

# **ALFALFA PESTS (INSECTS, DISEASES, AND NEMATODES)**

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## **ABSTRACT**

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

**Key Words: alfalfa, plant pathology, disease control, insect control, nematode control, alfalfa pests, alfalfa insects, alfalfa diseases, alfalfa nematodes.**

## **INTRODUCTION**

From the time alfalfa was first introduced into North America by immigrants there has been a progressive effort to improve its performance. In the early years this effort was minimal and farmers were satisfied with just knowing what alfalfas 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 alfalfas 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 296 improved alfalfa varieties being marketed in the U.S. Much of the improvement of alfalfa has been in the area of increased resistance to diseases, insects and nematodes. 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, needs must first be able to be identified. Farmers must know what varieties are adapted to their locations and what pests are known to limit production in their areas, and how to identify them. With this knowledge they will be able to select which variety best fits the needs of the farm, and provides the protection needed from pests that may limit yields.

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## VARIETY SELECTION

Variety selection should take into consideration the following suggestions.

1. Fall Dormancy - Use varieties with the proper dormancy for your area (Consult local farm advisor, county agent).
2. Identify Major Pest Problems known to occur in your area. (Use past experiences or consult farm advisor, county agent).
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.

## INSECTS

Anyone that walks into a mature alfalfa field soon realizes that alfalfa is a haven for numerous insects, good and bad. Proper identification of these insects and their impact on alfalfa growth is crucial for optimal hay production. The following is a list of some of the major and minor insect pests commonly found in alfalfa hay fields throughout the U.S. (listed in approximate order of importance).

**(1) Alfalfa Weevil (*Hypera spp.*)**

Geographic impact area - Found in majority of continental U.S.

Description – Adult approximately ¼ inch long; light brown in color with dark brown strips on back. Larva is light green with black shiny head. Larva feed on new growth and can severely defoliate alfalfa plants. Majority of damage is seen in early spring on first cut.

Control – No resistant varieties are currently available. Severe infestations may require chemical control.

(2) **Potato Leafhopper (*Empoasca fabae*)**

Geographic impact areas - Mainly eastern half of U.S.

Description- Small light green insect approximately 3 mm long, nymphs are light yellow. Insect characteristically walks sideways and will jump when disturbed. Insect injects a toxin into the alfalfa plant when feeding, resulting in a yellowing or reddening of the plant. Leaf tips may display a “V” Shaped yellowing similar to Verticillium wilt. Severe infestations result in plant stunting. Majority of crop damage occurs in mid to late summer.

Control – New resistant varieties (glandular hair types) have greatly reduced yield losses associated with potato leafhopper infestations. Severe infestations may still require chemical control.

(3) **Spotted Alfalfa Aphid (*Therioaphis maculata*)**

Geographic impact area – Historically has been a problem mainly in Southwestern U.S., but may be found in other areas during hot dry periods (prefers warm climates)

Description - Smallest of alfalfa aphids. Yellowish green color with dark spots in rows on its back. Prefers to feed on lower portion of plant, and injects a toxin when feeding that can result in seedling death, severe stunting and yellowing of mature plants. Leaf veins may turn yellow from toxin.

Control – Resistant varieties best control.

(4) **Blue alfalfa Aphid (*Acyrtosiphon kondoi*)**

Geographic impact area – Historically has been found mainly in the Southwestern U.S. and parts of Oklahoma and Kansas.

Description – Bluish-green color with uniformly dark antennae. Injects a mild toxin when feeding, resulting in plant stunting. Prefers to feed on terminal leaves or new re-growth. Prefers mild temperatures, with its peak period in late winter or early spring.

Control – Resistant varieties best control.

(5) **Pea Aphid (*Acyrtosiphon pisum*)**

Geographic impact area – Can be found throughout continental U.S.

Description – Largest alfalfa aphid, green color. Antennae have dark bands on the end of each segment. May buildup in large numbers up and down plant stems, with minimal plant damage (*No Toxin*)

Control – Resistant varieties are best control.

(6) **Cowpea Aphid (*Aphis craccivora*)** Potential New Threat: This black aphid has historically been considered a very minor pest of alfalfa. Recent outbreaks in western hay fields (California & Arizona) and increased reportings across the U.S., have resulted in a renewed interest in this aphid. It is still too early to know if the recent outbreaks of this aphid is a short-term population fluctuation or the beginning of a new long-term problem.

(7) **Clover Root Curculio (*Sitona hispidula*)**

Geographic impact area – Found in most of continental U.S.

Description – Gray snout beetle about 3/16 inches long, or 2/3 length of alfalfa weevil. White larva feed on bark of alfalfa roots in late spring or summer. Root damage may provide entrance wound for common root pathogens.

Control – No resistant varieties are available. High soil moisture may reduce larva activity. Alfalfa variety selection with strong root disease resistance may be advisable to reduce yield losses following secondary disease infection from insect feeding.

(8) **Silverleaf Whitefly (*Bemesia argentifolil*)**

A relatively new pest to alfalfa. The silverleaf whitefly was the first reported as causing serious damage to alfalfa in 1991, in the southern areas of California and Arizona. Plant breeders are currently working on this new alfalfa pest, and resistant varieties are expected in the next few years.

