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Alfalfa Analyst

Alfalfa is a vigorous and productive crop. Like all farm crops, however, alfalfa is subject to stand injury and yield loss from disease, insect injury and nutrient deficiencies. Prompt and accurate diagnosis of a problem can allow early treatment to modify or correct the situation before yields are seriously affected or stands are lost.

The purpose of the ALFALFA ANALYST is to provide an identification guide to alfalfa diseases, nutrient deficiency symptoms and problem insects. Please use it to help identify any alfalfa problems you may have. Then secure specific up-to-date control recommendations from your local, county or state agricultural authority.

EC 93-131-C

Diseases

An Aid To Identification

1. Bacterial Wilt

2. Phytophthora Root Rot

3. Fusarium Wilt

4. Crown Rot

5. Sclerotinia Crown and Stem Rot

6. Verticillium Wilt

7. Anthracnose

8. Rhizoctonia Stem and Root Canker

Disease section prepared by F. I. Frosheiser, AR, SEA, USDA, Department of Plant Pathology, University of Minnesota.

For more detailed information on diseases refer to **A Compendium of Alfalfa Diseases.**

1. **Bacterial Wilt** *Corynebacterium insidiosum*
First symptoms are a yellowish-brown discoloration in the woody cylinder of the tap root. This occurs in cross section as a ring under the bark and will eventually extend throughout the woody cylinder. Plants become stunted with many yellow shoots having small, cupped leaves. The bacteria are in the soil and enter through wounds.

2. **Phytophthora Root Rot** *Phytophthora megasperma f. sp. medicaginis*
Phytophthora root rot occurs in wet, poorly drained soils during extended periods of rainfall or excessive irrigation. It can be detected by digging surviving plants in areas where stands have been thinned. If the tap roots are rotted off, then *Phytophthora* was the likely cause of the stand loss. It causes yellowish-brown rotted areas on the roots that may extend to the crown, killing the plants. The rotted areas turn black later.

3. **Fusarium Wilt** *Fusarium oxysporum f. sp. medicaginis*
Stems on one side of the plant wilt and die or the entire plant dies. Brown to brick-red streaks, that appear as partial or complete rings in cross section, occur in the woody cylinder of the tap root. As the disease progresses, the entire outer portion of the woody cylinder becomes discolored and the plant dies. The fungus lives in the soil and enters through wounds or fine roots. Other *Fusarium* species cause root, crown and seedling rots.

4. **Crown Rot** Usually caused by one or more species of *Fusarium, Rhizoctonia, Phoma, Stagnospora,* or *Colletetrichum*
The rot often begins as a small cone shaped discoloration below the base of a cut stem. The rotted area enlarges and may merge with rot from other infection sites until the central portion of the crown is destroyed, often leaving a rim of live tissue. Crown buds are often rotted and the rot progresses until a portion or all of the meristematic tissue is destroyed. Crown and bud rot are usually initiated during the first and second season and become progressively more severe until the entire crown is destroyed.

5. **Sclerotinia Crown and Stem Rot** *Sclerotinia trifoliorum*
The first symptoms occur in the fall as small brown spots on leaves and stems. The parts wilt and die, then the fungus spreads to the crown. In early spring the crown or basal part of the stem becomes soft and discolored. As the infected parts die a white fluffy mass grows over the area forming hard, black bodies (sclerotia) which may adhere to the surface of or be imbedded in the stem or crown.

6. **Verticillium Wilt** *Verticillium albo-atrum*
Symptoms begin as temporary wilting of upper leaves on warm days at prebud to floral stage and progresses to a yellow blotchiness and/or yellow to pinkish-orange-brown V-shaped segments of leaflets. Leaflets may curl along the midrib. Stems remain erect and green or chlorotic for a while after the leaves on the stem die. Yellowish to brown discoloration is usually present in the woody cylinder of the tap root. Regrowth appears normal in most infected plants but symptoms reappear as top growth approaches the prebud stage. Plants become progressively weaker and may die later in the season or during the winter.

