

# **Blossom Drop and Reduced Fruit Set in Tomato**

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# Reproductive Features of Tomato

- A tomato flower has both male (stamens) and female (pistil) parts within the same flower
- The 'yellow' stamens wrap around the 'greenish' pistil in the center of the flower
- Stamen: filament and anther
- The pistil: ovary, style and stigma
- The style is the long stalk reaching up to the bumpy and sticky stigma, which extends out well beyond the surrounding stamens



# Pollination in Tomato



- The tomato are self-pollinated at the rate of 98% or more (10am to 4pm).
- There are often no insect pollinators.
- No pollination means blossom drop.
- Tomatoes need biotic or abiotic agent to pollinate.

# Agents of Pollination in Tomato

## Biotic agent (Greenhouse)

Insects - Bees e.g. bumblebee **sonicates** for pollination. **Sonication** is the vibration of the wing muscles without flight, causing the whole flower to vibrate, and a cloud of pollen to be released onto the bee's body and at the same time, onto the stigma.



Bumblebee pollinating a tomato blossom  
Image copyright 2009, David L. Green



# Agents of Pollination in Tomato

## Abiotic agent

- ❖ Wind (Open fields)
- ❖ Mechanical shaking (Greenhouse)

Shaking by wind or mechanical means can cause the release of the pollen, which drops down (the blossoms normally hanging downward) through the stamen tube to the stigma.



# What is Blossom Drop?

Blossom drop is defined as the loss of flowers. It is a condition suffered by **tomatoes, peppers, snap beans, and some other fruiting vegetables.**

This is usually preceded by the yellowing of the pedicle.

Tomato flowers need to be pollinated with 50 h (2 days) or they will abort and drop off. It takes that long for the pollen to germinate and travel up the style to fertilize the ovary at above 55°F.



# Major Potential Causes of Blossom Drop

Any stress which interferes with the pollination or fertilization process that results in abortion of flowers

## Stress (Abiotic)

- ❖ Environmental (Temperature & Relative Humidity)
- ❖ Nutritional

Other Potential Causes of Blossom Drop!

Lack of water

Lack or extended light exposure

Excessive wind

Biotic

Insect damage

Foliar disease

Excessive pruning

Too heavy fruit set



# Temperature: Blossom Drop in Tomato

Temperature

Day

More than 85° F

Night

More than 70° F  
or  
Lower than 55° F

Flower drop





# Temperature: Blossom Drop in Tomato

***Low temperature:*** Interference with the growth of pollen tubes prevents normal fertilization. The pollen may even become sterile, causing blossoms to drop. *Tomato fruit will not set until nighttime temperature is above 55°F for at least 2 nights in a row.*

***Hot temperature:*** Due to the sustained hot temperature especially in night, the food reserves in the tomato produced during the day burns. The result is sticky pollen, altered viability and no pollination. Ultimately the blossom dries and falls off. Also, female flower morphology changes such drying of the stigma.

# Relative Humidity and Nitrogen

Abiotic Stress		
Factor	Rate	Effect
<b>Relative humidity</b> <b>Plays major role in pollen transfer</b>	<b>Too high or too low</b> <b>Ideal range:</b> <b>40-70%</b>	<b>Low: Interference in pollen release. Pollen is dry no able to stick to stigma.</b> <b>High: The pollen will not shed properly.</b>
<b>Nitrogen</b>	<b>High</b>	<b>Encourage vegetative growth and inhibit flower production and/or pollination. This led to poor fruit set.</b>
	<b>Low</b>	<b>Produce spindly vines with low food reserves that cannot support a crop.</b>

## Other Potential Causes of Blossom Drop in Tomato

Abiotic/Biotic Stress		
Factor	Rate	Effect
Water	Low/Lack	Deep root of tomato are stress and weaken the plants.
	High	Excess of water cause oxygen starvation in roots
Excessive Wind	Wind can desiccate flowers and/or physically knock off flowers reducing fruit set.	
Excessive pruning	Pruning can reduce the amount of energy the plant can produce and thus reduce yield.	
Foliar Disease/insect	Fungal diseases such as botrytis or heavy bacterial spot or speck pressure.	
Heavy fruit set	When a tomato plant has too many blossoms, the resulting fruits are all competing for the limited food supplied by the crop. Once the initial crop is harvested, the problem should subside	

