Effects of Sunlight on the growth of Tomato Plants

**Slide 1:**

The following presentation aims to demonstrate that exposure to sunlight affects the growth of tomato plants. We intend to demonstrate this clearly, step by step.

**Slide 2:**

First I will go into a little detail about the plant itself, and talk about its characteristics.

**Slide 3:**

Then I will discuss how it is grown, both in the wild and domestically in gardens. Finally, I will explain how direct exposure to sunlight increases the growth of tomato plants, using a variety of sources and images to prove this point.

**Slide 4:**

The technical term for the tomato plant is "Solanum Lycopersicum". The plant is from South and Central America, and thrives in hot, sunny climates, often requiring a greenhouse to grow in colder areas that have less direct sunlight. The fruit of this plant is of course the tomato, which is sometimes mistaken for a vegetable. The fact that the plant grows in warm climates already shows us that the plant requires and feeds off of sunlight, but to demonstrate this scientifically we must explore the technical details of how exactly sunlight affects the plant.

The tomato plant, like most plants, relies on three processes for its nutrients. Those processes are

**Slide 5:** photosynthesis

**Slide 6:** respiration

**Slide 7:** and transpiration.

**Slide 8:** Photosynthesis is a process that allows plants to take energy directly from sunlight, feeding them and causing them to grow, just like we take our energy from the food that we eat. Out of these three processes, this presentation will mostly focus on the photosynthesis of the tomato plant, to show how the plant transfers light energy into chemical energy in order to make glucose for sustenance.

**Slide 9:** The plant cells contain tiny organelles called "chloroplasts", shown here in a microscopic image. The next slide contains a diagram of a chloroplast in greater detail.

**Slide 10:** The function of the chloroplast is to facilitate photosynthesis. As you can see in this image, there are many parts of the chloroplast. The sunlight enters the chloroplast, and the energy from this light is captured by the grana inside. Several things are happening at this point, as you will see in the next image. The plant is also working to create oxygen - however, the presentation will focus for now on the extraction of light energy. So, light enters the grana, and the remaining energy is transported to the stoma, where carbohydrates are made. These are then transported throughout the plant for sustenance or food. This is a basic explanation of how the tomato plant "eats" by being exposed to sunlight. The processes discussed just now can be seen in this next image, which is a flowchart describing photosynthesis.

**Slide 11:** As you can see, the process is outlined here in this image - you can take a moment to read it. So, now we know more or less how tomato plants use sunlight to feed themselves. We can assume that if a tomato plant is exposed to sunlight, it will grow (as long as it has water and other things needed for growth). Because a plant also needs minerals in the water to grow, sunlight is not the only factor in the growth of a plant. However, because the plant will die in natural conditions without sunlight, it is clear that a certain amount of sunlight is necessary for tomato plants to grow - without it, growth is completely impossible.

Recently, scientists in the Netherlands have tried to genetically modify tomato plants to allow them to grow 4 hours a day under artificial light. This is an interesting scientific project that may help us to understand even more about the growth of these plants. It seems that unlike many other plants, which can grow constantly, wild tomatoes need a break in growth or they will become sick and die. Their leaves will turn yellow and the plant will slowly stop growing, as seen in this next image.

**Slide 12:** By identifying and using a protein known as CAB-13, scientists can breed a tomato plant that can grow all day and all night under artificial lights. There has been some success in developing this plant, although it is not ready for global consumption, and of course, this is a genetically modified plant - not a natural tomato plant. So, while tomato plants need a certain amount of sunlight to grow, too much light can also have negative effects on their growth.

**Slide 13:** This image is taken from the study conducted by scientists in the Netherlands, and demonstrates the effects of over-exposure on different tomato plants. There are many different types of tomato plants, as seen here.

**Slide 14:**

One very informative source on the growth of tomato plants regarding their light intake is the study conducted Dietmar Schwarz, Andrew Thompson, and Hans-Peter Klaring in 2014 called "Guidelines to use tomato in experiments with a controlled environment", which explored the ideal amount of light needed to grow a tomato plant. A quote from this study states that "Plants grow, flower, and develop fruits well at daily light lengths between 8 and 16 hours. The required daily light integral of an experiment depends on growth stage and temperature investigated."

What does this mean?
In more simple language, this means that while there are several different types of tomato plants, each with different needs, the ideal amount of exposure to direct sunlight required for a tomato plant to grow is anywhere between 8 and 16 hours a day. This is the amount of sun exposure that will increase the growth of a tomato plant.