Looking at the average response to the VND and the ND varieties, the only types included in the trial, the VND varieties exceeded the ND varieties by 11% on the field station, but actually yielded 3% less than the ND varieties on the better drained soil in a trial conducted in the grower's field. When one looks at the individual response of the best varieties, the best VND variety yielded 16% better than the best ND variety in that trial, versus a virtually equal response on the part of the best varieties in the grower's field. Mesa Sirsa, a long-used standard variety for Imperial Valley, yielded only 75% of the best variety on the field station but yielded essentially equal (98%) to the best varieties in the grower's field.

Looking at varietal response to stand decline problems present on a sandy soil adjacent to the Colorado River in Palo Verde Valley near Blythe, California (Table 5) one can see the spectacular decline in stand persistence for certain varieties in a 4-replicated observational trial. Varieties and brands chosen for this trial were selected on the basis of the expected response to root nematodes, based on past performance in other trials throughout California. While it cannot be assumed that the total response is due to nematodes, other diseases such as Phytophthora root rot have not been detected in this planting. Such devastation to stands

in a 10-month period after planting allows a more critical evaluation of nematode involvement. The Nevada Syn XX (SD) and YY (MND) germplasms have been specifically developed for resistance to root knot nematode spp. (*Meloidogyne hapla*, *M. javanica*, and *M. incognita*). UC PX 1971 was selected from a variety trial and field in Perris Valley, Riverside County, for excellent appearance. UC 118 and UC 127 are field selections of W. F. Lehman from a nematode-infested variety trial and field in Palo Verde Valley, indicating progress in developing increased persistence in non dormant material. These five entries were so outstandingly superior to other entries, many of which had similar backgrounds, that it is apparent that progress from field selections can be made for increased persistence on similar soils.

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Table 1. Yield comparisons between varieties from five dormancy groups at four locations in California.

	Percent of Non Dormant Variety(s)[1]									
	Tulelake Stn. 1974-79 34 Entries		UC Davis 1977-79 20 Entries		West Side Stn. 1977-80 35 Entries		Imperial Valley IVFS 1978-79 8 Entries		Imperial Valley Grower 1976-78 6 Entries	
AVERAGE RESPONSE OF VARIETIES IN DORMANCY GROUPS										
VND[2]	--		104		101		111		97	
ND	--		100		100		100		100	
ID	99		97		92		--		--	
SD	102		94		89		--		--	
D	100		91		77		--		--	
INDIVIDUAL VARIETY RESPONSE										
Best VND	--		100		100		116		99	
Best ND	--		100		100		100		100	
Best ID	97		94		89		--		--	
Best SD	103		90		88		--		--	
Best D	100		83		79		--		--	
Vernal vs Best Variety in Trial	92	Lahontan vs Best	81	Moapa 69 vs Best	93	Mesa Sirsa vs Best	75		98	

[1]At Tulelake the dormant variety(s) were used as 100%.

[2]See Table 6 for key to dormancy symbols.

Table 2. Effect of Phytophthora root rot and blue alfalfa aphid resistance on stand remaining and yield of fourth year, UC Davis, 1980. (Schoner et al.)

No. of Entries	Phyt.RR Rating[1]	% Stand Remaining 10/28/80	Yield T/A 1980	Blue AA Rating[2] 5/29/80	Yield T/A 2nd Cut 5/23/80
5	R	70	47.27	6.8	1.09
6	T	45	7.36	4.2	1.07
7	S	26	5.53	6.9	0.75
2	Highest R	78	8.08	6.5	1.22
2	Lowest S	26	3.49	6.5	0.76

[1]R = Resistant; T = Tolerant; S = Susceptible.

[2]1 = no damage; 10 = severe damage.

Table 3 35 alfalfa variety and brand trial, West Side Field Station, Fresno County; 3-year summary (Marble et al.).

