

## Wheat Streak Mosaic in Alberta and Its Control

The information in this factsheet was prepared five decades ago by Dr. J.T. Slykhuis and Dr. J.E. Andrews at the Agriculture Canada, Lethbridge Research Station. With a few minor revisions, all their virus control information is as valid now as it was then.

Wheat streak mosaic, which is probably native to southern Alberta, was first recognized here in 1952. In both 1952 and 1953, wheat streak mosaic caused severe damage to a number of winter and spring wheat crops. It did so again on winter and spring wheats in 1992 in the Claresholm to Mossleigh area.

This disease can be controlled or reduced to a minimum by following certain cultural and agronomic practices. The following information is provided to answer some of the questions being asked by farmers about wheat streak mosaic and to suggest methods for its control.

### What is wheat streak mosaic?

Wheat streak mosaic is a disease of wheat caused by a virus. The virus enters the leaves and spreads to all parts of the plant. The first signs of the disease are light green dashes or streaks in the leaves caused by the destruction of chlorophyll. As the disease progresses the light green dashes and streaks turn to yellow streaks and blotches giving the leaf a green and yellow pattern of colour called a "mosaic", hence the disease is called "streak mosaic".

### How does streak mosaic damage the wheat plant?

The virus causes destruction of the green chlorophyll that harnesses the sun's energy for the manufacture of sugar in the plant. Infected plants are usually stunted and produce fewer seeds, which are often badly shrivelled. The earlier

the infection, the greater is the effect on the plant. Thus plants may die, fail to set seed, be stunted or show little effect depending on when they were infected.

### How can the disease be recognized?

In young plants, the disease can be recognized by the presence of light green or yellow streaks in the leaves. These streaks distinguish wheat streak mosaic from yellowing due to other causes.

Later as the crop matures, stunting of diseased plants is the most obvious indication of wheat streak mosaic. These stunted plants are usually intermingled with plants of normal height. Thus heads occur at two levels throughout large areas of the field. This contrasts with the effect of "take-all" root rot that causes stunting in scattered, irregular patches. Blackened bases and roots are typical signs of "take-all".

### How serious is streak mosaic?

Damage ranging from complete crop failure to severe reduction in yield can result from mosaic infection. Such severe damage usually occurs in localities where a combination of conditions happens to favour the disease. Sometimes, as in western Kansas in 1949, streak mosaic causes severe losses in many fields over extensive areas. However, usually only an occasional field is severely damaged. It is customary to find crops with little or no damage from streak mosaic within a few miles and sometimes even adjacent to fields that were ruined by the disease.

## **How does the disease spread?**

The virus causing wheat streak mosaic, like most viruses, can not spread without the aid of some carrier. Streak mosaic has unusually interesting carriers, which are very tiny, four-legged, worm-like mites. These mites are only one-one hundredth of an inch long, and they cannot be recognized without the aid of a strong magnifying glass. In fact no one knew these mites occurred on wheat, nor just how wheat streak mosaic spread in the field until October 1952, when the mites were found and then proven to be the carriers of the streak mosaic virus.

The mites, known by the scientific name of *Aceria tulipae*, are not the actual cause of streak mosaic. They merely carry the virus from diseased to healthy plants. It is an odd coincidence, however, that conditions favorable for the virus also favor the mites.

The mites, like the virus, must have living plants to survive throughout the year, and they prefer wheat. They survive the winter on winter wheat. The delicate looking mites can actually stand more freezing than the hardiest varieties of winter wheat, but if the wheat plants die from freezing the mites also die.

Mites that survive the winter on winter wheat increase rapidly during the warm spring and summer weather and find their way to susceptible plants nearby. The mites have no wings and cannot fly, and they are too small to crawl far. They are so light that they are blown about by the wind like specks of dust or tiny flakes of snow.

## **What conditions favor the disease?**

Important conditions that favor the spread of the disease are the presence of a source of infection coupled with early planting of fall wheat. The most severe losses have occurred in early planted fields of winter wheat although the disease has been observed in other winter wheat fields and in spring wheat. The streak mosaic virus and its carrier, the mite, need living plants to survive not only the winter but throughout the year.

During the warm weather of spring and early summer they can spread from winter wheat on which they overwintered to other winter or spring wheat nearby. They can spread continuously throughout the summer as long as the infected wheat plants remain green.

