

## RESISTANCE OF ALFALFA VARIETIES AND BRANDS, MARKETED IN CALIFORNIA, TO INSECTS, DISEASES AND NEMATODES

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This paper represents the seventh compilation I have made of resistance characteristics to major pest problems in California of alfalfa varieties and brands marketed in the state. The first was at the Seventh California Alfalfa Symposium in 1977, when 72 varieties and brands were characterized. I believe that was the first attempt to classify and characterize the pest resistance levels of alfalfa varieties in a single resource document. Many of those varieties used in 1977 are no longer part of our varietal complex -- in fact 32 of them are no longer marketed. Yet today there are even more available -- some 116! Most, 45, are dormant (D) and are mostly sold in northern California. There are also 24 semidormant (SD), 17 intermediate (ID) and moderately nondormant (MND), 18 nondormant (ND), and 12 very nondormant (VND) varieties and brands.

The last characterization done in California was in the 1983 proceedings, having skipped this topic last year. Some 23 new varieties and brands are characterized in this new compilation, compared to the compiled in 1983 (Alfalfa Variety and Brand Characteristics for California. V. L. Marble and G. Peterson. In: Proceedings, 13th California Alfalfa Symposium, pages 16-31. December 7-8, 1983. El Centro/Holtville, California. University of California Cooperative Extension).

### New Problems Require New Varieties

In 1958 when I began this job our varietal choices were simple -- only six were available: African (a very nondormant progenitor to Moapa), Caliverde, Cal Common 49, Lahontan, Moapa, and Buffalo. There were also the two similar ecotypes, Cal Common and Hilmar Longlife. Choices were easy, but problems weren't answered by the existing varieties. Those not resistant to the spotted alfalfa aphid (SAA) became obsolete overnight, leaving only Lahontan, Moapa and some African planted in the state. Phytophthora root rot (PRR) became more serious as farming intensified. Stagonospora root rot was found to be a slow killer and present in almost every mature field of alfalfa in the state. Blue alfalfa aphid (BAA) appeared in 1975 and devastated our fields for several years until resistance was developed. Now, nearly every variety released has a good level of resistance to SAA, BAA and PRR.

Earlier, bacterial wilt was a severe problem and led to the development of Caliverde from California Common, but now seems to have tapered off due to our shorter rotations, and resistance in most new varieties released sufficient to resolve the problem. Stem nematode likewise has succumbed to resistant varieties and doesn't pose a major problem due to the large number of varieties that have different types of dormancy characteristics that have resistance. Recently, we have identified root nematodes, particularly the root-knot nematode, frequently coupled with the stubby root nematode, as causing severe stand loss on some sandy soils. Verticillium wilt, found in the mid 1970's in the Pacific northwest, has been the focus of many breeding programs that have developed dormant and semidormant varieties with a good level of resistance to this devastating disease from Europe. No nondormant varieties are available with resistance.

Still, most problems I encounter that involve serious stand losses or perplexing alfalfa problems, occur because the individual who made the varietal recommendation did not completely understand the problems involved in that particular location. The most graphic illustrations involve new varieties that are "tried out" by the producer when all of the problem factors are not known in a particular field, or from recommendations of "why don't you try this out" that fail for the same reason. Careful study of varietal characteristics must be combined with a careful analysis of the potential problems before the final varietal selection can be made. So producers and fieldmen alike could have the most complete information available on characteristics of varieties and brands, Tables 1 and 2 were compiled from the best sources available.

### Three Essential Criteria

All of these problem areas affect three factors, which I have frequently spoken to you about before: (1) yield; (2) stand persistence and a variety's ability to produce at a high level for four to five years; (3) production for four to five years of a high quality forage, free from weeds.

Today I am not going to speak much about yield. We all recognize that this is the most essential part. Suffice it to say that the state average yield per acre since 1958 has increased from 4.8 tons to 6.5 tons per acre in 1984, an increase of nearly 40%. Some of the old timers in the audience may remember that I coined a phrase in 1971 at the first alfalfa symposium, "7.7 by '77". We didn't achieve that -- it was probably too ambitious, but I believe we have made great strides in productivity through attention to the entire sequence of activities that goes into the production of alfalfa, first discussed as a complete unit in 1972 (Optimizing Alfalfa Production in California. V. L. Marble. In: Proceedings, 1972 California Alfalfa Symposium, pages 41-55. December 5-6, 1972. Fresno, California. University of California Cooperative Extension). These include:

1. Selection of an adequate alfalfa soil.
2. Develop an adequate irrigation system.
3. Provide enough water -- not too much.
4. Select the right variety for your particular conditions.
5. Don't short cut establishment.
6. Determine the correct fertilizer needs.
7. Use the correct harvest schedule for quality and quantity desired.
8. Control diseases by varietal selection and good management practices
9. Develop an integrated insect control program.
10. Control weeds through management and chemicals.
11. Control vertebrate pests (gophers, meadow mice, squirrels, rabbits).

It is only when all of the factors of production are adequately accounted for and controlled, that a variety can truly express itself in increased productivity, for four to five years, of high quality alfalfa hay that can be sold for the top price.

I will not speak on quality, except something about weed control and the ability of certain varieties to have some influence on the development of weeds in alfalfa fields, particularly green foxtail (Tables 6 and 7). Weed competition is intimately tied with stand persistence. I for one believe that weeds follow a reduction in vigor and/or the death of alfalfa plants. Weeds, and the subsequent reduction in quality that they bring, in my experience, are a result of inadequate management practices, either deliberate or unintentional.

Persistence, while maintaining or increasing yields, is the factor we can do most about with new alfalfa varieties and brands.

### The Private-Public Partnership

Until the early 1960's, nearly all the varieties released were from public breeding programs, either university or the USDA. Today, nearly all the new releases are from private sources, with most of the energies of universities and the USDA going into germplasm development that are made available freely to the private alfalfa breeding industry. I believe this is a healthy situation, with each group committed to doing those things they do best. The degree of cooperation between public and private industry in the area of alfalfa varietal improvement is indeed remarkable, and has resulted in a great choice of materials available to California alfalfa producers. Almost without exception the new varieties released that are nondormant or very nondormant, have a great deal of public variety and/or germ plasm in their background. This will become even more evident as university and USDA researchers focus on more important and more difficult problems to resolve such as germ plasm with resistance to leaf diseases, Stagonospora root rot, etc.

## Stand Persistence Problems

### Root Nematodes

Since 1969, Cooperative Extension has had a number of observation and yield trials scattered throughout the eastern San Joaquin Valley, and both the high and low desert areas of southern California where root nematodes are a severe problem in stand decline. Over the years, I have observed a severe stand loss, complex and undoubtedly not entirely due to nematodes, but which have made it very difficult for me to believe that nematodes do not cause stand loss in and of themselves. Table 3 is an illustration. This trial was planted in a known root-knot nematode infested area by Marsha Feyler, our Farm Advisor in Stanislaus County. Seventeen months after the date of planting, the farmer was so disappointed with his alfalfa that he plowed up the entire field. Very high populations of root-knot nematodes and other root nematodes were found. Can anyone doubt that this well-drained, sandy soil site lost plants, many of them due to nematode infestation? By the time the sixth and seventh cuttings were taken in August and September, yield was down to about one-half ton per acre, and most of that weeds, for all but a very few entries. Marsha and I attempted to categorize the stand loss by making stand ratings on October 15, a week or so after the grower had disced out his entire field except for our plot area. As you can see, there are several entries that had better stands than others, but most were practically nonexistent! Public and private breeders were invited to the site to make selections and view the decimation. Only one or two varieties were anything but a patch of bermudagrass and a few alfalfa plants during the summer of 1985, and virtually nothing escaped the invasion of prickly pigweed in the late summer. This experience closely parallels a similar experience with other species of root-knot nematode in the Blythe area of Palo Verde Valley, which was reported several years ago when most varieties in a trial disappeared in a 10-month period after planting. **Greater resistance to root nematodes is needed!** UC Cibola, developed for the Blythe area, and which persists quite well under that environment, wasn't outstanding in this trial but was obviously better than quite a lot of other entries. Unfortunately, the best looking entry in the trial, NK 80343, is still an experimental selection and I understand not scheduled for release. WL Southern Special was quite obviously superior to all others except NK 80343, and this is available, but isn't the final answer either.

Table 4 summarizes some stand ratings taken on sandy soil infested with root nematodes in Imperial Valley, some four years after planting. UC Cibola is superior yielding and persisting to many other entries, notably the main variety grown in the Imperial Valley, CUF 101. Other experimental varieties show some small promise, but all are still deficient in terms of stand persistence. **We need more attention to breeding for nematode resistance!** It is interesting to note that in Imperial Valley, only on sandy soils does UC Cibola out-perform CUF 101, which is about the best variety identified on heavier soils in Imperial Valley.

