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Physiological disorders of tomato and their management

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Abstract

Tomato is one of the important crop in the family solanaceae. It is the third most important cultivated crop in India but it is adversely affected by various abiotic factors. The purpose of this review is to know about the non-parasitic disorders which are affecting the crop and the remedies which should be followed to control them. The major physiological disorders which are affecting the crop are blossom end rot, fruit cracking (radial and concentric cracking), puffiness, sunscald, blotchy ripening etc., The visible symptoms of the blossom end rot affected fruits are showing small darkened or water soaked area near the blossom end of the fruit which is majorly caused due to Calcium deficiency. Fruit cracking is associated with cracks develop at the stem end of the fruit, due to heavy rainfall or irrigation followed by long dry spell. The fruits affected with puffiness are looks normal from outside, but the fruit are hollow inside. One of the seed cavities is usually empty. Causes of puffiness are extreme high or low temperature, excessive fertilization and poor pollination and fertilization. Sunscald occurs on fruit exposed to the sun during periods of extreme heat and the affected fruits are shiny white or yellow patches would be on the sides of the fruit exposed to the sun. So this article will help the growers on various physiological disorders which are affecting the crop and the remedial measures to be followed to grow the healthy crop.

Keywords: Tomato, physiological disorders, blossom end rot, fruit cracking, puffiness, sunscald, control measures

Introduction

Tomato (*Solanum lycopersicum* L.) is a very important crop in the world as well as in india. In India it is cultivating in open field as well as in the green house conditions. Tomato is cultivating in area of about 0.81 million hectares with the production of 20.51 million metric tonnes (Horticultural statistics, NHB, 2018-19) [1]. Tomato is adversely affected by various physiological disorders and the control measures which should be followed to minimise them are explained in this review.

Physiological disorders

Blossom end rot: Blossom end rot is a physiological disorder of tomato that can appear on fruits at any time in their development, but most commonly appears when fruits are one-third to one-half grown. The initial symptoms are water-soaked spots on the blossom end of the fruit. These spots later enlarge and become black. Secondary infection by other decay causing organisms usually follows. The cause of this disorder is considered to be calcium deficiency in the developing fruit. Extreme fluctuations in moisture, root pruning and excessive nitrogen fertilization can also result in blossom end rot. (Department of Crop Sciences, University of Illinois Extension).

Control: Avoid excessive application of Nitrogen particularly in ammonium form. Application of lime or calcium based fertilizers (eg. Calcium Ammonium Nitrate) as basal dose is commonly used to control this physiological disorder. Soil testing is recommended to determine if there is a shortage of calcium. Liming with high-calcium limestone 2-4 months before planting can alleviate blossom-end rot. Foliar spray of Calcium chloride (3 g/litre of water) also controls this disorder.

Fruit cracking: Two types of cracking occur in tomato fruit (Radial and Concentric cracking). Concentric cracking is a splitting of the epidermis in circular patterns around the stem scar. Radial cracking is a splitting that radiates toward the blossom end from the stem scar. Radial cracking is more likely to develop in full ripe fruit than in mature green. Fruits exposed to sun develop more concentric cracking than those, which are covered with foliage. Cracks occur on tomatoes as they near maturity, depending on the cultivar.

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Less susceptible cultivars do not crack until the breaker stage; more tolerant cultivars do not crack until they are red ripe; resistant cultivars rarely crack at all. Cracking is associated with rapid fruit development and wide fluctuations in water availability to the plant. Fruit that has reached the ripening stage during dry weather may show considerable cracking if the dry period is followed by heavy rains and high temperatures (Department of Crop Sciences, University of Illinois Extension).

Control: Cracking could be minimized by planting cultivars tolerant to cracking, proper water management, practicing good nutritional program to prevent overly succulent plants, and preventing defoliation due to foliar diseases to limit fruit exposure. If the cracking is associated with the Boron deficiency, it can be minimized by Soil application of Borax @ 15-20 kg/ha and also Spraying of borax 0.25% 2-3 times fruiting stage to ripening stage.

