CHAPTER THREE

VARIETY SELECTION

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Alfalfa growers in the Intermountain Region, like growers elsewhere, need to select alfalfa varieties based on yield and quality performance in their specific region. The varieties best suited for the high-elevation intermountain valleys of northeastern California are different from the varieties adapted to the warmer, longer-season production areas in the remainder of the state.

After choosing varieties with growth characteristics and pest and disease resistances suitable for your area, plant test strips to check their performance under specific field and management conditions. Time and money spent on selecting the most suitable variety will be rewarded with higher yields and a net increase in profits.

YIELD

Economics force growers to be concerned about the yield potential of selected varieties. Many costs associated with crop production are fixed costs, such as those relating to stand establishment, land rent or ownership, and equipment ownership. The increased yield afforded by the selection of an improved variety spreads these costs over greater amounts of hay, which lowers the cost of production per ton of hay produced.

Harvesting alfalfa in variety trial, Tulelake, California.

Restated, it simply costs less per ton to produce high-yielding alfalfa, particularly if the increased yields are the result of a simple change to an improved variety.

STAND PERSISTENCE

Annual yields are important, but it is the yield of the crop over the total years of production, or life of the stand, that determines the actual profitability of the crop. The cost of alfalfa stand establishment is relatively fixed for a given farm operation. The effect of stand establishment costs on overall profitability depends largely on the number of years that the crop is in production. The longer the stand life, the greater the number of years in which to recover the cost of establishment. Generally, growers in the Intermountain Region would like to maintain stands for 5 years or more, with a stand life of 7 years being typical. Failure to meet this goal means that establishment costs will be spread over fewer growing seasons; the total cost of production per year will be higher.

Stand life refers to the need to maintain minimum average plant populations greater than five or six plants per square foot. Fields with stands below this level will have reduced yields (see chapter 15). Also, sparse stands usually produce thick-stemmed, "low-test" hay that may be quite weedy. With the high cost of producing and making hay, growers cannot afford to farm fields when poor stands result in low yields or low-quality hay.

The most important varietal factor in maintaining adequate stands in the Intermountain Region is winter hardiness. The intermountain area is subjected to months of subfreezing winter temperatures. To make things worse, these cold temperatures often occur without the benefit of an insulating blanket of snow. Accordingly, varieties without winter hardiness suffer winterkill and stands may be reduced to subeconomic levels after only one or two seasons. Of course, plant populations can be reduced by other factors, such as disease or cultural mismanagement; but if a variety is not sufficiently winter hardy, optimum management of other production factors will not prevent winter stand loss.

FALL DORMANCY

A major component of winter hardiness is fall dormancy. *Dormancy* refers to a variety's tendency to cease growth in the fall as days shorten and temperatures drop. Dormant varieties begin growing again in the spring as soil temperatures warm. The fall dormancy of a variety can be classified based on industry standards for fall regrowth. On this scale, the dormant variety Vernal is rated as a 2, less dormant varieties similar to Ranger receive the rating of 3, and semidormant varieties similar to Saranac are grouped in class 4 (Table 3.1 and Figure 3.1).

Plants that are winter dormant are much less susceptible to cold temperatures and winterkill (Figure 3.2). Less-dormant varieties that begin growth early in the spring may be hit by early spring frosts that can damage both yield and quality of the first cutting (Figure 3.3; see color photo 3.1). In contrast, the yield of third or fourth alfalfa cuttings may be reduced in dormant varieties that go dormant early in the fall.

Thus, the selection of a variety with the proper dormancy is a compromise. Select varieties that are sufficiently dormant to assure winter survival and to prevent premature spring growth, but do not select those varieties that are so dormant that valuable growing days are lost in spring and fall. In studies conducted in Tulelake, California, the varieties that produced the highest yields with adequate winter survival tended to be in fall dormancy class 3 (Figure 3.4). In intermountain areas with warmer, longer growing seasons, dormancy class 4 varieties may be better performers. Dormancy class 2 varieties would perform better in

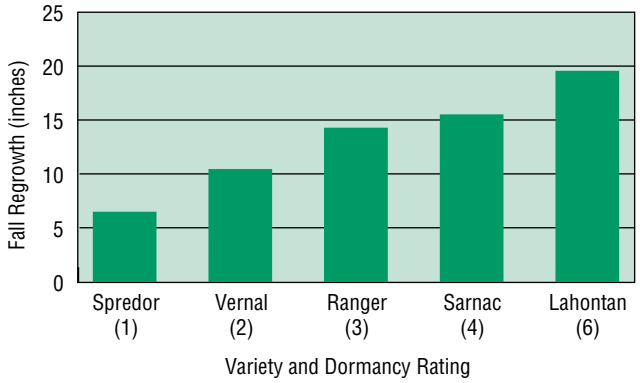

Figure 3.1. Observed fall regrowth of standard varieties for fall dormancy rankings. (Data were gathered in a 1986 variety trial, Tulelake, California.)