Table 5 summarizes a reading taken October 3, 1985, on a trial planted two miles south of Kerman in Fresno County by Bob Sheesley, again where nematodes had been identified, but not a heavy population. Over the two and one-half years since planting, NK 80343 again, as in Stanislaus County, has emerged as the most persistent.

In all three instances, root-knot nematodes and stubby root nematode species were identified.

### Phytophthora Root Rot and Others

On clay loam, clay and compacted sandy clay loam soils, Phytophthora root rot is a serious stand decline problem. As you can see from the large number of entries documented in Table 2, many varieties are now resistant or highly resistant to Phytophthora root rot. This kind of resistance classification is really important for the dormant, semidormant, intermediate, and moderately nondormant varieties. However, for reasons not clearly understood, the same level of resistance classified in a seedling or young first-year alfalfa test, in the nondormant and very nondormant class, does not always impart the same level of resistance expressed as stand life under Phytophthora conditions in planted fields. This is why first Lahontan, and later varieties similar to Lahontan have persisted and continued to be grown on very heavy soils of the central and western part of the San Joaquin Valley -- so-called adobe clay soils. Look at the data in Table 6, where a five-year stand at the West Side Field Station in Fresno County was read for persistence

on September 24, 1985. CUF 101 has a level of resistance to Phytophthora root rot between 20 and 30%, but it doesn't persist at this latitude and soil nearly as well as more dormant varieties with equal resistance. Progress is slow, but it is evident that new selections for more root rot resistance in Imperial Valley and by private breeders do show more persistence. The most outstanding entries for persistence are among the private varieties and experimental selections, which have been subjected to much more intense Phytophthora root rot selection programs.

Note also the loss of stand and increase in weeds, both significant, from one late fall-early winter cutting (CUF 101A) compared with CUF 101 not cut for four years after the last cutting in October. Does grazing damage stands?

Table 7 illustrates the lack of persistence for some very nondormant entries, with a fourth year stand persistence rating taken in October 1984, four years after establishment in a Stockton adobe clay soil near Stockton by Mick Canevari, Farm Advisor from San Joaquin County. Note the direct correlation between stand loss and higher weed infestations. The weed in this instance was green foxtail, which virtually covered the 10 feet X 20 feet individual plots of CUF 101, Granada, Maxidor, and Rere, the latter an introduction with CUF 101 breeding from New Zealand. The contamination was startling and delineated at the border of every plot. No yields were taken in this trial, but observations were taken periodically. There is a direct relationship at this northern San Joaquin Valley location, between increased persistence and increased winter dormancy. There are a number of exceptions among the nondormant varieties including AS-13R, WL 515, and the moderately nondormant WL Southern Special and DeKalb Brand 185, but in general the relationship holds.

#### **Winter Kill and Anthracnose?**

In the winter of 1984-85, in the high elevation mountain valleys of northern California, many stands were severely damaged. This was first noted by Harry Carlson, Farm Advisor at the Tulelake Field Station, who has been conducting a trial for the past five years containing 46 entries of varying degrees of winter dormancy from very dormant to semidormant. Many growers experienced severe stand loss noted when spring regrowth began in April of 1985. Plants were collected and sent to our plant pathologist for diagnosis. To our surprise, every plant submitted had severe infestation with anthracnose. As you can see from Table 8, there was about one ton yield reduction in each of the last two years, even in 1984 when four cuttings were taken. Much colder temperatures and earlier fall rains must have contributed to the sizeable stand loss during the winter of 1984-85, indicated in Table 9. With so many entries, this problem is harder to take apart, but it is quite obvious that the more winter hardy varieties were the ones that yielded highest in 1985. Even the very dormant and low-yielding UC experimental, Strain 201, jumped from 46th to 35th! Some of the varieties that have more fall growth have declined in their ranking over the years. Vernal came from 43rd place in 1984 to 11th place in 1985, and several other examples could also be shown, such as Oneida and Iroquois and several private varieties. We haven't been able to get good classifications for winter hardiness and anthracnose that could be quantified numerically so we could run correlations. We hope that will soon be rectified. It is evident that the most nondormant entries (for example 167, FSRC IH-129 and others) were the lowest yielding and suffered the most severely from winter kill/anthracnose problems. Careful examination of Table 9 will illustrate that point. It is interesting to note, however, that when plants were killed and stands thinned, the plants that survived were able to make a great recovery in this cool, slow-growing environment, and yield didn't suffer as drastically as one would expect from the severe stand loss documented in the early spring.

#### **Variety Evaluation Program**

The University of California variety evaluation program, designed to provide information of adaptation characteristics and yield in all the seven major alfalfa growing regions of California, has about 55 trials throughout the state. About half of these are observation trials that are not harvested for yield, but are in farmers' fields and subjected to his conditions. The others are yield trials, most of which are located at experiment stations and field stations, but with a number in growers' fields. Yield data and observations collected throughout the state are summarized in four regional Agronomy Progress Reports. These have been published annually since 1982. The 1984 data was

summarized in four regional publications summarizing trials from northern high elevation mountain counties, the Sacramento Valley/north coast region, the San Joaquin/central coast/high desert valleys of southern California region, and the low elevation valleys of southern California. Approximately 200 varieties, brand and experimental selections, both public and private, are under evaluation throughout the state.

Foreign varieties that may have some interest to our breeders or to the seed industry as potential varieties for marketing, are also evaluated. Entries from Australia, New Zealand, Argentina, Chile, Canada, England, France, Germany, South Africa, Oman, Saudi Arabia, the Democratic People's Republic of Yemen (South Yemen) and the Sudan are currently being evaluated.

Of interest are some of the selections from the Near East, particularly Saudi Arabia, Sudan, Oman and South Yemen. Some of the Near Eastern selections, which I term "ecotypes" because there is no formal multiplication or identification program which would maintain varietal purity, have some extremely interesting characteristics. In a planting made at the West Side Field Station near Five Points in Fresno County, on October 31, 1984, some of these lines showed such exceptional vigor and rapid recovery, that some measurements were taken during the year to try and identify their characteristics more precisely. Some of these measurements are presented in Tables 10, 11, and 12.

The ecotype identified as NE NAF-3, from South Yemen, was nearly twice as tall as CUF 101 eight days after harvest (Table 10). By 16 days, Wadi Quriyat, which I first collected in Oman in 1976, was significantly taller than all other entries, including the South Yemen ecotype. By the 24th day the South Yemen ecotype was falling badly behind, and just before cutting, 29 days after harvest, both CUF 101 and Pioneer Brand 5929 (a new cultivar with much background from selections in CUF 101) were significantly taller to all entries except Wadi Quriyat. NE NAF-3 was in flower about 20 days after cutting, and needs to be evaluated under much shorter harvest schedules. It is cut 17 times per year in South Yemen!!

Three entries from Saudi Arabia, one variety an improved Hasawi, were compared. Two sources of the ecotypes listed as NE NAF-4 and NE NAF-1, were obviously different populations (Tables 10 and 11). NE NAF-1, the Hasawi ecotype obtained from the Saudi government joint program with the USDA, is significantly inferior in nearly every characteristic except pubescence to NE NAF-4, which I obtained from the Al Hasa Oasis, where it was being grown and multiplied at the Saudi Arabian Ministry of Agriculture Hofuf Experiment Station. Not only is NE NAF-1 inferior in its recovery characteristics, but it was much more variable, having many plants that were not as pubescent and which had much slower recovery than either the improved Hasawi I variety or NE NAF-4 from the Hofuf Experiment Station. Its lack of uniformity was apparent when standard deviations were calculated on 12 height measurements made per plot, which were about twice the value for NE NAF-4 and Hasawi I.

The reaction to three aphids for many of these entries were also obtained through the cooperation of Dr. Edgar Sorenson, USDA alfalfa breeder and his entomology collaborators at Kansas State University in Manhattan, Kansas. In Table 12 the percent resistant plants for blue alfalfa aphid, pea aphid, and spotted alfalfa aphid readings are given for most of the entries discussed previously, plus others that were obtained in 1984 in Morocco. The entry from South Yemen showed an exceptionally high resistance to the spotted alfalfa aphid, and a fairly good level of resistance to the pea aphid, but no resistance to the blue alfalfa aphid. This entry was collected in an isolated wadi in the northeast part of South Yemen, where apparently it had developed resistance over centuries to these pests. Suspicions that UC Salton or other American varieties had somehow penetrated such an isolated region don't hold up when you view the degree of pubescence present on all plants of this particular entry, a characteristic not shared by our varieties. Interestingly, the Sudanese ecotype, obtained from northern Sudan near the Egyptian border, has many similarities to African, which was the progenitor for Moapa and subsequently Moapa 69. African was brought to this country from Egypt in the late 1920's and was the predominant variety grown in Imperial Valley up until the time of the spotted alfalfa aphid in 1954-58, when it was replaced by Moapa.