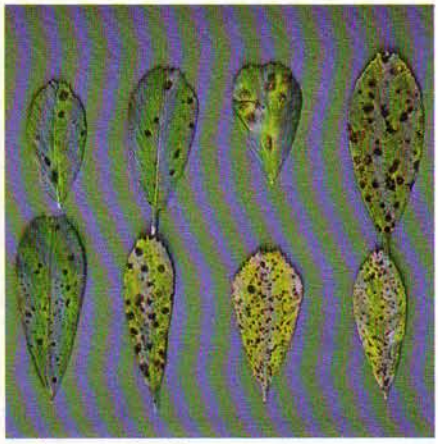
7. **Anthracnose** *Collototrichum trifolii*
Diamond shaped tan lesions with dark borders appear near the base of the stems. The centers of the lesions contain small black bodies that produce spores. The fungus may girdle and kill stems, crown buds and eventually the crown. Crown rot due to anthracnose is characteristically bluish-black (gunmetal). The "shepherd's crook" is often observed in young, dead shoots. Dead, strawcolored stems scattered through a field may indicate anthracnose infection. The disease is favored by hot, moist weather.

8. **Rhizoctonia Stem and Root Canker** *Rhizoctonia solani*
Dark sunken cankers form near the base of the stem. The cankers may girdle and kill the stems. The fungus also causes eliptical tan to buff sunken cankers on the root, especially in the southwestern states. The cankers are often darker at the margins and turn black with age. This fungus also causes seedling and crown rot and, in the humid areas of southeastern USA, a leaf blight characterized by dead leaves sticking to each other and to stems by hyphal strands. It is most severe under high temperature and moist conditions.

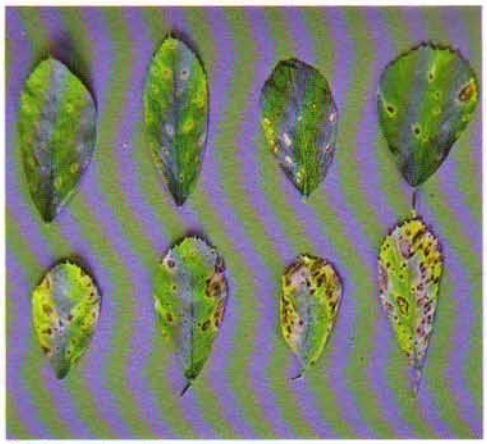
DARK COLOR AREAS — Disease usually occurs annually and affects yield, quality or persistance when susceptible varieties are grown.
LIGHT COLOR AREAS — Disease occurs but is of minor economic importance except occasionally in local areas.
WHITE AREAS — Disease is usually absent or of little significance.

Diseases

An Aid To Identification (continued)

