

DISEASES AND NEMATODES

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ABSTRACT

Alfalfa diseases and parasitic nematodes can significantly reduce yields, stand life, and forage quality. Reduction in farm revenues can be avoided in most cases by using a few common sense approaches. Selection of high yielding disease resistant cultivars in combination with proven cultural practices can minimize potential losses. Knowledge of the conditions that promote disease buildup and the ability to recognize the symptoms of each major pathogen or nematode is a substantial tool in being successful in alfalfa hay production.

Key Words: alfalfa, plant pathology, disease control, nematode control, alfalfa pests

INTRODUCTION

From the time alfalfa was first introduced into North America by immigrants there has been a progressive effort to improve it's performance. In the early years this effort was minimal and farmers were satisfied with just knowing what alfalfa's would survive on their farm for more than one year. This was reflected in the fact that prior to 1955 only 33 alfalfa cultivars were recognized in the U.S. and Canada, half of which were plant introductions. As time progressed farmers soon discovered that if their alfalfa operation was to remain profitable, better alfalfa's were needed. The first effort to improve alfalfa, beyond winter hardiness, was disease resistance. The success of the first varieties with disease resistance and their ability to increase yields and profitability caused a large demand for continued improvements, and by 1977 the number of improved alfalfa varieties increased to 160. Today there are 256 improved alfalfa varieties being marketed in the U.S. Much of the improvement of alfalfa has been the in the area of increased resistance to diseases, insects and nematodes, and most varieties today are characterized for their resistance level to at least 6 diseases, 3 insects and 3 nematodes. This increased pest resistance has resulted in higher yields and stand persistence in areas where these pests are limiting factors.

If today's farmer is to fully utilize these improved varieties he must first be able to identify his needs. He must know what varieties are adapted to his location and what pests are known to limit production in his area, and how to identify them. With this knowledge he will be able to select which variety best fits the needs of his farm, and provides the protection he needs from pests that may limit yields.

VARIETY SELECTION

Variety selection should take into consideration the following suggestions.

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1. Fall Dormancy - Use varieties with the proper dormancy for your area (Consult local farm advisor).
2. Identify Major Pest Problems known to occur in your area. (Use past experiences or consult farm advisor).
3. Prioritize what pests are the major yield limiting problems. (Many pests may occur in your area, but it is highly unlikely that any one variety will have high resistance to all pests.)
4. Consider soil type in prioritizing your pests. i.e. Nematodes occur more often in sandy soils; Phytophthora root rot occurs more often in clay or poorly drained soils.
5. Select 5-6 varieties using the above criteria.
6. Check performance of these varieties in local yield trials or test in small strips on your farm, to determine which variety best fits your needs.
7. Use certified seed when planting.

DISEASES

Numerous alfalfa pathogens have been documented in alfalfa fields in California. The severity of any one pathogen may vary from year to year and/or location to location. Various conditions may influence disease severity such as; environmental conditions, rainfall, soil type, irrigation, elevation, cutting schedules, nematodes, cultural practices, soil fertility, and varietal resistance to name a few. The following is a list of the major diseases known to reduce alfalfa yield and/or stand persistence in California. (Listed in approximate order of importance).

(1) Phytophthora root rot (*Phytophthora megasperma f. sp. medicaginis*)

Optimal disease conditions - Occurs most often in soils with poor drainage where water stands for an extended amount of time.

Symptoms - Stunting and/or plant death in low areas of field where water stands. Damaged plants may have taproot girdled at same depth in soil.

Control - Resistant varieties; cultural practices that promote better drainage i.e. deep plowing, laser leveling, planting on beds.

(2) Fusarium wilt (*Fusarium oxysporum*)

Symptoms - Stunting of plants; Red to reddish brown discoloration inside the root that becomes more severe with age of stand.

Control - Resistant varieties; Root knot nematode resistance may also be desirable to complement Fusarium wilt resistance by reducing exposure of the plant to the pathogen by nematode feeding on the roots.

(3) Crown Rot Complex (Combination of various pathogen such as Fusarium, Pythium, Rhizoctonia, Phoma and Stagonospora)

Optimal disease conditions - Most severe when the crown is damaged in some way that allows the pathogen access to crown tissue. This occurs most often due to mechanical damage, insects, nematodes, frost, extensive grazing etc.

Symptoms - Yield reduction and stunting brown necrotic or dead tissue will be present in the crown area of the plant, often enveloping the whole crown area. Taproot may appear healthy.

Control - Avoid mechanical injury to crown as much as possible. Resistant varieties

(4) Anthracnose - (*Colletotrichum trifolii*)

Optimal disease conditions - Occurs most often in spring or fall and spreads rapidly under warm wet conditions from spores produced on lower stems of infected plants.