Variety or Brand	Yield[1] in tons/acre, rank in parentheses					% of
	1977	1978	1979	Ave. over years		Moapa 69
	dry tons/acre					
A-21R[3]	10.51(14)	11.34(1)	12.15(1)	11.33(1)	a[2]	106.87
UC 110[3]	10.57(11)	11.22(2)	12.08(2)	11.29(2)	ab	106.45
CUF 101	10.85(7)	11.08(3)	11.77(3)	11.23(3)	ab	105.92
Matador	11.36(1)	10.66(12)	11.53(5)	11.18(4)	ab	105.42
WL 514	11.11(2)	10.84(8)	11.44(6)	11.13(5)	ab	104.91
UC 103[3]	10.93(6)	11.01(4)	11.14(11)	11.03(6)	abc	103.99
Ardiente	10.54(12)	10.87(6)	11.36(7)	10.92(7)	abcd	103.00
572	10.97(5)	10.84(7)	10.91(16)	10.92(8)	abcd	102.84
Converde 95 Br	10.98(4)	10.52(15)	11.22(9)	10.91(9)	abcd	102.83
UC 76E[3]	10.46(15)	10.75(10)	11.27(8)	10.83(10)	abcd	102.08
WL CA 423-26[3]	10.14(21)	10.66(11)	11.60(4)	10.80(11)	abcd	101.83
Hayden PXPRRR[3]	10.80(9)	10.77(9)	10.81(18)	10.79(12)	abcd	101.77
WL 512	11.10(3)	10.53(14)	10.57(24)	10.73(13)	abcde	101.20
UC 104[3]	10.81(8)	10.18(22)	11.05(13)	10.68(14)	abcdef	100.70
AS-13R	10.20(18)	10.65(13)	11.15(10)	10.67(15)	abcdef	100.58
UC 111[3]	10.18(19)	10.97(5)	10.74(20)	10.63(16)	abcdef	100.24
Moapa 69	10.52(13)	10.23(20)	11.06(12)	10.61(17)	abcdef	100.00
B-210[3]	10.68(10)	10.33(18)	10.62(23)	10.54(18)	abcdefg	99.42
UC Cargo	10.32(17)	10.49(17)	10.64(22)	10.48(19)	abcdefgh	98.84
$SW32AN_4P_3$ 76[3]	10.16(20)	10.50(16)	10.76(19)	10.47(20)	abcdefgh	98.76
UC 108[3]	10.33(16)	10.24(19)	10.51(25)	10.36(21)	bcdefghi	97.71
Condura 73 Br.	9.65(25)	9.69(25)	10.96(14)	10.10(22)	cdefghi	95.22
CW 8	9.68(24)	9.55(27)	10.88(17)	10.04(23)	defghi	94.64
DK Br. 167	9.60(26)	9.68(26)	10.70(21)	9.99(24)	defghi	94.22
WL 318	10.08(22)	9.69(24)	10.17(29)	9.98(25)	defghi	94.13
Amador	9.73(23)	10.20(21)	10.00(31)	9.98(26)	defghi	94.06
581	9.21(29)	9.37(29)	10.95(15)	9.84(27)	efghi	92.82
Nevada Syn YY[3]	9.54(27)	9.31(30)	10.39(26)	9.75(28)	fghij	91.92
PX-745[3]	9.19(30)	9.76(23)	10.03(30)	9.66(29)	ghij	91.10
CW-116[3]	9.46(28)	9.09(31)	10.29(28)	9.61(30)	hijk	90.64
CW-22-03[3]	8.58(33)	9.44(28)	10.35(27)	9.46(31)	ijkl	89.17
A55[3]	8.69(31)	8.56(32)	9.45(33)	8.90 (32)	jkl	83.92
WL 219	8.60(32)	8.44(33)	9.35(34)	8.80(33)	kl	82.96
Lahontan	8.18(34)	8.38(34)	9.47(32)	8.68(34)	l	81.81
CW-0131-23[3]	7.85(35)	7.04(35)	6.62(35)	7.17(35)	M	67.63
Grand Mean	10.04	10.08	10.68	10.27		96.85
CV	7.7	6.8	7.4	9.3		
LSD (.05)	1.080	0.960	1.102	0.770		
(.01)	1.430	1.270	1.459	1.019		

[1]To convert to hay equivalent at 12% moisture, multiply by 1.137.

[2]Varieties followed by the same letter are not significantly different from one another at odds of 19:1.

[3]Experimental varieties, no seed available.