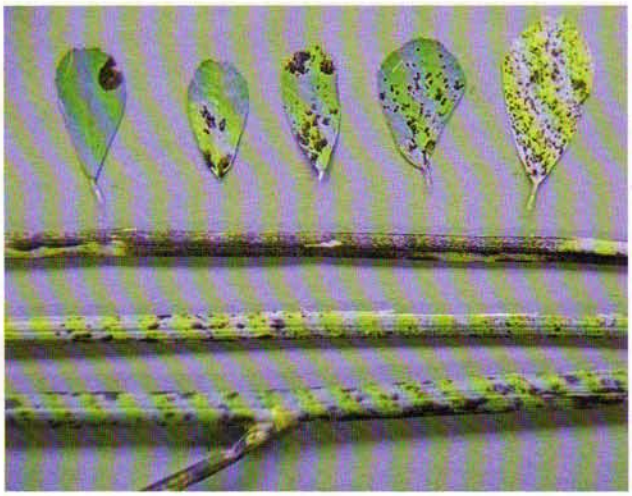


9. Common Leaf Spot

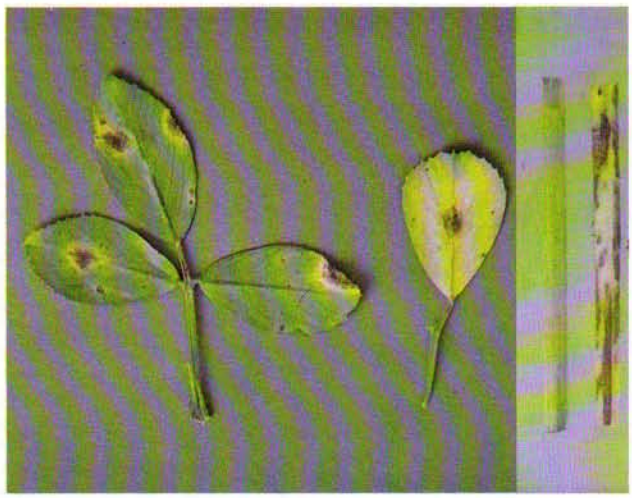


10. Lepto Leaf Spot

11. Stemphylium Leaf Spot



12. Spring Black Stem



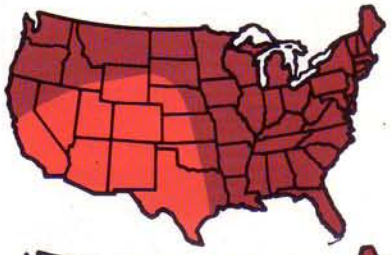
13. Summer Black Stem

14. Bacterial Leaf Spot

15. Downy Mildew

16. Alfalfa Mosaic Virus

9. **Common Leaf Spot** *Pseudopeziza medicaginis*
Small, circular, brown to black spots apprear on the leaflets. As the spots become older, a small, raised disc, usually lighter in color, appears in the center of the spot. The infected leaves turn yellow and drop as the disease progresses. This disease occurs wherever alfalfa is grown and develops during moist periods at moderate to cool temperatures.



10. **Lepto Leaf Spot** *Leptosphearulina briosiana*
Small brown spots on the leaflets, surrounded by a halo, enlarge and acquire a tan center with an irregular brown border. The infected leaves die and cling to the stem for a time. Only young leaves become infected and the greatest damage occurs on young growth after clipping if favorable, moist weather conditions occur at that time. In older growth only the young upper leaves become infected and have typical symptoms and these seldom die.

11. **Stemphylium Leaf Spot** *Stemphylium botryosum*
Spots on the leaves are slightly sunken and dark brown with a lighter center. Young lesions are surrounded with a yellow halo. Older spots may be concentric ringed, resembling a target. In western USA, especially California, (upper photo) the fungus produces elongate lesions, irregular in outline, with tan centers and brown borders. The disease is favored by warm, moist weather.

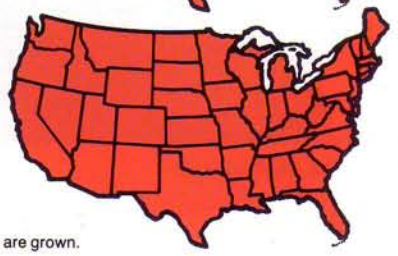
12. **Spring Black Stem** *Phoma medicaginis*
Dark spots with irregular borders appear on the leaves. They enlarge and merge until much of the leaflet is covered. The leaves turn yellow and drop. Stem lesions are dark green at first, later turning black. Stem lesions may enlarge and merge until most or all of the lower portion of the stem becomes black. Young shoots are often girdled and killed. The disease is favored by cool, moist weather.

13. **Summer Black Stem** *Cercospora medicaginis*
Large, usually circular, light gray to black spots appear on the leaves during the summer and early fall. Young spots on the leaves are often surrounded by a halo. Considerable leaf drop results from severe infections. Brown to black lesions appear on the stem. These lesions enlarge and often cover large portions of the stems. The disease is favored by warm, moist weather.

14. **Bacterial Leaf Spot** *Xanthomonas alfalfae*
Small water-soaked spots on the leaves enlarge, become brown to black, and sometimes have a lighter center. The spots are irregular and more pronounced on the underside of the leaflets. They usually glisten in the light due to the dried exudate. Infected leaves usually drop. Stem lesions are water-soaked at first, later turning brown or black. Seedlings are often killed, especially in summer or early fall seedings.

15. **Downy Mildew** *Peronospora trifoliorum*
Light green to yellow blotches appear on the leaves. Terminal portions of the shoots are often dwarfed and the leaves twisted or rolled. A grayish cottony growth, which is the mycelium of the fungus, is often visible on the underside of the leaflets. Cool, moist weather favors the disease.

16. **Alfalfa Mosaic Virus**
Symptoms of alfalfa mosaic are yellow streaks between the leaf veins or light green to yellow mottling of the leaflets, often accompanied by malformation of the leaflets. Plants are sometimes stunted and may be killed by the virus. Many infected plants show no symptoms. Symptoms are most evident in the spring and fall.