None of these ecotypes or foreign entries have shown much yield adaptation. To the contrary, they have a number of deficiencies that make them unadapted to our growing conditions. However, their unique characteristics include, hairiness (which may be useful in insect resistance), rapid recovery, non winter dormancy, broad crowns with nearly all

regrowth confined to crown rather than stem buds (perhaps helpful in increasing persistence), and in the high number of root branches and the size of those root branches in the upper six inches of the taproot.

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Table 1 Alfalfa variety and brand growth characteristics, principal areas of use, and distributor/owner/originator. December 1985.

Variety or brand	Winter <sup>1</sup> dormancy	Fall <sup>2</sup> growth	Principal <sup>3</sup> areas of use	Distributor or owner or originator	Information supplied by:
WINTER DORMANT					
Action	D	4	8	Land O'Lakes	R. R. Kalton
Apollo	D	3	6,8	Nickerson American Plant Breeders	Jim Moutray
Apollo II	D	3	6,7,8	" "	" "
Armor	D	2	6,7,8	" "	" "
AS-67	D	2	8	Ferry-Morse	Phil Robnett/Tony Wilson
Atra 55	D	2	8	Arnold-Thomas Seed Service	Jack McGillis
Blazer	D	2	8	Union Seed Co.	Jess Bice/Don Brown
DeKalb Brand 120	D	2	8	Ramsey Seed/ DeKalb-Pfizer Genetics	J. Andrews
DeKalb Brand 130	D	3	2,8	" "	" "
DeKalb Brand 131	D	3	8	" "	" "
Drummor	D	3	6,7,8	Northrup King	Bill Knipe
Edge	D	4	8	Land O'Lakes	R. R. Kalton
Elevation	D	3	8	" "	" "
Epic	D	2	8	Union Seed Co.	" " "
Gladiator	D	2	8	Northrup King	Bill Knipe
GT-58	D	3	6,8	Ferry-Morse	Phil Robnett/Tony Wilson
Husky	D	2	6,7,8	Lovelock Seed	Lloyd Stockton
Iroquois	D	1	8	New York College of Ag., Cornell Univ.	R. P. Murphy/C. C. Lowe
Max 85 Brand	D	3	8	SeedTec	Craig Sharp
Milkmaker	D	3	6,7,8	Lovelock Seed	Lloyd Stockton
Oneida	D	1	8	New York College of Ag., Cornell Univ.	R. P. Murphy/C. C. Lowe
Pacer	D	2	8	Union Seed Co.	Jess Bice/Don Brown
Peak	D	2	8	Union Seed Co.	R. R. Kalton
Phytor	D	2	8	Northrup King	Bill Knipe
Pioneer Brand 524	D	2	8	Pioneer Hi-Bred International Inc.	Boyd Hartman
Pioneer Brand 526	D	2	8	" "	" "
Pioneer Brand 532	D	3	7,8	" "	" "
Pioneer Brand 545	D	2	8	" "	" "
Pro 96 Brand	D	3	2,6,8	Garner Seed	Bob Garner
Raidor	D	3	8	Northrup King	Bill Knipe
Ranger	D	1	8	USDA/Univ. of Nebraska	Vern Marble
RS 209	D	3	6,8	Ramsey Seed/ DeKalb-Pfizer Genetics	J. Andrews
Sparta	D	3	8	Land O'Lakes	R. R. Kalton
Spredor 2	VD	1	8	Northrup King	Bill Knipe
Summit	D	3	6,8	NC+ Calif. Seed	Jim Loe
Sunrise	D	1	6,8	" "	" "
Thor	D	2	8	Northrup King	Bill Knipe
Trumpetor	D	2	8	" "	" "
WL 220	D	2	8	Germain's/W-L Research	Larry Satterlee
WL 221	D	2	8	" "	" "
Valor	D	1	8	Union Seed Co.	Jess Bice/Don Brown
Vancor	D	2	8	Northrup King	Bill Knipe
Vernal	D		8	University of Wisconsin	Vern Marble

Table 1. (Continued)

Variety or brand	Winter <sup>1</sup> dormancy	Fall <sup>2</sup> growth	Principal <sup>3</sup> areas of use	Distributor or owner or originator	Information supplied by:
Vernema	D	2	8	USDA/Washington State University	R. Peaden
Wrangler	D	3	6,8	USDA/University of Nevada	Bill Kehr
SEMI WINTER DORMANT					
Alpha I	SD	4	2,3,5,6,8	NC+ Calif. Seed	Jim Loe
AS-49R	SD	4	2,3,5,6	Ferry-Morse	Phil Robnett/Tony Wilson
Brute Brand	SD	4	2,3,5,6	SeedTec	Craig Sharp
Cimarron	SD	4	2,5,6,8	Great Plains Research Co., Inc.	Thad Busbice
DeKalb Brand 167	SD	4	2,3,5,6	Ramsey Seed/ DeKalb-Pfizer Genetics	J. Andrews
Eagle	SD	3	2,6,7,8	O's Gold	Jerrold Ocheltree
GT-55	SD	3	2,3,5,6,8	Ferry-Morse	Phil Robnett/Tony Wilson
Hawk Brand	SD	3	2,8	Green Thumb, Inc.	Jim Froman
Lahontan	SD	3	2,3,5,6	USDA/Univ. of Nevada	Boyd Hartman
L-720 Brand	SD	4	2,4,5,6,8	Lovelock Seed	Lloyd Stockton
NC+ 5500 Brand	SD	4	2,3,5,6	NC+ Calif. Seed	Jim Loe
Pike	SD	4	2,3,4,5, 6,7	Northrup King	Bill Knipe
Pioneer Brand 555	SD	4	6,8	Pioneer Hi-Bred International, Inc.	Boyd Hartman
Preferred 101 Brand	SD	4	2,5,6	Kellogg's Seed Service	Bill Kellogg
Pro 86 Brand	SD	4	2,5,6	Garner Seed	Bob Garner
SD 76 Brand	SD	4	2,5,6,8	Tri-Cal Dist.	Bob Shotwell
Seagull Brand	SD	3	2,8	Green Thumb, Inc.	Jim Froman
WL 312	SD	3	2,6,7,8	Germain's/W-L Research	Doug Elkins/Frank Bedard
WL 314	SD	3	2,6,7,8	" "	" "
WL 316	SD	4	2,6,7,8	" "	" "
WL 318	SD	4	2,5,6,8	" "	" "
WL 320	SD	4	2,5,6,8	" "	" "
1019 Brand	SD	4	2,3,4,5,6, 7,8	Northrup King	Bill Knipe
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
Baron	ID	4	2,3,4,5,6	Nickerson American Plant Breeders	Jim Moutray
Caliverde 65	ID	4	2,3,5,6	Univ. of Calif.	Vern Marble
Condura 73 Brand	ID	4	2,3,5,6	Continental Grain	Eldon Hoffman
DeKalb Brand 185	MND	5	4,5,6	Ramsey Seed/ DeKalb-Pfizer Genetics	J. Andrews
Diamond	ID	5	2,3,4,5,6	Nickerson American Plant Breeders	Jim Moutray
Joaquin 1	MND	5	2,3,4,5,6	Security Ag Research	Steve Rusconi
L-1920	ID	4	2,3,4,5, 6,8	Lovelock Seed	Lloyd Stockton

Table 1. (Continued)