Table 4. Stand loss, Whittendale variety and brand trial, Visalia, Tulare County[1]. August 20, 1980. (Frate and Marble)

Entry	% Stand Remaining	Homogeneous Sub-groups[2]
UC PX 1971[3]	60	a
CW 8	53	a b
WL 318	47	a b c
AS-13R	43	a b c d
WL 514	40	a b c d
GS 260 Brand	40	a b c d
WL 451	40	a b c d
WL 512	40	a b c d
581	33	b c d e
UC 128[3]	30	b c d e
GS 241 Brand	30	b c d e
Moapa 69	30	b c d e
CW 67[3]	27	c d e
$SW32AN_4P_3$	23	c d e
CUF 101	23	c d e
Matador	20	d e
Condura 73 Brand	20	d e
Converde 95 Brand	13	e
Lahontan	13	e
Amador	13	e
AS-49R	10	e

[1]Nematodes present in samples collected August 26, 1980 include: root knot spp., pin, lesion, stubby root, stunt and ring (McHenry and Lownsbery). Planted February 23, 1978, 4 replicates, plots 25' x 20'.

[2]Varieties followed by the same letter are not significantly different from one another at odds of 19:1.

[3]Experimental selections, no commercial seed available.

Table 5. First-year stand loss, Hull Farms alfalfa variety trial, Blythe, Riverside County[1]. October 18, 1980. (Ede, Marble, Radewald, and Lehman)

Entry	% Stand Remaining	
Nevada Syn XX[2]	82.5	Group 1[3]
UC 127[2]	75.0	
Nevada Syn YY[2]	72.5	
UC PX 1971[2]	65.0	Group 2
UC 118[2]	62.5	
AZ-BAA[2]	57.5	
Valador	57.5	
UC 143[2]	55.0	
AZ-CAP[2]	55.0	
UC 133[2]	52.5	
Pioneer Brand 572	52.5	
WL 514	50.0	
UC 126 Salton RR[2]	47.5	
UC 146[2]	42.5	Group 3
UC Cargo	40.0	
UC-121-Tucson BAA[2]	40.0	
UC 131[2]	37.5	
UC 177[2]	37.5	
Maxidor	37.5	
WL 512	37.5	
CUF 101	35.0	
Mesa Sirsa	35.0	
UC 103[2]	32.5	
AZ-RKN[2]	32.5	
NK-K-7-702[2]	32.5	
Pioneer Brand 581	32.5	
Ardiente	25.0	Group 4
Matador	20.0	
AZ-Hayden PX[2]	17.5	
Lahontan	10.0	

[1]Nematodes present before planting included: dagger, Xiphinema spp.; root knot nematode, Meloidogyne spp.; ring, Criconemoides and Criconema spp.; lesion, Pratylenchus spp. (Radewald). Planted December 12, 1979. Four replicates.

[2]Experimental selection. No seed available.

[3]This grouping formed by cluster analysis of averages. Groups are highly significantly different from each other at the 1% level of significance or higher (odds of 99:1).

Table 6. Alfalfa variety and brand growth characteristics, principal areas of use, and distributor/owner/originator.