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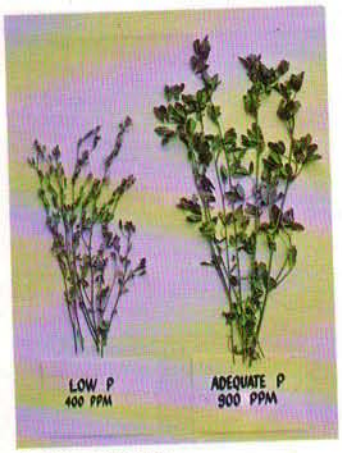
Deficiencies and Damage

An Aid To Identification

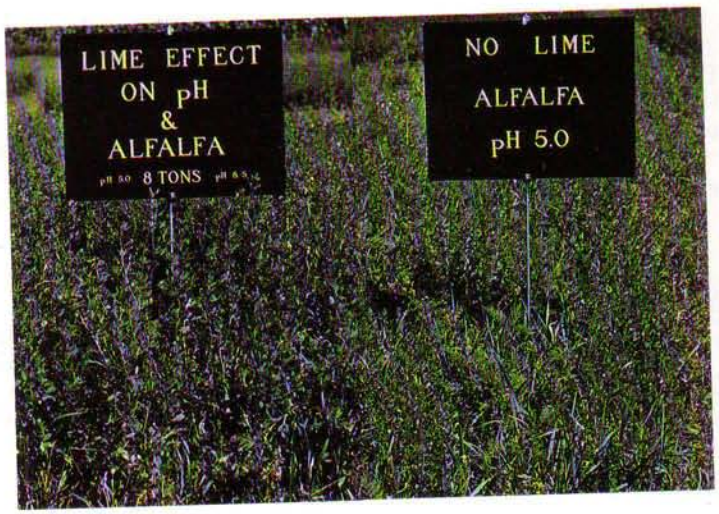


1. Phosphorus

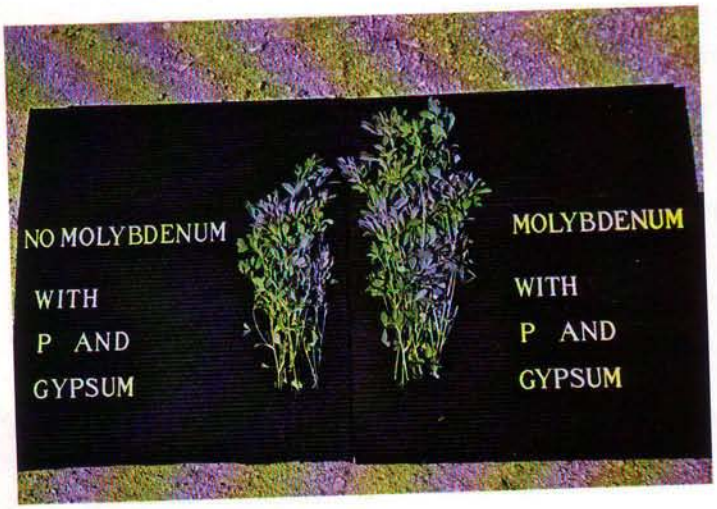
2. Potassium

3. Sulfur

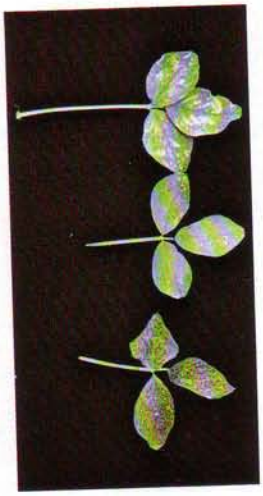
4. Boron



5. Lime



6. Molybdenum



8. Air Pollutant Damage

9. Heaving

Deficiency section prepared by R.D. Munson, Midwest Director, Potash & Phosphate Institute.

1. **Phosphorus**
Phosphorus deficiency usually does not produce a definite symptom, only a very stunted growth. The stunting of growth and color of the crop will vary with the degree of the deficiency and the soil conditions. Under acid soil conditions, low phosphorus produces a stunted bluish-green colored plant, while under other conditions, plants appear light yellow, as if they were nitrogen or sulfur deficient. The deficiency is readily corrected by applying fertilizer containing phosphate. High yielding alfalfa removes about 5.6 lb. of P or 13 lb. of P_2O_5 per ton of hay produced.

