more effective with the addition of supreme oil at 2 gallons per acre (table 3). X77 spreader did not prove as effective as oil, but was still more effective than Benlate used alone. A reduction in the rate of Benlate 50 percent W.P. to 1 pound per acre with oil was also effective in controlling scab. Our tests suggested that under normal California weather conditions, Benlate can be effective for 30 days. When rain and showers persist, this period should be shortened to 7 to 14 days. One disadvantage of Benlate not present in Cyprex is that Benlate loses some effectiveness with low volume concentrate applications (tables 1 and 2). Full dilute spray at 400 gallons per acre is needed for optimum control.

Whatever the choice of fungicides, whether it be liquid lime sulfur plus wettable sulfur, Captan, Cyprex, or Benlate, the key to success in an apple or pear scab program is exact timing and full coverage.

More effective monitoring of wet and dry periods, temperatures, and relative humidity (all important factors for infection) is needed in scab-prone districts. Much is known about these relationships, but more research is needed to make monitoring more practical and less time consuming to the growers and consultants.

Tests were also conducted to determine if combinations of Benlate plus Manzate or Benlate plus Dithane M-45 at lower rates would control scab (table 1). These tests were conducted to offset the possible resistance that might occur later and still keep material costs down. This combination gave excellent control. Other orchards in Mendocino, Lake, and Napa counties did show that Dithane M-45 or Manzate 200 has a suppressive effect on both pear psylla and pear rust mite populations.

In summary, with present instrumentation technology and available research, great improvements can be made in the accurate prediction of scab infection periods. With these methods, more effective use of materials for control of both pear scab and apple scab can be made.

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This research was supported by the federally sponsored Pear Pest Management Project and the California Apple Advisory Board.

Influence of Variety and Cutting

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Demand for oat hay has been stimulated by an increasing number of pleasure horses in California. Production now involves more than 250,000 acres annually in the state, on irrigated as well as dry-farmed lands.

Over a ten-year period a number of oat varieties have been evaluated for hay production potential in the Sacramento Valley. Nine trials were conducted in dry-farmed areas near Dunnigan, and two under irrigated conditions at U.C. Davis.

Observations were made on yield per acre and on the factors that influence hay quality: grain yield, disease resistance, early maturity, leafiness, and stem diameter. The influence of cutting stage on yield was evaluated over a two-year period.

In the 10-year testing period four varieties were found most suitable for producing high quality hay—California Red, Montezuma, Sierra, and Curt. (Kanota, which was evaluated only early in the testing period, was found to produce acceptable quality and yield of hay; no data is included in this report.) Each of these varieties has a particular set of qualities that may be of importance to a given farm operation.

Hay yields

California Red oats had the highest average yield, approximately 3.5 tons per acre, over nine years of testing under dry-farmed conditions, but the other varieties all averaged slightly over three tons per acre (table 1). The yield ranking of varieties changed from year to year according to rainfall patterns and the occurrence of the virus disease, barley yellow dwarf. Mild winters and late spring rains were beneficial to all varieties, especially the late-maturing California Red. Barley yellow dwarf virus can cause severe stunting with accompanying low forage and grain yields in susceptible plants. California Red, more than the others, is extremely susceptible to barley yellow dwarf, which caused it to have low production during 1974.

In the two irrigated trials Sierra oats produced the highest yields, and California Red was second, followed by Montezuma and Curt (table 2). Under irrigation all varieties yielded more dry

TABLE 1. HAY YIELD OF FOUR OAT VARIETIES, DRYLAND TRIALS.

Harvest year	Planting date	Yield — Tons dry matter per acre Calif. Red	Montezuma	Sierra	Curt	LSD .05	CV*
1965	12/ 1/64	4.75	–	4.15	3.72	.40	6.9
1966	12/17/65	2.24	–	1.72	2.09	.14	4.4
1967	1/ 2/67	4.58	–	3.36	3.57	.54	11.0
1968	12/18/67	4.29	4.14	3.82	3.69	.44	9.6
1969	12/ 6/68	3.91	3.06	3.16	2.92	.49	9.4
1970	11/18/69	2.58	1.63	2.04	1.53	.42	13.5
1972	11/30/71	3.30	3.41	3.08	3.37	.18	3.6
1974	1/28/74	.99	1.82	1.59	1.43	.48	20.6
1975	11/26/74	4.81	5.18	4.68	4.84	.41	5.8
Avg. yield, all years		3.49	3.21	3.07	3.02	3.19	
Avg. yield, 1968-75		3.31	3.21	3.06	2.96	3.13	

* CV, (Coefficient of Variation) is a measure of amount of unexplained variation present in a particular trial.

