Cooperative Extension
Colorado State University, Fort Collins, Colorado 80523

Colorado State University

AGRON-  -GRAM

October, 1986

Since we have been getting a number of questions on alfalfa, we decided to devote most of this newsletter to alfalfa. The first paper written by Dan Smith and John Shanahan is on the "New Recommendations for Alfalfa Hay Quality Evaluation." In the second paper, John Shanahan and Bill Brown summarize information from the Certified Alfalfa Seed Council on the "Important Characteristics of Various Alfalfa Varieties."

I have been told by many of you that you do not receive the Technical Reports. Attached to this newsletter are two technical reports on the fertilization of dryland winter wheat.

The Extension Agronomy Team

Mark Brick
Extension Agronomy Specialist

Robert L. Croissant
Extension Agronomy Specialist

Ted Davis
Extension Seed Certification Specialist

James Echols
Extension Agronomy Specialist

R. Hunter Follett
Extension Agronomy Specialist (Soils)

James Hain
Research Associate

John Shanahan
Extension Forage Specialist

Steve Workman
Extension Soil Test Specialist

FILE: Alfalfa Quality
October, 1986

NEW RECOMMENDATIONS FOR ALFALFA HAY QUALITY EVALUATION

by

D. H. Smith and J. F. Shanahan
Department of Agronomy
Colorado State University

Forage quality evaluation is a vital component of forage management and feeding systems. Quality measures based on sensory evaluation (appearance, odor, etc.) are inadequate because they are subjective. Laboratory methods of determining quality can provide a basis for objective evaluations that can be used in orderly marketing and efficient utilization of forages. Unfortunately, the existing hay grading standards recognized by the Federal Grain Inspection Service are based on sensory characteristics. These standards are largely ignored by producers and buyers of hay and have proven inadequate in ration formulation. Sampling procedures and sample handling are other factors to be considered in hay testing. However, adequate guidelines for sampling have not been widely publicized.

The U.S. Alfalfa Hay Quality Committee was established in 1982 to address issues involving alfalfa hay quality testing. This committee, which is composed of industry, university, and USDA representatives from throughout the US, recently presented their recommendations for establishing uniform alfalfa hay sampling and testing procedures. The Committee has also established a national laboratory certification program to promote uniformity in the analytical methods used by laboratories. Standardized terminology for visual appraisal of hays was also proposed. These recommendations apply specifically to all forms of unground alfalfa hay, but they can also be used for ranking grass hays if the analytical values from these hays are not directly compared to those from alfalfa. These recommendations offer unique opportunities for more efficient marketing and utilization of alfalfa hay, both in Colorado and throughout the US. This report provides an overview of the recommendations.

Hay Sampling Methods and Equipment

Laboratory analytical values are useful only if the sample analyzed is representative of an identifiable quantity of hay that is relatively uniform in quality. Therefore, the first step in sampling is to identify and define this hay. Hay is generally grouped into units called lots. Although there can never be a single definition that would cover all the possible exceptions, the Committee did provide specific guidelines for grouping hay into separate lots. An individual lot can be designated as all

the hay harvested from a given location or field at one cutting provided that stage of maturity is uniform and the duration of cutting or packaging (baling) does not exceed 48 hours.

Using this definition, the size of a lot could range from one to several hundred tons. Ideally, a single lot should not consist of more than 100 tons of hay. In some cases, buyers may specify an optimum size for each lot. Whatever the size, producers are responsible for separating and identifying lots to insure uniformity. This requires being observant of any factors, even within a field, that could cause the forage quality of one group of hay to differ from another.

One sample for each individual lot of hay should be collected for laboratory analysis. The sample should be taken from the final packaged product and consist of several subsamples selected at random from throughout the lot. After a lot has been sampled, all subsamples should be combined and placed in a durable plastic bag or some other sealed container to prevent moisture loss.