Variety or brand	Winter <sup>1</sup> dormancy	Fall <sup>2</sup> growth	Principal <sup>3</sup> areas of use	Distributor or owner or originator	Information supplied by:
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	Boyd Hartman
WL 450	MND	5	3,5,6	Germain's/W-L Research	Doug Elkins/Frank Bedard
WL Southern Special	MND	5	2,3,5,6	" "	" "
919 Brand	ID	5	3,4,5,6	Northrup King	Bill Knipe
Yolo	MND	5	2,3,5,6	Plant Genetics	Ike Kawaguchi
NON WINTER DORMANT					
Ardiente	ND	6	1,3,4,5	Ferry-Morse	Phil Robnett/Tony Wilson
Armona	ND	6	3,4,5,6	Plant Genetics	Ike Kawaguchi
Galaxy	ND	6	1,3,4,5,6	NC+ Calif. Seed	Jim Loe
GT-13R Plus	ND	6	3,4,5,6	Ferry-Morse	Phil Robnett/Tony Wilson
Madera	ND	6	3,4,5,6	Plant Genetics	Ike Kawaguchi
Maricopa	ND	6	3,4,5,6	" "	" "
Moapa 69	ND	6	1,3,4,5,6	USDA/Univ. of Nevada	Boyd Hartman
ND 80 Brand	ND	6	1,3,4,5,6	Tri-Cal Dist.	Bob Shotwell
Pierce	ND	7	1,4,5	Northrup King	Bill Knipe
Pioneer Brand 572	ND	7	1,3,4,5	Pioneer Hi-Bred International	Boyd Hartman
Rincon	ND	6	2	New Mexico State University	Bill Melton
Sapphire	ND	6	1,3,4,5,6	Nickerson American Plant Breeders	Jim Moutray
WL 512	ND	6	1,3,4,5,6	Germain's/W-L Research	Doug Elkins/Frank Bedard
WL 514	ND	6	1,3,4,5,6	" "	" "
WL 515	ND	6	1,2,3,4,5,6	" "	" "
WL 516	ND	6	1,3,4,5,6	" "	" "
819 Brand	ND	6	1,4,5	Northrup King	Bill Knipe
Valador	ND	6	1,4,5	" "	" "
VERY NON WINTER DORMANT					
Converde 95 Brand	VND	7	1,3,4,5	Continental Grain	Eldon Hoffman
CUF 101	VND	8	1,4,5	Univ. of Calif.	Bill Lehman
Hayden	VND	7	1,4	Univ. of Arizona	Mel Schonhorst
Lew	VND	7	1,3	" " "	" "
Maxidor	VND	8	1,4,5	Northrup King	Bill Knipe
Mecca	VND	8	1,4,5	Plant Genetics	Ike Kawaguchi
Mesa Sirsa	VND	7	1	Univ. of Arizona	Mel Schonhorst
Pioneer Brand 5929	VND	8	1,3,4,5	Pioneer Hi-Bred International	Boyd Hartman
Sonora 70	VND	7	1	Univ. of Arizona	Mel Schonhorst
UC Cibola	VND	7	1,4	Univ. of Calif.	Bill Lehman
UC Salton	VND	7	1,4	" " "	" "
WL 605	VND	8	1,4	Germain's/W-L Research	Doug Elkins/Frank Bedard

### 1 Winter Dormancy and Example Variety

VND = Very nonwinter dormant (CUF 101)  
ND = Nonwinter dormant (Moapa 69)  
MND = Moderately nonwinter dormant (Mesilla)  
ID = Intermediate winter dormant (Caliverde 65)  
SD = Semi winter dormant (Lahontan)  
D = Winter dormant (Vernal)  
VD = Very winter dormant (Norseman)

### 2 Fall Growth Similarities \*\*

1 = Vernal  
2 = Thor  
3 = Lahontan  
4 = Caliverde 65  
5 = DeKalb Brand 185  
6 = Moapa 69  
7 = UC Salton  
8 = CUF 101

### 3 Principal Areas of Use

1 = Low desert valleys of southern California, southern Arizona, and southern Nevada.  
2 = Intermediate and 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.

\*\* New proposed fall growth scores not in effect in 1985

Table 2. Alfalfa variety and brand ratings for pest resistance December 1985.

Variety or brand	SAA	PA	BAA	PRR	Sc	Rz	BW	FW	S An	CLS	DM	SN	RKN	VW
WINTER DORMANT														
Action	R	R	--	R	--	--	R	--	R	--	--	--	--	MR
Apollo	MR	R	S	R	S	S	R	R	MR	LR	LR	MR	S	--
Apollo II	MR	MR	S	HR	--	--	R	HR	MR	--	--	MR	--	MR
Armor	S	MR	S	R	--	--	R	R	MR	--	--	--	--	--
AS-67	MR	MR	LR	LR	--	--	R	MR	MR	MR	MR	LR	MR	--
Atra 55	S	MR	S	MR	--	--	R	MR	S	HR	HR	--	--	--
Blazer	S	HR	S	MR	S	S	HR	R	LR	--	--	R	--	S
DeKalb Brand 120	S	R	--	R	--	--	HR	R	S	--	--	R	--	S
*DeKalb Brand 130	R	R	LR	LR	--	LR	R	MR	MR	MR	--	MR	--	--
*DeKalb Brand 131	R	S	S	S	--	--	MR	--	S	LR	R	S	--	--
Drumcor	R	--	--	R	--	--	R	--	MR	R	R	MR	--	--
Edge	MR	R	--	R	--	--	R	--	R	--	--	--	--	MR
Elevation	S	R	--	MR	--	--	R	R	S	--	--	HR	--	MR
Epic	S	HR	--	R	--	--	R	MR	S	MR	--	HR	--	S
Gladiator	S	R	S	S	--	--	R	MR	LR	MR	R	MR	--	--
GT-58	HR	R	LR	HR	--	LR	R	HR	MR	MR	MR	MR	MR	--
*Iroquois	S	S	S	S	S	S	R	--	S	LR	--	S	--	--
Max 85 Brand	LR	HR	S	R	S	S	HR	R	LR	MR	--	R	--	--
*Oneida	S	S	S	R	--	--	HR	--	S	R	MR	S	--	--
Pacer	S	R	S	LR	--	--	R	MR	S	--	--	LR	LR	S
Peak	S	HR	S	MR	S	S	HR	R	S	--	--	R	--	LR
Phytor	S	S	S	R	--	--	R	--	S	MR	MR	S	--	--
Pioneer Brand 524	R	LR	--	--	--	--	MR	R	--	--	MR	--	--	--
Pioneer Brand 526	R	MR	--	--	--	--	R	--	--	--	MR	--	--	--
Pioneer Brand 532	R	MR	--	MR	--	--	R	R	MR	--	--	--	LR	--
Pioneer Brand 545	R	LR	--	R	--	--	R	R	--	--	--	LR	--	--
Pro 96 Brand	MR	R	--	R	--	--	R	R	MR	--	--	R	--	R
Raidor	S	S	S	S	--	--	R	MR	R	R	R	MR	--	--
*Ranger	S	S	S	S	--	--	MR	--	S	MR	MR	S	--	--
*RS 209	R	LR	S	R	S	S	R	R	MR	LR	LR	S	S	--
Sparta	S	R	--	MR	--	--	R	MR	S	--	--	HR	--	R
Spredor 2	S	S	S	S	--	--	HR	--	S	R	R	--	--	--
*Summit	R	R	LR	MR	--	LR	R	MR	LR	LR	LR	R	--	--
*Sunrise	R	LR	S	LR	--	--	R	MR	LR	LR	MR	LR	--	--
Thor	S	S	S	S	--	--	HR	--	S	R	R	MR	--	--
Trumpetor	S	R	S	S	--	--	MR	R	R	R	R	MR	--	--
WL 220	MR	HR	MR	MR	--	--	R	MR	S	LR	LR	LR	S	--
WL 221	R	R	--	LR	--	--	R	MR	MR	LR	--	MR	--	--
Valor	S	R	S	S	S	S	R	MR	LR	MR	--	MR	LR	S
Vancor	S	R	S	R	--	--	R	MR	R	R	R	R	--	--
*Vernal	S	S	S	S	--	--	R	--	S	LR	MR	S	MR	--
Vernema	MR	--	S	LR	--	--	MR	--	LR	--	R	R	--	MR
Wrangler	R	R	--	R	--	--	R	R	R	--	R	--	--	--
SEMI WINTER DORMANT														
*Alpha I	R	HR	LR	R	--	LR	R	MR	R	LR	MR	MR	--	--
AS-49R	HR	MR	S	MR	--	--	MR	R	LR	MR	LR	R	LR	--
Brute Brand	HR	R	S	R	--	--	MR	R	MR	MR	MR	MR	S	S
*Cimarron	MR	R	S	MR	--	--	R	R	R	MR	LR	--	--	--
*Condura 74 Brand	R	R	LR	R	--	LR	R	MR	R	LR	MR	MR	--	--
*DeKalb Brand 167	R	LR	S	MR	--	--	LR	--	S	LR	LR	LR	--	--
Eagle	R	R	LR	R	--	--	R	R	R	--	--	R	--	--
GT-55	R	R	LR	HR	--	LR	MR	HR	MR	MR	MR	MR	MR	--
Hawk Brand	R	R	--	R	--	--	R	MR	MR	MR	LR	LR	S	--
Husky	S	R	--	MR	--	--	R	R	MR	--	--	MR	--	S
*Lahontan	R	S	S	R	S	S	R	S	S	S	S	R	S	--
L-720	R	R	--	MR	--	--	R	S	MR	--	--	--	--	S
LS-1920	MR	R	MR	MR	--	--	MR	LR	LR	--	--	LR	LR	--

Table 2. (Continued)

