

BLOTCHY RIPENING SYMPTOMS OF TOMATOES AND PROCEDURES FOR RATING

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During the writer's visit in Florida in the winter of 1964, numerous inspections were made of tomato fruits grown both in the field and in plastic houses. It became apparent that the array of symptoms attributed to "blotchy ripening" in New York State also were commonly found in Florida though the disorder is usually referred to as "graywall." It is also interesting to note that the same symptoms have been observed in tomatoes in all districts the writer has visited in recent years, including Ontario province of Canada, Mexico, California and a number of other mid-western and eastern states. These personal observations along with the numerous literature references and first hand reports of many scientists indicate that blotchy ripening is a wide spread disorder that impairs the quality of tomato fruits for both fresh use and processing.

Much confusion has ensued in respect to terminology and nature of the symptoms which in turn has slowed both the communication and accurate interpretation of research data and other observations regarding this disorder. The purpose of this paper is to present the symptoms being ascribed to the disorder in New York State along with the rating procedures being used. If all workers adopt a similar procedure, communication of information regarding the problem can be improved.

Two internal symptoms referred to as "white tissue" and "brown tissue" which develop in the ovary walls (and sometimes in other portions of the fruit), are now being considered as the basic symptoms. These give rise to the external symptoms, if any, depending on the location in the walls.

During coloration of the fruit the "white tissue" either remains devoid of lycopene or develops the red pigment much slower than normal tissue. It also becomes much harder in texture than normal tissue. The color may range from

light green, yellow, translucent white to cottony white. The extent may vary from very small islands to large complete sections of the walls or flesh. This white tissue may develop before coloration but is not always distinguishable by the eye.

The "brown tissue" symptom is composed mostly of dead cells invariably associated with white tissue and often is closely aligned with the vascular bundles. This browning, illustrated by Wiebe (2), can be confused with the "internal browning" caused by tobacco mosaic virus as described by Boyle (1), but in New York State, at least, the former seems to be much more prevalent. The brown tissue symptom appears much less frequently and less extensively than white tissue, but when it does, it is more objectionable in nature.

The external symptoms attributed to blotchy ripening can be grouped into three categories as follows:

1. Blotch (or blotches) which usually have rather sharply defined margins, may occur anywhere on the fruit surface, may be green, gray or yellow in color and may vary in shape from round spots to long, narrow streaks. Typical "graywall" would be included. It is believed the defect known as green or yellow shoulder belongs in this group, but since there is much disagreement on this point, this group of symptoms might be identified separately for the time being.
2. Yellow or green bands, ringing the stem scar (or nearly so). Frequently this narrow band is the only visible symptom but is frequently portends some white tissue not evident externally.
3. "Subsurface Yellowing" is a less distinct symptom that is also sometimes confused with sunburn. While with the previous external symptoms white tissue occurs adjacent to the epidermis, in this symptom a thin layer of relatively normal, red tissue exists between the white tissue and the epidermis giving rise to an off-color varying from yellow to orange.

In rating or evaluating tomato fruits for blotchy ripening it seems desirable to determine the amount of the affected tissue as well as the number or percentage of fruits showing symptoms. A numerical rating system of 1 to 5 has been used in New York about as follows:

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Preparation of a publication describing these symptoms in detail with histological investigations as supporting evidence is in progress.

<u>Rating</u>	<u>Extent of symptom</u>	<u>Fruit condition</u>
5	None	Entirely red flesh when ripe and no external blemish
4	Slight amount	Considered good quality
3	Moderate amount	Usable but borderline quality
2	Serious amount	A cull
1	Very severe	Most of fruit affected

White tissue and brown tissue each rated separately, will give an accurate indication of the extent of the disorder in a given fruit. External symptoms can be evaluated on the same basis, though once these are related to the internal symptoms by a worker, they become of less importance. To obtain an accurate evaluation of a treatment or variety, fruits should be rated at each harvest throughout the season. It may be preferable to rate all of the fruits on one or two plants per replication than to rely on a limited sample from a larger number of plants. Narrower limits in the readings can be obtained, if desired, by going to one-half scales (like 3.5) or by adjusting to a 1 to 9 scale.

An example of a flat of commercial tomatoes selected at random in the Homestead area during January 1965 and examined as the 31 fruits ripened will illustrate the pattern obtained by evaluation based on the above rating system.

The external symptoms were minor for this

flat of tomatoes being mostly yellow or green blotches at the shoulder area. Most fruits showed a narrow yellow band or ring around the stem scar but this seldom detracts from the overall appearance. A rather significant amount of white tissue was observed in over half of the fruits while only 1 showed any brown tissue. One fruit definitely was a cull and another came close.

A rating system as illustrated will provide a much more accurate description in respect to blotchy ripening than can be obtained by using only one symptom especially if it is an external one. If only one symptom is to be utilized, experience indicates that cutting the fruit and rating the white tissue will be the best indicator.

LITERATURE CITED

- Boyle, J. S. and D. C. Wharton. 1957. The experimental reproduction of tomato internal browning by inoculation with strains of tobacco mosaic virus. *Phytopathology* 47(4):199-207.
- Wiebe, J. 1960. Blotchy Ripening of Tomatoes. Ontario Department of Agri. Toronto, Publication 355.

<u>Rating group & quality</u>	<u>Percentage of fruits in each rating group for 4 symptoms</u>			
	<u>Blotch</u>	<u>Yellow Bands</u>	<u>White tissue</u>	<u>Brown tissue</u>
5-excellent	29	3	19	97
4-good	45	26	19	0
3-fair	23	52	56	3
2-poor	0	13	3	0
1-worthless	3	6	3	0