

# ALFALFA VARIETY TESTS IN CENTRAL CALIFORNIA

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**T**HE SACRAMENTO and San Joaquin Valleys contain 70% of the State's 1.16 million acres of alfalfa. Alfalfa grows on one of every six acres devoted to field crops, and it provided California farmers with a gross revenue of \$173,000,000 in 1966. Development and evaluation of new and improved alfalfa varieties constitute an important part of the University of California's alfalfa research and extension program.

This report summarizes results of variety tests located at the Agronomy Farm, University of California, Davis, and the West Side Field Station, Fresno County. Varieties were tested for yielding ability, insect and disease resistance, winter dormancy and stand life. They were divided into either non-dormant or semi-dormant test groups, based on winter growth characteristics. This procedure allowed varieties with similar growth characteristics to be harvested together. Harvests were made at the 10% bloom stage (when 60% of the alfalfa

crowns had bud regrowth of  $\frac{1}{2}$  to  $\frac{3}{4}$  inch in length).

## Yield data

Yield data collected over a three-year period are summarized in table 1 for the West Side Field Station tests, and table 2 for tests conducted at Davis. Individual alfalfa varieties did not yield identically in both tests. For example, WL-501 significantly outyielded AS-10, Joaquin 11, Moapa, and Mission 63 at Davis, but was not significantly different from AS-10, Moapa or Mission 63 in the San Joaquin Valley. Because of differences in climate and growing conditions, comparisons should be made only between varieties within the same test, and not between tests.

Yield differences required for significance (LSD .05) between the check variety and any other variety are shown at the bottom of each table. Small differences (less than the LSD) may be due to chance alone and should not be con-

sidered when comparing varieties. A Duncan Multiple Range test was used to calculate significant yield differences between varieties for the three-year average yields. No true differences in yielding ability exist between varieties connected by a solid line.

## San Joaquin Valley

Considering Moapa as the check variety (table 1), only the experimental variety, Arizona DC-1, showed significantly higher yields over the entire three-year period. There is, however, a definite trend for the extremely non-dormant alfalfas to outyield Moapa types—as indicated by the fact that the highest eight varieties are all extremely non-dormant types (see table 3). Extremely non-dormant varieties recover more quickly after cutting, grow longer in the fall, and begin growth earlier in the spring than Moapa types.

In 1964, Arizona DC-1, Davis 64-A, Mesa Sirsa, and SW-17 were all significantly higher yielding than Moapa. At



U.C.-built alfalfa plot harvester designed for harvesting and weighing small plots.

TABLE 1. ALFALFA VARIETY TRIAL—WEST SIDE FIELD STATION, FRESNO COUNTY  
NON-DORMANT VARIETIES—3-YEAR SUMMARY—AVERAGE OF 5 REPLICATIONS

Variety	Seed Source	1964	1965	1966	3 Year	3 Year <sup>1</sup>	3 Year % of Moapa
		(5 cuts.)	(8 cuts.)	(8 cuts.)	Total	Average	
Arizona DC-1 <sup>2</sup>	U. of Ariz.	4.93	13.44	11.88	30.25	10.08	120
Davis 64-A <sup>2</sup>	U. of Calif.	4.50	12.98	10.53	28.01	9.34	110
SW-7 <sup>2</sup>	U. of Calif.	4.32	12.25	10.48	27.05	9.02	106
Mesa Sirsa	U. of Ariz.	4.39	11.83	10.52	27.04	9.01	106
Mission 63	H. W. Walcott	4.18	12.60	10.24	27.02	9.01	106
SW-17 <sup>2</sup>	U. of Ariz.	4.43	12.15	10.27	26.85	8.95	105
AS-10 <sup>2</sup>	Advance	4.07	12.79	9.98	26.84	8.95	105
Sonora	U. of Ariz.	4.29	12.32	10.20	26.81	8.94	105
SW-21 <sup>2</sup>	U. of Calif.	3.92	12.05	10.50	26.47	8.82	104
WL-501	Germain's	4.29	11.34	10.20	25.83	8.61	101
SW-22 <sup>2</sup>	U. of Nev.	3.81	11.52	10.28	25.71	8.57	101
Moapa <sup>3</sup>	USDA	3.74	11.67	10.11	25.52	8.51	100
Germain's Eldorado	Germain's	3.78	11.03	9.71	24.52	8.17	96
AS-13	Advance	3.60	10.87	9.94	24.41	8.14	96
Joaquin 11	Security	3.57	11.01	9.49	24.07	8.02	94
Average		4.02	11.78	10.14	25.92	8.64	
LSD (.05)		0.61	1.08	1.42		0.90	
C.V.%		13.9	7.21	11.13		14.3	

<sup>1</sup> Yields of varieties connected by a solid line were not significantly different at the 5% level of probability.