The method of sampling will vary with the type of hay package produced. Cube sampling is accomplished by selecting individual whole cubes. Bales and compressed loaf-type stacks should be sampled using a coring device with an internal diameter of at least 3/8 of an inch that is long enough to be inserted at least 12 inches into a bale. Excellent home-made core samplers have been constructed from items such as ski poles and golf club shafts. In addition, commercial core samplers can be obtained from the following sources:

Nasco West
1524 Princeton Avenue
Modesto, CA 95354

Northwest Ag., Inc.
P.O. Box 238
Culver, OR 97344

Malm Metal Products
P.O. Box 4299
Santa Rosa, CA 95402

Oakfield Apparatus, Inc.
P.O. Box 65
Oakfield, WI 53065

Information on methods of collecting subsamples and the number required for a 'true' representative sample is not yet complete. However, the Committee did provide tentative recommendations for immediate use while further research on this subject is being conducted. At least 20 whole cubes should be randomly selected from an entire lot. For compressed bales, cores (subsamples) should be taken from each of 20 to 25 randomly selected bales. Individual cores should be taken from the center of compressed ends of rectangular and square bales by inserting the coring device horizontally. For round bales, the cores should be obtained from around the circumference of the bale with the coring device directed toward the center of the bale. Loaf-type packages can be sampled from any side with cores taken at a slight angle (either up or down) rather than horizontally.

After the sample has been sealed in an air-tight bag, it should be labelled to identify the lot represented by the sample and the grower's name, address, and phone number. Some laboratories provide bags with labels on which the appropriate information can be supplied. Sealed and labelled samples should be promptly submitted to a laboratory along with a written statement of the analyses being requested.

Hay sampling is as important in the hay evaluation process as the laboratory analyses used. If the techniques used in sampling and identifying lots are poor, the potential benefits from the analytical results will not be realized.

Laboratory Analysis and Data Interpretation

Forage quality and nutritive value are terms used to describe how well a forage will satisfy the animal's requirements for various nutrients. A complete list of nutrient requirements would include components such as vitamins, minerals, protein, and energy. Laboratory estimates of crude protein and digestible energy are the most useful measures of overall forage quality, because these nutrients are required in the greatest quantities by livestock. The presence of undesirable components such as toxins is an additional factor affecting quality. Laboratory analysis can also be used to detect these problem components when their presence is suspected.

Measurements of protein content in forages are obtained by determining total nitrogen and converting the values obtained to an expression of crude protein content. Energy availability, which can be expressed as digestible energy or total digestible nutrients (TDN), is indirectly evaluated under laboratory conditions by determining fiber content. Laboratory determination of crude protein is relatively straightforward, and the results from different labs are usually consistent. Unfortunately, laboratory methods for estimating fiber content vary greatly among laboratories. In addition, the conversion systems used to predict energy availability from fiber content are not uniform. The purpose of the Committee's recommendations on laboratory testing was to promote uniformity in hay testing procedures and to provide information for producers, buyers, feeders, and laboratories rather than to impose a set of arbitrary standards on the hay industry.

The Committee concluded that the best information on hay quality for marketing purposes can be obtained by requesting laboratory analyses for oven-dry moisture, crude protein, and acid detergent fiber content. The procedures recommended for moisture and protein analysis are already used by most laboratories. With respect to fiber analysis, however, the Committee's recommendations differ from what is currently practiced in many labs. Acid detergent fiber analysis was judged superior to commonly used crude fiber methods as the best measure of fiber

content. Although the Committee only issued recommendations on analyses to be used primarily for hay marketing purposes, other analytical data, such as mineral or nitrate content, may be useful.

Because fiber content and forage quality are negatively related, a conversion equation was also provided to calculate digestible dry matter, which is positively correlated with quality, from acid detergent fiber. An additional conversion equation was furnished for calculating digestible energy values. The equations are as follows:

$$\% \text{ DDM} = 88.9 - 0.779(\% \text{ ADF})$$
$$\text{DE} = -0.027 + 0.0428(\% \text{ DDM})$$

where: DDM = estimated digestible dry matter,
ADF = acid detergent fiber, and
DE = estimated digestible energy expressed as Mcal/kg.

Representative analytical values and estimated DDM and DE values for typical alfalfa hays harvested at various stages of maturity are presented in Table 1 along with a description of sample grade hay.

