EFFECT OF FALL/WINTER CUTTING ON ALFALFA (Medicago sativa L.) YIELD, PEST MANAGEMENT, AND STAND LIFE

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Abstract: Fall/winter (F/W) harvesting (grazing) does affect normal season (NS) yield, stand life, weediness, damage from the Egyptian alfalfa weevil [Hypera brunneipennis (Boh.)], (EAW) rate of spring regrowth, and yield of the first three to four cuttings of the season. At the University of California, Davis, harvesting once, either in early November or mid-December for two years, did not significantly reduce total NS yield or stand life compared with the uncut. Any treatment with multiple harvests, or one early March harvest, reduced NS yield (7%), persistence, vigor and EAW damage. When NS + F/W harvests were combined, all double harvests, and single November and December harvests were higher yielding than the uncut, triple, or single March harvest treatments by 5 to 10%.

At the West Side Field Station, harvesting once in mid-December for two years did not significantly reduce NS yield or spring recovery rate nor increase weediness, but did reduce stand life, compared to the uncut. A single mid-November, early March, or any double or triple harvests reduced NS yield 10 to 16%. When NS + F/W harvests were combined, a single harvest in December increased yield by 5%. Making two harvests in November and December did not improve yields over the November date alone. Three varieties with different dormancy yielded similarly. The semidormant (SD) Lahontan did not increase in yield when F/W harvests were added, but did maintain its stand in all treatments.

These results suggest that one harvest in November or December at the University of California Davis, and December at the West Side Field Station, can be made without reducing total NS yield. This practice will increase total seasonal yield without affecting the yield of the normal season cuts, and without seriously harming stand life and vigor, increasing weed contamination, or influencing EAW damage.

Keywords: Alfalfa (Medicago sativa L.), Yield, Stand ife, Vigor, Fall/winter harvests, Weediness, Egyptian alfalfa weevil.

Alfalfa grows in seven different major environments in California. Harvests per year range from three to ten. Approximately 95% of the 1,050,000 acres grown are utilized as baled or cubed hay, mostly for dairy cattle and horse feed. The climate in winter is moderate to cool and wet, and in summer hot and dry. In the major producing areas of the San Joaquin and Sacramento Valleys (56% of the total), the production season is determined by when rains begin and end in the autumn and spring and not by cold weather. The low desert (Palo Verde, Coachella and Imperial Valleys), the other large producing region (30%) has no similar limits because of extremely low annual rainfall (2.5 inches) and warm winter temperatures that permit growth throughout the year.

Approximately 70% of the state acreage is either grazed by sheep or harvested for hay/green feed/silage, one or more times from October through February. Producers receive some income from these post normal-season harvests (PNSH), but usually growers lack information about the long-term effect of these practices on insect control, vigor, weed contamination, persistence, or productivity in subsequent years.

Few detailed studies have been conducted on F/W harvest practices in areas climatically similar to California. At Davis after November 1, in north central California, Schoner (1981) reported that one PNSH, made about 30 days after the normal sixth harvest of early October, reduced yield for both the semidormant (SD) WL 318 and the very nondormant (VND) CUF 101 about 9% when averaged over a three-year period. When two harvests were made in November and December, the losses were similar (12%) for WL 318, but doubled to 27% for the VND variety CUF 101. Losses were minimal the first year, but increased each year, especially for the VND CUF 101, which also suffered a severe stand and vigor loss not shown by the SD cultivar. All yield losses for both cultivars cut once occurred only in the first three harvests of the spring, but CUF 101 cut twice was lower yielding and much less vigorous for all six harvests.

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Worker and Marble (1987) found that in Imperial Valley, where 10 harvests are made annually, there was no reduction in yield, vigor or stand in subsequent years with either one or two F/W harvests for CUF 101, if a 45 day rest period was allowed between harvests from December to mid-February. In this mild winter area, total seasonal yield was increased by 12% when two harvests were made in early December and mid-January. In addition, quality of these two cuts and also the quality of the first normal season cut in March, was increased from about 52% TDN to 55%!

