

Practices Relating to Control of Tobacco Mosaic

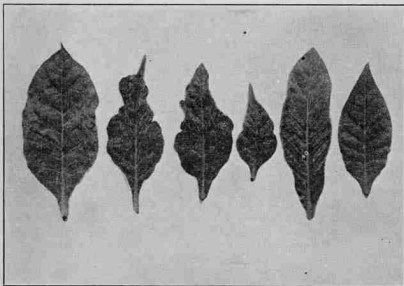


Figure 1.—Symptoms of tobacco mosaic as they appear on small plants in the bed. The one on the right was from a healthy plant; the others from diseased plants. Note the leaf deformity and fading of color on some portions of the diseased leaves.

THE AGRICULTURAL EXPERIMENT STATION
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PRACTICES RELATING TO CONTROL OF TOBACCO MOSAIC

By

S. G. LEHMAN, *Plant Pathologist*
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NAMES

The disease of tobacco herein described is most commonly and most appropriately designated by the name "mosaic." Other names sometimes used locally are "walloon," "gray top," "mottle top," and "calico."

OCCURRENCE

The disease is wide spread in North Carolina and is most prevalent in the areas of concentrated tobacco culture. In the Coastal Plain and lower Piedmont relatively few fields are entirely free of mosaic. Many fields are found with 10 to 25 percent of diseased plants and not infrequently 50 percent or more of the plants have mosaic at the beginning of harvest.

LOSSES

Carefully planned tests made by several research workers show that surprisingly large losses result when flue cured, Burley, or Maryland tobacco become diseased with mosaic. The tests show that, when mosaic starts as early as setting time, the yield from diseased plants is likely to be reduced 30 to 35 percent and the monetary value 50 to 60 percent. When mosaic starts as late as topping time, there may be little or no reduction in yield but the quality of the cured leaf is so impaired as to make it worth 20 to 25 percent less than leaves from healthy plants.

HOW TO RECOGNIZE MOSAIC

Mosaic may occur on very small plants in the seed bed as well as on large plants in the field. Before the tobacco grower can successfully combat this disease he must learn to recognize it. This can be done only by observation of the symptoms, that is, the effects which the disease is known to produce on the tobacco plant. Some of these are as follows:

Leaf Mottling. The symptom of most common occurrence on large as well as small plants is a color mottling of the leaves. This is caused by a variation in intensity of the green color in the leaf so that certain small areas appear abnormally light green, sometimes nearly white, while adjacent areas have the normal green color of healthy leaves. The light green areas may be smaller, larger, or equal to the areas of normal color. The normal green color borders the larger veins while the light green is found in the areas between, the two together forming a color pattern, or mosaic, of more or less irregular detail.

Leaf Deformity. Still more striking symptoms of mosaic often seen on plants in the plant bed and on young plants in the field are certain kinds of leaf malformation. These irregularities appear as a blistering, cup-

ping, or puffing wherein small areas of the leaf blade bend or puff upward, domelike, so as to appear as small elevations when viewed from above and as shallow depressions from beneath. Young mosaic leaves often become irregular in outline. Whereas the normal healthy tobacco leaf has a smooth, regular or uniform outline, the edges of young leaves of mosaic plants are often indented, lobed or otherwise so irregular as to attract attention. Often they are much narrower than healthy leaves.

Fading of Color. It often happens that the first leaves which develop on young infected plants in the plant bed show neither mottling nor malformation but only a general uniform, faint loss of green color often accompanied by a rolling of the margins. When such plants are found standing among others of healthy aspect, they should be regarded as diseased.

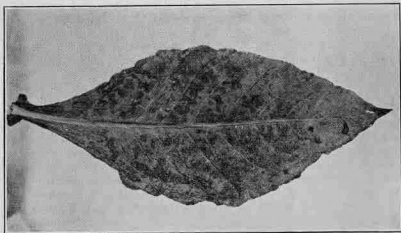


Figure 2.—A tobacco leaf showing the mottling characteristics of mosaic. Note the normal green color in the tissue along the veins and the light green between the veins and involving a large portion of the leaf.

Death of Leaf Tissue. The mosaic virus does not usually kill the tobacco tissue which it enters, and as a consequence such startling effects as death of leaves or plants are seldom seen. However, in mid-summer and on plants infected with mosaic, one sometimes finds large areas of dead or dying tissue extending across the middle of one or two large leaves of each diseased plant. Usually the affected leaves would have been ready to gather within a week or 10 days, but the dead areas render them practically worthless. The dead areas are on the part of the leaf which has received the most perpendicular rays of the sun, and resulted from decreased ability of the diseased tissues to withstand the effects of intense sun rays.

CAUSE OF DISEASE

The agent which causes tobacco mosaic is called a virus. Although its true nature is still imperfectly understood, certain of its properties and activities are well known. It is extremely minute, so small as to have, as

yet, escaped definite recognition even when the highest power microscopes are used. It increases tremendously and, so far as known, only in living plant tissue, but is able to survive for many years in dead dry leaves from diseased plants. It enters the tobacco plant chiefly through wounds. It is easily distributed by a transfer of juice from diseased to healthy plants and survives for a considerable time on the hands and clothing of persons who have been handling diseased tobacco and on farm implements used in tobacco culture. It is not eliminated from tobacco by those curing processes which are carried out at ordinary temperatures and is only partially removed by the high temperatures employed in flue curing. The virus also persists in certain brands of manufactured tobacco which happen to have been made from leaves of diseased plants. The debris which accumulates in and on soil carrying a crop of diseased tobacco carries the disease virus from one crop year to another. In farm practice man himself is apparently the agent chiefly responsible for spread of the disease but it may also be carried from plant to plant by certain insects.