**MINOR OR SPORADIC INSECT PESTS  
COMMONLY FOUND IN ALFLAFA FIELDS**

(1) **Variiegated Cutworm (*Peridroma saucia*)**

Nocturnal worm that can severely damage alfalfa seedlings or reduce new growth in established fields. Adult worm is approximately 2 inches with yellow diamond shaped spots down the middle of back.

(2) **Caterpillars**

Caterpillar infestations are generally kept in check by natural parasites and/or cutting regimes. Severe infestations may require chemical control, since like most minor pests, resistant varieties are not available. The following is a list of the more common caterpillars and their descriptions.

(a) Alfalfa caterpillar (*Colias eurytheme*)

The adult is the common yellow or white butterfly often seen in alfalfa fields. Caterpillar is green with a white strip on both sides of body.

(b) Beet armyworm (*Spodoptera exigua*)

Caterpillar is green to purple-green

(c) Western yellow striped armyworm (*Spodoptera praefica*)

Caterpillar is black with orange stripes on sides

(d) Alfalfa Looper (*Autographa californica*)

Caterpillar is dark green with darker strips down back and sides

**(3) Thrips (*Frankliniella spp.*)**

Very small insect, that feeds on young leaves and buds. Damage to developing leaves results in wrinkled or distorted leaves. Generally not considered economically important in hay fields, but leaf symptoms are very common in alfalfa fields.

**(4) Plant bugs (*Lygus spp.*)**

Often seen in alfalfa hay fields but are only considered serious pest in alfalfa seed production. Damage to hay production is minimal. Insects are 7mm long and half as wide, are broad, flattened and oval shaped with small projecting head. They range in color from yellowish-green to reddish-brown. Distinguishing mark is a yellowish triangular area between the wing bases.

## DISEASES

Numerous alfalfa pathogens have been documented in alfalfa field. 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 across the U.S. (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) Bacterial wilt (*Clavibacter michiganense subsp insidiosum*)**

Optimal disease conditions - Can occur in most soil types but damage can be more severe in the presence of nematodes or root feeding insects that create sites for entry into root system. More common in cold climates.

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

Control - Resistant varieties;

### **(3) Fusarium wilt (*Fusarium oxysporum f.sp. medicaginis*)**

Optimal disease conditions - Can occur in most soil types but damage can be more severe in the presence of nematodes or root feeding insects that create sites for entry into root system. More common in warm climates.

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. This reduces exposure of the plant to the pathogen by nematode feeding on the roots.

### **(4) Crown Rot Complex (Combination of various pathogens 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.

### **(5) 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.

### **(6) 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.

### **(7) Stagonospora root rot (*Stagonospora meliloti*)**

Optimal disease conditions - Spores are produced on lower stems and leaves and are spread by irrigation water or rainwater 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.

### **(9) Aphanomyces (*Aphanomyces euteiches*)**

Optimal disease conditions Occurs most often in soils with poor drainage where water stands for an extended amount of time, or when there is a extended wet period at planting.

Symptoms – Damping-off of seedlings may be yellow-red to brown. Surviving plants may be stunted and feeder roots of older plants may turn brown.

Control - Resistant varieties and/or fungal seed treatment at planting. Cultural practices that promote better drainage i.e. deep plowing, laser leveling, planting on beds.

### **(9) 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 are 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 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;

<u>Diseases</u>	<u>Pathogen</u>
Alfalfa dwarf/Pierces diseases	<i>Xylella fastidiosa</i>
Alfalfa Mosaic	<i>Alfalfa Mosaic Virus</i>
Crown Wart	<i>Physoderma alfalfae</i>
Common Leaf Spot	<i>Pseudopeziza medicaginis.</i>
Downy Mildew	<i>Peronospora trifoliorum</i>
Lepto Leaf Spot	<i>Leptosphaerulina briosiana</i>
Rust	<i>Uromyces straitus</i>
Sclerotinia	<i>Sclerotinia trifoliorum</i>
Spring Black Stem	<i>Phoma medicaginsis</i>
Stemphylium Leaf Spot	<i>Stemphylium botryosum</i>
Summer Black Stem	<i>Cercospora medicaginsis</i>

## 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 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 alfalfa fields, but the majority of damage is attributed to the following three.

### (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
- Alternate host – Sainfoin, Potatoes, garlic, and beets  
 Non-Host Crops – Sorghum, small grains, beans, and corn

Control - Resistant varieties or rotation with a non-host crop such as 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

Alternate host – Potato, sugar beet, bean, tomato, and cotton.

Control -

- ∪ Resistant varieties
- ∪ Crop rotation to a non-host is generally not feasible due to wide host range

**(3) Lesion Nematode (*Pratylenchus spp.*)**

Conditions that promote nematode damage: -

- ∪ Sandy Soil

Symptoms -

- υ Major symptoms occur in the form of black or lesions on outside of the root. Lesions may become severe enough to completely darken taproot.
- υ Taproots appear stunted with reduced lateral root growth

Alternate host – Corn

#### Control -

- υ Resistant varieties
- υ Crop rotation to non-host crop generally not feasible due to wide host range.
- υ Leaving field fallow, followed by a treatment nematicide.

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