

Article

## Taxonomic Study Of Tomato Plant *Lycopersicon Solanum*, Its Diseases and Methods Of Controlling Them In Kirkuk Governorate / Al-Hawija District

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**Abstract:** The research dealt with a comprehensive definition of the structures of tomatoes (*Lycopersicum Solanum*) - its classification and determining its growth conditions. The word tomato refers to both the fruits and the plant, which are characterized by their smooth, round shape, light acidic taste, and are usually juicy. Its original homeland is South America, and then its cultivation spread throughout the world until it reached Iraq, especially in the district of Al-Hawija, where it is famous for its cultivation to this day. The varieties of tomatoes (Plum, Cherry, Ribbed, Brandywine) were studied. In addition to noting the increasing demand for tomatoes in Iraq due to their benefits, as they are used in many industries It is a converting tomato paste, ketchup, and salads and is beneficial for some heart diseases because it contains the lycopene formula, which is considered an antioxidant The study included morphological characteristics such as root, stem, leaves, flowers, fruits and seeds, in addition to Diagnosis of diseases affecting tomato plants such as bacterial wilt, sunburn, bacterial spot, smoke mosaic virus, fruit flats, fruit top rot, bacterial canker and leaf curl virus The factors that cause it and ways to combat it

**Keywords:** Pome - Cherry Processing Industries, Lycopene, Diseases, Bacterial Wilt Fruit Stem Cracking.

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### 1. Introduction

The increase in the world population has led to an increasing demand for singing, and Iraq has recently witnessed a significant increase in growth Demographics, which required taking field measures to achieve self-sufficiency. Given the human need for some vegetable crops throughout the year, especially those widely consumed, such as tomatoes, they are grown in a medium that does not allow them to grow. Plant production depends on the availability of nutrients and water in the soil on the one hand, and on the other hand, it depends on the availability of Special rates of environmental factors such as light, heat and humidity (Nihad, Sally .,2020). Tomato fruits are considered a very desirable food item due to their taste and nutritional qualities, as they contain sugars, minerals, vitamins and even proteins (Al-Sayed .,2006) Tomato plants are affected by many diseases Viral, bacterial, fungal physiology( Al-Essa .,2017)

Tomato is an annual herbaceous plant that belongs to the Solanaceae family, and is classified among the most important Vegetables contain nutrients that are recommended to be eaten daily in limited quantities because of their role in the continuation of various

vital functions. Tomato varieties differ according to the mechanisms used in planting, and the conditions of the agricultural environment that affect the morphology and physiology of tomatoes. A lack of nutritional elements in tomatoes also leads to exposure to diseases (Nihad Sally .,2020)

Research objectives

1. Determine the environmental conditions suitable for tomato growth.
2. To show the importance of tomatoes in the diet and how to use them as a treatment for some diseases.
3. Highlighting the harm of tomatoes to humans if consumed daily
4. Diagnosis of diseases affecting tomato and date plants and how to combat them in Al-Hawija District.
5. Knowing the mechanisms of tomato production and developing its cultivation under climate change conditions.
6. Identify the different varieties of tomatoes grown in that area

## 2. Materials and Methods

### Tools used

- Cartoon papers (background for pictures)
- 30cm ruler
- 180cm tape measure
- Sharp knife, scissors, camera
- Cellophane paper

### Study area Study earis

The study area, which includes Al-Abbasi sub-district/Al-Hawija district, is characterized by extensive tomato cultivation, The study area was 5 dunums (one dunum equals 1000 m).

### Specemens Collection-

Tomato samples *Lycopersicon esculentum* were collected by field trips from the beginning of February 2023 to the end of July 2023, where the plants were collected during the two stages of florist The fruits were studied and their morphological characteristics were diagnosed..

## 3. Results

A tomato plant Tomatoes are grown in the genus *Lycopersicon*, belonging to the Solanaceae family, All over the world for its smooth, round or irregularly shaped juicy fruits (1994 - Chaux et Foury) The word tomato refers to both the plant and the fruit, and the fruit has a mild taste, Acidity The number of tomato varieties is estimated at more than 4,000. The tomato plant has a strong smell and is found in On its stems are small hairs. The tomato fruits are green at first, but most of them turn into, Red, orange or yellow when ripe, tomatoes grow well in warm, fertile soils

In areas exposed to direct sunlight for at least 6 hours a day, tomatoes are grown in Almost all types of land and gives a good crop from a relatively small area, so it is considered one of the crops, A favorite for home garden cultivation (Alsaed., 2006).