# Control of Blossom Drop in Tomato

- **Grow varieties suited to your climate Variety!**
- Variety! variety!**
- **Ensure pollination**
- **Used recommended N rates**
- **Water deeply during dry weather**
- **Control insect and diseases**

**High temperatures and low RD:** In greenhouses, directing a gentle spray of water at the blossoms twice during a hot day will improve flower set when daytime temperatures range between 90° and 100° F and below 75° F at night. The evaporating moisture lowers the temperature, raises the humidity and jars the pollen loose, therefore improving flower set. If daytime temperatures exceed 100 °F and night temperatures above 75° F, this technique is not effective.

**High temperatures and high RD: No water**  
**Low temperatures: Maybe hormones?**



# Hormone and Tomato Fruit Set

**Hormones:** natural organic compounds that are produced in the plant and regulate certain responses such as bud development, root growth and fruit setting. Hormones can be produced artificially.

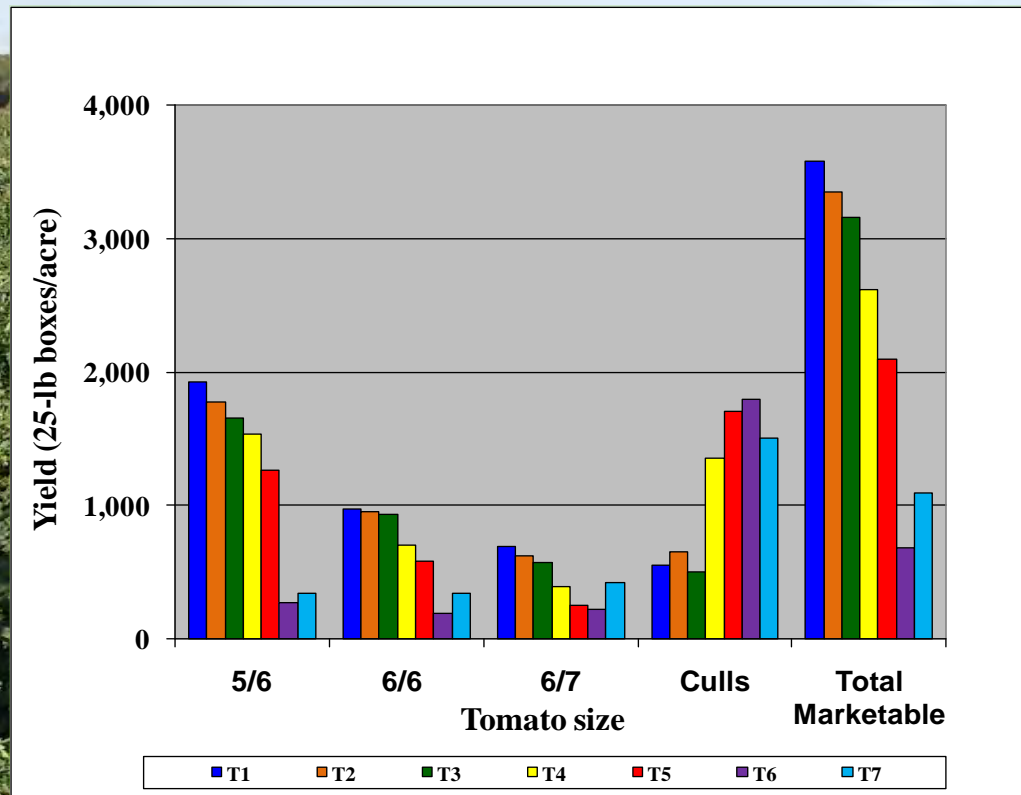
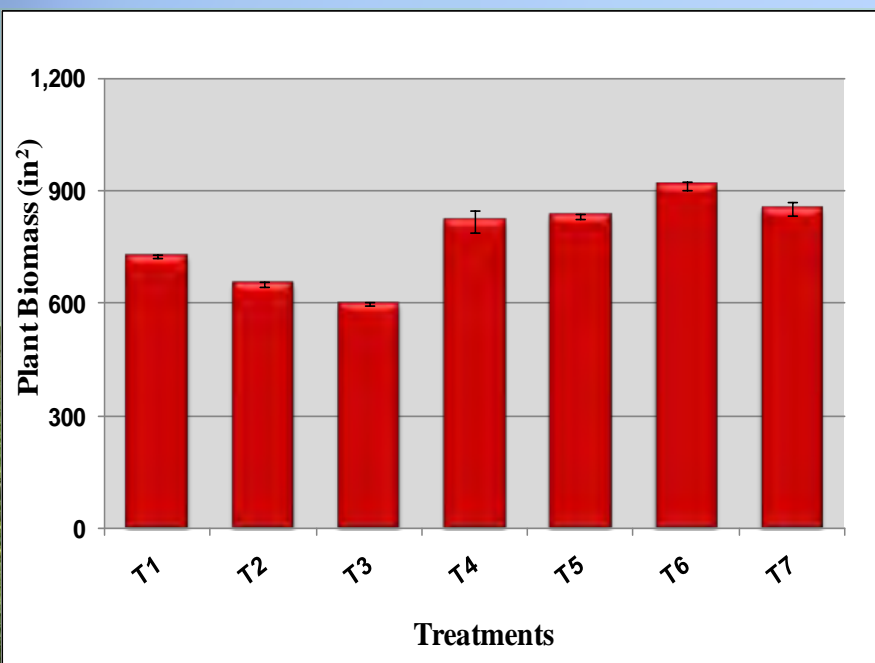
- Hormone treatment is effective in low night temperature only.
- However, favorable results were obtained when the hormones were applied with hand sprayers directly on the flowers rather than the whole plant (injury).
- Hormone treatments do not increase total marketable yields of tomatoes but can shift a portion of the yield earlier in the season (by increased fruit size). Puffiness and blossom end rot may be higher.
- 2 treatments at flower better results