In order to clarify the long-term effect of single and multiple PNSH on alfalfa productivity and persistence when grown in the Sacramento and San Joaquin Valleys, trials were established at the Agronomy Farm near Davis (UCD) and 210 miles south at the West Side Field Station (WSFS), about 40 miles southwest of Fresno.

METHODS

Similar irrigated trials were planted at 30 lbs/acre in October 1983 at WSFS and in March 1984 at UCD, using a split-block design with four replications. Main plots (each 50x20 feet) were: varieties with different fall dormancies, CUF 101 (VND), Moapa 69 (ND) and Lahontan (SD); subplots were the F/W harvest treatments of: 1) November+December+March (HHH); 2) November+December (HH-); 3) November+March (H-H); 4) November (H--); 5) December-+March (-HH); 6) December (-H-); 7) March (--H); 8) uncut (---). All plots were harvested with a Carter flail plot harvester seven times per year for two years before fall harvests began. Excessive rains October through December 1984 prevented the beginning of the F/W harvests until November 1985. F/W harvests continued for two years through March 1987. Seven NS harvests were made at WSFS and six at UCD from all plots in 1986 and 1987 from April to October. Samples were taken for dry matter and chemical analyses (not complete at date of writing). Plant counts, stand estimates, regrowth, and visual ratings for weeds, insects and diseases were made. Light frosts of 1 to 5°F, which usually killed young regrowth, occurred several times each year from mid-December to early February, but daytime temperatures were always 10 to 30°F above freezing. Data was analyzed by standard statistical procedures.

RESULTS AND DISCUSSION

Stand Life

High persistence was associated with greater varietal winter dormancy and fewer F/W cuts. Average percent cover ratings in March 1988 after three seasons of F/W harvests are given in Table 1 for the WSFS, and after two years (Table 2) for UCD. Only the semidormant variety Lahontan was able to maintain essentially the same stands for F/W cuts as the uncut check treatment. After cutting in November, Lahontan did not regrow at all, and Moapa 69 and CUF 101 but little until normal spring growth commenced in mid-February. Both varieties that grew some in the winter, CUF 101 and Moapa 69, had substantial stand loss from all harvests made in March as well as all double harvests. These were made when regrowth was very immature, and were always followed by the first NS harvest 20 to 35 days later. One November or one December harvest at UCD or one in December at WSFS, did not reduce stands, especially for Moapa 69, which has more winter dormancy than CUF 101.

Pests

Contamination from winter annual weeds was greatest at WSFS for all treatments which involved a March or multiple harvest (Table 3). At this location, one F/W harvest in November or December, or even harvests on both dates, had little effect on weediness compared to the March treatments. The uncut, or one harvest in November or December, treatments were nearly weed-free for all F/W harvests and varieties. CUF 101, the most winter growing variety of the three, and the most likely to have low root carbohydrates as a result, was contaminated more by weeds than the other varieties, especially when harvested in March.

Damage from the Egyptian alfalfa weevil at UCD was significantly less in all plots that were harvested in March (Table 4). Harvesting in November or December did not reduce EAW damage anymore than the uncut treatment, which was heavily damaged. However, harvesting in both November and December, but not in March, reduced vigor and increased EAW damage. Apparently the spring harvests removed EAW larvae and eggs, and allowed the new re-

growth to develop free of damage. Regrowth from all treatments not harvested until March, or which had sufficient time for regrowth to develop prior to March, but which were uncut, were available as egg laying sites and subsequent larval damage.

Vigor

Height measurements at WSFS taken 22 days after the first NS harvest in the spring of 1987 represented the effect on the vigor of the alfalfa after two years of F/W harvesting (Table 5). This was a near identical response to the weed ratings, both of which reflect lack of vigor and a reduction in ability to compete. This "hidden" damage from F/W harvesting is often overlooked or never considered. There were no differences between varieties; all varieties reacted the same.