Marketing strategies based on hay quality can be devised using individual analytical values or combinations of these values. The estimates of moisture and crude protein content and DE can also be used directly in ration formulation. Although widely applicable, the recommended evaluation system does have some limitations. Analytical and predicted values for crude protein and digestible energy are not reliable if the hay has undergone heat damage. If black or brown discoloration is obvious upon sampling, this should be noted on the description sheet (see next section on visual appraisal). Extreme discoloration may indicate that lab analysis is unnecessary as a marketing tool because the hay would be classed as 'sample grade' regardless of the analytical results. In some instances, an analysis of the extent of heat damage can be conducted by determining the quantity of nitrogen present in the acid detergent fiber. Not all laboratories offer heat damage analysis as a routine service, so one should check with the lab before submitting samples suspected of heat damage.

Another limitation is that the estimated digestible energy values should not be used to determine comparative market values of alfalfa and grass hays. The estimates are valid for both types of hays, but they do not account for differences in intake; therefore, market values of alfalfa and grass hays should be established separately.

Even when common procedures are used, analytical results can vary among different laboratories. This variation would eventually render a program of uniform testing recommendations

useless. To encourage uniformity in hay testing and aid laboratories in becoming familiar with the recommended procedures, the Committee established a lab certification program. Certification consists of sending standard hay samples to laboratories several times each year, comparing the results from all labs, and publishing the names of those that produce values considered within a normal range of accuracy. Lists of certified laboratories will be distributed as they become available from the Laboratory Certification Subcommittee.

Table 1. Representative analytical values and estimated digestible dry matter (DDM) and digestible energy (DE) values for alfalfa hays harvested at various maturity stages.

Stage of Maturity	Crude Protein	Acid Detergent Fiber	DDM	DE
	% of Dry Matter			Mcal/kg
Pre-bloom	> 19	< 31	> 65	> 2.76
Early bloom	17-19	31-35	62-65	2.61-2.76
Mid-bloom	12-16	36-40	58-61	2.46-2.60
Full bloom	< 12	> 40	< 58	< 2.46

Sample grade: Hay that contains more than a trace of injurious foreign material (toxic or noxious weeds and hardware); is undercured, heat damaged, hot, musty, moldy, caked, badly broken, or severely weathered; or contains more than 20% foreign material or more than 20% moisture.

Visual Appraisals of Hay

Laboratory testing is the most accurate and objective tool for evaluating hay quality, but visual appraisal also serves a useful purpose. In some instances, buyers may be more familiar with sensory measures of quality such as color and odor than with analytical values. More important, heat damage and the presence of foreign material or injurious foreign material cannot be detected directly by laboratory analysis. However, the informal terminology normally used to visually appraise hay is not standardized. The Committee carefully evaluated the role of visual appraisals and proposed a standardized description sheet, which should be completed by the seller or someone designated by the seller or buyer for each lot of hay. An example of the proposed description sheet is provided at the end of this document.

The primary consideration in completing the description sheet is the buyer's satisfaction. Maintaining good records during all phases of haymaking will help in providing accurate information. Most of the categories under 'hay description' can be completed by observing core samples obtained from chemical analysis. Foreign material estimates can be obtained from cores and field observations prior to cutting and after windrowing. Some hay inspectors use a device similar in shape to a crochet hook to obtain interior samples from a bale for visual inspection. Descriptions for hay cubes will usually be based on windrow observations. A brief guide for completing the description sheet is provided below.

LAB INFORMATION: Enter name of lab that conducted the analysis and the number assigned by the lab.

NAME AND ADDRESS: Give for individual performing the appraisal.

DATE: Date the appraisal was made.

LOT IDENTIFICATION:

Farm: Farm name (or owner's name) and town.

Harvest Date: Date the hay was stacked.

Lot Code: Code used by seller to identify lot.

Field Location: Field number or other means of describing the field. (Could be same as lot code.)

Maturity: Pre-bloom - no plants blooming; early bloom - flowers present on less than 50% of plants; late bloom - flowers present on more than 50% of plants.

Cutting Number: Cutting number for current year's production.

LOT DESCRIPTION:

Quantity: Estimated of the entire lot.

Storage: Uncovered, tarped, straw-covered, open shed, enclosed barn, etc.

Bale Type and Size: Type (round, square, rectangular, or cubes), number of wires or strings, and dimensions.

