



LEAF VARIEGATION OR JUNE YELLOWS IN STRAWBERRIES

Although leaf variegation or June yellows in strawberries was noted and described as "gold-striped" and "silver-striped" as early as 1719, the cause of the disorder is still not known. Various synonyms for the disorder are Blakemore yellows, spring yellows, chlorosis, and noninfectious variegation. Leaf variegation occurs commonly in, but is not limited to, strawberry cultivars that have Blakemore, Howard 17 (Premier) or Auchincruive Climax in their parentage.



Figure 1. Leaf variegation or June yellows; healthy leaf to right.

Suspected Causes

No causal agent has been associated with leaf variegation or June yellows. The disorder has not been transmitted asexually by grafting or sap inoculation but can be transmitted sexually to seedlings of affected parents. Its appearance is unpredictable in all breeding lines and may not become evident in a particular clone for several years. The current theory is that leaf variegation is due to some entity within the strawberry host cells that acts similarly to certain virus or mycoplasma infections. Electron microscopy has thus far not identified a virus or mycoplasma in diseased plants.

SYMPTOMS

Symptoms first appear in the spring on new unfolding leaflets. A puckering and distortion may occur in leaves with a "white streak" type of variegation in early stages of the disease. The leaves become irregularly mottled, streaked, or spotted with golden or pale yellow-to-white and light green areas (Figure 1). A slight loss of plant vigor accompanies the color change. Variegation occurs mainly during cool weather, when the temperatures are below 50°F (10°C), in the spring or fall, although some cultivars may remain mottled throughout the summer. Variegation has been observed only on the foliage and flowers – never on fruit. All runners and daughter plants produced by diseased plants are also variegated with **no** reversion to a normal green color. Seemingly healthy green plants may become variegated at any stage. There is no way to predict when a plant or its offspring will become variegated.

As the disease progresses, the symptoms increase in intensity. The leaves become progressively more

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mottled each year until they are completely golden yellow-to-white and frequently puckered or otherwise distorted. White-streaked or fully yellowed leaves never regain a normal green color during the summer. Affected plants become dwarfed. Fruit production is reduced considerably, with the fruit being small and of poor quality. Affected plants never recover and usually die within two to three years.

Permanent white streaks or sectors, with or without accompanying mottling symptoms, may occur in some cultivars affected by leaf variegation or June yellows. White streak may be a chimera (the result of a somatic mutation). It occurs more commonly in some cultivars, for example, in Earliglow, than in others.

Economic Importance

The economic losses from leaf variegation are of two types. The first and most obvious is a reduction in productivity. The degree of reduction in fruit yield depends on the severity of the symptoms and the presence of other diseases. Losses range from practically no reduction with mild symptoms to a complete crop loss when the symptoms are severe. Thus, new plantings with relatively mild variegation may be highly productive the first year. As symptoms increase in severity, however, the yields will decline.

The second type of loss is the extinction of a potentially superior variety. The cultivars Dixieland and Vermilion were formerly grown on a large acreage in Illinois and were widely recommended for commercial production. These two cultivars are now nearly extinct due to variegation. The only cultivar still on the market that has variegation is the everbearer Ozark Beauty. This cultivar has been largely replaced by newer and improved cultivars such as Tristar and Tribute.

CONTROL

1. Do **not** propagate from variegated mother plants.
2. The only control to save a variety from extinction is to locate a source of "yellows-resistant" or normal plants of the desired variety. These plants, if found, should be propagated by virus-free procedures to increase the number of healthy plants. **Never** accept plants that show leaf variegation.
3. The disorder appears to be noninfectious in that normal green clones may grow beside variegated clones for long periods without becoming variegated.
4. Where the percentage of variegated plants in new or established plantings is reasonably low, variegated plants should be rogued (removed and destroyed) as soon as the disease is detected and replaced with nonvariegated, certified, virus-free plants.
5. At present there is no cure for leaf variegation, and there is no assurance that healthy green plants in a variegation-susceptible cultivar will remain nonvariegated.