Yield: F/W Harvests

A summary of the preseason, F/W cuts for 1986-87 for the WSFS are given in Table 6. All F/W single harvests yielded about 0.75 tons/acre regardless of the season or length of time for growth. This poor growth response during the winter was also noted in grazing trials in California (Frate et al., 1988) and a cutting trial of Worker and Marble (1987), but is contrary to results found in a colder area (Edmisten et al., 1988). The results at WSFS were apparently due to the combined action of mild weather intermingled with light frosts, loss of leaves from old age, and leaf feeding damage from the EAW. Similar results were found from the F/W harvests at UCD, except slightly higher yields of about 1.05 tons/-acre were obtained (Table 7).

All combinations of F/W harvests significantly reduced yield of the first three spring harvests at the WSFS (Table 6) and the first four harvests at UCD (Table 7). In both instances, no further yield reduction was obtained from other harvests in this second season. The average yield from seven harvests at WSFS was significantly less (7%) than the combined seven plus F/W harvests, but most of this increase was from the single December harvest treatment, which yielded 5% more than the uncut check.

Yield: NS and NS+F/W Harvests - WSFS

Three F/W harvests at WSFS (Table 6) reduced normal season yield by 16%. The addition of yield from the three harvests was not enough to make up for the reduced vigor and stand loss that resulted in reduced production the next year. Harvesting once in November or March, or any two-cut combination, reduced second year normal yields approximately 10% at the WSFS.

When the two-year NS yields are compared with two-year NS plus three plus F/W harvests (Tables 8 and 9), the average of all F/W harvests increased NS yields by 9%. Each year, the difference between the best and poorest treatments widened. This was due to the increasing depletion of root carbohydrate reserves in the multiple and wrongly timed F/W harvests. Only the harvest made in mid-December was able to maintain its productivity in relation to the uncut check over the two-year period. Undoubtedly, continued harvesting in the F/W period would further reduce the vigor and widen the margin between the uncut check and the inappropriate treatments. March harvesting was particularly detrimental to NS yields, reducing them by an average of approximately 15%. The added gain from the multiple harvests was not sufficient to make up the difference.

Yield: NS+F/W Harvests - UCD

At UCD, results followed the same type of trends, but were not exactly the same. For example (Table 7), there was much more flexibility in choices of F/W treatments. Individual F/W harvests were greater than at WSFS, and this was reflected in a higher percent increase for the F/W treatments compared to the uncut check, approximately 11% higher yielding for all combinations of single and multiple cuts except the triple cutting. As at the WSFS, at UCD a single harvest in mid-December was significantly (9%) better than the uncut check. However, at UCD a November cutting was equal to a mid-December cutting, and two of the two F/W harvest treatments were about 10% higher than NS yield when two years results were averaged (Tables 10 and 11). Making three cuts at either UCD or WSFS was fairly devastating to yield, resulting in a 16% yield reduction in both instances, compared to the NS uncut check.

These results differ from those of several workers located in areas with much cooler climates (Jensen et al., 1981; Scheaffer et al, 1988). Apparently all F/W harvest treatments, except the mid-December cutting at WSFS, and this same treatment and the single mid-November harvest at UCD, which occurred after growth was severely reduced by low temperatures (low temperatures occur earlier at Davis than in Fresno County), were unable to maintain sufficient root carbohydrate reserves for normal growth in the spring. The increased weediness and decreased stand and spring recovery height from all other F/W harvests would confirm this conclusion.

CONCLUSIONS

The results of these two experiments suggest that it is possible to increase total seasonal yield without affecting normal season yield in the central San Joaquin by making a late harvest in mid-December, and either a mid-November or mid-December harvest in the southern Sacramento Valley.

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Table Third year stand persistence ratings (% cover) for 1983 San Joaquin Valley 3 variety and 8 fall harvest trial. West Side Field Station, Five Points, Fresno County. Planted October 26, 1983 at 30 lbs/acre with four replications on Panoche clay soil. (Marble and Peterson) 1987.