<sup>2</sup> Designates experimental variety which has not been released for grower use.

<sup>3</sup> Check variety.

Note: Trial was planted March 10, 1964.

the end of the second year, Arizona DC-1, Davis 64-A, and AS-10 were superior, and by the end of the third year, only Arizona DC-1 maintained a significant yield advantage over Moapa. This illustrates the danger of accepting yield data based on only one year of testing.

The two experimental varieties, Arizona DC-1 and Davis 64-A, represent a distinct plant-breeding advance in the development of high-yielding varieties adapted to the San Joaquin Valley. It is expected that this evaluation program will result in the commercial release of at

least one high-yielding alfalfa for the San Joaquin Valley.

#### Downy mildew

Table 3 indicates that both Arizona DC-1 and Davis 64-A are more tolerant of downy mildew than Moapa or Sonora. Detailed observations on early spring growth characteristics indicate that both of these experimental varieties begin growth earlier in the spring and show faster recovery following cutting than Moapa. Measurements and observations taken indicate that all varieties have an

adequate stand for production at the end of three years despite the frequent cutting schedule imposed. Cutting intervals averaged 29 days for the five cuttings (10% bloom stage) made between May and September.

#### Sacramento Valley

Trials reported in table 2 represent growing conditions in the Sacramento Valley. Alfalfa growers in this area have traditionally used semi-dormant types which will maintain stand and production for four to five years. Table 2 indicates no significant difference between the 3-year average yields of the semi-dormant varieties. Therefore, these alfalfas are assumed to be approximately equal in yielding ability through the first three years of stand life. It should be noted however, that significant differences in yield between varieties did appear during the third year of this trial. In 1966 AS-49 and Germain's Eldorado were superior yielding to PSA-1, Resistador, Caliverde, and SW-21. A possible explanation of this development may be found in 1966 fall stand counts, which show PSA-1, Resistador, Caliverde and SW-21 to be losing stand more rapidly than the higher-yielding varieties. Further changes in yielding ability are anticipated over a four- or five-year period, primarily as a result of stand depletion from physiological and disease problems.

Among the non-dormant varieties, WL-



Alfalfa variety test area at West Side Field Station, Fresno County, showing layout of plots in the field.

501 was the top yielder at Davis, with AS-10 and Joaquin 11 also yielding significantly more than Moapa and Mission 63 over a three-year period. Examination of yield data from 1964, 1965, and 1966 reveals that Mission 63, AS-10, and Moapa declined sharply during the third year while Joaquin 11 and WL-501 maintained yield. Since AS-10 and Mission 63 are extremely non-dormant varieties, reduction in third-year yields is not unexpected. This has been the previous test pattern for varieties of this type in the Sacramento Valley. Observations to date indicate that WL-501 and Joaquin 11 are both slightly more dormant than Mission 63 and AS-10.

### Insects and diseases

All varieties tested, except Caliverde, showed resistance to the spotted alfalfa aphid. Resistador, however, was observed to have a lower level of resistance than other varieties, allowing spotted alfalfa aphid populations to increase to a moderate level at least once each season. Pea aphid populations were never high enough to make an evaluation of varietal resistance; however, pea aphid did attack all varieties. Disease rating for downy mildew and common leafspot are given in table 3.

At the West Side Field Station only Arizona DC-1, Davis 64-A, and WL-501 showed tolerance to downy mildew. At Davis, Caliverde, Lahontan, and Resistador showed a good degree of resistance to downy mildew and WL-501, PSA-1, and AS-49 showed tolerance to this disease. No tolerance to common leafspot was observed among the non-dormant varieties at the West Side Field Station, or the Davis location. Very good tolerance to common leafspot was observed in Resistador and Caliverde at Davis.

### Dormancy and stand life

Winter dormancy refers to the amount of growth alfalfa plants make during the short, cold days of winter. Three dormancy classifications were developed from observations at both locations. These are non-dormant, intermediate, and semi-dormant. Height measurements were made in December, February, and March to establish the proper placement of varieties among the three categories. Table 3 lists the dormancy classification for each variety.