Symptoms - Early stages may appear as individual straw colored stems on plants that display a curved top “Shepherds Crook”. Diamond shaped lesions will occur on lower part of the stem. Advanced stages will be seen in the crown tissue as a dark black or coal color. Plant death usually occurs at this stage.

Control - Resistant varieties; Avoid spreading spores from plant debris on harvest equipment to uninfected fields.

(5) Rhizoctonia (*Rhizoctonia solani*)

Optimal disease conditions - Wet humid conditions; Root damage generally occurs in warm soils or those conditions that favor high-temperature flooding injury (scald)

Symptoms - Seedling damage may appear as damping off ; Root damage in established fields occurs as elliptical shaped lesions on the taproot at the point where the lateral roots emerge.

Control - Some varietal differences may occur however no clear cut control is available.

(6) *Stagonospora* root rot (*Stagonospora meliloti*)

Optimal disease conditions - Spores are produced on lower stems and leaves and are spread by irrigation water or rain water to other plants. Root infection develops from stem and crown infections

Symptoms - Evidence of the pathogen may be seen in cross sections of taproots or large stems as pockets of red-orange specks in the tissue. This pathogen is considered by some pathologists as one of the major causes of stand decline in California. It has also been identified as one of the causal agents of crown rot. Major effect of pathogen is seen in second and third years of stand.

Control - Resistant varieties are not known. No effective cultural control measures are known at this time.

(7) *Verticillium* wilt (*Verticillium albo-atrum*)

Optimal disease conditions - Thought to occur only in cooler northern climates until it was identified in the late 1980's in parts of Southern California. The pathogen can be spread by dry or fresh plant material on harvest equipment. Cutter bar blades of mowing equipment is extremely effective in spreading the pathogen spores from diseased fields to healthy fields.

Symptoms - Stunting of plants; Yellow 'V' shape at the tip of leaves. Leaves may curl along midrib and turn a pinkish color. Stems will remain green after leaves die.

Control - Resistant varieties; Clean farm equipment between fields, and mow younger fields before older to prevent spore transfer on mower blades. Cutter bar sanitation with 10% bleach may be useful.

MINOR DISEASES

Many other diseases occur in alfalfa fields in California and can be found on a routine basis, but for the most part they are not considered a major limiting factor to production. However they may in some cases affect the quality of the alfalfa hay, or periodically be a serious problem. The following is a list of a few of these pathogens;

Alfalfa dwarf/Pierces disease

Alfalfa mosaic virus

Alfalfa wart

Common leaf spot

Lepto leaf spot

Rust

Sclerotinia

Spring Black Stem

Stemphylium leaf spot

Summer Black Stem

Witches Broom

Vitis vinifera

Alfalfa mosaic virus

Urophlytis alfalfa

Pseudopeziza

Leptosphaerulina briosiana

Uromyces straitus

Scerotinia trifoliorum

Phoma medicaginis

Stemphylium botryosum

Cerespara medicaginis

Witches Broom

NEMATODES

Nematodes are microscopic wormlike animals that live in the water held between soil particles. These plant parasitic animals are generally more prevalent in sandy soils and have a high reproductive rate. They can persist in the soil for many years in the absence of a host, and move from field to field on farm equipment and/or irrigation water contaminated from runoff water of infested fields. Numerous plant parasitic nematodes are known to occur in California but the majority of damage is attributed to the following two.

(1) Stem nematode (*Ditylenches dipsaci*)

Conditions that promote nematode damage: -

- ◆ Sandy soil
- ◆ Cool moist spring or fall
- ◆ Sprinkler irrigation
- ◆ Susceptible plant or weed hosts

Symptoms: -

- ◆ In the spring or fall, sporadic white stems or “White flags” may be seen throughout the field.
- ◆ Stunting in somewhat circular patterns in the field
- ◆ Swollen stem buds
- ◆ Shorten internodes and swollen nodes on lower stems
- ◆ In advanced stages lower stem may blacken
- ◆ Fewer symptoms seen during summer months

Control - Resistant varieties or rotational with a grain crop for 3 years

(2) Root Knot Nematode (*Meloidogyne spp.*)

Conditions that promote nematode damage: -

- ◆ Sandy Soil
- ◆ Nematode infection may increase severity of some root diseases such as Fusarium wilt

Symptoms -

- ◆ Stunting in somewhat circular patterns in the field
- ◆ Stand reduction
- ◆ Excessive root branching and small galls on roots

Control -

- ◆ Resistant varieties
- ◆ Crop rotation is generally not feasible due to wide host range

References

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