Variety or brand	SAA	PA	BAA	PRR	Sc	Rz	BW	FW	S An	CLS	DM	SN	RKN	VW
Milkmaker	S	R	--	MR	--	--	R	R	MR	--	--	--	--	S
*NC+ 5500 Brand	R	R	S	R	--	--	R	--	S	LR	LR	LR	--	--
Pike	MR	R	S	R	--	--	MR	MR	S	R	R	R	MR	--
Pioneer Brand 555	R	MR	--	LR	--	--	R	R	LR	--	--	--	LR	--
Preferred 101 Br.	R	MR	LR	MR	--	--	R	LR	MR	MR	MR	--	S	--
Pro 86 Brand	HR	R	S	R	--	--	LR	--	S	LR	LR	LR	--	S
*SD 76 Brand	R	R	LR	MR	--	LR	R	MR	MR	LR	LR	MR	--	--
Seagull Brand	R	R	--	R	--	--	R	MR	MR	MR	MR	MR	S	--
WL 312	R	R	LR	R	--	--	R	MR	LR	MR	LR	MR	--	--
WL 314	R	HR	LR	LR	--	--	R	R	LR	--	--	HR	--	--
WL 316	R	R	LR	MR	--	--	MR	R	R	--	--	MR	--	--
WL 318	R	HR	LR	MR	--	--	R	MR	MR	MR	MR	LR	S	--
WL 320	R	MR	MR	R	--	--	R	R	MR	--	--	MR	--	MR
1019 Brand	MR	LR	--	R	--	--	MR	--	--	R	R	R	--	--
*Washoe	R	MR	S	R	--	--	R	S	S	S	S	R	S	--

## INTERMEDIATE WINTER DORMANT TO MODERATELY NON WINTER DORMANT

Amador	MR	S	S	R	--	--	--	R	--	MR	MR	MR	S	--
Baron	HR	HR	HR	R	--	--	MR	R	MR	--	--	--	--	--
*Caliverde 65	HR	S	S	MR	--	--	R	--	S	LR	LR	MR	--	--
*Condura 73 Brand	R	LR	S	R	S	S	R	--	S	LR	LR	R	--	--
*DeKalb Brand 185	R	LR	S	LR	--	--	S	--	S	LR	LR	S	--	--
Diamond	R	R	R	R	--	--	LR	R	MR	--	--	--	--	--
*Joaquin 11	R	S	S	LR	--	--	--	--	S	S	S	LR	LR	--
*Mesilla	R	R	S	LR	--	--	--	R	--	--	--	LR	--	--
*NC+ 6600 Brand	MR	LR	S	MR	--	--	LR	LR	S	LR	LR	LR	--	--
*NC+ 8000 Brand	R	MR	LR	LR	--	--	S	MR	S	S	LR	S	--	--
*NC+ 8800 Brand	R	MR	S	R	--	--	S	--	S	LR	LR	S	--	--
Pioneer Brand 581	R	LR	S	MR	LR	S	R	--	S	LR	LR	R	S	--
WL 450	R	MR	MR	MR	--	--	MR	--	LR	LR	MR	R	LR	--
WL Southern Special	R	R	MR	MR	--	--	R	R	MR	--	--	MR	--	--
919 Brand	MR	LR	--	R	--	--	MR	--	--	MR	MR	MR	--	--
Yolo	HR	HR	R	MR	--	--	MR	HR	LR	--	--	MR	--	--

## NON WINTER DORMANT

Ardiente	R	LR	LR	MR	--	--	MR	R	LR	MR	MR	LR	LR	--
Armona	HR	HR	R	MR	--	--	MR	R	LR	--	--	R	--	--
*Galaxy	MR	R	LR	MR	--	--	MR	MR	LR	--	MR	LR	--	--
GT 13R Plus	R	LR	LR	HR	--	MR	R	HR	LR	MR	MR	R	MR	--
Madera	HR	HR	LR	MR	--	--	MR	R	LR	--	--	MR	--	--
Maricopa	HR	HR	MR	R	--	--	MR	R	LR	--	--	R	--	--
*Moapa 69	R	S	S	S	S	S	S	R	S	S	S	S	LR	--
*ND 80 Brand	HR	MR	MR	--	--	MR	HR	S	--	--	--	--	--	--
Pierce	HR	R	HR	R	--	--	LR	HR	S	MR	MR	R	--	--
Pioneer Brand 572	R	R	S	LR	LR	S	S	R	S	S	R	S	R	--
*Rincon	R	R	S	S	S	--	LR	LR	--	--	LR	--	--	--
Sapphire	R	R	R	R	--	--	LR	R	MR	--	--	--	--	--
WL 512	HR	R	LR	MR	LR	LR	MR	R	MR	LR	MR	LR	LR	--
WL 514	R	R	MR	LR	--	--	MR	MR	S	--	--	LR	--	--
WL 515	R	R	MR	R	--	--	LR	R	S	--	--	R	--	--
WL 516	HR	R	R	HR	--	T	MR	R	LR	T	--	MR	--	--
819 Brand	R	MR	LR	MR	LR	--	--	R	LR	--	--	--	LR	--
Valador	R	--	S	R	LR	--	--	R	MR	LR	LR	--	MR	--

## VERY NON WINTER DORMANT

*Converde 95 Brand	R	R	S	S	S	S	S	--	S	S	R	S	LR	
CUF 101	HR	HR	HR	MR	LR	--	S	HR	S	S	LR	--	MR	
Granada	HR	HR	HR	R	--	--	S	HR	S	--	MR	S	LR	

Table 2. (Continued)

Variety or brand	SAA	PA	BAA	PRR	Sc	Rz	BW	FW	S An	CLS	DM	SN	RKN	VW
*Hayden	HR	S	S	S	S	S	--	--	--	S	LR	S	LR	--
*Lew	HR	S	S	S	S	S	--	--	--	S	LR	R	S	--
Maxidor	HR	HR	R	MR	--	--	--	HR	--	--	--	R	LR	--
Mecca	HR	HR	MR	MR	--	--	--	LR	LR	--	--	MR	--	--
*Mesa Sirsa	HR	S	S	S	S	S	--	--	--	S	LR	LR	LR	--
Pioneer Brand 5929	R	MR	R	MR	--	--	S	R	S	--	--	--	R	--
*Sonora 70	MR	S	S	S	S	S	S	--	--	S	S	S	LR	--
UC Cibola	HR	R	LR	MR	LR	--	S	HR	--	--	LR	--	R	--
UC Salton	HR	LR	S	LR	LR	S	S	HR	S	S	LR	S	--	--
WL 605	HR	HR	HR	HR	--	T	LR	R	S	T	--	MR	--	--

<sup>1</sup>According to the system used by the National Certified Alfalfa Variety Review Board. Information supplied by companies or individuals indicated in Table 1. The author assumes no responsibility for accuracy of the data supplied by the different contributors. Those entries marked with an asterisk (\*) have had 1982 ratings which involved "Tolerance" changed to the new system by Vern Marble. This was done since no information on this change was received from the originator/owner/distributor as requested.

#### 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  
 VW = Verticillium wilt

#### Resistance Symbols<sup>1</sup>

HR = High resistance >51%  
 R = Resistance 31-50%  
 MR = Moderate resistance 15-30%  
 LR = Low resistance 6-14%  
 T = Tolerance (see definition below)  
 S = Susceptible <5%  
 -- = No data available

#### Definitions

I = Immune. Not subject to attack for a specified pest. Immunity is absolute, and seldom occurs in alfalfa.

R = Resistance. Ability of plants to restrict the activities of a specified pest.

T = Tolerance. Ability of plants to endure a specified pest or an adverse environmental condition, performing and producing in spite of the disorder. Not synonymous with low resistance. Used where the resistance mechanism is concerned with the plant's ability to repair, recover, or withstand infestation.

S = Susceptible. Inability of plants to restrict the activities of a specified pest, or to withstand an adverse environmental condition.

Table 3. 17-month stand persistence ratings for 1984 Stanislaus County 25 alfalfa variety, brand and experimental selection trial. Brouhard Ranch, Turlock, California. Planted May 19, 1984 at 25 lbs/acre with four replications on Hilmar sandy loam soil. 1985. (Feyler and Marble)

Entry	Percent stand remaining 10/15/85	Yield of 4 cuts
NK 80343	5.3	2.89
WL Southern Special	3.6	2.87
WL Ca 513-2	1.6	2.76
UC 288	2.1	2.72
Ca 508-2	1.7	2.72
Valador	1.7	2.62
UC 287	2.1	2.60
Pioneer Brand 5929	2.8	2.60
Sapphire (NAPB 29)	1.7	2.59
Pierce	1.6	2.55
GT 13R Plus	2.2	2.53
UC 290	1.7	2.51
UC 291	1.6	2.50
UC Cibola	2.1	2.49
WL 515	1.6	2.46
NC+ Galaxy	1.0	2.46
C/W 304	2.1	2.40
Baron	1.0	2.39
NAPB 28	1.2	2.35
Lahontan	1.2	2.35
LS C23	2.6	2.34
DK 187	1.7	2.34
Hilmar	1.5	2.30
Moapa 69	1.3	2.21
LS C14	0.7	1.95
LSD, 5%	1.1	0.38
CV %	39.30	10.84

Entries different than the LSD are significantly different from each other at odds of 19 to 1.

Only four harvests of the seven made by the grower are reported for April 3, May 30, June 26 and July 22. The September 24 harvest was highly contaminated with pigweed and not included. Bermudagrass heavily contaminated most plots with poor stands for the June cutting on.