Entry	CUF 101	Moapa 69	Lahontan	Mean	
8 ---	50.0	66.3	75.0	70.4	A
6 -H-	37.5	55.0	75.0	55.8	B
2 HH-	42.5	52.5	70.0	55.0	B
7 --H	42.5	50.0	72.5	55.0	B
4 H--	38.7	53.8	68.8	53.8	B
1 HHH	32.5	47.5	70.0	50.0	C
5 -HH	31.3	40.0	76.3	49.2	C
3 H-H	36.3	42.5	66.3	48.4	C
Mean	39.9 c	51.0 b	71.7 a	54.7	

Table 2. Stand persistence ratings (taken before 1st cutting) for 1984 (spring) UC three variety and eight fall/winter harvest trial. UC Davis, Yolo county. Planted March 12, 1984 at 30 lbs/acre with four replications on Yolo loam soil. 1987. (Marble, Schoner, Peterson) <UC384R7.11>

	1986 - 1987 Treatment			Percent Cover (4/7/87)			
	11/10	12/15	3/10	CUF 101	Moapa 69	Lahontan	All varieties
(4)	H	-	-	63.75	62.50	72.50	66.25 A
(8)	-	-	-	57.50	57.50	71.25	62.08 AB
(6)	-	H	-	55.00	58.75	70.00	61.25 AB
(2)	H	H	-	48.75	53.75	70.00	57.50 ABC
(3)	H	-	H	47.50	51.25	63.75	54.17 BC
(5)	-	H	H	42.50	47.50	65.00	51.67 C
(7)	-	-	H	41.25	46.25	66.25	51.25 C
(1)	H	H	H	21.25	35.00	67.50	41.25 D
Grand Mean				47.19 B	51.56 B	68.28 A	55.68
LSD (.05)				13.02	10.60	7.59	8.25
(.01)				17.73	14.43	10.34	11.23
% C.V.				18.77	13.98	7.56	10.05

LSD	(.05)	(.01)
Between treatments for the same variety	10.51	14.21
Between treatments for different varieties	8.03	10.90

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

Entries that differ from each other by more than the LSD are significantly or highly significantly different from each other at odds of 19 to 1 (.05) and/or 99 to 1 (.01), respectively.

Table 3. Fourth year weed ratings, taken 23 days after first harvest, April 1st for 1983 San Joaquin Valley 3 variety fall harvest trial. West Side Field Station, Five Points, Fresno County. Planted October 26, 1983 at 30 lbs/acre with four replications on Panoche clay soil. (Marble and Peterson) 1987. <WS283R7.31>

	1986 - 1987 Treatment			Weed ratings (4/24/87)			
	11/10	12/15	3/10	CUF 101	Moapa 69	Lahontan	All varieties
(8)	-	-	-	9.50	9.75	9.25	9.50 A
(6)	-	H	-	9.00	9.25	8.75	9.00 AB
(4)	H	-	-	8.50	8.25	8.50	8.42 B
(2)	H	H	-	7.75	8.25	8.75	8.25 B
(7)	-	-	H	6.25	7.25	7.50	7.00 C
(5)	-	H	H	5.75	6.75	7.50	6.67 C
(3)	H	-	H	5.25	5.75	7.00	6.00 C
(1)	H	H	H	3.25	5.25	6.25	4.92 D
Grand Mean				6.91	7.56	7.94	7.47
LSD (.05)				1.48	1.20	1.00	0.96
(.01)				2.01	1.63	1.36	1.31
% C.V.				14.53	10.75	8.53	8.69

LSD	(.05)	(.01)
Between treatments for the same variety	1.22	1.65
Between treatments for different varieties	0.99	1.35

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Weed rating: = very weedy; 10 = no weeds present

Table 4. Egyptian Alfalfa Weevil (EAW) damage ratings for 1984 (spring) UC three variety and eight fall/winter harvest trial. UC Davis, Yolo county. Planted March 12, 1984 at 30 lbs/acre with four replications on Yolo loam soil. 1987. (Marble, Schoner, Peterson) <UC384R7.51>