Variety or brand	Winter dormancy	Fall growth	Principal areas of use	Distributor or owner or originator	Information supplied by:
			WINTER DORMANT		
Anchor	D	2	8	North American Plant Breeders	Jim Moutray
Apollo	D	3	6,8	" "	" "
AS-63	D	2	8	Ferry-Morse	Phil Robnett/Tony Wilson
AS-67	D	2	8	" "	" " " "
AS-60F	D	3	8	" "	" " " "
Atra 55	D	2	8	Arnold-Thomas Seed Service	Jack McGillis
DeKalb Brand 120	D	2	8	Ramsey Seed/DeKalb AgResearch	Don Haeseker
DeKalb Brand 130	D	3	2,8	" "	" "
DeKalb Brand 131	D	3	8	Ramsey Seed	Tim Martin
Gladiator	D	2	8	Northrup King	Bill Knipe
Pacer	D	2	8	Union Seed Co.	Jess Bice/Don Brown
Pioneer Brand 545	D	3	7,8	Pioneer Hi-Bred International	Marvin Miller
Ranger	D	1	8	USDA/Univ. of Nebraska	Vern Marble
Summit	D	3	6,8	NC+ Calif. Seed	Jim Loe
Sunrise	D	1	6,8	" " "	" "
Thor	D	2	8	Northrup King	Bill Knipe
WL 215	D	2	8	Germain's/WL Research	Ike Kawaguchi
WL 219	D	3	8	" "	" "
WL 220	D	2	8	" "	" "
WL 221	D	2	8	" "	" "
Valor	D	1	8	Union Seed Co.	Jess Bice/Don Brown
Vernal	D	1	8	Univ. of Wisconsin	Vern Marble
			SEMI WINTER DORMANT		
Alpha I	SD	4	2,3,5,6,8	NC+ Calif. Seed	Jim Loe
AS-49	SD	4	2,3,5,6	Ferry-Morse	Phil Robnett/Tony Wilson
AS-49R	SD	4	2,3,5,6	" "	" " " "
Cimarron	SD	4	2,5,6,8	Great Plains Research Co., Inc.	Thad Busbice
Condura 74 Brand	SD	4	2,5,6,8	Continental	Eldon Hoffman
DeKalb Brand 167	SD	4	2,3,5,6	Ramsey Seed	Tim Martin
Lahontan	SD	3	2,3,5,6	USDA/Univ. of Nevada	Boyd Hartman
NC+ 5500 Brand	SD	4	2,3,5,6	NC+ Calif. Seed	Jim Loe
Resistador II	SD	4	2,5,6,7,8	Northrup King	Bill Knipe
SD 76 Brand	SD	4	2,5,6,8	Garner Seed	Bob Shotwell
WL 309	SD	3	6,8	Germain's/WL Research	Ike Kawaguchi
WL 310	SD	2	2,8	" "	" "
WL 311	SD	3	2,8	" "	" "
WL 312	SD	3	2,8	" "	" "
WL 313	SD	3	8	" "	" "
WL 314	SD	3	7,8	" "	" "
WL 315	SD	3	6,7,8	" "	" "
WL 318	SD	4	2,5,6,8	" "	" "
1019 Brand	SD	4	2,3,4,5,6,7,8	Northrup King	Bill Knipe

Variety or brand	Winter[1] dormancy	Fall[2] growth	Principal[3] areas of use	Distributor or owner or originator	Information supplied by:
Vangard	SD	4	6,8	North American Plant Breeders	Jim Moutray
Washoe	SD	3	2,4,5,6,8	USDA/Univ. of Nevada	Boyd Hartman
INTERMEDIATE WINTER DORMANT TO MODERATELY NON WINTER DORMANT					
Amador	ID	5	2,3,4,5,6,7	Northrup King	Bill Knipe
Caliverde 65	ID	4	2,3,5,6	Univ. of Calif.	Vern Marble
Condura 73 Brand	ID	4	2,3,5,6	Continental	Eldon Hoffman
DeKalb Brand 185	MND	5	4,5,6	Ramsey Seed	Tim Martin
Joaquin 11	MND	5	2,3,4,5,6	Security Ag Research	Steve Rusconi
Mesilla	MND	5	2,4	New Mexico State Univ.	Bill Melton
NC+ 6600 Brand	ID	5	3,5,6,7	NC+ Calif. Seed	Jim Loe
NC+ 8000 Brand	MND	7	4,5,6	" " "	" "
NC+ 8800 Brand	ID	5	4,5,6	" " "	" "
Pioneer Brand 581	ID	4	2,3,5,6	Pioneer Hi-Bred International	Marvin Miller
WL 450	MND	5	3,5,6	Germain's/WL Research	Ike Kawaguchi
919 Brand	ID	5	3,4,5,6	Northrup King	Bill Knipe
NON WINTER DORMANT					
Ardiente	ND	6	1,3,4,5	Ferry-Morse	Phil Robnett/Tony Wilson
AS-13R	ND	6	3,4,5,6	" "	" " " "
Galaxy	ND	6	1,3,4,5,6	NC+ Calif. Seed	Jim Loe
Matador	ND	6	1,4,5,6	Northrup King	Bill Knipe
Moapa 69	ND	6	1,3,4,5,6	USDA/Univ. of Nevada	Boyd Hartman
MD 80 Brand	ND	6	1,3,4,5,6	Garner Seed Co.	Bob Shotwell
WL 508	ND	6	1,3,4,5,6	Germain's/WL Research	Ike Kawaguchi
WL 512	ND	6	1,3,4,5,6	" "	" "
WL 514	ND	6	1,3,4,5,6	" "	" "
WL 515	ND	6	1,2,3,4,5,6	" "	" "
819 Brand	ND	6	1,4,5	Northrup King	Bill Knipe
Valador	ND	6	1,4,5	" "	" "
VERY NON WINTER DORMANT					
Abunde Verde Brand	VND	8	1	Northrup King	Bill Knipe
Converde 95 Brand	VND	7	1,3,4,5	Continental	Eldon Hoffman
CUF 101	VND	8	1,4,5	Univ. of Calif.	Bill Lehman
El Unico	VND	7	1,4	Univ. of Ariz.	Mel Schonhorst
Granada	VND	8	1,4,5	North American Plant Breeders	Jim Moutray
Hayden	VND	7	1,4	Univ. of Ariz.	Mel Schonhorst
Lew	VND	7	1,3	" "	" "
Maxidor	VND	8	1,4,5	Northrup King	Bill Knipe
Mesa Sirsa	VND	7	1	Univ. of Ariz.	Mel Schonhorst
Pioneer Brand 572	VND	7	1,3,4,5	Pioneer Hi-Bred International	Marvin Miller
Rincon	VND	7	1	New Mexico State Univ.	Bill Melton