### **Photo (1) Tomato plant spread**

Tomatoes in Central and South America (Jaloul and Badie .,2004) were transferred from Mexico by the Asean priests to Europe in the mid-sixteenth century AD and then cultivated as food (Jaloul and Badie., 2004). As for the annual global production of tomatoes, it is about 80 million tons. China is considered the largest producer of tomatoes, followed by the United States, Italy and Egypt. China's tomato production is about 13 million tons annually, while its commercial production in the United States of America is more than 11 million tons (Agromine Info). Tomatoes are considered one of the most prominent vegetable crops economically and the most widely distributed in the world (Khwairakpam et al., 2012).

### **Other names for tomatoes**

The names of tomatoes vary from one country to another. Some call them tomatoes (Hayek ., 2001) or tomato or al-wata or matisha, while in Iraq they are called tomato. The name tomato comes from the Artic language in central Mexico and is derived from the Nautilus word Tomatl, literally (swollen date) (Jaber.,1987) and is called algarden tomato.

### **The importance of tomatoes**

Tomatoes are considered one of the most important vegetable crops (Foulad, 2012) due to being an important crop in the diet that achieves food security for the turbulent population increase (Morsi et al., 2013), in addition to being one of the crops that the majority of the population eats fresh, cooked or processed . ( (Obaseki, Obikwe et al.,1987

Tomatoes play an important role in human nutrition (Arab et Steck., 2000) due to the acids they contain Sugars, minerals, fibers and vitamins (Bradley 2003) and water constitutes about 94% and it is free of Cholesterol and low in fat (2000) Agarwal et Rao), and many other nutrients contribute to The compounds contained in tomatoes help prevent serious diseases such as cancer, heart disease, and ((Juroszek., 2009) Blood vessels.

### **Tomato harms**

1 It causes hypersensitivity in some individuals, which leads to the secretion of histamine in the external areas of the The body, such as the skin, eyes, respiratory and digestive systems, and the allergy appears in the form of a rash, eczema and swelling of the face, mouth and teeth, in addition to spasms in the digestive system such as abdominal pain Nausea, diarrhea, vomiting and may lead to increased coughing, sneezing, runny nose and shortness of breath(Michael.,2017)

-People with psoriasis are advised to avoid eating tomatoes because they may cause an outbreak .(Elea, 2015)

-Tomatoes are dangerous if consumed in large quantities by patients with kidney problems because they contain large amounts of potassium, which the kidneys cannot remove from the blood (Megan,2016)

Risk of poisoning from the sap used in tomato cultivation that remains stuck to the peelTomatoes (Megan, 2016) Nutritional uses of tomatoes Due to the sour taste of tomatoes, people use them as a type of vegetable. They are considered a main ingredient in the kitchen, as they are included in many salads and dishes, and are also consumed as juice (Maryam, 2020) And tomato processing industries Tomatoes are consumed in many ways. They can be used as a fresh fruit without additives, dried, concentrated paste or (Salles, 2008). The most famous sauce is ketchup Tomato paste production: As in the type Solanum Brandywin in factories or at home Ketchup making as in Solanum Cherry Sun-dried tomato industry: All types are suitable for drying For the botanical classification of tomatoes Tomatoes are scientifically known as *Lycopersicon esculentum*, as it was identified by the scientist Linne in the year (Munro et al., 1997) Solanum Lycopersicum 1753 and gave it the name Spichger) (Dupont et Guignard., 2012) Tomatoes are classified into the following botanical taxa according t(et al., 2004)

Table (1) Botanical classification of tomatoes *Lycopersicon esculentum*

<b>Plantae</b>	النباتات	المملكة
<b>Magnoliophyta</b>	نباتات زهرية	الشعبة
<b>Magnoliopsida</b>	ثنائية الفلقة	الصف
<b>Asteridae</b>	النجمية	تحت الصف
<b>Solanales</b>	باذنجانية	الرتبة
<b>Solanaceae</b>	الباذنجانية	الفصيلة (العائلة)
<b>Solanum</b>	باذنجانية	الجنس
<b>Lycopersicum</b>	الطماطم	النوع

Botanical description of tomato plant Tomato is an annual herbaceous plant, varying in length from 35 cm to more than 4 meters depending on the variety and method of cultivation, fertile and self-pollinated, grown in temperate and hot regions (Jalloul and Badie, 2004), (Dumortier., 2010), (Guy., 1967). As its parts are characterized by: \

#### -Root 1

the root root be a wedge in the case of planting seeds in directly in the permanent ground and when the seedlings are transferred and planted again, the sphenoid root will die and form new roots that extend horizontally and do not go deep into the soil and reach their horizontal spread of more than 60 cm as transverse roots are formed, on the hold of the stem buried under the soil (Najdat, 2008).