1986 - 1987 Treatment			EAW (4/7/87)			
11/10	12/15	3/10	CUF 101	Moapa 69	Lahontan	All varieties
(7) -	-	H	9.75	9.75	9.75	9.75 A
(5) -	H	H	9.50	9.25	9.50	9.42 A
(3) H	-	H	9.25	8.50	8.75	8.83 A
(1) H	H	H	8.00	9.00	8.75	8.58 AB
(6) -	H	-	7.75	7.00	7.75	7.50 BC
(4) H	-	-	7.75	7.25	6.25	7.08 C
(8) -	-	-	5.75	5.75	8.75	6.42 C
(2) H	H	-	7.75	3.50	6.00	4.50 D
Grand Mean			7.72 B	7.50 B	8.06 A	
LSD .05)			1.24	1.37	1.15	1.06
.01)			1.69	1.87	1.57	1.44
% C.V.			10.92	12.43	9.71	

LSD	(.05)	(.01)
Between treatments for the same variety	1.25	1.69
Between treatments for different varieties	0.86	1.19

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Entries that differ from each other by more than the LSD are significantly or highly significantly different from each other at odds of 19 to 1 (.05) and/or 99 to 1 (.01), respectively.

EAW ratings: 1 = complete defoliation; 10 = no damage

Table 5. Fourth year recovery height ratings taken 23 days after first harvest, April 1st, for 1983 San Joaquin Valley 3 variety fall harvest trial. West Side Field Station, Five Pionts, Fresno County. Planted October 26, 1983 at 30 lbs/acre with four replications on Panoche clay soil. (Marble and Peterson).1987. <WS283R7.21>

	1986 - 1987 Treatment			Height (Inches) 4/24/87			
	11/10	12/15	3/10	CUF 101	Moapa 69	Lahontan	All varieties
(8)	-	-	-	22.75	22.25	20.25	21.75 A
(6)	-	H	-	22.25	21.75	20.00	21.33 A
(4)	H	-	-	21.00	20.00	19.00	20.00 B
(2)	H	H	-	20.00	19.50	17.75	19.08 B
(5)	-	H	H	18.25	18.00	17.25	17.83 C
(7)	-	-	H	18.00	18.00	16.00	17.33 C
(3)	H	-	H	17.00	16.75	16.50	16.75 C
(1)	H	H	H	15.00	16.50	15.25	15.58 D
Grand Mean				19.28	19.09	17.75	18.71
LSD (.05)				1.61	1.43	1.63	1.01
(.01)				2.19	1.95	2.22	1.37
% C.V.				5.68	5.10	6.24	5.29

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Table 6. Total normal season plus fall/winter yields after second year of fall/winter harvests of 1983 West Side Field Station 3 variety X 8 fall/winter harvest trial. West Side Field Station, Five Points, Fresno County. Planted October 26, 1983 at 30 lbs/acre with four replications on Panoche clay loam soil. 1987. (Marble and Peterson) <WS283Y7.FW1>