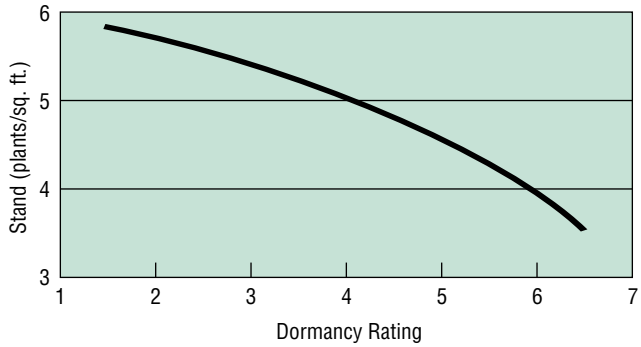

Figure 3.2. Fall dormant varieties are less susceptible to stand loss from winterkill. (Data were gathered in fifth-year stands in a variety trial planted in 1981, Tulelake, California.)

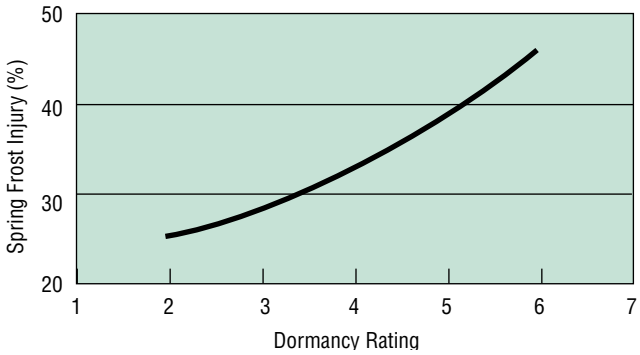

Figure 3.3. Spring frost injury is more likely with less-dormant varieties. (Data were gathered in a 1985 variety trial, Tulelake, California.)

Table 3.1. Alfalfa varieties categorized by fall dormancy class, which are based on fall growth.

FALL DORMANCY CLASS	STANDARD VARIETY	EXAMPLE VARIETIES
1 (very dormant)	Norseman	Spredor 3
2 (dormant I)	Vernal	DK 122, Avalanche +Z
3 (dormant II)	Ranger	Blazer XL, Centurion
4 (moderately dormant I)	Saranac	Agressor, Webfoot MPR
5 (moderately dormant II)	DuPuits	Archer, Robust
6 (semidormant)	Lahontan	
7 (moderately nondormant)	Mesilla	
8 (nondormant)	Moapa 69	
9 (very nondormant)	CUF 101	

Table 3.2. General guidelines for varietal pest and disease resistance needed in the Intermountain Region.

PEST OR DISEASE	RESISTANCE CLASS
Bacterial wilt	Resistance (R)
Verticillium wilt	Resistance (R)
Fusarium wilt	High resistance (HR)
Southern anthracnose	Resistance (R)
Phytophthora root rot	Resistance (R)
Spotted alfalfa aphid	Susceptible (S)
Pea aphid	Resistance (R)
Blue alfalfa aphid	Moderate resistance (MR)
Stem nematode	Resistance (R)
Root-knot nematode	Resistance (R)