Stand ratings: 0 = no stand remaining; 10 = 100% canopy cover when recovery was 6 to 14 inches tall.

Nematodes present for 250 ml of soil, sampled on September 13, 1985, included: 233 root-knot (*Meloidogyne* spp.); 89 stubby root (*Trichodorus* spp.); 2 root lesion (*Pratylenchus* spp.); and 8 stunt (*Tylenchus* spp.).

Table 4. Fourth year stand persistence ratings (percent ground cover) of Imperial County 11 alfalfa variety and experimental selection root nematode tolerance trial. Moore Ranch, Westmoreland, Imperial County. Planted October 5, 1981 at 36 lbs/acre with four replications on Meloland sandy loam soil. (Laemmlen and Radewald)

Entry	Percent ground covered 8/8/85		2-year average tons dry matter/acre 1983-84	
UC Cibola (127)	41.25	a	4.96	a
UC 193B	34.38	ab	4.28	bc
Ca 513-2	33.75	ab	4.37	bc
Moapa 69	33.13	b	4.41	bc
UC 227	32.88	b	4.60	b
Maxidor	30.63	b	4.31	bc
WL 514	30.25	b	4.34	bc
Ca 508-2	28.13	bc	4.15	cd
Granada	21.88	cd	4.28	bc
Mesa Sirsa	20.00	d	3.94	d
CUF 101	20.00	d	4.56	b
Mean	29.67		4.38	
LSD 5%	7.26		0.31	
1%	9.78		0.42	
% CV	16.96		6.90	

Average of two independent observations by W. F. Lehman and Larry Gibbs when plants were 6 to 10 inches tall.

Root nematodes present include: root-knot species, stubby root species, and others.

Entries followed by the same letter are not significantly different from each other at odds of 19 to 1 (5%).

Entries that differ by at least the least significant difference (LSD), are significantly (5%) or highly significantly (1%) different from each other.

Table 5. Third year stand persistence ratings for Fresno County observational 18 variety, germplasm, and experimental selection trial. Eugene Nord Ranches, Kerman, Fresno County. Planted April 11, 1983 at 46 lbs/acre with four replications on Hanford sandy loam soil. 1985. (Sheesley, Marble, McKenry).

Entry	Stand ratings 10/17/85	Duncan's Multiple Range Test (5%)
NK 80343	7.38	A
UC Cibola (127)	6.75	AB
UC PX-1971 (Isom PX)	6.75	AB
UC 247	6.50	ABC
Lahontan	6.38	ABCD
Pioneer Brand 572	6.25	BCD
Valador	6.25	BCD
Washoe	6.13	BCD
Moapa 69	6.00	BCDE
Hilmar	6.00	BCDE
Pierce (NK 79176)	6.00	BCDE
WL 515	5.50	CDEF
WL 514	5.25	DEF
AS-13R	5.00	EF
Nev. Syn XX	4.75	
CUF 101	4.63	F
WL 318	4.50	F
Nev. Syn YY Miz	3.50	G
Mean	5.75	
L.S.D. (5%)	0.97	
(1%)	1.29	
% C.V.	11.89	

Entries followed by the same letter are not significantly different from each other at odds of 19 to 1 (5%).

Entries that differ by at least the least significant difference (L.S.D.), are significantly (5%) or highly significantly (1%) different from each other.

Table 6. Fifth year stand persistence and weed ratings for 1980 U.C. Regional 36 Alfalfa Variety brand and experimental selection trial. West Side Field Station, Five Points, Fresno County, California. Planted November 18, 1980 with four replications at 38 lbs/acre on Panoche clay loam soil. 1985.

Entry	Percent stand remaining 9/24/85	Weed rating 9/24/85
Lahontan	63.75	1.25
AS-13R	61.25	0.75
NK C-80-628	55.00	1.25
NK C-80-631	55.00	0.50
UC 193	52.50	1.25
WL 515	52.50	1.25
Pioneer Brand SM	52.50	1.25
WL 75 Ca A-W	51.25	1.00
WL 514	50.00	1.25
C/W 8037	48.75	1.50
Moapa 69	48.75	0.75
UC 186	48.75	1.75
FSRC 80A6	48.75	1.25
WL 76 Ca K	46.25	1.50
NK 79176	46.25	1.00
Nova	46.25	5.50
Galaxy	46.25	3.00
UC 196	45.00	1.75
NC+ 6600 Brand	45.00	1.50
FSRC A-21R	42.50	2.25
Ardlente	42.50	2.00
Pioneer Brand 5929	42.50	2.50
CUF 101	40.00	2.50
NK C-79-616	40.00	2.75
NC+ 8000 Brand	40.00	1.75
UC 195	38.75	2.50
C/W 8035	37.50	2.25
Florida 77 (66a)	36.25	4.75
Pioneer Brand 572	33.75	2.50
MeA 00	32.50	3.75
Rere	31.25	5.75
Baron	30.00	4.25
CUF 101A	28.75	4.75
Silver	26.25	4.25
MeA MM	22.50	4.50
Granada	16.25	6.00
Mean	42.92	2.45
L.S.D. (5%)	7.61	1.56
(1%)	10.07	2.07
% C.V.	12.64	45.38

Ratings for weed contamination: 0 = no weeds; 10 = completely covered by weeds - alfalfa very difficult to identify. Dominant weed present : Yellow Foxtail (*Setaria glauca*).

Entries that differ by at least the least significant difference (L.S.D.), are significantly (5%) or highly significantly (1%) different from each other.

Table 7. Fourth year stand persistence ratings. San Joaquin County, 30 variety, brand, and experimental selection trial. Planted October 20, 1980 at 24 lbs/acre with three replications on Stockton adobe clay soil. (Canevari and Marble, 1984)

Entry	Winter dormancy ranking	Percent full stand October 30, 1984	Weed infestation October 30, 1984
Pioneer Brand RX	SD	63.3 a	1.5 fg
NC+ 8800 Brand	ID	61.7 ab	1.5 fg
AS-13R	ND	61.7 ab	1.3 g
WL Southern Special	MND	60.0 abc	1.3 g
DeKalb Brand 167	SD	60.0 abc	1.8 efg
Lahontan	SD	60.0 abc	1.8 efg
WL 515	ND	56.7 abcd	1.3 g
DK 185	MND	56.7 abcd	1.3 g
Pioneer Brand 545	D	53.3 abcde	1.8 efg
WL 318	SD	51.7 abcde	2.3 defg
Pioneer Brand 581	ID	50.0 abcdef	2.6 defg
UC 143 Syn 2	VND	50.0 abcdef	1.6 efg
Nova	SD	50.0 abcdef	2.2 defg
WL 76 Ca K	ND	48.3 bcdefg	2.0 defg
Moapa 69	ND	46.7 cdefg	4.2 bcd
AS-49R	SD	46.7 cdefg	3.7 cdef
NC+ Alpha I	SD	46.7 cdefg	3.2 cdefg
NK 79174	ND	45.0 defgh	2.6 defg
Cimarron	SD	43.3 defghi	2.3 defg
UC 196	VND	43.3 defghi	2.6 defg
UC 118 Syn 2	VND	43.3 defghi	3.0 cdefg
Amador	ID	40.0 efghij	3.3 cdefg
Megluc II	VND	36.7 fghijk	2.8 defg
Galaxy	ND	35.0 ghijk	2.8 defg
Megluc I	ND	31.7 hijk	4.0 cde
Condura 73 Brand	SD	30.0 ijk	5.0 bc
CUF 101	VND	28.3 jk	7.7 a
Granada	VND	28.3 jk	5.0 bc
Maxidor	VND	25.0 k	6.0 ab
Rere	MND	23.3 k	7.3 a
Average		45.9	3.1
LSD .05		12.0	1.8
.01		16.0	2.4
CV %		16.1	36.5

Entries that are followed by the same letter are not significantly different at odds of 19 to 1. Said another way, only entries followed by different letters are significantly different.

Weed infestation rankings: 1 = no weeds; 2 = trace; 4 = moderate; 7 = heavy weeds; 10 = very heavy weeds, completely covering plot.