Cat-facing: Cat face tomatoes are misshapen, with enlarged scars and holes in the blossom end of the fruit. Cold weather at the time of blossom set distorts and kills certain cells that should develop into fruit, resulting in the deformities. The disorder is most often observed among first-formed fruit. Generally, any disturbance to flowers can lead to abnormally shaped fruits. Extreme heat, drought, low temperature, and contact with hormone-type herbicide sprays may cause flower injury. (Department of Crop Sciences, University of Illinois Extension).

Control: Cat-face can be controlled by planting cultivars not subject to this damage. In greenhouse, heating to avoid low temperatures can reduce cat-facing. This includes temperature control for the growing of transplants for field planting. Other than keeping herbicides away from flowers, control for cat-face is planting less susceptible tomato varieties.

Puffiness: The outer wall of the fruit is normal, but the tomato is hollow inside. One of the seed cavities is usually empty. Cause: Extreme high or low temperatures, excessive nitrogen fertilization, and heavy rains may interfere with normal pollination, resulting in puffy fruit. Puffiness occurs most frequently on early fruit. (Richard Jauron, 1997) [5].

Control: No effective controls. Puffiness should decline later in the summer. Optimum dosage of fertilizers should be applied to minimize the disorder.

Sunscald: Green fruits exposed to direct sunlight ripen unevenly so that yellow patches appear on the side of the tomato fruit when it ripens. Symptoms are most likely to appear at the mature green to breaker stage of development. The lesions are infected by secondary infection of fungus which shows black dark spots making tomatoes unfit for consumption. Sunscald caused due to High fruit pericarp temperature 40C. In bright sunlight, surface temperature may be more than 10C highest than the air temperature. (K.L. Chada, 2001) [2].

Control: The best protection against sunscald is to utilize cultivars with enough foliage to cover the fruit and to provide enough water and pest protection to maintain the healthy foliage. Crop are planted at higher densities are less susceptible to this malady. Cultivation of indeterminate /semi-determinate varieties without staking also could be helpful.

Blotchy ripening: This disorder also known as the gray wall is recognized as grayish appearance caused by partial collapse of the wall tissue hence the term gray wall. The affected area remain green or yellow are usually found nearly at the stem end of the tomato fruit. It was due to the deficiency of potassium (K). (Lalit Kumar Verma *et al*, 2018) [3].

Control: Use of balanced fertilizer dose (after soil testing) in the crop prevents the occurrence of blotchy ripening. Adjust the planting date to achieve favorable light intensity for good fruit development.

Blossom drop: In this malady, tomato plants fail to set fruits due to extremes in temperature and dry conditions may result in poor pollination and cause the flowers to drop from the plant without setting fruit. Blossom drop on tomatoes occurs when night temperatures are below 55 F or above 75 F (Richard Jauron, 1997) [5].

Control: Water the plants deeply once a week during dry weather. Fruit set should increase when temperatures moderate. Hormone sprays, such as "Blossom Set", may prevent some blossom drop due to low temperatures. However, the resulting fruit are often misshapen. Hormone sprays do not prevent blossom drop due to high temperatures.

Chemical injury: Major chemical damages to tomatoes are caused by herbicides. A common herbicide injury problem in tomatoes is caused by phenoxy herbicides such as 2,4-D and dicamba. These are hormone-type herbicides that are common components of products used to control broadleaf weeds in lawns, pastures and grain crops. These herbicides are prone to drift or move with water to non-target sites. Symptoms of phenoxy herbicide injury appear primarily as a distortion of new growth that occurs following exposure to the herbicide. Young leaves do not fully expand, are narrow and pointed, and tend to curl downward (Department of Crop Sciences, University of Illinois Extension).

Control: To avoid herbicide injury, spray of the herbicide should be avoided when wind may carry spray drift toward tomatoes or other sensitive crops. Also, herbicide spray should be with low pressures coarse spray nozzle, and spray should be applied as close to the ground as possible.

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