HAY DESCRIPTION:

Chemical Treatment: If used, indicate type (preservative or drying agent), brand name, and amount applied.

Color: Estimate color ranging from dark green to bleached. If brown or black, add 'heat damaged' to color description.

Odor: Score as fresh, dull, light musty, moderate musty, moldy.

Foreign Material: Estimate total amount of all foreign material, then name the type of noninjurious foreign material such as straw, grasses, weeds, etc.

Injurious Foreign Material: Same as above for only injurious material. Examples include noxious weeds, blister beetle, hardware, or rocks. Presence of excessive pesticide should also be noted. Describe to the extent possible any substance that would make the hay undesirable .

Leaf Attachment: Approximate percentage of leaves still attached to stem.

Leaf Retention: Proportion of leaves originally on plants retained in bale (Excellent=high retention, Poor=low).

Visible Mold: If mold present, indicate degree of discoloration from 'light cure discoloration' to 'obvious white mold'. If mold present, reappraise color for heat damage.

Stem Texture: Give size and hardness of stems. Size should range from coarse to fine. For hardness, use palm of hand to break over cut ends of stems at bale edges. Hard, tough stems will be painful to the palm of hand.

Potential Weather Damage: Estimate amount of precipitation during curing and storage and approximate time during curing when rainfall occurred.

Other Descriptive Comments: Include any additional comments that would help a buyer to 'visualize' the status of the hay.

ALFALFA HAY DESCRIPTION SHEET

LAB INFORMATION:
Lab Name_____

Sample Number_____

DATE_____

NAME_____

ADDRESS_____

LOT IDENTIFICATION

Farm_____ Maturity_____

Harvest Date _____ Lot Code_____ Cutting Number _____

Field Location_____

LOT DESCRIPTION

Quantity_____ Storage_____

Bale Type and Size_____

HAY DESCRIPTION

Chemical Treatment_____

Color_____ Odor_____

Foreign Material_____

Injurious Foreign Material_____

Leaf Attachment_____ Leaf Retention_____

Visible Mold _____ Stem Texture_____

Potential Weather Damage_____

_____

Other Descriptive Comments_____

_____

Hay Inspected by _____
(Signature)

FILE: Alfalfa Varieties
October, 1986

Important Characteristics of Various Alfalfa Varieties

J.F. Shanahan and W.M. Brown[1]

Introduction

There are over 100 certified alfalfa varieties currently marketed in the United States. More than half of these varieties have been released in the last five years. This has made it difficult to keep up to date on available varieties and their characteristics.

The organization of Certified Alfalfa Seed Council has compiled a listing of currently available certified alfalfa varieties and their important agronomic traits (shown in the following Table). The descriptions were provided by the developers of each variety and confirmed by the National Alfalfa Variety Review Board. The descriptions are grouped by fall dormancy scores and include a resistance rating for each of the major alfalfa diseases and insects. The format was designed to facilitate comparisons among varieties.

About 15% of the available certified alfalfa varieties were developed by public institutions, such as land grant universities and the USDA, which are sold by many different marketers. The remainder were developed by private seed companies, which are sold only by specific marketers.

Fall Dormancy

Fall dormancy ratings are an important trait to consider when selecting a variety for production in Colorado. The rating scheme used in this publication involves a scale of 1 to 8, with 1 being highly dormant and 8 being nondormant. Dormant varieties will exhibit marked reductions in growth with approaching fall conditions; whereas, nondormant varieties continue to grow under these same conditions. Dormant varieties have a higher level of winter hardiness than nondormant varieties and, therefore, will survive under harsher winter conditions than nondormant varieties. The varieties evaluated by CSU in the performance trials located throughout Colorado have been in the fall dormancy rating range of 1-5. However, varieties in the 5 category have been evaluated only in the Arkansas and Grand Valley areas of the State. Therefore, their use should probably be restricted to these areas of the state.