2. **Potassium**
Potassium can be a major limiting factor for alfalfa production in high rainfall regions. In areas of generally low rainfall, potassium deficiencies appear less frequently, except on sandy soils. Symptoms show up first as white spots around the outer edges of the upper leaflets. Under severe deficiency the size and number of the spots increases and the leaves become yellow and dry, causing the lower leaves to drop. Potassium has a positive effect on nodulation and nitrogen fixation. Alfalfa stand failure and subsequent takeover by grasses is sometimes an indication of low potassium in soils. Where soil potassium is low, an intensive potash fertilizer program is necessary to obtain and sustain high yields of alfalfa. High yielding alfalfa removes about 50 lb. of K or 60 lb. of K_2O per ton of hay produced.

3. **Sulfur**
Like phosphorus, sulfur deficiency produces stunting, the degree varying with the severity of the deficiency. Plants appear light yellow, because sulfur deficiencies reduce nitrogen fixation. It also influences amino acid and protein production. Sulfur can be provided by elemental sulfur or by fertilizers containing sulfate. High yielding alfalfa removes about 5 lb. of S per ton of hay produced.

4. **Boron**
Boron deficient alfalfa is sometimes called "yellow top." The symptoms are often confused with leafhopper yellowing. The top leaves are yellow and reddish and bunched and the growing tip may actually die, while the lower leaves and branches remain green. Boron deficient alfalfa does not bloom normally and produces poor seed yields. The deficiency symptoms are most prominent during dry periods, particularly on coarse textured soils. When moisture conditions improve, side branches may often continue growth and extend beyond the main stem. The deficiency is readily corrected by small rates of borate or borated fertilizers.

5. **Lime**
Alfalfa will not grow well on acid low pH soils. On acid soils, plants are light green, stunted and stands become thin. Aluminum and manganese may be toxic to alfalfa plants on highly acid soils. Adding agricultural limestone increases soil pH and reduces their availability, correcting the condition. Increasing the soil pH on many soils increases the availability of soil molybdenum, stimulating nitrogen fixing bacteria in root nodules. It also allows for a greater uptake of magnesium and may increase soil phosphorus availability. Lime provides calcium and magnesium, the amount varying with the type of limestone. The amounts of lime needed vary greatly, depending upon the pH and buffering capacity of the soils.

6. **Molybdenum**
Molybdenum deficiency reduces the growth of alfalfa. It is part of the nitrogenase enzyme, which is essential to N fixation. On many acid soils (pH 5.5) liming increases the solubility and availability of soil molybdenum, correcting deficiencies. On soils low in molybdenum, the deficiency may be corrected by applying molybdate to seed. Only ounces per acre are required.

7. **Zinc**
Symptoms have seldom been observed in the field because of the low zinc requirement of alfalfa. Deficient plants grow slowly and the older leaves become slightly yellowed, followed by progressive necrosis from the top of the plants downward. New leaflets become progressively smaller as they emerge. Deficiency may become worse as phosphorus availability is increased. The likelihood of deficiency would tend to increase with increasing soil pH.

8. **Air Pollutant Damage**
Alfalfa is sensitive to high concentrations of smog, sulfur dioxide or ozone in the air. The leaf symptoms are similar for all three. Symptoms range from veinal chlorosis to chlorosis of the entire leaf. Varying degrees of leaf necrosis result from very high concentrations or long periods of exposure. Older leaves are more sensitive than young leaves. Damage usually occurs near urban or industrial areas.

9. **Heaving**
Heaving usually occurs on heavy soils high in moisture. Alternate freezing and thawing temperatures cause the wet soil to expand and exert upward pressure on the crown. When the pressure is great enough the root and crown are lifted and the tap root will often break when the base of the root is frozen solid. Heaving can often be severe in late summer or fall seedings because the root systems are short and not well developed.

Insects

An Aid To Identification

1. Alfalfa Weevil

2. Clover Leaf Weevil

3. Clover Root Curculio

4. Alfalfa Snout Beetle

5. Potato Leafhopper

Insect section prepared by M. Curtis Wilson, Department of Entomology, Purdue University.