Photo(2) shows the roots of the tomato plant

- ❖ **Stem stem:** be erect or creeping growth. It is 40 cm to four meters long. It is full and contains secretory glands . Its surface is covered with thick bristles (Benhamza et Bourras.,2013).

Where erect growth is in the species *Solanum Cherry*, *Solanum plum*. In the species *Brandywine Solanum*, the stem is groundbreaker (creeping).



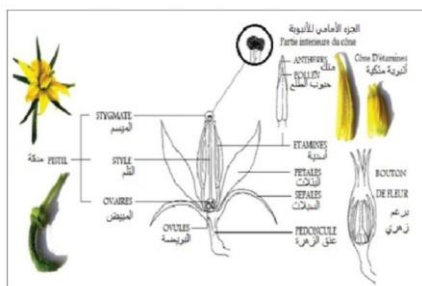
**Photo (3) shows the stem of the tomato plant**

**Leaves:** The leaves of the tomato plant are yellowish-green in color, alternately pinnate compound, lobed edges, aromatic and their surface is covered with bristles (Chergui et Guermit., 2016).



**Photo (4) shows the leaves of the tomato plant**

**Flowers** Flowers are found in racemic pink inflorescences, the number of flowers per inflorescence ranges from (4-8) flowers (Najdat, 2008). It is a symmetrical hermaphrodite, consisting of five separate green sepals and five conjunctive petals of bright yellow color, five suprapetal stamens whose filaments are short and tense that are long and conjunctive and form the tubule that surrounds the baggage and two conjunctive carpels (Reguieg.,2016).