[1](Assistant Professor and Extension Forage Crop Specialist, and Associate Professor and Extension Plant Pathologist, respectively; Dept. of Agronomy, and Plant Pathology and Weed Science, respectively, Colorado State University)

Insect Pests

The most important insect pests in Colorado are the Spotted Alfalfa Aphid (SAA), Pea Aphid (PA), Alfalfa Weevil and Blister Beetles. While chemical management is possible, resistance for the Spotted Alfalfa Aphid (SAA) and the Pea Aphid (PA) is available and should be considered in varietal selection where other factors are not limiting. There is also resistance available for the Blue Alfalfa Aphid (BAA), but this insect is not a state-wide problem, being found principally in the southeast area of the state. There is some resistance available to Alfalfa Weevil, but such varieties have not yet been extensively tested and their potential under Colorado conditions is still unknown. No resistance is presently available for any of the Blister Beetle species known to occur in Colorado. Management of these latter problems must continue to center on timely insecticide application and biological control alternatives where available.

Disease Pests

While many insect problems are readily approached with chemical, biological, or other management tools, disease problems many times can only be controlled through deployment of resistant varieties. Thus, disease resistance can be a very important consideration in variety selection. Fortunately Colorado, with its semi-arid environment, does not have the multitude of disease problems in alfalfa that occur in many parts of the U.S. and the world.

The most important alfalfa diseases in Colorado vary according to the location. On the western slope the Fusarium fungi, both crown rot and wilt types are frequently encountered. In many instances where these fungi have been recovered from declining alfalfa stands, there and elsewhere in the state, stem nematode (SN = Ditylenchus dipsaci) has also been present. At the present time the relative importance of Fusarium species and stem nematode is undetermined. Stem nematode can be found in the state and may be difficult to manage. There are no chemical controls presently available. Stem nematode resistance should be given a high priority in most areas and varieties such as Vancor, DeKalb-Pfizer 120, Garst 629 and Blazer that have resistance to both Fusarium wilt (FW) and stem nematode (SN), and where other factors are not limiting, would be extremely valuable.

Bacterial wilt (BW), Verticillium wilt (VW), and Root Knot Nematode (RKN) have not been encountered to any great extent in the state. Bacterial wilt (BW) historically has been reported as a problem in the Arkansas Valley and should be considered in that area. Verticillium wilt (VW) and Root Knot Nematode (RKN) have not yet been reported in the state and presently are not a consideration in varietal selection. Phytophthora Root Rot (PRR)

is a very important problem where it is found. In areas with heavy soils, excessive water, and/or high water tables, such as parts of the lower San Luis Valley, Phytophthora Root Rot (PRR) is the most important consideration in variety selection.

Foliar diseases such as Downy Mildew and Anthracnose (AN) will occasionally be encountered, but are not significant problems. Generally these kinds of diseases are best managed by early cutting which results in eliminating infected leaves and further sources of subsequent crop infection.

Rhizoctonia root and crown rot is a disease that is being more frequently encountered. At the present time we have little information on this disease and potential varietal resistance for it. Rotation is presently the only significant management option for control of Rhizoctonia. There are not available chemical alternatives and, thus, a 4-5 year rotation must be considered where this disease becomes a problem.