1. **Alfalfa Weevil** *Hypera postica* (Gyllenhal)
The alfalfa weevil is the most important insect pest of alfalfa in the U.S. Damage from this insect usually starts in early spring when the larvae emerge. The young larvae have black heads and a white stripe down the back. They feed first in the growing tips and then shred the foliage giving infested fields a greyish cast. The adults are about ¼ inch long and usually not seen during the day. The pupae may be found in net-like cocoons either on the plants or in debris on the soil. Both larvae and adults are present after the first cutting, feeding on new growth. Remaining larvae soon mature and the new adults leave the fields during the summer, but return in the fall and start depositing eggs. The map includes both alfalfa and Egyptian weevils.

2. **Clover Leaf Weevil** *Hypera punctata* (Fabricius)
The larvae of this insect look very much like alfalfa weevil larvae except that they are larger (½ inch long) and have brown heads, not black. They are found feeding on alfalfa at night, very early in the spring. They are very susceptible to a fungus disease and diseased, dying or dead larvae curled around the stems are commonly seen. Usually their numbers are reduced by the disease before extensive damage occurs.

3. **Clover Root Curculio** *Sitona hispidula* (Fabr.)
The adult clover root curculio is a small, slender, dark-gray snout beetle about 3/16 inch long. It feeds on the foliage, but is rarely serious in this stage. However, extensive larval damage to the roots is frequently found, particularly in older stands. Damage is characterized by extensive scarring of the epidermal layers of the roots as pictured. These lesions may become avenues of entrance for various disease pathogens causing wilt and root rot.

4. **Alfalfa Snout Beetle** *Brachyrhinus ligustici* (L.)
This large snout beetle, nearly half an inch long, has been found thus far only in the State of New York. The beetles' spread has been limited because they do not fly. The larvae are large, white, and grub-like in appearance. Damage from adults feeding on the foliage and larvae feeding on or in the roots may be severe enough to kill the plants.

5. **Potato Leafhopper** *Empoasca fabae* (Harris)
This tiny light green insect which jumps when disturbed is a common cause of alfalfa yellowing. The nymph or immature stage is light yellow and characteristically walks sideways. Feeding by these insects causes severe stunting of the plants and yellowing or reddening of the foliage. Leafhopper damage starts in wedge-shaped area at the tip of the leaf. The first cutting is not usually affected, but subsequent cuttings may be severely damaged.

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LIGHT COLOR AREAS — Insect occurs, but usually is of minor importance.
WHITE AREAS — Insect is usually absent or of little significance.

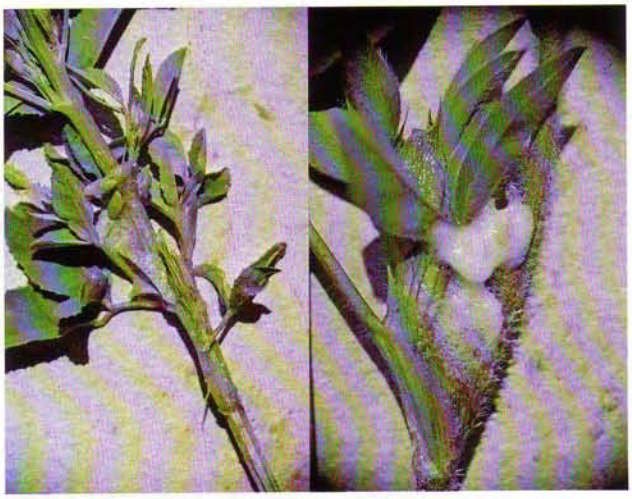
Insects

An Aid To Identification (continued)