**Hormones and nutritional products:**

**Commercially available blossom-set hormones should not be relied upon because they do not give consistent results. Caution!**







# Post-Pollination Disorder

## CATFACE



Reference: [3 forums.gardenweb.com](https://forums.gardenweb.com)



Reference: [2wintersown.org](https://2wintersown.org)



# Post-Pollination Disorder

## Catface

- **Catface** is a condition involving malformation and scarring of fruits, particularly at blossom ends. Affected fruits are puckered with swollen protuberances and can have cavities extending deep into the flesh.

**Causes:** Possible extreme heat, cold weather with night temperatures 58° F or lower at flowering time, drought, or high N levels. The tomato varieties with very large fruits are more susceptible.

**Control:** Avoid setting transplants too early in the season, grow catface resistant varieties, and avoid herbicide injury.



1urbanext.illinois.edu

# Post-Pollination Disorder

## Zippering



Reference: [omafra.gov.on.ca](http://omafra.gov.on.ca)

# Post-Pollination Disorder

## Zippering

It is characterized by the presence of brown tissue (resembling a zipper) usually running from the stem end to the blossom end due to abnormalities in early flower development

### Causes:

- Zippering is the result of an anther remaining attached to newly forming fruit
- It is also associated with incomplete shedding of flower petals when fruit is forming
- Although sometimes attributed to high humidity.
- In cooler weather, parts of the flower may adhere to the developing fruit and result in zippering.

### Control

The only control is to select varieties that are not prone to zippering.



# Post-Pollination Disorder

## Puffiness



Reference: [omafra.gov.on.ca](http://omafra.gov.on.ca)



# Post-Pollination Disorder

## Puffiness

**Puffiness** causes fruit to appear somewhat bloated, flat-sided or angular leading to oddly shaped fruit. The locular gel (the liquid that surrounds the seeds) fails to fill the fruit's inner cavity resulting in a fruit with flattened sides that lacks firmness.