Variety or brand	Winter[1] dormancy	Fall[2] growth	Principal[3] areas of use	Distributor or owner or originator	Information supplied by:
Sonora 70	VND	7	1	Univ. of Ariz.	Mel Schonhorst
UC Cargo	VND	7	1,4	Univ. of Calif.	Bill Lehman
UC Salton	VND	7	1,4	" "	" "

[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 = DeKalb Brand 185
6 = Moapa 69
7 = UC Cargo
8 = CUF 101

[3]Principal Areas of Use

1 = Low desert valleys of southern California, southern Arizona, southern Nevada, and southern New Mexico.
2 = High desert valleys of southern California, southern Arizona, southern Nevada, southern New Mexico and west Texas.
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 of northern California, Nevada, northern Arizona, and northern New Mexico.

Table 7. 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
						WINTER DORMANT							
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
AS-63	--	--	--	S	--	--	R	--	S	T	T	--	
AS-67	MR	--	--	T	--	--	R	--	--	R	--	--	
AS-60F	MR	--	--	MR	--	--	MR	--	--	R	--	MR	
Atra 55	S	S	S	S	S	S	R	--	S	R	T	S	--
DeKalb Brand 120	S	HR	--	R	--	--	T	T	T	--	--	--	--
DeKalb Brand 130	R	R	MT	T	--	T	R	MR	MR	HT	--	MR	--
DeKalb Brand 131	R	S	S	S	--	--	MR	--	S	T	R	S	--
Gladiator	S	T	S	S	--	--	R	T	T	--	R	MR	--
Pacer	S	R	S	T	S	S	R	--	T	T	--	--	--
Pioneer Brand 545	R	S	S	R	S	S	R	--	S	R	R	S	
Ranger	S	S	S	S	--	--	T	--	S	MT	HT	S	
Summit	R	R	MT	MR	--	MT	R	MR	T	T	T	R	
Sunrise	R	ST	S	ST	--	--	R	MR	T	T	MR	T	
Thor	S	S	S	S	--	--	HR	--	S	R	R	S	
WL 215	T	T	S	S	--	--	R	MR	MR	MR	T	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 221	R	R	--	S	--	--	R	MR	MR	HT	--	T	
Valor	S	R	S	S	S	S	R	--	MT	MT	--	--	--
Vernal	S	S	S	S	--	--	R	--	S	T	HT	S	HT
						SEMI WINTER DORMANT							
Alpha I	R	HR	MT	R	--	T	R	MR	R	T	MR	MR	
AS-49	T	S	--	R	T	--	R	--	S	T	T	R	
AS-49R	T	--	--	R	T	--	R	--	--	T	T	R	
Cimarron	MR	R	S	MR	--	--	R	R	R	MR	T	--	--
Condura 74 Brand	R	R	MT	R	--	T	R	MR	R	T	MR	MR	--
DeKalb Brand 167	R	T	S	MR	--	--	T	--	S	T	T	T	--
Lahontan	T	S	S	MR	S	S	R	S	S	S	S	R	S
NC+ 5500 Brand	R	R	S	R	--	--	R	--	S	T	T	T	--
Resistador II	R	T	S	T	--	--	MR	--	S	R	R	--	--
SD 76 Brand	R	R	MT	MR	--	T	R	MR	MR	T	T	HT	
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 313	MR	HR	T	T	--	--	HR	HR	MR	HT	--	T	
WL 314	R	R	T	T	--	--	R	R	MR	HT	--	R	
WL 315	MR	R	T	MR	--	--	HR	HR	MR	HT	--	T	
WL 318	R	HR	MT	R	--	T	R	MR	R	T	MR	MR	
1019 Brand	MR	T	--	R	--	--	MR	--	--	R	R	R	--
Vangard	T	S	S	S	S	S	R	T	R	T	T	S	S
Washoe	R	MR	S	R	--	--	R	S	S	S	S	R	S
						INTERMEDIATE WINTER DORMANT TO MODERATELY NON WINTER DORMANT							
Amador	T	S	S	R	--	--	--	R	--	MR	MR	MR	
Caliverde 65	HR	S	S	MT	--	--	R	--	S	MT	MT	MT	--
Condura 73 Brand	R	T	S	R	S	S	R	--	S	T	T	R	--
DeKalb Brand 185	R	T	S	T	--	--	S	--	S	T	T	S	--
Joaquin 11	R	S	S	T	--	--	T	--	S	S	S	T	T
Mesilla	R	R	S	T	--	--	--	R	--	--	--	T	--
NC+ 6600 Brand	MR	T	S	MR	--	--	T	T	S	T	T	T	--
NC+ 8000 Brand	R	MR	T	T	--	--	S	MR	S	S	T	S	--