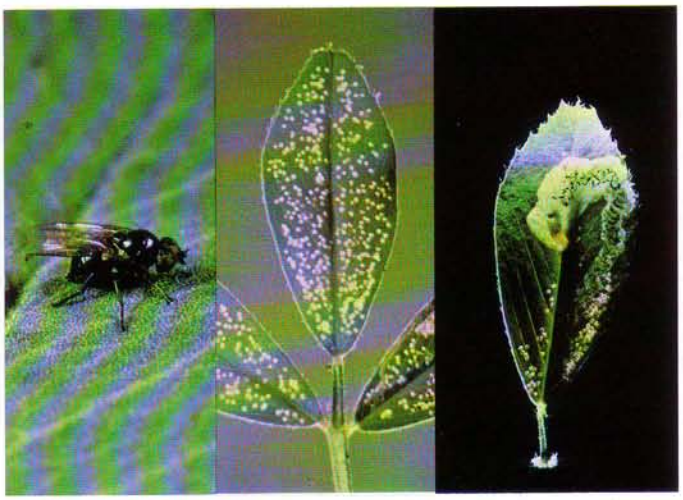
6. Blue Alfalfa Aphid

7. Pea Aphid

8. Spotted Alfalfa Aphid



9. Meadow Spittlebug



10. Alfalfa Blotch Leafminer

11. Variegated Cutworm

12. Differential Grasshopper

13. Plant Bugs

6. **Blue Alfalfa Aphid** *Acyrthosiphon kondoi* (Shinji)
The blue alfalfa aphid was first found in California in 1974 and now occurs in several western and midwestern states. It is similar to the pea aphid in appearance, but can be distinguished by its bluish green coloration in contrast to the yellowish or light green color of the pea aphid. Coloration of the third antennal segment of adults and nymphs and thoracic area of the winged forms can also be used in the field. The third antennal segment of the blue alfalfa aphid is a uniform brown in contrast to a narrow dark band at the tip of the third antennal segment in the pea aphid. The thoracic area of the winged pea aphid is light brown in contrast to a dark blackish brown for the blue alfalfa aphid.

7. **Pea Aphid** *Acyrthosiphon pisum* (Harris)
This large bright green aphid is common on alfalfa. It builds up huge populations which cover the stems and terminal buds in cool wet seasons. It causes damage by sucking plant juices causing the plants to wilt. Usually as drier and warmer weather develops natural controls reduce the infestations. This insect has many natural enemies.

8. **Spotted Alfalfa Aphid** *Therioaphis maculata* (Buckton)
This tiny aphid is light yellowish green or straw colored with rows of dark spots on its back. Unlike the pea aphid, it develops under hot dry conditions. It causes severe stunting and yellowing of plants and will kill seedling stands. It secretes a great abundance of sticky honeydew in which a sooty black fungus may develop. This aphid is most severe in the arid areas of western and southwestern U.S.

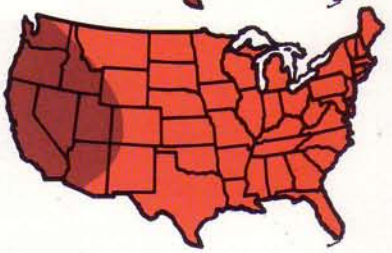
9. **Meadow Spittlebug** *Philaenus spumarius* (L.)
The meadow spittlebug is an early spring pest. The most characteristic symptom of infestation is the frothy spittle secreted by the yellowish green nymphs as they feed. Feeding causes stunting with a shortening of internodes so that the leaves are bunched together giving a rosette appearance. The jumping adults emerge in early June and cause little economic damage to alfalfa, but may be abundant and annoying to the grower at harvest time.

10. **Alfalfa Blotch Leafminer** *Agromyza frontella* (Rondani)
The adult leafminer is a tiny dull-black humpbacked fly which emerges in the northeast in late May from overwintering pupae on the ground. The fly's presence is best recognized by its pinhole oviposition and feeding punctures which may range from a few to over 100 per leaflet. The female deposits 1 to 3 eggs per leaflet, so most of the punctures are due to feeding. Mines are produced in the leaves from feeding by the larvae on leaf tissue between the upper and lower leaf surfaces. A mine or tunnel is formed as feeding progresses, usually beginning at the base of the leaf, widening as it approaches the leaf apex and terminating with an enlarged blotch which is often "comma" shaped, The mature larvae leave their mines and drop to the ground to pupate. In the northeast a second generation emerges about a week after pupation in mid-July followed by a third generation in late August.

11. **Variegated Cutworm** *Peridroma saucia* (Hubner)
This cutworm prefers non-grass crops and can cause extensive damage to alfalfa during warm wet seasons. When fully grown it is about two inches long and may range in color from almost black to light greenish yellow or tan. It has a distinctive row of light yellow diamond-shaped spots aligned down the middle of the back. The worms feed mainly at night and hide under clods or in soil debris during the day. There are also other species of cutworms which occasionally damage alfalfa.

12. **Differential Grasshopper** *Melanopus differentialis* (Thomas)
The differential grasshopper is only one of several species of grasshoppers which may attack alfalfa and cause serious damage. Grasshoppers become most numerous in uncultivated areas. Consequently, heaviest infestations are usually found in field margins, fence rows, pastures, grass waterways, etc. Their populations increase in seasons which are hot and dry. New seedings of alfalfa are favorite foods of grasshoppers. From field margins grasshoppers will move into these new seedings, depleting them as they feed.