Entry	Preseason cuts 11/13/86	12/15/86	3/3/87	Total	Yield in dry tons per acre, rank in parenthesis Cut 1 4/2/87	Cut 2 5/6/87	Cut 3 6/4/87	Cut 4 7/1/87	Cut 5 8/5/87	Cut 6 8/27/87	Cut 7 10/2/87	Total 1987 1-7+3WN		% of Trmt. 8
6 -H-		0.75(1)		0.75(6)	0.93(2)	1.95(2)	1.78(2)	1.91(3)	2.04(1)	1.29(2)	1.17(1)	11.81(1)	A	104.7
8 ---					1.11(1)	1.97(1)	1.81(1)	2.01(1)	2.01(2)	1.27(4)	1.10(3)	11.28(2)	AB	100.0
5 -HH		0.61(2)	0.53(2)	1.14(1)	0.79(4)	1.65(6)	1.62(4)	1.81(7)	1.88(7)	1.22(5)	1.10(2)	11.21(3)	AB	99.4
2 HH-	0.71(2)	0.07(4)		0.78(4)	0.70(6)	1.78(4)	1.68(3)	1.85(6)	1.97(3)	1.30(1)	1.04(4)	11.09(4)	BC	98.4
7 --H			0.72(1)	0.72(7)	0.87(3)	1.69(5)	1.58(7)	1.92(2)	1.95(4)	1.27(3)	1.01(6)	11.02(5)	BC	97.7
4 H--	0.77(1)			0.77(5)	0.76(5)	1.83(3)	1.61(5)	1.86(4)	1.86(8)	1.21(6)	1.02(5)	10.93(6)	BC	96.9
3 H-H	0.70(3)		0.38(3)	1.08(2)	0.64(7)	1.64(7)	1.59(6)	1.85(5)	1.88(6)	1.16(8)	0.98(8)	10.82(7)	BC	96.0
1 HHH	0.67(4)	0.08(3)	0.26(4)	1.01(3)	0.60(8)	1.58(8)	1.41(8)	1.79(8)	1.90(5)	1.21(7)	0.98(7)	10.49(8)	C	93.0
GRAND MEAN	0.71	0.38	0.47	0.89	0.80	1.76	1.63	1.88	1.93	1.24	1.05	11.08		98.3
% CV	11.0	77.0	28.5	28.1	15.3	8.0	12.2	11.8	8.6	10.9	17.2	6.0		
LSD (.05)	NS	0.25	0.12	0.22	0.10	0.12	0.17	NS	NS	NS	NS	0.56		
(.01)	NS	0.36	0.18	0.29	0.14	0.16	0.23	NS	NS	NS	NS	0.76		

To convert dry tons per acre to hay at 12% moisture, multiply by 1.136.

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

Entries that differ from each other by more than the LSD are significantly or highly significantly different from each other at odds of 19 to 1 (.05) and/or 99 to 1 (.01), respectively.

Table 7. Total season and total fall/winter production from second year of fall/winter harvest of 1984 UC Davis 3 variety X 8 harvest trial. UC Davis, Yolo County. Planted March 12, 1984 at 30 lbs/acre with four replications on Yolo loam soil. 1987. <UC384Y7.1>

Entry	Yield in dry tons per acre, rank in parenthesis												
	Preseason cuts				Cut 1	Cut 2	Cut 3	Cut 4	Cut 5	Cut 6	Total 1987		% of
	10/31/86	12/2/86	3/10/87	Total	4/23/87	5/28/87	6/25/87	7/23/87	8/20/87	9/23/87	1-7+3 WNT		Trmt. 8
3 H-H	1.04		0.78	1.82	1.21	1.74	1.45	1.84	1.71	1.21	10.97(1)	A	113.1
5 -HH		1.15	0.82	1.97	1.12	1.69	1.44	1.82	1.68	1.25	10.96(2)	A	112.9
4 H--	1.03			1.03	1.48	1.91	1.63	1.86	1.77	1.26	10.94(3)	A	112.7
6 -H-		1.16		1.16	1.30	1.84	1.51	1.82	1.62	1.29	10.54(4)	AB	108.6
2 HH-	1.03	0.28		1.31	1.16	1.78	1.47	1.74	1.63	1.24	10.34(5)	ABC	106.6
7 --H			0.94	0.94	1.22	1.73	1.48	1.84	1.65	1.23	10.10(6)	BC	104.0
1 HHH	0.95	0.25	0.49	1.69	0.92	1.49	1.30	1.70	1.54	1.16	9.81(7)	C	101.1
8 ---					1.50	1.84	1.55	1.87	1.69	1.26	9.70(8)	C	100.0
GRAND MEAN	1.01	0.71	0.76	1.42	1.24	1.75	1.48	1.81	1.66	1.24	10.42		107.4
% CV	10.98	10.01	28.90	14.74	13.5	9.2	7.6	7.1	13.1	9.3	6.7		
LSD (.05)	NS	0.07	0.20	0.18	0.14	0.14	0.09	0.11	NS	NS	0.59		
(.01)	NS	0.09	0.29	0.25	0.19	0.18	0.13	0.15	NS	NS	0.81		

To convert dry tons per acre to hay at 12% moisture, multiply by 1.136.

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

Entries that differ from each other by more than the LSD are significantly or highly significantly different from each other at odds of 19 to 1 (.05) and/or 99 to 1 (.01), respectively.