*Information supplied by companies or individuals indicated in Table 6. The author assumes no responsibility for accuracy of the data supplied by the different contributors.

Variety or brand	SAA	PA	BAA	PRR	Sc	Rz	BW	FW	S An	CLS	DM	SN	RKN
NC+ 8800 Brand	R	MR	S	R	--	--	S	--	S	T	T	S	--
Pioneer Brand 581	R	T	T	R	T	S	R	--	S	T	R	R	--
WL 450	R	MR	S	T	S	S	MT	MR	T	T	R	R	T
919 Brand	MR	T	--	R	--	--	MR	--	--	MR	MR	MR	--
NON WINTER DORMANT													
Ardiente	T	T	--	MR	T	--	T	--	--	T	T	R	T
AS-13R	T	--	T	R	R	--	T	--	--	T	T	R	MR
Galaxy	MR	R	MT	HT	--	--	MR	MR	T	--	MR	T	--
Matador	R	--	S	T	--	--	MR	R	--	--	T	--	--
Moapa 69	T	S	S	S	S	S	S	MR	S	S	S	S	T
ND 80 Brand	HR	MR	MR	--	--	MR	HR	S	--	--	--	--	--
WL 508	HR	R	S	T	S	T	S	MR	MR	T	R	S	HR
WL 512	HR	R	MT	MR	MT	T	MR	R	--	T	MR	R	T
WL 514	R	R	R	T	--	--	MR	MR	--	--	T	T	--
WL 515	R	R	T	R	--	--	T	R	S	T	--	MR	T
819 Brand	R	MR	T	MR	T	--	--	R	T	--	--	--	T
Valador	R	T	S	R	T	--	--	R	MR	T	T	--	T
VERY NON WINTER DORMANT													
Abunde Verde Brand	R	R	MR	T	T	--	--	R	--	--	--	MR	T
Converde 95 Brand	R	R	S	S	S	S	S	--	S	S	R	S	T
CUF 101	HR	HR	R	MR	T	--	S	HR	S	S	MT	S	ST
El Unico	R	S	S	S	S	S	--	--	--	S	T	S	T
Granada	R	R	R	HR	--	--	--	MR	--	--	--	--	--
Hayden	R	S	S	S	S	S	--	--	--	S	T	S	T
Lew	R	S	S	S	S	S	--	--	--	S	T	R	S
Maxidor	HR	HR	R	MR	T	--	--	R	--	--	--	R	T
Mesa Sirsa	R	S	S	S	S	S	--	--	--	S	T	T	MT
Pioneer Brand 572	R	R	T	T	T	S	S	--	S	S	HR	S	T
Rincon	R	R	S	S	S	--	T	T	--	--	T	--	--
Sonora 70	T	S	S	S	S	S	S	--	--	S	S	S	MT
UC Cargo	R	T	S	T	T	S	S	HR	S	S	ST	S	T
UC Salton	R	T	S	T	T	S	S	HR	S	S	ST	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, and seldom occurs in alfalfa.
R = Resistant. Ability of plants to restrict 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.