Alfalfa Variety Characterization

VARIETY	MARKETER	FD	BW	VW	FW	AN	PRR	SAA	PA	BAA	SN	RKN
MAVERICK	AGRIPRO	1	R	--	R	--	MR	--	--	--	--	--
SPREADOR 2	NORTHRUP KING	1	HR	--	MR	--	--	--	--	--	--	--
AGATE	PUBLIC	2	HR	--	HR	MR	R	--	--	--	--	--
BAKER	PUBLIC	2	HR	--	R	LR	--	HR	HR	--	--	--
DAWSON	PUBLIC	2	R	--	R	--	--	R	R	--	--	--
GARST 636	GARST	2	HR	R	R	MR	R	--	--	--	--	--
IROQUOIS	PUBLIC	2	R	--	--	--	--	--	--	--	--	--
MOHAWK	PUBLIC	2	HR	--	R	HR	--	--	--	--	--	--
ONEIDA	PUBLIC	2	HR	--	R	--	HR	--	--	--	--	--
VANCOR	NORTHRUP KING	2	HR	--	R	R	MR	--	MR	--	R	--
VERNAL	PUBLIC	2	R	--	MR	--	--	--	--	--	--	MR
WRANGLER	PUBLIC	2	R	LR	R	LR	HR	HR	HR	--	--	--
120	DEKALB-PFIZER	3	HR	--	R	LR	R	--	R	--	R	--
629	GARST	3	R	MR	R	MR	MR	MR	R	--	R	--
ADMIRAL	PICKSEED	3	R	R	HR	MR	R	--	--	--	--	--
ARROW	AGRIPRO	3	HR	R	HR	MR	HR	--	--	--	--	--
BIG 10	GREAT LAKES	3	HR	--	HR	R	R	LR	R	--	--	--
BLAZER	LAND O'LAKES	3	HR	LR	R	LR	MR	--	HR	--	HR	--
CENTURION	AGWAY/ALLIED	3	HR	R	R	R	R	MR	R	--	--	--
ELEVATION	JACQUES	3	R	MR	R	--	MR	--	R	--	HR	--
ENDURE	PAG	3	R	R	R	MR	R	LR	--	--	--	--
HUSKY	LOVELOCK	3	R	--	R	MR	MR	--	R	--	--	--
IMPACT	PETERSON	3	HR	R	HR	MR	R	--	--	--	--	--
MERCURY	MOEWS	3	R	--	HR	MR	HR	LR	--	--	--	--
MILKMAKER	LOVELOCK	3	R	--	HR	MR	MR	--	R	--	--	--
ONEIDA VR	PUBLIC	3	R	HR	HR	LR	MR	--	--	--	--	--
PERRY	PUBLIC	3	R	--	R	LR	LR	MR	R	--	--	--
PHYTOR	NORTHRUP KING	3	R	--	R	--	R	--	--	--	--	--
POLAR II	PRIDE	3	HR	--	R	--	HR	--	MR	--	--	--
SHIELD	GREAT LAKES	3	HR	R	R	HR	R	MR	R	--	R	--
SPARTA	LAND O'LAKES	3	R	R	MR	--	MR	--	R	--	HR	--
SURPASS	CENEX	3	HR	R	HR	MR	R	--	--	--	--	--
THOROBRED	LOVELOCK	3	HR	--	R	--	MR	--	--	--	--	--
THUNDER	AGRIPRO	3	R	--	HR	MR	R	LR	--	--	--	--
VALOR	LAND O'LAKES	3	R	LR	MR	LR	--	--	R	--	MR	LR
624	GARST	4	R	--	--	MR	MR	MR	--	--	--	--
655	GARST	4	R	--	--	MR	LR	R	--	--	--	--
88	L.L. OLDS	4	R	R	R	R	MR	MR	R	--	--	--
ACTION	RESEARCH SEEDS	4	R	MR	R	HR	R	MR	R	--	--	--
ADVANTAGE	DEKALB-PFIZER	4	R	--	R	MR	R	LR	--	--	--	--
ANSTAR	FFR	4	R	--	MR	R	--	--	--	--	--	--
ANSWER	CENEX	4	R	--	HR	LR	HR	LR	--	--	--	--
APOLLO	AGRIPRO	4	R	--	R	LR	R	MR	MR	--	MR	--
APOLLO II	AGRIPRO	4	R	MR	R	MR	HR	MR	--	--	MR	--
ARC	PUBLIC	4	LR	--	MR	HR	--	--	HR	--	LR	LR
ARMOR	AGRIPRO	4	R	--	R	MR	R	--	--	--	--	--
ATLAS	MOEWS	4	R	--	R	R	--	--	--	--	--	--
BELLRINGER	LOVELOCK	4	R	MR	MR	LR	LR	--	R	--	--	--
CHALLENGER	CARGILL	4	R	--	MR	R	R	--	--	--	--	--
CIMARRON	GREAT PLAINS	4	HR	LR	HR	R	MR	HR	R	--	--	--
CLASSIC	FFR	4	R	--	R	LR	LR	--	--	--	--	--
COMMANDOR	NORTHRUP KING	4	R	MR	R	HR	R	LR	--	--	MR	--
DK-135	DEKALB-PFIZER	4	R	MR	R	MR	MR	MR	R	LR	R	--
DART	AGRIPRO	4	HR	R	HR	R	HR	--	--	--	--	--