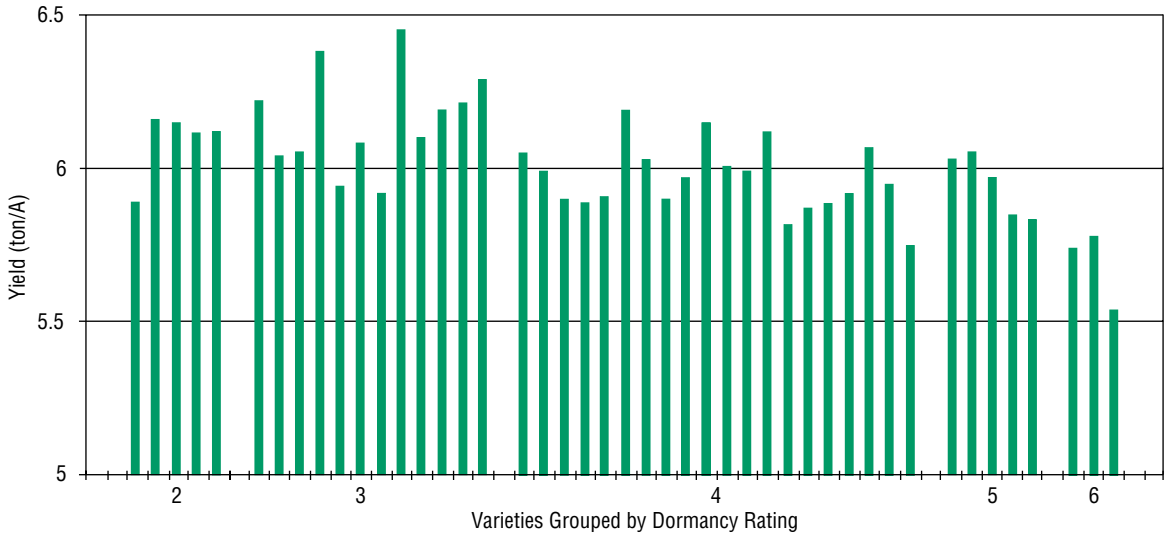

Figure 3.4. In Tulelake, California, varieties with a dormancy ranking of 3 provide the best average yield performance. Some varieties in dormancy rankings 2 and 4 perform well also. (Data reflect 6-year average yields from 45 varieties, 1981–86.)

intermountain areas with seasons that are cooler and shorter than those typical of the Tulelake region. These distinctions are not absolute. Growers should consider varieties with dormancy ratings one above and one below the rating generally recommended for your region.

PEST AND DISEASE RESISTANCE

The yield performance and stand life of an alfalfa variety are assumed to be related to the pest and disease resistance of the cultivar. Cultivar resistance may be less important in the Intermountain Region than in other areas, however. Many areas in the Intermountain Region are not plagued by several of the serious disease and pest problems that significantly limit alfalfa production in other regions. A variety with little pest or disease resistance may perform very well there. This does not mean that pest and disease resistance are not important—it only indicates that a review of yield results from one area may not show the whole picture.

In specific fields, varietal pest and disease resistance may be critical. For example, high resistance to Phytophthora root rot may not be needed in the very well drained soils common in areas such as Tulelake,

Table 3.3 Fall dormancy and pest resistance ratings for alfalfa varieties

		PEST RESISTANCE**									
	FALL DORMANCY*	BACTERIAL WILT	VERTICILLIUM WILT	FUSARIUM WILT	ANTHRACNOSE RACE 1	PHYTOPHTHORA ROOT ROT	SPOTTED ALFALFA APHID	PEA APHID	BLUE ALFALFA APHID	STEM NEMATODE	NORTHERN ROOT-KNOT NEMATODE
Spredor 3	1	HR	MR	HR	R	MR	S	MR	—	MR	—
5262	2	HR	LR	MR	—	R	R	R	—	MR	—
Agate	2	HR	—	HR	MR	R	—	—	—	—	—
Alfagraze	2	MR	—	R	MR	LR	—	R	—	R	—
Avalanche + Z	2	HR	HR	HR	HR	HR	—	R	—	MR	—
DK122	2	HR	R	R	HR	HR	MR	R	—	—	—
Pacesetter	2	HR	R	R	HR	HR	—	—	—	—	—
Sterling	2	HR	R	HR	HR	HR	R	R	—	—	—
Vernal	2	R	—	MR	—	—	—	—	—	—	MR
WL 252 HQ	2	HR	R	HR	HR	HR	MR	R	LR	R	—
120	3	HR	—	LR	LR	R	—	R	—	—	—
5246	3	HR	R	HR	HR	HR	R	R	—	MR	—
5396	3	R	R	R	HR	R	R	R	—	HR	MR
Achieva	3	R	R	HR	HR	HR	R	R	—	MR	—
Arrow	3	HR	R	HR	MR	HR	—	R	—	MR	—
Blazer XL	3	R	R	HR	HR	HR	HR	R	—	R	—
Centurion	3	HR	R	R	R	R	MR	R	—	—	—
Class	3	HR	R	R	HR	HR	R	R	—	MR	—
Columbo	3	R	HR	HR	R	R	R	HR	—	MR	MR
Guardian	3	HR	HR	HR	HR	HR	—	HR	—	R	R
Innovato+Z	3	HR	HR	HR	HR	HR	MR	R	S	R	—
MultiKing 1	3	HR	R	HR	R	R	MR	MR	—	MR	—
Oneida VR	3	R	HR	HR	MR	MR	—	—	—	—	—
Treasure	3	HR	R	HR	HR	R	MR	R	—	MR	—
Ultra	3	R	R	HR	HR	R	LR	R	—	R	—
Victory	3	HR	R	HR	HR	MR	—	—	—	—	—
Webfoot	3	R	—	MR	—	R	—	—	—	—	—
5364	4	R	MR	R	MR	MR	HR	HR	—	R	—
5472	4	HR	MR	HR	MR	MR	R	HR	—	R	—
Affinity +Z	4	HR	HR	HR	HR	HR	—	R	—	R	—
Agressor	4	HR	R	HR	HR	HR	MR	HR	MR	MR	—
Allstar	4	HR	R	HR	HR	HR	LR	R	—	R	MR
Apollo Supreme	4	HR	R	HR	HR	R	—	HR	—	—	—
Aspen	4	HR	R	HR	HR	HR	—	HR	—	R	R
Cimarron VR	4	HR	R	HR	HR	R	HR	HR	MR	R	—
Crystal	4	HR	R	HR	R	HR	LR	R	MR	MR	—
DK133	4	HR	R	HR	HR	HR	R	R	—	MR	—
Extend	4	HR	R	R	HR	HR	—	HR	—	R	—
Fortress	4	R	R	R	—	HR	HR	R	—	HR	—
Laser	4	HR	R	HR	R	HR	MR	—	MR	—	MR
Magnum III	4	R	MR	R	MR	R	MR	R	MR	MR	—
MagnumIV	4	HR	R	HR	R	HR	MR	—	MR	R	MR
Webfoot MPR	4	HR	HR	HR	HR	HR	—	R	—	—	—
WL 322 HQ	4	HR	R	HR	MR	R	HR	HR	R	LR	LR
WL 323	4	HR	R	HR	HR	HR	MR	R	—	HR	—
Archer	5	MR	MR	HR	R	R	HR	HR	R	R	R
Robust	5	R	R	HR	R	R	R	R	MR	R	MR
Lahontan	6	MR	—	LR	—	LR	MR	LR	—	R	—