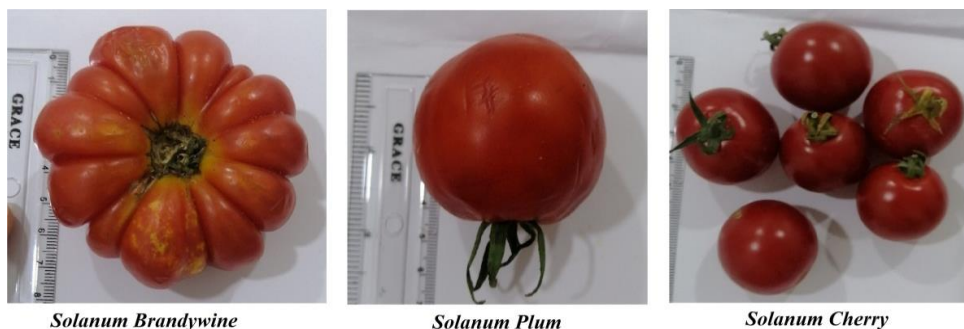
**Photo(5)Tomato Flower (Original)**



**Photo(6) Tomato flower longitudinal section**

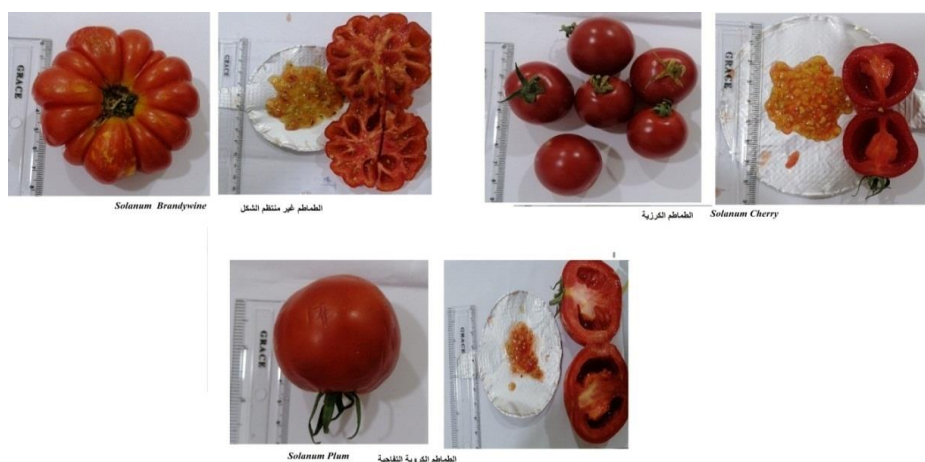


- ❖ **Fruits:** be fleshy in different forms, including cherry small size as in the type *Solanum Cherry* and irregular shape ribbed as in the type of *Solanum Brandywine* and circular (apple shape) as in the type *Solanum Plum*, where the number of chambers ranges from (2-18) chamber, corresponds to the color of fruits with the presence of red lycopene pigments (Lycopena) and yellow carotene (Carotein), (Najdat, 2008). As for the juice of the fruit, it may be in a large proportion in the cherry and ribbed types, while in the third type the apple is very little.



Photo(7) shows the fruits of the tomatoes under study.

**Seeds:** numerous renal or pear-shaped, densely haired, 3-5 mm long and 2-3 mm wide, the embryo is surrounded by endosperm (Naika et al., 2005). Where the seeds in the *Solanum Brandywine* and *Solanum Cherry* species are numerous while in the *Solanum Plum* type the number of seeds is limited.



(8) The original photo shows the fruits and seeds of the tomato plant *Lycopersicon*  
**Table 2 shows some of the phenotypic characteristics of the species under study for the tomato plant..**

البذور	عصير الثمرة	حجم الثمرة	شكل الثمرة	نوع الساق	classification
قليلة العدد	قليل جدا	متوسطة	دائرية	منتصب/ قائم	<i>Solanum plum</i>

كثيرة	كثير	صغيرة	دائرية	منتصب/ قائم	<i>Solanum cherry</i>
كثير جدا	كثير جدا	big	مضلعة (غير منتظمة الشكل)	repent	<i>Solanum brandywine</i>

The life cycle of the tomato plant The tomato plant is considered a warm weather plant Season Crop \_ Warm and its growth requires a warm frost-free season (18-29 m0), for a period of not less than 4 months from the beginning of planting until the maturity of fruits (Obaidi, 2012), where the germination stage to flowering takes 7-8 weeks, while the stage extending from flowering to fruit ripening takes 7-9 weeks (Benhamza et Bourras). 2013). **This cycle can be described as five basic biological phases (Garnham., 2017).**

**Germination stage:** begins with the growth of the embryo inside the seed thanks to the presence of warmth and moisture, the root extends to the bottom in search of moisture and nutrients after which oval seedling leaves (cotyle) appear on the surface of the soil  
Vegetative growth stage: This stage corresponds to the physiological production (leaves stem) and the first appearance of flowers..

**The reproductive stage (flowering):** corresponds to the period of flower and fruit production, and ends at the ripening of fruits. 4\_ The stage of pollination and fertilization: The pollination in the tomato plant is self-pollinating by (95-99) % in nature due to the presence of the stigma inside the staminal tube, which plays an important role in the arrival of pollen grains to the flower stigma itself after the opening of the mutok, and cross-pollination occurs by insects by (1\_ 5) % (Melo., 1989), (Chamarro., 1994). 5\_ Fruit ripening stage: This stage starts from 7 to 10 days before the first harvest of fruits and ends at the final harvest (Guermi et Chergui., 2016).).

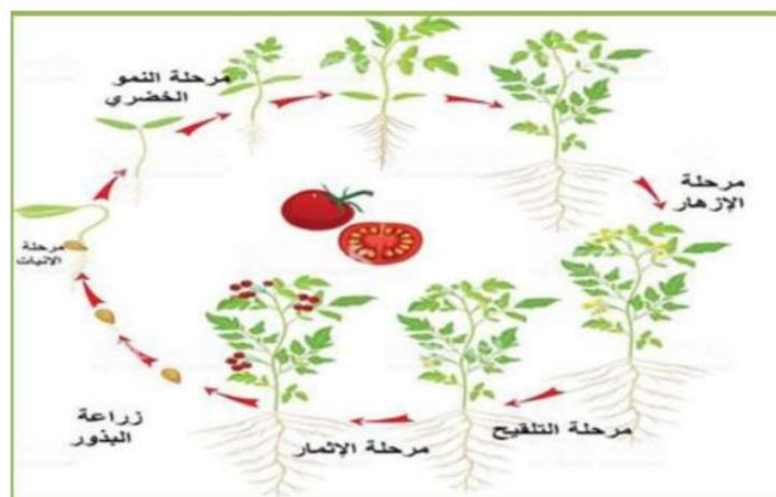


Photo (9) Biological cycle of tomato plant (Botanika.,2016)