VARIETY	MARKETER	FD	BW	VW	FW	AN	PRR	SAA	PA	BAA	SN	RKN
DECATHLON	CARGILL	4	HR	MR	R	MR	MR	R	R	MR	R	--
DRUMMOR	NORTHRUP KING	4	R	--	MR	MR	R	HR	--	--	MR	--
DUKE	AGRIPRO	4	R	--	R	MR	HR	MR	--	--	--	--
EAGLE	ASGROW/O'S GOLD	4	HR	MR	R	R	MR	R	R	LR	R	--
EDGE	RESEARCH SEEDS	4	R	R	R	HR	R	R	R	--	--	--
EMERALD	HOFFMAN/PLAINS	4	R	MR	R	MR	R	LR	R	--	--	--
EPIC	L. PETERSON LTD.	4	R	--	MR	--	R	--	HR	--	HR	--
EXCALIBUR	AGWAY/ALLIED	4	R	R	HR	MR	LR	LR	R	--	R	--
EXPO	PAYMASTER	4	R	--	R	MR	R	R	--	--	--	--
G-2815	FUNK SEED	4	R	--	HR	R	MR	LR	R	--	--	--
G-2852	FUNK SEED	4	HR	R	R	HR	R	MR	R	--	--	--
G-7730	FUNK SEED	4	HR	--	HR	LR	HR	--	--	--	--	--
HI-PHY	FFR	4	HR	--	HR	--	MR	--	--	--	--	--
HONEOYE	PUBLIC	4	MR	--	--	--	--	--	--	--	--	--
JUBILEE	NC+ HYBRIDS	4	R	--	R	R	R	MR	R	--	--	--
MAGNUM	DAIRYLAND	4	HR	--	--	MR	LR	MR	--	--	LR	--
MAGNUM+	DAIRYLAND	4	R	--	--	MR	R	LR	--	--	--	--
MAXIM	CENEX	4	R	R	R	MR	MR	R	R	MR	R	--
OLYMPIC	AGRIPRO	4	R	--	R	R	--	--	--	--	--	--
PACER	LAND O'LAKES	4	R	--	MR	--	LR	--	R	--	LR	LR
PEAK	RESEARCH SEEDS	4	R	LR	R	--	MR	--	HR	--	HR	--
PRESERVE	PRIDE	4	R	--	R	MR	MR	HR	--	--	--	--
PRIMAL	PRIDE	4	HR	--	R	--	LR	--	--	HR	--	--
RAIDOR	NORTHRUP KING	4	R	--	MR	R	--	--	--	--	--	--
RILEY	PUBLIC	4	HR	LR	--	MR	--	HR	HR	--	--	--
SALUTE	DAIRYLAND	4	R	--	--	MR	MR	MR	--	--	--	--
SARANAC	PUBLIC	4	R	--	--	--	--	--	--	--	--	--
SARANAC AR	PUBLIC	4	R	--	--	HR	--	--	--	--	--	--
SPECTRUM	CENEX	4	R	--	MR	LR	MR	HR	HR	--	R	--
SUMMIT	STAUFFER	4	R	R	R	HR	R	MR	R	--	--	--
TARGET	DAIRYLAND	4	R	--	--	MR	MR	MR	--	--	--	--
THOR	NORTHRUP KING	4	HR	--	MR	--	--	--	MR	--	MR	--
TOMAHAWK	JUNG	4	R	MR	R	HR	MR	LR	R	--	--	--
TRIDENT	PAG	4	R	--	HR	MR	HR	MR	--	--	--	--
TRUMPETOR	NORTHRUP KING	4	MR	MR	HR	R	LR	LR	MR	--	R	--
TURBO	PICKSEED	4	R	--	R	MR	R	--	--	--	--	--
VANGARD	AGRIPRO	4	R	--	R	HR	--	--	--	--	--	--
VERNEMA	PUBLIC	4	MR	MR	--	LR	LR	MR	--	--	HR	--
VERTA+	NC+ HYBRIDS	4	HR	R	R	HR	R	LR	R	--	--	--
VORIS 77	VORIS	4	R	--	R	HR	MR	--	--	--	--	--
WL-315	W-L RESEARCH	4	HR	MR	HR	MR	MR	MR	R	LR	MR	--
WL-316	W-L RESEARCH	4	MR	R	R	HR	MR	R	R	LR	MR	--
DESERET	PUBLIC	5	MR	--	--	--	--	--	--	--	R	--
PIKE	NORTHRUP KING	5	MR	--	R	--	MR	MR	R	--	R	--
SHENANDOAH	GREAT PLAINS	5	HR	--	HR	HR	HR	--	--	--	MR	--
WL-320	W-L RESEARCH	5	R	MR	HR	MR	R	R	MR	MR	MR	--
WASHOE	PUBLIC	5	R	--	--	LR	R	R	R	--	R	--
ZIA	PUBLIC	5	MR	--	MR	--	--	MR	--	--	--	--
167R	DEKALB-PFIZER	6	MR	--	MR	--	R	HR	MR	--	MR	--
AMADOR	NORTHRUP KING	6	--	--	R	--	R	MR	--	--	MR	--
BARON	AGRIPRO	6	MR	--	R	MR	R	HR	HR	HR	--	--
DIAMOND	AGRIPRO	6	LR	--	HR	R	R	HR	HR	HR	--	--
DONA ANA	PUBLIC	6	MR	--	MR	LR	R	R	R	--	--	--
LAHONTAN	PUBLIC	6	MR	--	LR	--	LR	MR	LR	--	R	--
MESILLA	PUBLIC	6	MR	--	MR	--	--	R	R	--	--	--
SOUTHERN SPECIAL	W-L RESEARCH	6	R	LR	HR	MR	MR	R	HR	MR	MR	--