***Fall Dormancy Ratings**
1 = Very dormant
2 = Dormant I
3 = Dormant II
4 = Moderately dormant I
5 = Moderately dormant II
6 = Semidormant

****Pest-Resistance Ratings**
S = Susceptible
LR = Low Resistance
MR = Moderate Resistance
R = Resistance
HR = High Resistance

Source: Association of Official

but high resistance to this disease is clearly required in wet, poorly drained fields in other intermountain production areas. Likewise, stem nematode resistance may not be important in the region as a whole, but it is critical in fields that have stem nematode infestations.

Although the minimum resistance levels required will vary for different fields and production areas, the guidelines in Table 3.2 are helpful when considering resistance needs for a field about which little is known. As more is learned about the problems in a specific field or area, the grower can select varieties with more or less resistance than suggested; the important thing is to counter a problem with a variety with resistance to it. Pest and disease resistances that may be critical in specific fields include resistance to bacterial wilt, Phytophthora root rot, Fusarium wilt, anthracnose, pea aphid, stem nematode, and root knot nematode.

The serious crop-threatening disease Verticillium wilt has recently been identified in a few isolated fields in the Intermountain Region. Because of the potential seriousness of Verticillium wilt, intermountain producers may wish to select varieties with resistance to this disease.

For information on relative resistance of varieties, refer to Table 3.3 or obtain a current copy of *Fall Dormancy and Pest Resistance Ratings for Alfalfa Varieties* produced by the Certified Seed Council (Davis, California). Note that resistance in a variety is not absolute. Alfalfa varieties have diverse genetic backgrounds, so a portion of the plants of resistant or even highly resistant varieties may be susceptible to the rated pest or disease. Table 9.1 (chapter 9) explains the resistance rating system and describes the percentage of resistant plants in each rating category.

HAY QUALITY

Quality is critical to the sale price of alfalfa hay. Growers need to match the quality of the hay produced with the demands of the market in which they choose to sell. For example, dairy hay demands a premium price but must also meet exacting quality test standards. Ideally, growers should select varieties to meet such criteria. Unfortunately, it is not that simple. Many factors other than variety selection affect hay quality. Factors such as stand density and cutting schedule have a great effect on quality. As mentioned, hay quality will decline as plant stands thin. Generally, alfalfa cut at an early stage of maturity is of higher quality than more mature alfalfa (see chapter 11). Management of irrigation, fertilizer, weeds, insects, and disease can have major impacts on hay quality. Because of the confounding effects of all these factors, measuring small differences in quality among different varieties is extremely difficult. One variety may produce the highest-quality hay under one set of conditions, but it may not perform as well as other varieties when grown under different management.