The persistency of an alfalfa variety refers to the length of time that an adequate stand can be maintained. This is not the same for all varieties. The semi-dormant and intermediate varieties usu-

TABLE 2. ALFALFA VARIETY TRIALS—UNIVERSITY OF CALIFORNIA, DAVIS  
THREE-YEAR SUMMARY—AVERAGE OF FIVE REPLICATIONS

Non-Dormant Variety Trial		1964	1965	1966	3 Year	3 Year <sup>1</sup>	3 Year
Variety	Seed Source	(5 cuts.)	(6 cuts.)	(6 cuts.)	Total	Average	% of Moapa
		Tons/Acre of Hay at 10% Moisture					
WL-501	Germain's	6.45	8.52	8.51	23.48	7.83	114
AS-10 <sup>a</sup>	Advance	6.32	8.40	7.36	22.08	7.36	107
Joaquin 11	Security	5.70	8.08	7.95	21.73	7.24	105
Moapa <sup>b</sup>	USDA	5.77	7.71	7.14	20.62	6.87	100
Mission 63	H. W. Walcott	6.17	7.86	6.17	20.20	6.73	98
Average		6.08	8.11	7.42	21.62	7.61	
LSD (.05)		0.25	0.39	0.49		0.31	
C.V.%		2.94	3.52	4.79		3.09	

  

Semi-Dormant Variety Trial		1964	1965	1966	3 Year	3 Year <sup>1</sup>	3 Year
Variety	Seed Source	(5 cuts.)	(6 cuts.)	(6 cuts.)	Total	Average	% of Lahontan
		Tons/Acre of Hay at 10% Moisture					
Germain's Eldorado	Germain's	6.97	9.00	8.65	24.62	8.21	105
AS-49	Advance	6.54	8.91	8.85	24.30	8.10	104
AS-13	Advance	6.61	8.80	8.47	23.88	7.96	102
PSA-1 <sup>2</sup>	U. of Calif.	6.87	8.90	7.91	23.68	7.89	101
Lahontan	USDA	6.23	8.78	8.41	23.42	7.81	100
Caliverde	U. of Calif.	6.84	8.69	7.51	23.04	7.68	98
X-2764 <sup>2</sup>	H. W. Walcott	6.35	8.46	8.19	23.00	7.67	98
Resistador	Northrup-King	6.26	8.50	7.90	22.66	7.55	97
SW-21 <sup>2</sup>	U. of Calif.	6.63	8.63	7.31	22.57	7.52	96
Zia	U. of N. Mex.	5.74	8.13	8.18	22.05	7.35	94
Average		6.50	8.68	8.14	23.36	7.77	
LSD (.05)		0.68	n.s.	.65		n.s.	
C.V.%		3.65	9.68	6.22		6.71	

<sup>1</sup> Yields of varieties connected by a solid line were not significantly different at the 5% level of probability.

<sup>2</sup> Designates experimental variety which has not been released for grower use.

<sup>3</sup> Check variety.

Note: Trials planted on February 17, 1964.

TABLE 3. DISEASE AND DORMANCY OBSERVATIONS (AVERAGE OF FIVE REPLICATIONS)

Variety	Disease Ratings <sup>1</sup>				Dormancy <sup>2</sup>
	Downy Mildew		Common Leaf Spot		
	WSFS (4/24/65)	Davis (4/1/65)	WSFS (4/24/65)	Davis (4/27/65)	
Moapa	S	S	S	S	ND
WL-501	T	T	S	S	ND
Joaquin 11	S	S	S	S	ND
AS-10	MS	MS	S	S	END
Mission 63	S	S	S	S	END
Sonora	S		S		END
SW-17	MS		S		END
SW-7	MS		S		END
SW-21	MS	MS	S	S	ND
SW-22	S		S		ND
Mesa Sirsa	S		S		END
Arizona DC-1	T		S		END
Davis 64-A	T		S		END
AS-13	S	S	S	S	I
Germain's Eldorado	S	S	S	S	I
PSA-1		T		S	I
AS-49		T		S	SD
Resistador		R		T	SD
Lahontan		R		S	SD
X-2764		MS		S	SD
Caliverde		R		T	I
Zia		MS		S	SD

<sup>1</sup> R = Resistant T = Tolerant MS = Moderately Susceptible S = Susceptible.

<sup>2</sup> Indicates results of winter dormancy measurements at the West Side Field Station and Davis.

END = Extremely Non-dormant ND = Non-dormant I = Intermediate SD = Semi-dormant.

ally persist for a longer period of time than do non-dormant alfalfas. Growers have found that Lahontan will live for up to ten years under favorable conditions, while Moapa thins to uneconomical stands after three to four years. Stand evaluations were made at Davis and Fresno periodically during the three-year period of variety testing. Although distinct differences in stand survival have appeared, no clear-cut relationship can yet be established between yielding ability and stand reduction. Most varieties

appear to have an adequate stand at the end of three years. Further observations will be made during the fourth year to establish a correlation between loss of stand and decrease in yield.

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