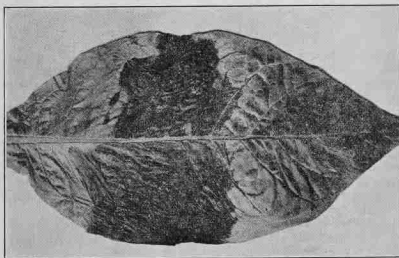


Figure 3.—Mosaic damage sometimes occurring on older leaves in the field. Note that a large area of leaf tissue across the middle of the leaf has died and adjacent areas are losing normal color.

KINDS OF PLANTS AFFECTED

Tobacco is not the only kind of plant subject to attack by the virus of tobacco mosaic. The same virus produces a disease on tomatoes very similar to that on tobacco. Pepper, egg plant, and petunia are also susceptible. Certain weeds such as Jimson weed, ground cherry, black night shade, horse nettle, and henbane may also harbor the tobacco mosaic virus. Among these, horse nettle, if infected, is especially obnoxious. It forms deep roots which remain alive overwinter and send up a new crop of diseased shoots each spring. These often come up in tobacco beds and constitute a perennial source from which mosaic virus may be transferred to tobacco.

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(e) Add no discarded tobacco nor extract of tobacco trash to the plant bed unless this material has been treated, as by boiling for a few minutes, to destroy any mosaic virus that may be present in it. Avoid use of manure containing discarded tobacco leaves, stalks, or roots.

(d) Use new plant bed frames and new cloth. Old cloth may be used without danger if sterilized by boiling for a few minutes.

(e) Prepare plant beds in such a way as to prevent growth of the kinds of weeds which harbor mosaic in or near the beds.

(f) Avoid the use of tobacco, particularly snuff and home cured chewing tobacco, while handling young plants. The mosaic virus is extracted by the saliva and often gets on the hands and is then accidentally rubbed on the plants.

SOURCES OF FIELD INFESTATION

Infection of tobacco plants after transplanting to the field may arise from the following sources:

(a) Plants drawn for setting from infested beds.
(b) The soil of fields which produced a diseased crop in the previous season.

(c) Virus on the workmen's hands contaminated by handling diseased plants or by use of diseased tobacco.

(d) Virus on implements of culture previously used in cultivating other fields containing diseased plants.

CONTROL OF MOSAIC IN THE FIELD

(a) Set only mosaic free plants in the field. If an occasional diseased plant is found in the bed from which plants are being pulled, the bed should be searched carefully and all diseased plants together with those immediately adjacent to them removed. Even with very careful searching of infested beds some diseased plants are likely to be overlooked and one may confidently expect the appearance of more or less diseased plants in the field. If more than an occasional diseased plant is found in the bed, the probabilities are that it will be better to abandon the bed if plants from other disease-free beds are available.

(b) In pulling plants for setting avoid indiscriminate handling of diseased and healthy plants. The virus in the juice of the diseased plants adheres to the hands and is transferred to other plants. If diseased plants are accidentally handled the virus should be removed by washing the hands with soap and water or by rubbing it off with disease free soil.

(c) After the plants have been set in the field, they should be examined and all diseased plants removed before each cultivation. This will effect an early elimination of diseased plants and prevent spread of the virus from them to healthy plants on the implements of cultivation.

(d) Avoid use of implements of culture that have been used in diseased fields from which the mosaic plants were not removed previous to cultivation. The virus of mosaic adheres where these implements rub diseased plants and is thus carried to and rubbed off on plants in disease free fields.

(e) If diseased plants are found while worming, topping and suckering avoid handling them until the healthy plants have been cared for.

(f) Plan the tobacco rotation so as to allow the lapse of at least one growing season before tobacco is replanted on land which grew a crop having a high percentage of mosaic. Little or no infection will then arise from the soil. Tests to be reported in detail in another bulletin show that production of a crop of tobacco diseased with mosaic results in a degree of soil contamination which constitutes an important disease hazard to tobacco set on the land in the following spring.

(g) Soon after the tobacco crop has been harvested, remove the diseased plants from the land or cut up the land and diseased plants with a disk. Either of these operations will greatly reduce disease arising directly from soil contamination and are equally effective when performed in early fall. However when the plants stand on the land over winter, removal of the diseased plants from the land is more effective in reduction of soil contamination and resulting initial infection than disking. These details are regarded as highly significant in control of mosaic if the cropping plan is such that tobacco follows tobacco without the growth in alternate years of some other crop not susceptible to tobacco mosaic. Spread of mosaic from the small proportion of plants which do become infected from the infested soil may be effectively prevented by removal of the diseased plants before each cultivation.

(h) It is not advisable to reset tobacco plants in places vacated by removal of diseased plants. A large proportion of such resets are likely to become diseased.

The above recommendations are subject to intelligent modification to meet special or peculiar situations. It is highly important to prevent seed bed contamination because this usually results in much spread of the mosaic virus and a large proportion of diseased plants in the field early in the season. Since control in the field is accomplished chiefly by early removal of diseased plants, it is important to prevent as far as possible field infections from contaminated soil and thus reduce to a minimum the depletion of stand resulting from necessary removal of diseased plants.