Never use yield results from a single cutting or even a single year to make a variety selection

This is not to say that quality differences among varieties do not exist—only that such differences are generally small and difficult to measure. Accordingly, very little unbiased information is currently available to help growers distinguish one variety from another on the basis of quality. Improved hay quality is a major emphasis in the current breeding programs of major alfalfa seed companies, and new varieties with measurable improvement in quality characteristics may be forthcoming in the near future. For now, the best available recommendations in regard to quality are to maintain healthy plant stands and to match the cultural and cutting management of a field to the growth characteristics of the variety selected (see chapter 11).

SOURCES OF INFORMATION

This chapter has already mentioned the information available from the Certified Alfalfa Seed Council. In addition, seed company representatives are a ready source of information about specific alfalfa varieties. Do not hesitate to ask pointed questions about variety dormancy groups, pest and disease ratings, and relative yield and quality performance in your area. The University of California (UC) is another source of

information. For years UC has conducted large alfalfa variety trials at the Intermountain Research and Extension Center in Tulelake, and UC Farm Advisors have conducted many variety tests in the major alfalfa-producing valleys throughout the intermountain area. Farm Advisors can provide growers and seed handlers with the performance results from these studies.

INTERPRETING YIELD TRIAL RESULTS

Performance information can be gleaned from reports of university-conducted research, provided that the tests were conducted under representative climatic conditions and management. Remember, the closer the test was to home, the greater the likelihood that research information will apply to a specific set of local conditions. Also, where possible, select varieties that have been in trials for multiple years at more than one location. A variety will be exposed to a range of cutting and weather conditions in different fields and over the life of the stand. The greater the number of years and locations tested, the greater the likelihood that the test data will reflect the various conditions a variety may encounter. Never use yield results from a single cutting or even a single year to make a variety selection.

In reviewing test results, avoid the temptation to automatically select the top-yielding variety. Typically, varieties yielding near the top of a given trial have measured yields only a small fraction of a ton less than those of the top-yielding variety. Such small differences may be the result of very small errors in the experimental technique. It is prudent to look at all the varieties in the top-yielding group and make final variety selections based upon factors in addition to yield. Such factors include relative pest and disease resistance, quality, experience with or information about the varieties, and seed price.

Once a new variety is selected, consider planting small test strips, 1 to 5 acres in size, of the new variety to check performance under your specific field and management conditions. Do not plant test strips on the edge of a field or in isolated or poor areas of the field. In a fair test the new variety receives management typical for the field. Count bales from the test strips to estimate yield and collect separate samples from the bales to determine quality.

VARIETIES, BRANDS, AND BLENDS

This chapter refers primarily to alfalfa varieties recognized by the Association of Official Seed Certifying Agencies. Alfalfa seed can also be purchased as trade name brands or as blends of various brands and varieties. Like recognized varieties, some blends and brands perform well and some perform poorly. The dilemma in dealing with blends and brands is that you cannot be sure that the material tested and discussed in reports of experimental trials is the same as will be sold under that specific name in the future. The varieties that make up a blend often vary from year to year, depending on seed availability. When you purchase a blend or brand because you used it successfully in the past, make sure that what you buy actually has the same components as the combination you bought before.

SEED PRICE

Paying extra money for seed of a variety that does not outperform seed of a less expensive cultivar is certainly foolish. On the other hand, it takes only a small difference in yield or stand life to justify a large difference in seed cost. For example, a grower who pays an extra dollar per pound for seed of a new variety that provides as little as a 5 percent improvement in yield (about 0.33 ton per acre per year, for a 6-year period) is money ahead. At planting the seed costs an extra $20 per acre, but over the life of the stand it provides an average increase in net profits of $200 per acre. As a rule, money used to purchase high-quality, certified seed of a locally adapted variety is money well spent.

ADDITIONAL READING

Certified Alfalfa Seed Council. 1994. *Fall dormancy and pest resistance ratings for alfalfa varieties.* Davis, CA: 1994/95 edition.

Hill, R. R., Jr., J. S. Shenk, and R. F. Barnes. 1988. Breeding for yield and quality. In A. A. Hanson, D. K. Barnes, and R. R. Hill, Jr. (eds.), *Alfalfa and alfalfa improvement,* 809–25. Madison, WI: American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America. Number 29.