When the wheat crops are ripe, both survive in living shoots of volunteer wheat and to some extent in susceptible grass weeds in the wheat stubble fields. Their abundance in the fall therefore depends to a large extent on the amount of living volunteer wheat, and perhaps susceptible weeds, that are allowed to grow in fields where the virus and mite have increased during the summer. If

such infested plants are allowed to survive in stubble or even in summerfallow fields and winter wheat is seeded in or adjacent to such fields early in the fall, the disease has its best chance to spread to the new winter wheat crop.

On the other hand, if the new winter wheat crop is sown late the disease has less warm fall weather in which to spread. Sources of infestation can be eliminated by destroying volunteer wheat and susceptible weeds before the new crop is sown. Prairie grasses are not an important source of infection.

## **Is streak mosaic serious in crops other than wheat?**

Although oats, barley and some other grass-type plants can be infected with the wheat streak mosaic virus, wheat is the only cereal that is seriously affected. All types of wheat including hard red winter, spring, soft and durum, are susceptible to this disease.

## **Is streak mosaic a menace only where winter wheat is grown?**

Although spring wheat is as susceptible as winter wheat, streak mosaic is not a menace in areas where winter wheat is not grown. This is because the virus and mites overwinter in living plants, and winter wheat is the most favourable plant known for carrying the virus and mites through the winter.

## **Is the virus carried in the soil, straw or seed?**

All experimental evidence to date indicates that there is no danger of the virus being carried over in the soil, straw, or seed. It is perfectly safe to sow seed from a streak mosaic infested crop. When a plant dies or matures in the field both the virus and the mites die.

## **Can the virus and the mites be controlled with sprays**

There is no chemical known to control the virus, nor to cure infected plants. There are sprays that will kill the mites, but as yet there has not been enough experimental work to find a spray that will be of value in the field. Possibly a good spray may be found to prevent the spread of the mites and hence the virus. Then as now there is no economic chemical control.

## **Are any varieties of wheat resistant to wheat streak mosaic?**

No commercial varieties of wheat possess sufficient resistance to streak mosaic to be of any value in controlling the disease. Nevertheless, there is some hope that a suitable source of resistance may be found and that good resistant varieties may be developed. None have been developed to date (1993).

## **Can wheat streak mosaic be controlled on Alberta farms?**

Any farmer in Alberta who is aware of wheat streak mosaic on his farm can control the disease by cultural means if he has a thorough understanding of these facts. It is still better when his neighbors also understand the danger. By a community effort, with little or no extra expense to any farmer, the disease can be essentially eliminated.

Shortly before seeding time destroy any volunteer wheat in or near fields in which winter wheat is to be seeded. It is not necessary to bury the stubble but only to destroy the growth. Perform all cultivating operations a week or two before seeding. Do not rush it and thus upset your cutworm control program.

Seed winter wheat between September 1 and 15. Later seedings are safest from mosaic infection, but a compromise must be made with good agronomic practices.

There is no danger of streak mosaic occurring in spring wheat if the virus does not overwinter on winter wheat crops or volunteer plants. Therefore, be certain that there is little or no mosaic in any winter wheat crop before seeding spring wheat next to it. If much streak mosaic is present in a field of winter wheat, seed a resistant grain like barley or oats adjacent to it rather than spring wheat.

When a winter wheat crop is so severely infected with mosaic that it must be destroyed in early spring, spring wheat can be safely seeded in the same field if all infected plants are killed. Allow several days for the diseased plants to dry out or begin to decay before seeding spring wheat. If the infected plants have not been completely killed then seed barley, oats or canola.

## **Are there other advantages or disadvantages of late versus early seeding?**

Seeding fall wheat early in August may be more convenient to some farmers since this is a period when other farm operations are at a minimum. In years of unfavourable fall conditions and early freeze-up, the earlier seeded fall wheat may have some advantage in attaining adequate fall growth. However, in most years, the disadvantages of early seeding far outweighs the advantages.

As previously mentioned, streak mosaic has a much better chance to spread in early-seeded than in late-seeded fall wheat. In early-seeded fall wheat, there is also a greater opportunity for development of root rots. Furthermore, the early-planted fall crop uses up a lot of soil moisture before freeze-up. Moisture used during this period does not add anything to the yield of the crop. If there is a dry fall, the early-planted crop may use up most of the available moisture before winter and consequently may die from drought before spring. Drought is one of the causes of winter killing.

Seeding fall wheat during the first two weeks of September appears to be the best date to satisfy all conditions for the successful production of winter wheat in southern Alberta.

## **Are there any recent developments?**

Since this fact sheet was written 50 years ago, there are no recommended chemical controls or resistant wheat varieties. The cultural control methods described are as effective now as they were then.

### **Prepared by:**

*Dr. Ieuan R. Evans*  
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