### Causes:

- **Poor pollination** It can be due to:
- **Incomplete fertilization or seed development** due to cool temperatures
- **In greenhouse,** a lack of vibration or shaking that mixes the blossoms' pollen
- **Other factors** such as low light or rainy conditions can also cause seed set problems
- **High N or low K**

### Control:

**Ensure adequate growing conditions and nutrition to prevent this problem.**

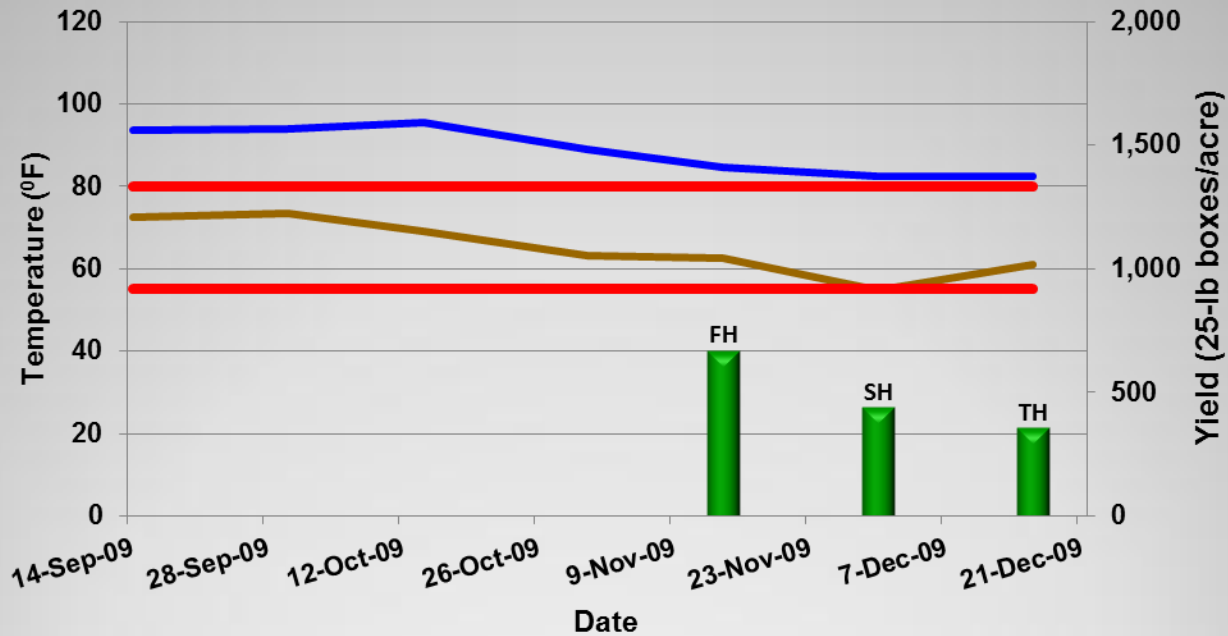


Reference:  
[vegetablemdonline.ppath.cornell.edu](http://vegetablemdonline.ppath.cornell.edu)

**In south Florida, tomatoes are planted continuously between August and February. Historical temperature (average +/- standard deviation, in °F) from a weather station located in Immokalee, FL are 79.6 +/- 1.5, 69.0 +/- 4.4, and 67.4 +/- 6.2 for fall, winter and spring, respectively.**

