



## VIRUS DISEASES OF ALFALFA AND CLOVERS IN ILLINOIS

Virus diseases of alfalfa and clovers are widespread in Illinois, and are responsible for reducing forage and hay yields. Almost every field of red clover two months of age or older contains some diseased plants. Seventy-five percent or more of the plants in certain fields may show symptoms of one or more viruses. Some viruses reduce vigor—causing infected clover plants to be stunted, with less of a lateral (stoloniferous) spread. Other viruses have no apparent effect on vigor. In Illinois, alfalfa appears to be less damaged by viruses than are clovers.



Figure 1. *Bean Yellow Mosaic.*

Studies show that virus infection has reduced yields of Ladino clover by 23 to 55 percent. The number of flower heads was reduced by 20 to 44 percent; seed yields, by 29 to 54 percent. The seed production of red clover was reduced by 96 percent. Clover plants infected with two viruses yielded less than similar plants infected with only one virus.

In addition to these effects, weakening by virus attack may predispose clover and alfalfa plants to root and crown rots, wilts, winter injury, and drought—thus causing stands to be thin and unproductive. For details, see Report on Plant Disease No. 300, “Bacterial Wilt of Alfalfa”; No. 302, “Root and Crown Troubles of Alfalfa”; and No. 304, “Root and Crown Troubles of Clovers.”

The viruses that are believed to infect clovers and alfalfa in Illinois include alfalfa mosaic, pea common mosaic, bean yellow mosaic, bean common mosaic, tobacco ringspot, tobacco streak, cucumber mosaic, beet mosaic, and potato virus X. Peanut stunt has been reported from clover in Iowa, so is likely here also.

Many annual and perennial legumes plus a wide range of nonlegume-crop plants and weeds are susceptible to these same viruses. For example, the red clover mosaic—or common pea mosaic virus—attacks more than 330 species of legumes, in addition to a large number of nonlegume crops and weeds. The alfalfa mosaic virus, composed of many strains, infects more than 220 species of plants in 73 genera.

### SYMPTOMS

The symptoms of virus infection vary greatly from plant to plant, depending on the virus, the virus strain, the legume that is infected, and the time of year. The symptoms of most virus diseases are most

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conspicuous during the cooler parts of the growing season. Sometimes the symptoms disappear (become masked) for short periods during hot weather. The most conspicuous symptoms usually develop on the leaves. Two or more viruses may occur in the same plant at the same time, but the symptoms are usually additive.

**ALFALFA AND SWEET CLOVER MOSAICS.** Several mosaic-type viruses are widespread on alfalfa and sweet clovers. The most common mosaic on sweet clovers is bean yellow mosaic (Figure 1). Alfalfa mosaic also occurs on sweet clovers. In the spring and autumn, mosaic-infected leaves often have a conspicuous, diffuse, light- and dark-green or yellow mottling and streaking. The leaves may be crinkled, distorted, irregular in shape, and about half normal size. The leaves of sweet clover may develop small, light-yellow spots. The symptoms usually disappear in hot weather. Alfalfa plants are sometimes dwarfed and weakened in succeeding years. Some virus strains kill very susceptible alfalfa plants by predisposing them to root rot. Most infected plants in a stand never show symptoms. Severely infected plants are not readily seen in an alfalfa field, since these plants soon become hidden under the canopy of healthy plants.

**COVER MOSAICS.** A number of different viruses infect clovers, producing a variety of symptoms. Two general types of symptoms are widespread.

**MOTTLING.** The symptoms vary. An irregular light- and dark-green to yellow mottling develops in the leaves. Individual leaves may be ruffled, puckered, or twisted. Plants are often dwarfed. Seed set is reduced. Alsike clover leaves may develop a yellow spotting between the veins. Later, these spots disappear, leaving green bands along the veins.



Figure 2. Red clover vein mosaic.

**VEIN MOSAIC.** Regular to irregular yellow patterns develop along the veins of the leaves, sometimes with a yellow interveinal spotting (Figure 2). The leaves are not mottled. Symptoms are usually most striking on the younger leaves. Plants are usually normal in size and shape, showing little or no reduction in vigor.

## **DISEASE CYCLE AND EPIDEMIOLOGY**

Feeding of virus-carrying insects, which acquire virus from overwintering host plants, and planting of infected seed are the most common sources of early virus infections. Alfalfa mosaic, red clover mottle, white clover mosaic, and possibly other viruses that infect alfalfa and clover can be readily transmitted from infected to healthy plants by mowing machines. Once early infection sites are established, the spread of a virus within a field is chiefly by the feeding of the transmitting insects (vectors).

Aphids are the most common vectors of the legume viruses. Some viruses from non-legume hosts, such as tobacco, tomato, potato, gladiolus, and certain weeds, readily infect clovers and alfalfa. These viruses can easily spread from one crop to another, or from weeds to crop plants, if a sufficient number of the correct aphid vector is present. Alfalfa, clovers, and perennial weed plants along roadsides, fence rows, and drainage ditches, or in other waste areas, are important as overwintering hosts for the viruses. In the spring, various species of aphids can transmit these viruses to annual legumes (for example, garden beans and peas) or to other crop plants where losses may be severe.

Alfalfa mosaic is readily transmitted by aphids and through alfalfa seed (Figure 3). Infection levels of up to 10 percent have been observed in field-grown alfalfa seed. A 1- to 3-percent level of infected seed in commercial seed lots is not uncommon. The virus is known to persist in alfalfa seeds for 5 years or more.

Most of the viruses that infect alfalfa and clovers are systemic. That is, they can be found throughout most parts of the plant. Once infected, such plants remain so for life.



Figure 3. Red clover alfalfa mosaic virus.

## CONTROL

1. **Unproductive fields should be plowed-down** and planted in corn, sorghum, a small grain, or forage grasses.
2. **Plant virus-free alfalfa and clover seed** that is certified.
3. Whenever feasible, **do not grow alfalfa and clovers close to other legumes**—especially garden peas and beans.
4. **Keep down weeds** in drainage ditches and fencerows, along roadsides, and in other waste areas.

**The ultimate solution is to develop alfalfa and clover varieties that are resistant to the most prevalent and injurious virus diseases.** It will be a number of years, at least, before varieties highly resistant to several viruses become available.