13. **Plant Bugs** *Lygus species*
There are several species of plant bugs which are common in alfalfa fields. The tarnished plant bug. *Lygus lineolaris* (Palisot de Beauvois) which is the one pictured, is one of the most common in the Midwest and eastern states. Plant bugs cause serious damage to seed and are not usually thought of as forage pests. However, they suck the juices from the foliage and are frequently very abundant, resulting in wilting of the plant tips and thus forage yield loss.



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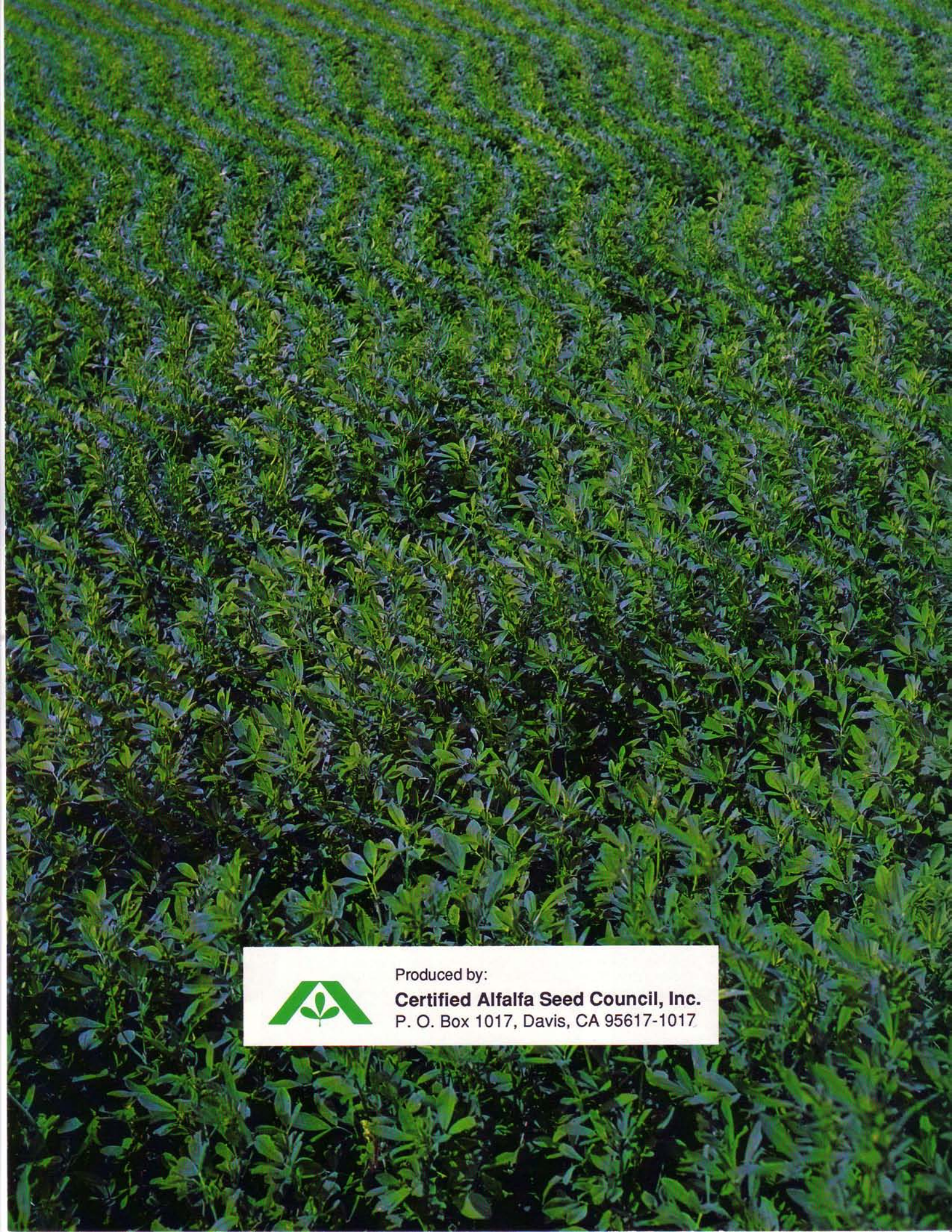

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