**Suitable conditions for the growth of tomato plant Suitable soil:**

The tomato plant grows in various lands, but it is found in fertile lands. Light: The tomato plant should be exposed to light at least 6 hours a day. Temperature: Temperature is an important factor for the germination of tomato plant seeds, as the seeds germinate after 6 days at a temperature of 25-30 ° C0. Humidity: Tomato cultivation is available when

a humidity of 60-65% is available. Ventilation: The availability of ventilation in the tunnels that grow tomatoes helps to reduce the percentage of moisture in addition to the vibration of the flowers, helping to complete the pollination process. Fertilization: Dip seedlings before seedling in a suspension of biofertilizer (Halex) for a period of 10 \_ 15 minutes in order to early flowering, increase productivity while improving the qualities of fruits, as well as increase the ability of plants to resist infection with nematodes and soil fungi. Irrigation: Take into account regular irrigation and determine its date according to the nature of the land, temperature, and stage of growth (plant age), at the beginning of growth is non-existent irrigation in order to help the root system to spread, and be regular when flowering and form nodes, while reducing irrigation inage), at the beginning of growth is non-existent irrigation in order to help the root system to spread, and be regular when flowering and form nodes, while reducing irrigation in the period of fruits....

3Diseases affecting tomato plants The most important diseases affecting the tomato plant (Al-Huwaidi et al., 1998) (Young et al., 1986; Blandcrad, 2009) includes Fungal diseases: include \_ wilt: is the yellowing and wilting of the leaves in addition to the color of the vascular system of the plant in brown. It is caused by the fungus *Fusarium Onysorum \f.sp.lyeopersici* . The disease can be controlled by implementing a comprehensive hygiene program for workers, sterilizing pruners and other equipment to reduce the spread of the disease, as well as avoiding working with plants when they are wet as workers can easily spread bacteria to nearby plants



**(10) Shows that the tomato plant has wilt disease**

\_ Early blight: It is the appearance of small blackish-brown spots, which quickly enlarge and the leaf becomes yellow. It is caused by the fungus *Ahernaria solani*. They are controlled by a fungicide spraying program for the plant



**(11) The photo shows that the tomato plant is infected with early blight.**

**Powdery mildew: It is the appearance of green to yellow spots on the upper surface of the leaf. Caused by the fungus *Leveillula taurico***





2. Photo (12) shows the tomato plant with powdery mildew

Bacterial diseases: include \_ scabies or bacterial spot: symptoms consist of spots that take the form of scabies and the spots are high or prominent from the surface of the fruit. Vesicatoria



Photo (13) shows that tomato fruits are infected with scabies or bacterial spot

Bacterial ulceration: symptoms dark brown spots on the leaves, small yellowish areas on the stem, the peel easily detached from the wood, white spots with a black center on the fruits.



Photo (14) shows the infection of bacterial ulceration of tomato fruits

Viral diseases: include \_ Parasitic virus smoke (TMV): symptoms of the appearance of spots on the leaves and yellowing and the edge of the leaf becomes more solid and the cause of it is the Tobacco Mosaic Virus



Photo (15) shows that the tomato plant is infected with smoke mosaic disease

\_ Yellow leaf curl virus (TYLCV): its symptoms are deformations of the leaves, leading to small leaf size and yellowing, plant growth stops. And the cause of it is *Bemisia tabaci* . This disease can be controlled by using resistant varieties and removing solanaceous weeds located near the tomato crop.



Photo (16) shows that the tomato plant is infected with leaf curl virus disease

Physiological diseases \_ cracking of fruits: symptoms of cracking in the fruits and increased irrigation increases cracking and fruits become infected with rot, one of the causes of which is the discharge in irrigation, and excessive fertilization.