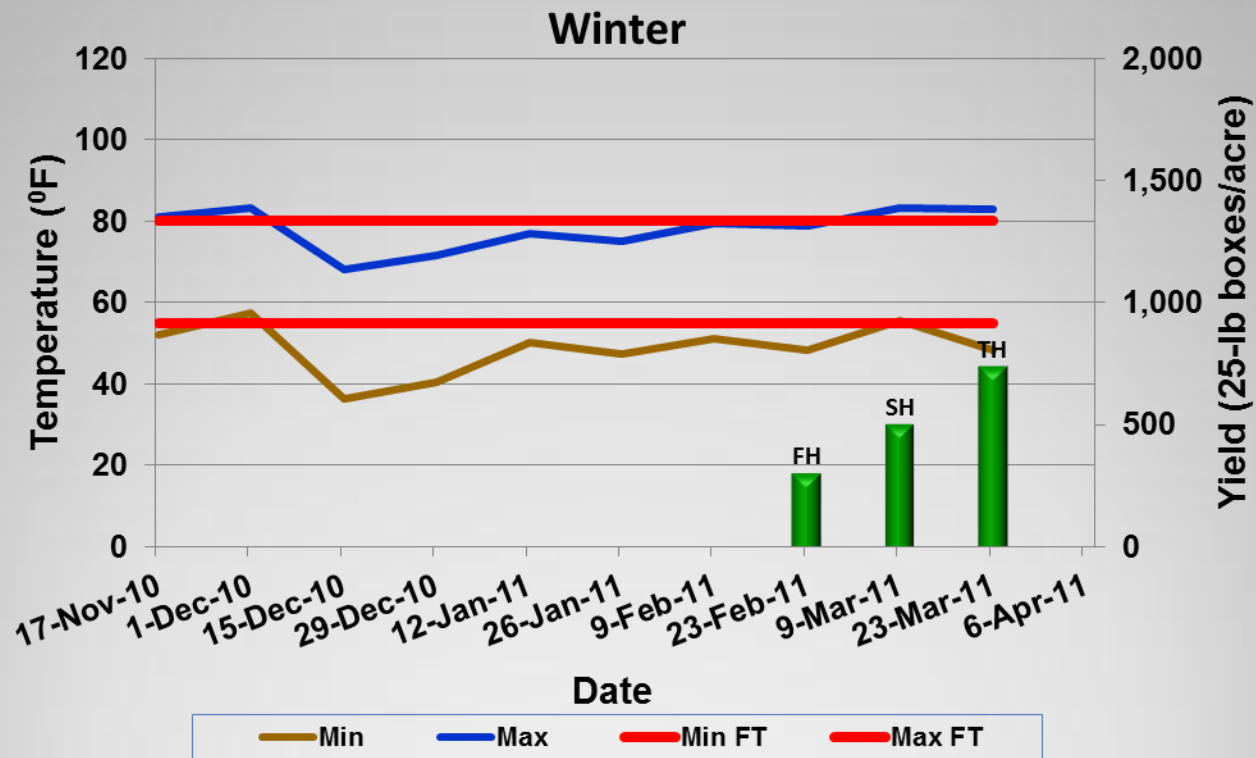


## Fall

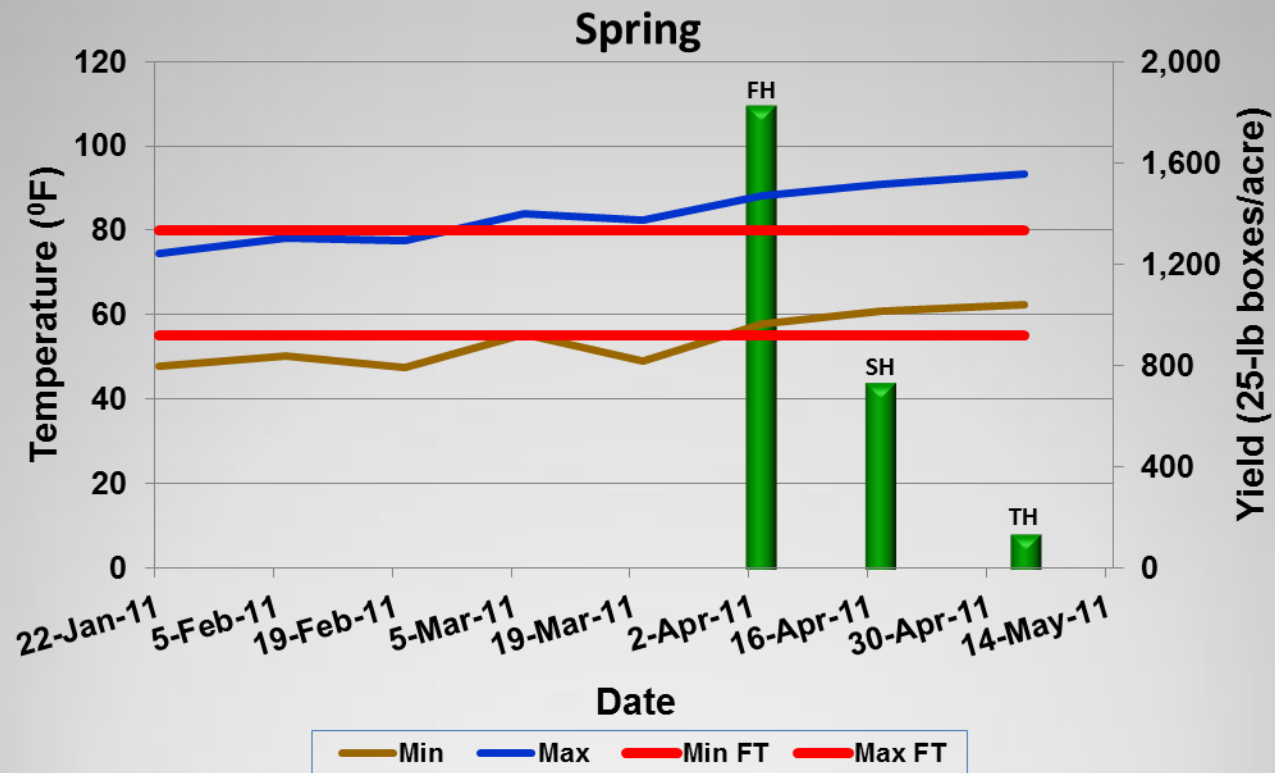


Min Max Min FT Max FT









Month	Week 1	Week 2	Week 3	Week 4
	<b>No Fusarium Crown Rot</b>			
<b>August</b>	Phoenix/FL 91	Phoenix/FL 91	Phoenix/FL 91	Phoenix/FL 91
<b>September</b>	FL 91/FL 47	FL 91/FL 47	FL 47	FL 47
<b>October</b>	FL 47	FL 47	FL 47	FL 47
<b>November</b>	FL 47	FL 47	FL 47	FL 47
<b>December</b>	FL 47/Tygress/SVR 200	FL 47/Tygress/SVR 200	Tygress/SVR 200	Tygress/SVR 200
<b>January</b>	FL 47/Tygress/SVR 200	FL 47/Tygress/SVR 200	FL 47/Tygress/ SVR 200	FL 47/Tygress/SVR 200
	<b>Fusarium Crown Rot</b>			
<b>August</b>	Phoenix	Phoenix	Phoenix	Phoenix
<b>September</b>	Sunkepper/Crown Jewel	Sunkepper/Crown Jewel	Sunkepper/Crown Jewel	Sunkepper/Soraya
<b>October</b>	Soraya/BHN 585	Soraya/BHN 585	Soraya/BHN 585	Soraya/BHN 585
<b>November</b>	Soraya/BHN 585	Soraya/BHN 585	Soraya/BHN 585	Soraya/BHN 585
<b>December</b>	Sebring/BHN 585	Sebring/BHN 585	Sebring/BHN 585	Sebring/BHN 585
<b>January</b>	Sebring/BHN 585	Sebring/BHN 585	Sebring/BHN 585	Sebring/BHN 585

In Southwest Florida tomato variety recommendations are normally based on disease packages, especially resistance to soil pathogens prevalent in the area and not on optimal flower and fruit set temperature and RH which is a main driving force for increasing tomato production.

# Conclusions

**Temperature and RH are out of the grower control. Sometimes you have to wait for favorable weather conditions.**

**Now, if weather conditions are optimal and other growers are not having fruit set problems, you should consider the cultural causes of tomato blossom drop.**

**Selecting a suitable variety, adequate N fertilizer, water and controlling insect and diseases will potentially insured high yields.**