Stage on Oat Hay Yields

matter per acre, averaging double the yields of dry-farmed plantings.

Grain yields

The grain portion of the oat plant contributes significantly to its dry matter yield when hay is cut in the dough stage, but is less important when plants are cut at the flower stage. High yielding grain varieties offer the option of harvesting for grain when prices are favorable. Grain yield also is an important factor in the availability of oat seed and its price. Montezuma was the highest grain yielding variety of the four reported. This is due in part to its resistance to grain shatter. Sierra and Curt were slightly less productive than Montezuma but California Red was clearly inferior. The grain shatter of California Red is severe when strong winds occur during the harvest period. Also, grain yield is reduced because of its susceptibility to barley yellow dwarf, which produces the greatest yield reductions when it occurs with plantings made in late January or later. Wherever barley yellow dwarf is a major disease problem, California Red oats should not be used.

TABLE 3. HAY YIELD OF FOUR OAT VARIETIES WHEN CUT AT FLOWER AND DOUGH STAGES OF MATURITY – DRY-FARMED AREA.

	Tons dry matter per acre							
	California Red		Montezuma		Sierra		Curt	
Year	Flower	S. Dough	Flower	S. Dough	Flower	S. Dough	Flower	S. Dough
1968	4.08	4.29	3.47	4.14	3.18	3.82	3.09	3.69
1969	3.04	3.91	2.54	3.06	2.46	3.16	2.30	2.92
Avg. yield	3.56	4.10	3.01	3.60	2.82	3.49	2.70	3.31
% of soft dough yield	87%		83%		81%		82%	

Yield differences between cutting stages are highly significant.

Early maturity

Early harvest can be important with both dryland and irrigated oat hay plantings. Late maturing oats may be lower in quality and yield if they fail to produce grain in exceptionally dry springs. Early harvest may also be of benefit when double cropping is planned. Montezuma was the earliest maturing of those varieties tested. It was harvested from mid to late May in dryland trials, and irrigated croplands reached soft dough in late May (1970) and early June (1975). Curt was one to three days later and Sierra four to six days later than Montezuma. California Red was the latest variety, maturing ten to fifteen days after Montezuma.

Quality characteristics

Although their direct relationship to hay quality is not known, fine stems and leafiness are often considered quality factors in oat hay. California Red was superior to the other three varieties in both characteristics; Curt was next to California Red in fineness of stem and was only slightly less leafy; Montezuma oat stems are slightly larger in diameter and have a less leafy appearance; and Sierra stems can be very coarse when grown in high yielding environments, but have many large, broad leaves. All four varieties are palatable to livestock.

Time of cutting

When early harvest is desirable, oats may be cut during the flower stage (as heads emerge from the boot). Fourteen to twenty-one days earlier harvest can be gained by this system. However, yields will be decreased as compared with dough stage hay (table 3). Yield comparisons of flower and dough stage hays showed these oat varieties yielded an average of 16 percent more dry matter when cut at dough stage. However, feeding tests (*California Agriculture*, May 1958) have shown flower stage hay to be higher in protein and TDN content than oats harvested in milk or soft dough stage, perhaps an advantage to certain classes of livestock. Cutting at flower stage can allow earlier planting of the second crop on irrigated lands where double cropping is practiced.

TABLE 2. HAY YIELD OF FOUR OAT VARIETIES, IRRIGATED AREA TRIALS.

		Yield – Tons dry matter per acre					
Harvest year	Planting date	Calif. Red	Montezuma	Sierra	Curt	LSD. 05	CV
1970	12/ 1/69	6.87	7.03	8.61	5.14	1.05	9.5
1975	11/27/74	7.59	6.26	7.51	5.66	.59	5.5
Avg. yield		7.23	6.65	8.06	5.40	6.83	

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