VARIETY	MARKETER	FD	BW	VW	FW	AN	PRR	SAA	PA	BAA	SN	RKN
DK-187	DEKALB-PFIZER	7	LR	--	HR	--	R	HR	HR	MR	--	--
MOAPA 69	PUBLIC	7	--	--	HR	--	--	R	--	--	--	MR
PIERCE	NORTHRUP KING	7	LR	--	HR	--	R	R	HR	R	R	--
RINCON	PUBLIC	7	LR	--	HR	--	--	MR	MR	--	--	--
SAPPHIRE	AGRIPRO	7	--	--	HR	MR	R	HR	HR	HR	--	--
WL-515	W-L RESEARCH	7	LR	--	R	--	R	R	R	MR	R	--
WL-516	W-L RESEARCH	7	MR	--	HR	LR	HR	HR	R	R	MR	--
CUF 101	PUBLIC	8	--	--	HR	--	MR	HR	HR	HR	LR	MR
FLORIDA 77	PIONEER	8	--	--	HR	MR	--	MR	--	--	--	R
GRANADA	AGRIPRO	8	--	--	HR	--	R	HR	HR	HR	--	--
LEW	PUBLIC	8	--	--	--	--	--	R	--	--	R	--
MAXIDOR	NORTHRUP KING	8	--	--	HR	--	MR	R	R	R	R	--
UC CIBOLA	PUBLIC	8	--	--	HR	--	MR	HR	R	LR	--	R
UC SALTON	PUBLIC	8	--	--	HR	--	LR	HR	LR	--	--	LR
WL-605	W-L RESEARCH	8	--	--	HR	LR	HR	HR	HR	HR	MR	--

FD = Fall Dormancy
BW = Bacterial Wilt
VW = Verticillium Wilt
FW = Fusarium Wilt
AN = Anthracnose
PRR = Phytophthora Root Rot
SAA = Spotted Alfalfa Aphid
PA = Pea Aphid
BAA = Blue Alfalfa Aphid
SN = Stem Nematode
RKN = Root Knot Nematode

Pest Resistance Ratings

% Resistant Plants	Resistance Class
0-5%	Susceptible(S)
6-14%	Low Resistance (LR)
15-30%	Moderate Resistance (MR)
31-50%	Resistance (R)
>50%	High Resistance (HR)

Blank spaces indicate variety is susceptible or has not been adequately tested.

Fall Dormancy Ratings:

Check Variety	Dormancy Rating
Norseman	1
Vernal	2
Ranger	3
Saranac	4
DuPuits	5
Mesilla	6
Moapa 69	7
CUF 101	8