**Photo(17) shows that tomato fruits are infected with cracking disease.**

\_ Sun blight: symptoms of the appearance of white spots on the green fruits and then turn to a pale yellow color at maturity, causing the exposure of the fruits to the sun. The disease can be controlled by ventilating crops and maintaining levels of humidity and temperature control that cause global warming that can help reduce this disorder and losses can be reduced by pruning and harvesting carefully to reduce leaf fall and exposure of fruits to direct sunlight.



Photo (18) shows the sun blight disease of tomatoes

\_ Fruit top rot: symptoms The appearance of a small water spot at the tip of the fruit pink may grow until it pervades about half of the fruit. The pathogen of this physiological disease is due to the water imbalance between the leaves and fruits.



Photo (19) shows the disease of fruit top rot in tomatoes.

Table 3 shows the disease infection of the varieties under study.

الأعراض التي تصيبها	classification
1. لفحة الشمس 2. البياض الدقيقي 3. الجرب البكتيري 4. التقرح البكتيري 5. التشقق	<i>Solanum plum</i>
He didn't get any disease.	<i>Solanum cherry</i>

<p style="text-align: center;">الذبول فيروس موزائيك الدخان فيروس تجعد الأوراق اللفحة المبكرة عفن قمة الثمرة</p>	<p style="text-align: center;"><i>Solanum bradywine</i></p>
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#### 4. Discussion

Through our study of tomato plants in Al-Hawija district, we found that there is a great demand for planting this crop from the genus *Solanum*, as we noticed the cultivation of 3 types of this genus, including the ribbed type *Solanum* cherry, the cherry *Solanum* plum, and the apple *Solanum* Brandywine. It is considered essential in the diet of this region, in addition to the fact that most people convert the ribbed type *Solanum* Bradywine tomatoes into homemade tomato paste or cut them into round discs, dry them, and use them in the winter because this type contains a lot of juice. It is also used fresh or cooked and in salads and other dishes.

We noticed that tomatoes are useful for humans in treating many diseases, but their results are counterproductive. If consumed daily. Through the research results as shown in Table No. (3), it is noted that the tomato plant varieties in this. The area is affected by some fungal, bacterial, viral and physiological diseases, as it was infected with The variety *Solanum* plum was infected with powdery mildew caused by *Leveillula tauricia* and was controlled by spraying the plant with fungicides at a rate of 1 liter of water/100 cm<sup>2</sup> in addition to dusting with fine sulfur powder since the morning when there was dew. Also, the same variety was infected with sunburn due to high temperature and exposure of tomato fruits to direct sunlight due to incorrect planting. We also found that this variety is infected with bacterial blight and bacterial scab, which are caused by bacteria, and it was infected with fruit cracking disease and was treated by regularly watering the plant and stopping the addition of fertilizer to the plant. As for the second variety *Solanum* Brandywine, it was infected with the following diseases: smoke mosaic virus, leaf curl virus, early blight, leaf apex rot, and wilt These diseases were controlled by removing the bushes and nightshade weeds near the tomato plant and burning them away, and reducing irrigation from time to time in order to occur Financial balance between leaves and fruits to eliminate the disease of the top rot of the tiger As for the last variety, *Solanum* cherry (cherry tomato), it was not affected by any disease because this variety is newly planted in this region and the land designated for it has not been planted for 3 years and is called (1) fallow land.

#### 5. Conclusion

Conclude the study connecting back to the aim of the study.

Through our study of this crop, we concluded the following The importance of this fruit in particular in Iraq, especially in Al-Hawija district, and the farmers' interest in it.

- Cultivate it because it is essential in our diet.
- The harm of tomatoes is great if they are consumed almost daily by humans.
- How to protect tomato crops from diseases and damage.
- Tomato plants are affected by some diseases as a result of some fungi, bacteria, viruses, in addition to
- To excessive watering, fertilization and exposure of the fruits to the sun.
- .The suitable weather for growing tomatoes is moderate or hot, while the suitable land for planting it is fertile soil



### Recommendations

1. Farmers should be made aware of modern agriculture.
2. It is better to grow new varieties of tomatoes.
3. Optimal use of doses and methods of administration.
4. Taking care of the plant by following it
5. Regular watering of this plant.
6. Advice on combating diseases that affect tomato plants early

Developing and improving the processing industries and storage methods for this valuable product. Wash tomatoes well before eating them to prevent the risk of poisoning.

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