Table 8. Two year normal seasonal yields of fall/winter harvests of 1983 West Side Field Station 3 variety X 8 fall/winter harvest trial. West Side Field Station, Five Points, Fresno County. Planted October 26, 1983 at 30 lbs/acre with four replications on Panoche clay loam soil. 1987. (Marble and Peterson) <WS283Y7>

Entry	Yield in dry tons per acre, rank in parenthesis: Total 1986	Total 1987	Average 1986-87		% of H---
8 ---	8.19(1)	11.28(1)	9.73(1)	A	100.0
6 -H-	8.08(2)	11.05(2)	9.56(2)	A	98.3
2 HH-	7.59(3)	10.31(3)	8.95(3)	B	92.0
4 H--	7.45(4)	10.16(5)	8.80(4)	B	90.4
7 --H	7.12(5)	10.29(4)	8.71(5)	B	89.5
5 -HH	7.05(6)	10.07(6)	8.56(6)	BC	88.0
3 H-H	6.66(8)	9.75(7)	8.21(7)	CD	84.3
1 HHH	6.78(7)	9.48(8)	8.13(8)	D	83.6
GRAND MEAN	7.37	10.30	8.83		
% CV	5.7	5.7	7.1		
LSD (.05)	0.35	0.50	0.37		
(.01)	0.48	0.68	0.50		

LSD's	.05	.01	
Between harvest treatments	0.37	0.51	7.1
Between years	0.11	0.15	4.8
Between years and same harvest treatment	ns	ns	ns

To convert dry tons per acre to hay at 12% moisture, multiply by 1.136.

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

Entries that differ from each other by more than the LSD are significantly or highly significantly different from each other at odds of 19 to 1 (.05) and/or 99 to 1 (.01), respectively.

1985-86 fall/winter harvest dates: 11/20/85; 12/23/85; 3/25/86.

1986-87 fall/winter harvest dates: 1/13/86; 12/15/86; 3/3/87

9. Two year total normal season plus all fall/winter cuts of 1983 West Side Field Station 3 variety X 8 fall/winter harvest trial. West Side Field Station, Five Points, Fresno County. Planted October 26, 1983 at 30 lbs/acre with four replications on Panoche clay loam soil. 1987. (Marble and Peterson) <WS283Y7.1W>

Entry	Yield in dry tons per acre, rank in parenthesis Total 1986	Total 1987	Average 1986-87		% of H---
6 -H-	8.55(1)	11.81(1)	10.18(1)	A	104.6
5 -HH	8.26(2)	11.21(3)	9.74(2)	B	100.1
8 ---	8.19(3)	11.28(2)	9.73(3)	B	100.0
2 HH-	8.12(4)	11.09(4)	9.61(4)	BC	98.7
7 --H	7.95(6)	11.02(5)	9.48(5)	BC	97.4
4 H--	7.94(7)	10.93(6)	9.43(6)	BC	96.9
3 H-H	7.80(8)	10.82(7)	9.31(7)	BC	95.7
1 HHH	7.95(5)	10.49(8)	9.22(8)	C	94.8
GRAND MEAN	8.10	11.08	9.59		98.5
	5.2	6.0	6.9		
SD (.05)	0.36	0.56	0.39		
(.01)	0.49	0.77	0.54		

LSD's	.05	.01	CV %
Between harvest treatments	0.39	0.54	6.9
Between years	0.12	0.16	4.8
Between years for same harvest treatment	ns	ns	4.4

To convert dry tons per acre to hay at 12% moisture, multiply by 1.136.

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Entries that differ from each other by more than the LSD are significantly or highly significantly different from each other at odds of 19 to 1 (.05) and/or 99 to 1 (.01), respectively.

1985-86 fall/winter harvest dates: 1/20/85; 12/23/85; 3/25/86.

1986-87 fall/winter harvest dates: 1/13/86; 12/15/86; 3/3/87.