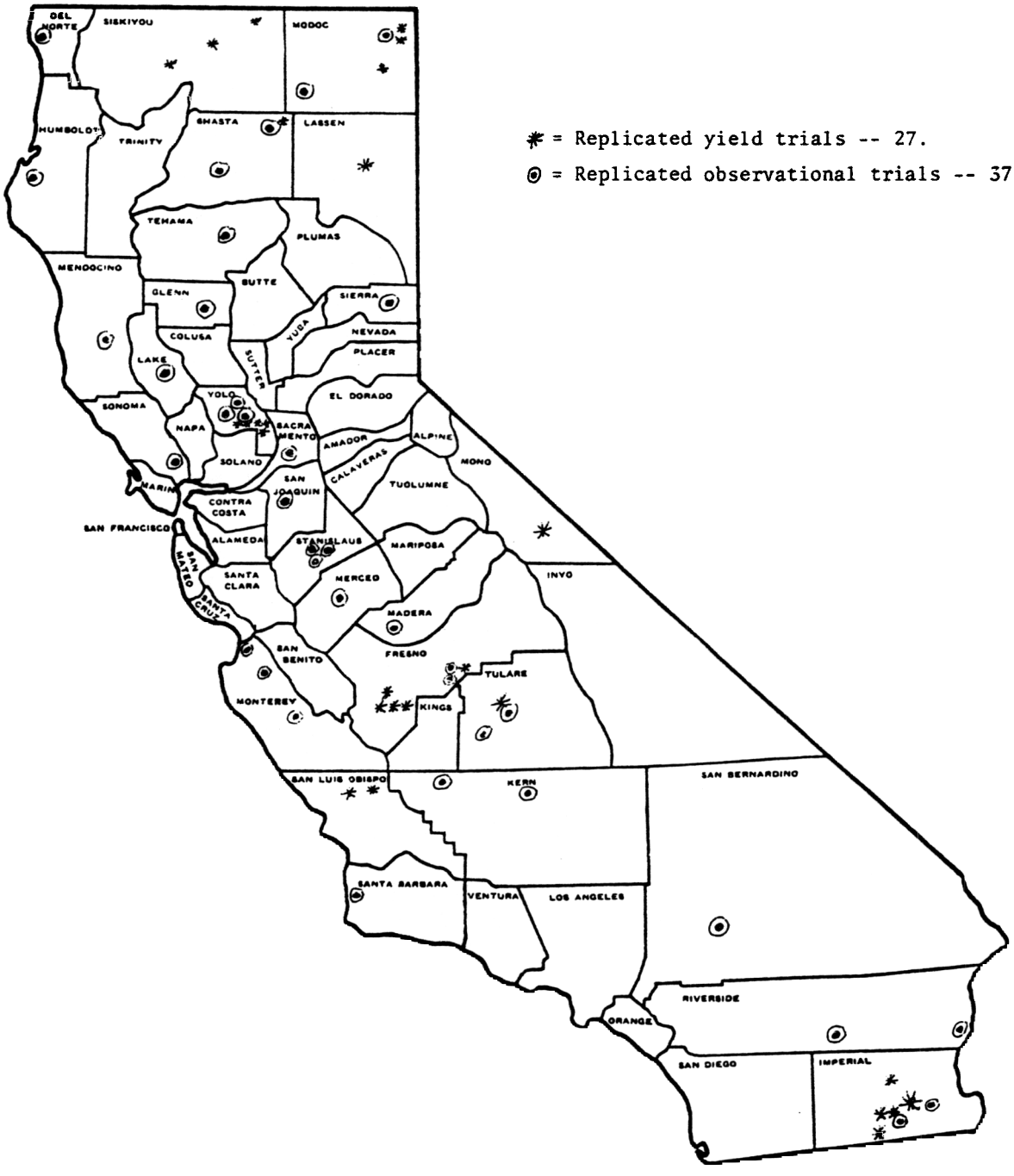

Figure 1. Locations of University of California alfalfa variety and brand trials; November 1980.