Table 6 Five year yield summary of 1981 Tulelake 46 alfalfa variety and experin trial. Tulelake Field Station, Tulelake, Siskiyou County. Planted May replications on a silty clay loam soil with 11% organic matter. (Carls)

Yield in tons per acre, rank in parenthesis							
Entry	1981 2 cuts	1982 2 cuts	1983 3 cuts	1984 4 cuts	1985 3 cuts	year avg.	of Vernal
DE KALB BR. 120	4.25 ( 3)	5.36 ( 2)	8.42 ( 1)	6.83 ( 6)	5.97 ( 8)	6.17	110.8
PIONEER BR. 526	4.11 ( 10)	5.47 ( 1)	7.82 ( 21)	6.92 ( 3)	6.42 ( 1)	6.15	110.5
PERRY	3.94 ( 23)	5.19 ( 7)	7.87 ( 14)	6.63 ( 20)	6.28 ( 2)	5.98	107.5
DRUMOR	4.01 ( 19)	5.15 ( 9)	8.02 ( 4)	6.72 ( 11)	6.00 ( 7)	5.98	107.5
WL 315	3.86 ( 30)	4.93 ( 25)	7.96 ( 7)	7.00 ( 1)	6.02 ( 5)	5.95	107.0
THUNDER	3.82 ( 33)	5.31 ( 3)	7.90 ( 9)	6.60 ( 25)	6.12 ( 3)	5.95	107.0
APPOLLO 11	4.28 ( 1)	5.20 ( 5)	7.87 ( 15)	6.86 ( 5)	5.46 ( 31)	5.93	106.7
BLAZER	3.91 ( 25)	5.11 ( 12)	7.83 ( 20)	6.72 ( 12)	6.08 ( 4)	5.93	106.6
ATRA 55	4.07 ( 14)	5.28 ( 4)	7.89 ( 11)	6.72 ( 13)	5.65 ( 20)	5.92	106.5
VALOR	4.10 ( 11)	5.07 ( 14)	7.97 ( 6)	6.63 ( 22)	5.64 ( 21)	5.88	105.8
WL 316	3.99 ( 21)	5.02 ( 20)	7.89 ( 10)	6.99 ( 2)	5.40 ( 32)	5.86	105.3
PIONEER BR. 532	3.90 ( 28)	5.04 ( 19)	8.00 ( 5)	6.52 ( 29)	5.80 ( 14)	5.85	105.2
WL 312	4.26 ( 2)	5.04 ( 19)	7.84 ( 19)	6.71 ( 15)	5.34 ( 34)	5.84	105.0
ARMOR	4.20 ( 7)	5.08 ( 13)	7.69 ( 27)	6.63 ( 21)	5.57 ( 27)	5.83	104.9
PACER	3.68 ( 42)	5.07 ( 15)	7.81 ( 22)	6.59 ( 26)	6.01 ( 6)	5.83	104.9
IROQUOIS	4.00 ( 20)	4.84 ( 35)	7.85 ( 18)	6.56 ( 28)	5.91 ( 9)	5.83	104.8
WL 221	3.79 ( 35)	5.20 ( 6)	8.05 ( 2)	6.48 ( 34)	5.64 ( 22)	5.83	104.8
UC 1030	4.21 ( 6)	4.87 ( 33)	7.62 ( 32)	6.70 ( 17)	5.67 ( 19)	5.81	104.5
WANGARD	4.03 ( 17)	5.18 ( 8)	7.96 ( 8)	6.51 ( 31)	5.34 ( 33)	5.80	104.3
6-2815	4.04 ( 16)	5.01 ( 22)	7.85 ( 17)	6.70 ( 16)	5.29 ( 37)	5.78	103.9
ONEIDA	3.84 ( 32)	5.07 ( 16)	7.54 ( 37)	6.62 ( 24)	5.79 ( 15)	5.77	103.8
DE KALB BR. 130	4.09 ( 13)	4.90 ( 29)	7.80 ( 23)	6.76 ( 9)	5.30 ( 36)	5.77	103.7
MAGNUM	4.04 ( 15)	4.88 ( 33)	7.67 ( 29)	6.56 ( 27)	5.64 ( 23)	5.76	103.5
RS 209	3.54 ( 45)	5.06 ( 17)	7.48 ( 40)	6.77 ( 8)	5.90 ( 10)	5.75	103.4
FUTURA	3.91 ( 27)	4.89 ( 30)	7.74 ( 24)	6.67 ( 18)	5.50 ( 30)	5.74	103.2
ANCHOR	3.51 ( 46)	4.97 ( 23)	7.52 ( 39)	6.82 ( 7)	5.87 ( 13)	5.74	103.2
FSR H-117	3.79 ( 22)	4.79 ( 37)	7.69 ( 26)	6.76 ( 10)	5.60 ( 25)	5.73	102.9
PIONEER BR. 545	3.89 ( 29)	4.63 ( 38)	7.36 ( 43)	6.87 ( 4)	5.87 ( 12)	5.72	102.9
CJ 61	3.79 ( 36)	5.13 ( 11)	8.03 ( 3)	6.36 ( 39)	5.25 ( 39)	5.71	102.7
WL 311	3.74 ( 38)	4.88 ( 31)	7.60 ( 33)	6.63 ( 23)	5.61 ( 24)	5.69	102.3
TRUMPETOR	3.92 ( 24)	4.93 ( 26)	7.52 ( 38)	6.52 ( 30)	5.55 ( 28)	5.69	102.3
PRESERVE	4.11 ( 9)	5.02 ( 21)	7.86 ( 16)	6.17 ( 44)	5.28 ( 38)	5.69	102.3
WANCOR	3.86 ( 31)	4.90 ( 29)	7.56 ( 36)	6.39 ( 28)	5.68 ( 12)	5.68	102.1
FSR H-103	4.03 ( 18)	4.62 ( 39)	7.46 ( 42)	6.43 ( 37)	5.74 ( 17)	5.66	101.7
CIMARRON	4.21 ( 5)	4.94 ( 24)	7.88 ( 12)	6.27 ( 41)	4.97 ( 44)	5.65	101.6
AS 60F	4.14 ( 8)	5.13 ( 10)	7.67 ( 30)	6.43 ( 36)	4.90 ( 45)	5.65	101.6
JUBILEE	3.75 ( 37)	4.86 ( 34)	7.58 ( 35)	6.50 ( 32)	5.58 ( 26)	5.65	101.6
RAIDOR	4.10 ( 12)	5.06 ( 18)	7.59 ( 34)	6.49 ( 33)	4.98 ( 43)	5.64	101.5
AS 67	3.70 ( 41)	4.91 ( 27)	7.70 ( 25)	6.34 ( 40)	5.51 ( 29)	5.63	101.2
PIONEER BR. 524	3.81 ( 34)	4.88 ( 32)	7.64 ( 31)	5.93 ( 45)	5.77 ( 16)	5.61	100.8
LS 79-1920 SYN 2	3.56 ( 44)	4.79 ( 37)	7.88 ( 13)	6.64 ( 19)	5.12 ( 41)	5.60	100.6
SVERRE	3.91 ( 26)	4.83 ( 36)	7.69 ( 28)	6.27 ( 42)	5.12 ( 40)	5.56	100.0
VERNAL	3.74 ( 39)	4.63 ( 38)	7.29 ( 44)	6.26 ( 43)	5.89 ( 11)	5.56	100.0
DE KALB BR. 167	3.59 ( 43)	4.25 ( 41)	7.47 ( 41)	6.72 ( 14)	4.78 ( 46)	5.36	96.4
FSR 1H-119	3.72 ( 40)	4.24 ( 42)	7.16 ( 45)	6.44 ( 35)	5.08 ( 42)	5.33	95.8
STRAIN 201	4.25 ( 4)	4.51 ( 40)	7.07 ( 46)	5.20 ( 46)	5.30 ( 35)	5.27	94.7
GRAND MEAN	3.94	4.96	7.73	6.56	5.59	5.76	103.5
% CV	8.4	4.3	3.1	5.8	7.7	4.2	4.2
LSD (.05)	0.46	0.30	0.34	0.53	0.60	0.30	5.4

Plot size: 5 feet X 20 feet. Harvested area: 3 feet X 20 feet.

Table 9. Plant stands, winter kill, and spring frost injury for Tulelake alfalfa trial planted May 4, 1981. (Carlson and Marble).