Table 10. Two year normal season yield without fall/winter harvests after two years of fall/winter harvests for 1984 UC Davis 3 variety X 8 fall/winter harvest trial. UC Davis, Yolo County. Planted March 12, 1984 at 30 lbs/acre with four replications on Yolo loam soil. 1987. (Marble, Schoner and Peterson) <UC384Y7.Y7R>

Entry	Yield in dry tons per acre, rank in parenthesis: Total 1986	Total 1987	Average 1986-87		% of Control
8 ---	9.77(1)	9.70(2)	9.74(1)	A	100.0
4 H--	9.22(3)	9.90(1)	9.56(2)	AB	98.2
6 -H-	9.71(2)	9.38(3)	9.55(3)	AB	98.1
2 HH-	9.19(5)	9.03(6)	9.11(4)	B	93.6
7 --H	9.03(6)	9.16(4)	9.10(5)	B	93.4
5 -HH	9.20(4)	8.98(7)	9.09(6)	B	93.4
3 H-H	8.95(7)	9.15(5)	9.05(7)	B	93.0
1 HHH	8.24(8)	8.12(8)	8.18(8)	C	84.0
GRAND MEAN	9.16	9.18	9.17		94.2
% CV	6.7	6.7	9.0		
LSD (.05)	0.52	0.52	0.50		
(.01)	0.71	0.71	0.68		

LSD's	.05	.01	CV %
Between treatments, same year	0.21	0.28	2.8
Between treatments, different year	0.22	0.30	2.8
Between treatments and variety	0.29	0.38	3.1
Between treatments, variety and year	0.36	0.48	2.8

To convert dry tons per acre to hay at 12% moisture, multiply by 1.136.

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

Entries that differ from each other by more than the LSD are significantly or highly significantly different from each other at odds of 19 to 1 (.05) and/or 99 to 1 (.01), respectively.

1985-86 fall/winter harvest dates: 10/31/85; 12/5/85; 3/19/86.

1986-87 fall/winter harvest dates: 10/31/86; 12/2/86; 3/10/87.

Table Two year summary of normal season yield plus fall/winter harvests after two years of fall/winter harvests for 1984 UC Davis 3 variety X 8 fall/winter harvest trial. UC Davis, Yolo County. Planted March 12, 1984 at 30 lbs/acre with four replications on Yolo loam soil. 1987. (Marble, Schoner and Peterson) <UC384Y7.Y6R>

Entry	Yield in dry tons per acre, rank in parenthesis: Total 1986	Total 1987	Average 1986-87		% of Control
5 -HH	10.46(1)	10.96(2)	10.71(1)	A	110.0
3 H-H	10.29(2)	10.97(1)	10.63(2)	A	109.2
4 H--	9.98(5)	10.94(3)	10.46(3)	AB	107.4
6 -H-	10.25(3)	10.54(4)	10.39(4)	AB	106.7
2 HH-	10.00(4)	10.34(5)	10.17(5)	ABC	104.5
7 --H	9.89(6)	10.10(6)	9.99(6)	BC	102.7
8 ---	9.77(7)	9.70(8)	9.74(7)	C	100.0
1 HHH	9.47(8)	9.81(7)	9.64(8)	C	99.0
GRAND MEAN	10.01	10.42	10.22		104.9
% CV	6.7	6.7	9.1		
LSD .05)	0.57	0.59	0.56		
.01)	0.78	0.81	0.76		

LSD's	.05	.01	CV %
Between harvest treatment, same year	0.22	0.29	2.7
Between harvest treatment, different year	0.24	0.33	3.2
Between harvest treatment and variety	0.33	ns	2.7
Between harvest treatment and variety, different years	0.38	ns	2.7

To convert dry tons per acre to hay at 12% moisture, multiply by 1.136.

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

Entries that differ from each other by more than the LSD are significantly or highly significantly different from each other at odds of 19 to 1 (.05) and/or 99 to 1 (.01), respectively.

1985-86 fall/winter harvest dates: 10/31/85; 12/5/85; 3/19/86

1986-87 fall/winter harvest dates: 10/31/86; 12/2/86; 3/10/87.