Entry	Stand Values				5/2/85	
	Plants/ft	Plants/ft	Plants/ft	Plants/ft	Winter*	Stand**
	9/11/82	9/25/84	4/12/85	9/11/85-	Kill Rating	Rating
VERNAL	9.50	5.25	6.13	6.44	2.0	5.5
ATRA 55	10.00	7.00	5.38	5.94	4.0	5.3
IROQUOIS	9.25	5.88	5.75	5.50	2.0	6.0
WL 311	9.00	6.25	5.00	4.63	3.3	4.5
ONEIDA	10.00	6.19	4.69	4.69	2.0	5.0
STRAIN 201	8.75	4.19	4.75	4.81	1.0	5.3
UC 1030	9.75	5.56	3.94	4.13	3.0	4.3
LS 79-1920 SYN 2	9.25	5.81	3.44	3.94	4.5	3.3
CIMARRON	7.50	5.37	3.94	4.88	4.3	3.8
PACER	9.25	5.75	5.50	6.25	2.0	5.5
BLAZER	10.00	6.69	5.75	6.19	2.0	6.3
VALOR	8.50	6.31	5.13	6.63	2.3	5.5
FSR H-117	8.50	6.94	5.19	5.19	3.8	4.0
FSR H-103	8.50	5.17	5.63	5.31	2.5	5.0
AS 67	9.25	6.94	4.75	4.56	4.0	4.3
AS 60F	10.25	5.75	4.19	4.44	4.0	3.0
WL 221	10.50	6.50	6.25	6.31	2.5	5.5
WL 316	9.00	5.88	5.55	6.00	2.3	5.3
WL 312	9.75	5.94	4.25	4.44	3.5	4.0
WL 315	9.25	6.75	5.13	5.94	2.3	5.5
DE KALB BR. 130	11.25	6.44	4.38	5.94	3.8	3.8
RS 209	8.00	6.81	5.13	5.31	2.8	5.0
DE KALB BR. 120	10.50	6.56	5.75	6.13	2.0	6.3
ARMOR	10.25	6.25	5.44	6.19	2.8	5.3
THUNDER	9.50	6.81	5.56	6.13	2.0	5.8
APPOLLO II	10.00	5.88	4.44	5.94	3.5	4.0
VANGARD	9.25	5.88	4.31	5.50	3.5	4.3
G-2815	10.00	5.94	4.19	5.00	3.5	4.3
CW 61	10.75	6.25	5.38	5.88	3.5	4.5
JUBILEE	8.75	5.25	4.38	4.31	3.8	3.5
FUTURA	11.25	6.75	4.81	5.44	3.3	4.5
MAGNUM	9.25	6.25	5.13	5.31	3.0	4.8
TRUMPETOR	9.50	6.00	4.94	5.50	3.3	4.5
VANCOR	9.75	6.56	4.19	5.69	3.3	4.5
PRESERVE	9.25	6.88	5.88	6.31	3.5	4.5
DRUMOR	8.50	5.62	5.50	4.69	3.3	4.8
PIONEER BR. 545	10.25	6.19	5.44	6.25	2.5	5.5
PIONEER BR. 532	9.75	6.13	5.38	6.56	2.0	6.0
PIONEER BR. 526	10.25	6.13	6.19	5.88	2.0	6.3
PIONEER BR. 524	9.75	6.69	5.44	6.00	2.5	5.3
FSR IH-119	8.75	5.44	2.69	4.25	5.8	2.5
DE KALB BR. 167	11.00	6.44	2.31	5.38	6.0	2.8
PERRY	11.00	7.06	6.38	6.38	2.3	6.0
ANCHOR	8.75	5.00	4.31	3.56	2.0	5.0
RAIDOR	9.25	5.56	4.63	4.44	4.0	3.5
SVERRE	7.75	6.13	4.81	5.56	3.5	3.8
GRAND MEAN	9.52	6.11	6.03	5.43	3.	4.7
% CV		16.2	20.1	20.1	26.4	15.6
LSD (.05)		1.38	1.37	1.52	1.1	1.0

\* 0-10 Scale, 0 equals no injury, 10 equals 100% kill.

\*\* 0-10 Scale, 0 equals no stand, 10 equals 100% stand.

Table 10. Height of recovery after the sixth cutting on September 16, 1985, for the 8th, 16th, 24th and 29th day after harvest. Two American (CUF 101 and 5929), one Saudi Arabian (Hasawi I) varieties, and five ecotypes from the Near East. From University of California 1984 regional alfalfa variety and experimental selection trial. West Side Field Station, Five Points, Fresno County, California. Planted October 31, 1984 at 32 lbs/acre with four replications on Panoche clay loam soil.

Entry	Height in centimeters			
	9/24	10/2	10/10	10/15
NE NAF-3 (South Yemen)	23.05 a	40.53 b	44.28 bc	42.98 c
Wadi Quriyat (Oman)	14.76 b	43.55 a	58.79 a	57.63 a
NE NAF-4 (Hasawi, Hofuf)	13.28 c	33.53 c	43.66 bc	41.44 c
NE NAF-2 (Sudan)	12.99 cd	30.63 d	42.29 c	43.73 c
FSI-6 (Hasawi I)	12.42 cd	31.20 cd	44.42 bc	42.39 c
CUF 101	12.38 cd	30.73 d	45.85 b	48.36 b
Pioneer Brand 5929	11.97 de	30.18 d	44.08 bc	46.54 b
NE NAF-1 (Hasawi-Jecor)	11.09 e	24.92 e	34.79 d	37.85 d
Mean	13.99	33.16	44.77	45.12
LSD .05	1.18	2.62	3.06	2.37
.01	1.61	3.57	4.17	3.23
CV %	5.75	5.37	4.65	3.58

All values are an average of 12 readings per replication.

Those values followed by the same letter are not significantly different from each other at odds of 19 to 1.

Table Pubescence and crown bud regrowth scores, percent full stand, and height of recovery (26 days after fifth cutting) for CUF 101, Hasawi I, and five alfalfa ecotypes from the Near East. From University of California 1984 regional 48 alfalfa variety and experimental selection trial. West Side Field Station, Five Points, Fresno County, California. Planted October 31, 1984 at 32 lbs/acre with four replications on Panoche clay loam soil.

	Pubescence score		Height (cm) 9/6 <sup>1</sup>	Percent full stand 9/24	Crown bud regrowth score 4/21
	9/6 <sup>1</sup>	9/24 <sup>2</sup>			
Hasawi I	1.25 a	1.49 ab	54.08 c	82.50 bc	4.25 d
Wadi Quriyat	1.27 a	1.22 a	62.45 a	76.25 e	5.00 cd
NE NAF-3 (South Yemen)	1.40 a	1.12 a	58.18 b	87.50 a	10.00 a
NE NAF-1 (Hasawi-Jecor)	1.50 a	1.91 b	48.15 d	78.75 de	1.75 e
NE NAF-4 (Hasawi-Hofuf)	1.62 a	1.77 b	56.80 b	83.75 bc	5.75 bc
CUF 101	4.43 b	4.45 d	50.30 d	86.25 ab	2.00 e
NE NAF-2 (Sudan)	4.45 b	3.97 c	49.03 d	83.75 bc	1.50 ef
5929	--	4.51 d	--	86.25 ab	--
Mean	2.27	2.56	54.14	86.00	4.63
LSD .05	.42	.45	2.24	4.64	1.35
.01	.57	.61	3.07	6.13	1.84
CV %	12.43	11.94	2.78	3.86	19.88

<sup>1</sup>Average of 10 observations per replication. (In bloom, 26 days after harvest.)

<sup>2</sup>Average of 12 observations per replication. (Vegetative, eight days after harvest.)

Values followed by the same letter are not different from each other at odds of 19 to 1.

Pubescence score: 1 = very heavy and long pubescence; 2 = very pubescent with mostly short hairs; 3 = moderate pubescence; 4 = slight pubescence; 5 = very slight pubescence to glabrous

Crown bud regrowth observed the same day as first cutting removed: 1 = none to very little regrowth; 5 = moderate crown bud regrowth; 10 = excellent crown bud regrowth, none from cut lower stems.

Table 12. Reaction of three North American alfalfa varieties, four Arabian Peninsula ecotypes, four Moroccan ecotypes, one Sudanese ecotype to the blue alfalfa aphid (BAA), the pea aphid (PA), and the spotted alfalfa aphid (SAA). Tests conducted by Dr. Edgar Sorensen, ARS/USDA, Manhattan, Kansas, using standard procedures. 1984.

	Percent resistant plants			Origin
	BAA	PA	SAA	
NE NAF-3	1.5 b	29.4	90.1 a	Peoples Democratic Republic of Yemen. Vern Marble, 4/24/84.
Kanza	0.0 b	70.0 b	61.0 b	Kansas.
CUF 101	38.9 a	78.4 a	51.6 c	California.
NE NAF-2	3.0 b	6.5 d	29.6 d	Northern Sudan. Vern Marble, 4/28/84.
Demnat	1.0 b	6.4 d	15.0 e	Morocco. Hussan II Institute. Vern Marble, 4/12/84.
Hasawi	0.5 b	2.5 def	3.1 f	Hofuf Experiment Station, Al Hasa Oasis, Saudi Arabia. Vern Marble, 4/20/84.
Hasawi	0.9 b	0.0 f	0.0 f	Reg. Soil and Water Inst., Riyadh, Saudi Arabia. Art Wilton.
Tafilalet	0.5 b	1.4 ef	0.0 f	Morocco (see above).
DRA	1.9 b	0.0 f	0.0 f	Morocco (see above).
DRA Oasis 4	2.6 b	5.4 de	0.0 f	Morocco (see above).
South African Standard	1.0 b	3.1 def	0.0 f	Lucerne Seed Control Board, Oudtshoorn, South Africa.
Buffalo	0.5 b	0.0 f	0.0 f	Kansas.
LSD .05	2.9	4.0	7.4	
CV %	45.6	16.4	24.7	